Exploring The Emergence Of Chikungunya Virus In The Adult Population Of Grenada

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From December 2013 to March, 2015, a total of 22,283 confirmed/probable cases and 863,207 suspected cases of Chikungunya were reported in the Caribbean. Limited information exists to accurately inform the public and have effective case management for this emerging infectious disease. The purpose of this study was to assess perceived age group differences with respect to Chikungunya symptoms and factors that contributed to the differences. The practice of vector control was also assessed to determine its effectiveness towards prevention. A cross-sectional study sampling 154 participants was conducted from April to June 2015. Participants completed a 37 item questionnaire and were recruited from public places in Grenada. Knee joint pain (P<0.05) and persisting symptoms (rash P<0.05, muscle pain P<0.005, ankle joint pain P<0.05) were statistically significant for all age groups. No statistical difference was found for taking precautions before and after the outbreak for those who did and did not have Chikungunya. However, precaution comparisons for the home (P<0.001) and work (P<0.001) environments showed no significant difference before and after the outbreak. This study found that age was a factor for symptom development and persistence, and resistance to behavior change is an important factor for future epidemic responses and intervention studies.
Grenada is located in Eastern Caribbean and is home to a significant population of stray dogs. Stray dogs pose a serious public health risk, as they are associated with an increased prevalence of zoonotic disease. The purpose of this study was to evaluate Grenada's stray dog control practices and obtain the knowledge level of stakeholders involved with Stray Dog Control Program (SDCP). A mixed methods approach consisted of reviewing and collecting the following data in Grenada: regulatory and legislative documents, quantitative analysis of documented dog registration and vaccinations and interviews from key stakeholders associated with SDCP. Act 24 of 2002 provided adequate framework for stray dog control. Registration of dogs has been ongoing during the program, yet there has been an annual reduction in the number of dogs registered/vaccinated by the SDCP. Dog complaints and captures have increased during the same time period. There was a decrease in the number of dogs registered/vaccinated, (5751 dogs in 2010), (3721 in 2011), (3435 in 2012), (2781 in 2013) and (1971 in 2014). Meanwhile there was a steady increase in both dogs captured and dog related complaints. The expansion of Grenada's SDCP services is needed to reduce free-roaming dogs in public places.
One Health Approach: Introduction course among future One Health Workforce in Beranang Community Training Center, National University of Malaysia.

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The Department of Community Health, UKM has a long history and wide experience in training both the undergraduates and postgraduates in public health. To train future public health professionals in Malaysia, the multidisciplinary approach towards public health problems usually revolve around the medical disciplines. For example, during the course training in managing an outbreak of a zoonotic disease, the students are trained based on the limited domains within the medical field. The scope of trans-disciplinary cooperation is usually lacking outside these medical disciplines. Therefore, formalized and structured training must be developed to increase management competency among future public health professionals in Malaysia. The main objectives of the One Health workshop training were to strengthen the links and communication between stakeholders, to improve the different aspects of health and welfare of humans, animals and the environment. This paper describes our experience in conducting the One Health workshop training involving post graduate students from the Faculties of Medicine, Faculty of Health Sciences and Veterinary Medicine.
Food safety risks associated with persistent circulation of highly pathogenic avian influenza in Nigeria

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Highly Pathogenic Avian Influenza (HPAI) was first introduced into Nigeria in 2006 with resurgence in 2015. The 2015 epizootics peaked in January 2016 with over 100 cases within weeks in backyard farms and live bird markets (LBM). Poultry production chains and LBM operations presenting food safety and human exposure risks from a public health perspective were monitored. Impounded live and frozen chickens were analysed for HPAI (H5N1) by RT-PCR and virus isolation. Locations with the highest concentration of outbreaks are clustered within 10 meters of each other with direct, informal poultry supply lines to loosely operated LBM. HPAI were detected and isolated in cloaca swabs of sick birds and meat/offals of frozen chickens. Hence buyers and consumers of such infected products are prone to HPAI infection. During the 2006 outbreaks, single report of fatal infection associated with LBM was recorded. However, no human infection has been described in Nigeria despite HPAI persistent circulation in the current epizootics. Though, high cooking temperature may be effective in inactivating influenza virus. The risk of exposure may arise from handling, inhalation and under cooking of poultry products. Food safety measures need to be adopted to prevent food borne pathogens and public health threat
Women's Health, Livelihood and Biodiversity Conservation

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Human health, well-being and development are dependent on healthy ecosystems but globally, ecosystems are losing resilience and function as a direct result of land and marine degradation and overexploitation, pollution, expansion of agriculture and human infrastructure. Evidence for this includes climate change, biodiversity loss and the emergence of novel diseases. Efforts to mitigate against these changes include increasing conservation protected areas (PAs). An unintended consequence of this policy is that the costs to adjacent rural communities tend to be local and immediate whilst benefits generated are mostly externalized or inaccessible. Women are particularly vulnerable and are entangled into poverty cycles leading to further environmental degradation and decreased resilience. By examining the roles and responsibilities that local women have in managing resources at the human/animal/environment interface, we show how women and children are disproportionately affected by a wide range of health concerns, including infections (zoonotic and anthroponotic) and noncommunicable illnesses. The underlying drivers of disease are limited health care, restricted access to resources, malnutrition, air and water quality, human and animal conflict. We suggest that global conservation strategies need to be reassessed and that the acute problem of poverty with a gender perspective be made a priority around protected areas.
Strengthening the Integration of One Health Concept among current One Health Workers: Sharing Experiences from Malaysia

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Community Health Department, Faculty of Medicine, National University of Malaysia has conducted One Health Workshop from 5 till 7 October 2015 in Malacca, Malaysia. The objectives of the workshop were to train current one health workforce, strengthening the technical knowledge of one health workforce and to encourage networking and collaboration among one health workforce. The workshop was attended by 50 participants consisting of officials from the Ministry of Health and Veterinary Services Department as well as lecturers from universities. Participants were introduced with One Health concept and competencies, presented with overview of zoonotic diseases and services provided by Department of Veterinary Services in Malaysia. Speakers from Australia, Thailand and Malaysia shared their experiences in handling zoonotic diseases management using One Health concept. Participants were also exposed to a table top exercise in managing avian influenza outbreak. Another activity which was conducted was a video show of an epidemiological investigations of a zoonotic disease outbreak. The feedback from participants revealed that they were satisfied with the contents, suggested to have field visit and to involve more personnel from other agencies such as environmentalists, wildlife officers, travel agents and occupational and safety officers who deal with forestry and dairy farm.
One Health-Whose Health is It Anyway?

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As argued by Jonathan Patz in a recent Lancet article, novel global threats require a novel Ethics, which is arguably implicit in One Health. One Health (OH) is slowly but surely attracting the attention of bioethicists. The definition of OH usually consists of two components: 1) interdisciplinary collaboration with the goal of 2) optimizing the health of humans, non-human animals, and ecosystems. Absent the second component, OH is hardly of interest to bioethicists. However, it is exactly the second component that is largely missing in current OH literature and practice (and OH conferences).

In this paper, I will use a normative analysis and first examine the justification for the second component: why should we optimize the health of humans, animals and ecosystems? I will argue that, in addition to anthropocentric motives, we should do so for biocentric motives, because life *qua* life is morally valuable. Specifically, I will raise from the dead Albert Schweitzer's theory of 'Reverence for Life,' and argue for its soundness and plausibility as a secular theory. Next, using Schweitzer's theory, I will critically examine commonly cited examples of a OH approach, such as the past use of canary birds as sentinels for health risks to miners.
Budgeting and Portfolio Allocation for Biosecurity Measures

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This work presents a practical model for optimally allocating a biosecurity budget across: (1) different invasive species and/or different geographical areas occupied by a single species; and (2) different biosecurity measures (e.g., prevention, active surveillance for early detection, containment and eradication). The model is designed to assist in allocating budgets to minimise the expected costs of biological invasions, including damage and control costs, and to allocate a budget appropriately across different invasive species and biosecurity measures. The model is applied as a pilot study for allocating a budget optimally (unconstrained and with various fixed budget amounts) among four of Australia's invasive pests and diseases: Red Imported Fire Ants, Foot and Mouth Disease, Papaya Fruit Fly and Hawkweed. The model can readily be extended to consider more species and activities, and more complex settings including the cases where more detailed spatial and temporal information must be considered.
A Retrospective Assessment Of Malaria Incidence Trends And Their Association With Climatic Variables In Rural Gwanda, Zimbabwe, 2005-2015

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Malaria is a public health problem in Zimbabwe. However, there is paucity of information on the trends of the disease. We assessed the trends of malaria incidences and their relationship with climatic variables in rural Gwanda, Zimbabwe for the period 2005 to 2015. Ward level malaria incidence data was collected from the district health information system (DHIS) and health facilities while data on climatic variables was obtained from remote sensing. There were 246 confirmed malaria cases in the 3 wards (Buvuma, Ntalale and Selonga) for the period 2005-2015 with a mean incidence of 1.38 per 1000 population. The mean annual incidences fluctuated from 0 to 5.96 per 1000 population over the study period. There was no significant relationship between the trends of malaria incidence and climatic variables (temperature and precipitation). Fluctuations in malaria incidence show the need for stepping up of control efforts to avoid possible resurgence of the disease.
The effects of climate change on the harvesting and availability of mopani worms.

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Rainfall, high temperatures and drought affect the availability of mopani worms. Mopani worms are the larval stage of the emperor moth, *Gonimbrasia belina* also known as *Imbrasia belina*. Rainfall is essential in watering mopani trees (*Colophospermum mopane*) so as to grow the green leaves that mopani worms feed on. On the contrary, very high temperatures may destroy the mopani trees. The drought that prevails due to climate change in the Southern African Development Community (SADC) region has greatly affected the availability of mopani worms. As such, harvesters, who basically depend on mopani worms as a stable source of protein in their diet experience a shortage in protein. This paper addresses the effects of climate change on mopani worms' availability. The findings revealed that climate change has a negative and ripple effects on mopani worms availability, harvesting and nutritional status of populations in developing countries.
Brucellosis is a major public health problem. In Lubumbashi, killings discharge secretions are spilled into sewers and drains are poorly maintained. Brucella can survive longtime in mud and water. Runoff is a public health risk.

Working conditions at many local slaughterhouses increase the risk of zoonotic disease infections in human. This serological study is conducted to: Assess the risk related to meat handling and processing practices, Identify One Health Core competencies necessary for implementation of Assessment Mitigation Performance (AMP) model, Determine brucellosis infection prevalence among female goat meat traders.

A Rose Bengal based serological study indicated brucellosis anti-bodies presence. Through observation and semi-structured interviews, handling and processing practices were documented.

Serological test revealed brucellosis presence in goats (n = 2/104), in slaughterhouse personnel (n= 5/47) and in female meat traders (n = 1/15). Daily, nearly 40 fetuses and a large quantity of blood from slaughtered animals are left on a slippery floor. Three One Health core
competencies were identified as necessary for the implementation of AMP: Communication, Culture and belief, and Management. Authors recommend that DRC slaughterhouse leadership train personnel in these soft skills.
Agronomic Bio-fortification: A Missing Link In Alleviating Dietary Micronutrient Deficiencies In Southern Africa?

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The high prevalence of micronutrient malnutrition of up to 40% among rural populations in Southern Africa often emanates from lack of diversified diets and high reliance on nutritionally poor staple cereals produced on micronutrient-deficient soils. Approaches for improving the nutritional wellbeing of humans such as food diversification, supplementation and industrial food fortification are often not commonly used by resource-constrained smallholder farmers in developing countries due to either high costs or inaccessibility. In view of the more urgent need to combat hunger and malnutrition, this research focused on understanding how farm-level knowledge of soil geochemistry and agronomic bio-fortification of staple cereals and legumes with Zn-enriched fertilizers can effectively and sustainably address on-farm micronutrient malnutrition. The diversity of micronutrient status on smallholder farms and inadequacy of current farmer soil fertility management practices to address the growing problem of micronutrient deficiencies in staple cereals was evident. Fertilization of maize and cowpea with locally available organic nutrient resources, legume-cereal rotations and different Zn fertilizer formulations supplied additional levels of Zn and enhance grain Zn concentrations from 18 - 40 mg kg⁻¹ required for improved human nutrition. These findings therefore suggest a high potential for enhancing crop productivity and human nutrition especially of women and children.
Potential Zoonotic Transmission Of Mycolactone Producing Mycobacteria Between Humans And Animals.

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The mode of transmission the non-tuberculous \textit{Mycobacterium ulcerans} (MU) still remains unclear and compounding this is the fact that mycolactone, the major virulence factor, has been found in other environmental mycobacteria species (MPMs) which cause disease in some animals. MU causes a debilitating human skin disease known as Buruli ulcer. Although there are no reports of human disease caused by these novel MPMs, they share similar ecological niches in the endemic aquatic environments. Our work is based on the One Health concept and suggests that overlapping environmental habitats of the pathogen, animals and humans directly influence transmission. Using Variable Number Tandem Repeat (VNTR) four MPM genotypes, were identified in both human and environmental samples with one type (Y) being common to all. We also report the first detection of MU infection in the African small rodent \textit{Mastomys natalensis} with 98% and 94% identity to MU strain Agy99 after IS2404 sequencing. These results suggest that MU and MPM transmission could involve several routes where humans have contact with risk environments, which may be further compounded by water bodies acting as vehicles for disseminating strains.
The emergence of antimicrobial resistance (AMR) is a global public health concern and requires an integrated approach for its intervention. AMR development has been on the rise and superseded the discovery of new antimicrobial molecules. Enteric bacteria can transfer their resistant genes from animals to man and vice versa through food chain in the gut. AMR presents a major threat in the control of zoonotic enteric infections. The present article reviews enteric bacteria responsible for diarrheal conditions in East Africa and their threat to therapeutic management. The causes of AMR in these settings and interventions necessary among these enteric bacteria are discussed. *Salmonella* spp, *Shigella* spp, *Vibrio* spp and *E. coli* remain important human pathogens that present most burden to common antibiotics. These enteric conditions are mainly hospital based (61%). However, in animals *Salmonella* spp and *E. coli* are the most important pathogens showing high resistance to commonly used antibiotics. Some actors identified as the causes AMR burden include indiscriminate use of antibiotics, variable quality of antibiotics, lack of awareness on AMR burden, poor regulation and limited resources in these countries among others. AMR burden containment requires multipronged one health programme employing appropriate mitigations for the actors of AMR emergence.
Highly Pathogenic Avian Influenza and the Spatio-Temporal relationship with climate in Central Java Province, Indonesia, 2009-2012

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There have been 199 confirmed cumulative human Highly Pathogenic Avian Influenza H5N1 (HPAI H5N1) cases with 167 deaths from August 2003 to July 2016 in Indonesia. Participatory Disease Surveillance and Response data collected between 2009-2012 in 4,617 villages were analysed with spatial Moran's I and Poisson space time scan statistics to identify clusters. Poisson regression was used to identify relationships between HPAI village incidence and rainfall and humidity. PDSR visited 43% (4,617/8,576) of total villages in Central Java. Of these visits, 56% were infected. The change in rainfall only increased HPAI incidence by 0.01%. HPAI incidence was 1.17 times more likely in high than low humidity (relative risk 1.17, 95% confidence interval 0.44-3). The spatial autocorrelation showed there was similarity in incidence from the first to the seventh geographically linked sub-districts (p<0.05). A spatial scan identified a primary cases cluster in eastern Central Java Province during February to March 2009; a second cases cluster was located in Banjarnegara district and surrounding areas, from December 2009 to March 2010. The spatial visual analysis showed the outbreak was
concentrated in a cluster that had the highest poultry distribution to other areas. This concentrated cluster could have spread HPAI more widely.

Key words: HPAI H5N1 in poultry, Spatial and Temporal Cluster, Climate, Indonesia.
Molecular Epidemiology Of Coxiella Burnetii Infection In Wildlife And Ticks Collected In Kenya

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Wild animals are important hosts for ticks and may act as useful sentinels for surveillance of diseases, including Q fever. A total of 152 blood samples and 851 adult ticks collected from free ranging wildlife species in Laikipia County and Maasai Mara national reserve in Kenya between 2012 and 2013 were tested for Coxiella burnetii by Polymerase Chain Reaction (PCR). The animals comprised of buffaloes, zebras, Grant's gazelles, waterbucks, Impalas, wildebeests, Topi and Coke's hartebeest. The ticks were 756 from Laikipia and 95 from Maasai Mara pooled into 137 and 95 samples of 1-8 ticks respectively. The pathogen was not detected in the blood samples and the tick pools in Maasai Mara. In Laikipia, the detection was highest in Rhipicephalus appendiculatus at 2 out of 53 (3.8%) followed by Rhipicephalus pulchellus at 1 out of 33 (3.0%) and Rhipicephalus evertsi evertsi at 1 out of 38 (2.6%). Partial sequences of the insertion element IS111 of the detected C. Burnetii showed 100% similarity to a strain isolated in Guyana. The detection of C. burnetii suggests that ticks from wildlife areas could act as reservoirs of this pathogen and demonstrates the likelihood of transmission of the agent to domestic animals.
A cross-sectional study was conducted in March 2016 to assess the need of mobile phone technologies for health surveillance in Benin. 25 medics, 33 vets and 72 respondents from the public participated from Southern Benin. Questionnaires were used to assess possession, use and need of mobile phone in health surveillance and interventions in Benin. All respondents possess cell phones and respectively 75%, 84% and 100% of the public, medics and Vets already use them for medical purposes. 75% all respondents acknowledged that the traditional surveillance systems in the country are ineffective and do not capture and share real time information. More than 92% of the respondents confirmed that mobile phones have potential to improve health interventions and surveillance in the country. Furthermore, all respondents adhered to a nascent project of mobile phone-based health surveillance and confirmed that there is no existing similar approach in the country. However, the most preferred methods by respondents for effective implementation of such platform are phone calls (96.92%) followed by SMS (49.23%) and smart phone digital forms (41.53%). This calls for the development of mobile phone-based surveillance network in Benin for timely and efficient one health surveillance leading to tropical diseases elimination.
Health Risks And Biosecurity Measures In Pig Production In Urban And Peri-urban Areas Of Morogoro Municipality, Tanzania

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A crosssectional study was conducted from October 2014 to January 2015 in Morogoro, Tanzania to assess health risks associated with urban and peri-urban pig production and identify available biosecurity measures. 282 pig farmers were enrolled and interviewed using questionnaires to assess husbandry systems and practises, animal waste management as well as biosecurity measures practised. Twelve key informants were interviewed on the subject. The study revealed that 48.6% of respondents were not aware of health risks associated with pig production. Approximately 9.2% reported to wear local protective gears (wrapping plastic bags on hands and local shoes known as Yeboyebò) while 19.1% did not have any protective gears. Only 0.4% generated biogas out of the manure. Animal quarantining was practised by 68.4%; presence of screening was 20.6%, while veterinary service was accessible to 66.3% of the farmers interviewed. Poor animal wastes disposal is becoming a major challenge to public and health as well as environmental health. Farmers should be advised and trained to generate biogas out of the manure, livestock officers should be supported with transport to ensure timely delivery of veterinary services to all the livestock keepers especially those who reside at the peripheral areas.
Bacteriological Quality Of Rastrineobola Argentea (Fine Fish) Along Its Value Chain In Lake Victoria, Mwanza, Tanzania

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A cross-sectional study was conducted to assess bacteriological contamination in Rastrineobola argentea along its value chain in Lake Victoria, Tanzania. Raw and dried on raised racks and on ground R. argentea were randomly collected from landing sites, drying areas and retail markets. Bacteria counts, antibiotic susceptibility and PCR were performed to detect Escherichia coli and Salmonella spp in the samples. Findings showed a significant difference in bacteria counts between raw, ground and racks dried R. argentea. Prevalence of S. typhimurium in raw R. argentea was 20% and in those dried on ground at processing and markets were 20% and 15%, respectively. Salmonella spp were not detected in R. argentea dried on racks and no S. enteritidis was detected in this study. For E. coli, raw R. argentea had $3.1 \log_{10} \text{mpn/g}$, those dried on ground had $2.7 \log_{10} \text{mpn/g}$ and on racks had $0.3 \log_{10} \text{mpn/g}$. Both Salmonella spp and E. coli were resistant to ampicillin, tetracycline and co-trimoxazole. Sun-drying R. argentea using racks is more hygienic than drying on ground as it provides good quality and safe fish for consumption. R. argentea were contaminated with antibiotic resistant Salmonella spp and E. coli of public health implications.
Molecular Epidemiology Of Africa Swine Fever Outbreaks In Tanzania

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Molecular epidemiological study was carried out from the ASF outbreaks which occurred between 2001 - 2013 by retrieving 32 sequenced isolates out of 57 isolates of ASFV P72 gene from the gene bank. The sequences were aligned by Mega 6 computer programme, and using Bioedit programme the phylogenetic tree were generated and used for analysis. Newly sequenced virulent isolate identified three clusters, one suggesting to have been derived from a sylvatic transmission cycle, another from domestic pig cycle and the last one a mixture of sylvatic and domestic pig cycles. Therefore, it is recommended that for control of ASF under this circumstance transmission cycles must be broken, more importantly, the sylvatic cycle by improving husbandry practices for domestic pigs.
Climate Change And Vector-borne Diseases: Use Of Participatory Epidemiology To Investigate Experience In Vulnerable, Cattle-keeping Pastoral Communities Of Monduli District, Northern Tanzania

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Climate change is predicted to increase incidence of vector-borne diseases (VBDs) in humans, however little is known about its impacts on livestock. Participatory epidemiological (PE) methods were used with Maasai pastoralists to establish local observations on East Coast Fever (ECF) and Animal Trypanosomiasis (AT). Data were collected between November 2014 and January 2015 in ten randomly selected villages involving gender segregated groups. Matrix scoring confirmed that Masaai easily recognise ECF and AT, and that these diseases ranked amongst the top five most important cattle diseases (strong agreement between informant groups; Kendall’s W=0.399 for men and 0.451 for women; p<0.01). All groups associated ECF with the wet season while AT was more variable throughout the year, with more cases reported in dry seasons. Likewise, different villages reported seasonal differences in occurrence of *Rhipicephalus appendiculatus* and Tsetse flies. Comparing 2014 to 1984, participant groups consistently reported declines in rainfall, vegetation cover, quality pasture, and increases in severe droughts. Experiences with ECF/AT and vector abundance were more variable across villages. Preliminary analysis reveals a complex interplay between human, animal and environmental factors, understanding of which is urgently required to devise approaches to mitigate effects of climate change in vulnerable areas.
Point Mutation Of Conserved Nss Cysteine Residues Prevents The Fatal Outcome Of Rift Valley Fever Virus Infection In Mice

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Rift Valley fever (RVF) is a zoonotic disease of great public and veterinary health importance with outbreaks resulting in severe socio-economical consequences. We rescued wild-type RVFV (SA35/74) as well as a mutant containing point mutations in the NSs gene, from plasmids using a T7-based reverse genetics system. BALB/c mice were inoculated subcutaneously with the wild-type and mutant viruses. Wild-type inoculated mice developed disease from 72 hours post infection and succumbed to disease within 48 hours post disease onset. Mice inoculated with the mutant virus survived until the completion of the study (14 days post infection) showing no signs of illness. Challenge virus was detected at high titres in serum, liver, spleen and brain of wild-type infected mice from day 3, and at lower titres in those inoculated with the mutant virus. Severe RVFV lesions (necrosis) were observed in the livers of infected mice. No viral antigen was detected by immunohistochemistry in liver samples collected from mice infected with the mutant virus, whereas liver samples from mice infected with the wild-type virus were positive for viral antigen. These data show that mutating a single conserved cysteine in the NSs protein significantly decreases virulence of RVFV in BALB/c mice.
Integrated Study Of African Swine Fever In East Africa Identifies The Disease Drivers And Provides Insights For Targeted Surveillance And Control

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We conducted studies to generate insights into factors influencing African swine fever (ASF) occurrence and control. Epidemiological research linked to laboratory diagnostics, mathematical modeling, social networks study and value chain analyses were used to generate evidence for control. ASF virus in internal tissues of healthy pigs demonstrated a carrier state. A 17% prevalence of exposure of pigs to bites by the ASF virus tick vector (Ornithodoros Moubata) was shown. High burden of other super-infections including helminthes, enteric viruses and ectoparasites was demonstrated in the pigs, portending reduced to increased host resilience and thus susceptibility to ASF virus. Critical ASF transmission paths and nodes using social networks analysis showed that pig value chain actors play a critical role in spreading the disease. Molecular characterization of ASF viruses in the area showed close similarity and limited diversity consistent with historical East African viruses from a genotype IX family. The study identified drivers for virus maintenance, transmission and spread, this understanding not only important in tracking virus movement but also important for trans-boundary surveillance of ASF. Results suggest need for innovative approaches for Prevention, Detection and Response (PDR) to ASF based on the epidemiological evidence to mitigate transmission and spread locally and globally.
Rift Valley fever risk mapping and modelling in Tanzania

Calvin Sindato Kimaro

Rift Valley fever (RVF) is an arthropod-borne viral zoonotic disease. The hypothesis tested in this study was that, "the risk of RVF occurrence is homogenously distributed throughout Tanzania". Retrospective study was set to describe the spatiotemporal pattern of RVF outbreaks using ArcGIS 10. MaxEnt modelling was used to predict habitat suitability for RVF occurrence. Cross-sectional study was carried out in domestic ruminants to validate predictive algorithms. Logistic regression model was used to analyse risk factors associated with RVF occurrence. Results show that between 1930 and 2007 a total of 10 outbreaks were reported in Tanzania with average inter-epidemic period of 8 years. Habitat suitability values for RVF occurrence were higher in the northern and central-eastern regions of Tanzania than the rest of the regions in the country. Soil type and precipitation of the wettest quarter contributed equally to habitat suitability (32.4%, each), followed by livestock density (25.9%) and rainfall pattern (9.3%). Ground-truthing of model outputs revealed that the odds of an animal being seropositive for RVF when sampled from areas predicted to be most suitable for RVF occurrence was twice the odds of an animal sampled from areas least suitable for RVF occurrence (95% CI: 1.43, 2.76, p < 0.001).
Viral Metagenomics Analysis Identify Pathogens Of Zoonotic Potential In Asymptomatic Pigs In East Africa

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Pigs harbor a variety of viruses in their gastrointestinal tract, some of them are closely related to human viruses and are suspected to have a zoonotic potential. Little is known about the presence of those viruses in smallholder pigs which are in close contact with human and wildlife. This study aimed to provide insight into viral communities, as well as characterization of enteric viral co-infections in smallholder pigs in East Africa using high-throughput sequencing and viral metagenomics approach on 12 asymptomatic pigs fecal samples. A total of 47,213 denovo assembled contigs were constructed of which 427 contigs (>200nt) were related to known viruses; mammalian viruses (53.4%), phages (17.3%), unassigned contigs (2.6%), the remaining contigs were related to either plant or insect viruses. The most frequent contigs related to mammalian viruses were homologous to the Astroviruses, Rotaviruses, Bocaviruses, Circoviruses and Kobuviruses. Other less abundant contigs were related to sapelovirus, swine pasivirus, posavirus, swine teschovirus and picobirnavirus. This study provides the first preliminary understanding of the diversity of fecal virome of pig populations in East Africa, which may be of help in the elucidation of the etiology of diarrheal diseases in pigs and identifying potential zoonotic and emerging viruses in the region.
Screening for bovine tuberculosis in buffaloes (*Syncerus caffer*) in Ngorongoro Conservation Area, Northern Tanzania: Implication for public health

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A study was conducted to assess the status of bovine tuberculosis (bTB) in African buffaloes (*Syncerus caffer*) that utilized the crater floor in Ngorongoro Conservation Area (NCA), northern Tanzania. Apparently healthy animals were randomly selected from herds in 9 randomly selected sites in the north, south, and east, central and western side of the conservation area. A total of 102 buffaloes from 16 herds were immobilized using a cocktail of 4-10 mg Etorphine hydrochloride (M99) and 60-150 mg tranquilizer (Azaperone tartate) and reversed, after sample collection, using 10-25 mg Naltrexone hydrochloride depending on age of animals. Blood samples were collected using heparinized tubes and incubated overnight at 37°C. Plasma were harvested and analyzed for gamma interferon (IFN-gamma) using sandwich Enzyme Linked Immunosorbent Assay (ELISA). Of the 102 animals sampled, 2 (2%) buffaloes were tested positive for bTB. Detection of bTB in buffaloes in crater, though in a low prevalence, potentially pose a challenge for public health and future conservation of wildlife considering the restricted movement of animals imposed by crater rim in NCA, behavior of buffaloes in transmission of bTB and its status as a maintenance host of bTB in Africa.
Behaviour Change In Commercial Poultry Farmers In Indonesia Has Improved Animal And Human Health.

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FAO has collaborated with the Government of Indonesia to control Highly Pathogenic Avian Influenza (HPAI) in poultry farms. The PVUK (Commercial Poultry Veterinary Services programme) trained 143 animal health officers from areas with high commercial poultry populations. Built trust between the government and the private poultry sector to jointly eradicate HPAI and concurrently increase poultry profitability. They provided technical assistance to 8,574 farmers through farm visits, surveillance and farmer training. Improved biosecurity, vaccination practices and farm management were the key activities and 445 farmers following the recommendation. Commercial poultry farms have created healthier, safer, and more comfortable environments for poultry, increased farm profitability and improved public health on the farms and surrounding communities. Key behaviour changes, including improved hygiene, dedicated footwear and clothing, have reduced disease introduction. Better waste management and carcass disposal have reduced environmental contamination from vermin and bad odours. HPAI outbreaks in commercial farms are reported to local clinics in case people present with respiratory signs. Information sharing between both sectors on suspect HPAI cases in poultry can initiate early detection and treatment of human infections. The one health approach addresses avian influenza and public health with interdisciplinary collaboration involving animal health, human health and environment sectors.
Communicating zoonoses: Exploring risks, perceptions, practices and beliefs among pastoralists in northern and eastern Tanzania

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Suspected zoonoses are reported through the medical authorities among pastoral communities in Tanzania. There is limited knowledge on how pastoral communities understand zoonoses in relation to their livelihoods, culture and their wider ecology. This study was carried out to assess knowledge and perceptions on zoonoses among pastoralists in Ngorongoro, Kibaha and Bagamoyo Districts. Qualitative interviews and participatory epidemiology were used. The understanding amongst pastoralists of zoonotic disease in these areas is still evolving, as there is no specific term in the local language that describes it. Pastoralists from Ngorongoro possessed a higher understanding on the existence of a number of zoonoses than others. Understanding of zoonoses could be categorized into two broad groups: a local syndromic framework, specific symptoms of a particular ailment in humans concurred with symptoms in animals, and the biomedical framework. While the knowledge about zoonoses is increasing, social and cultural practices maintaining social cohesion and certain passage rites will still put pastoralists at risk of zoonoses. Well-managed, equipped meat inspection practices could be used to advocate about zoonoses. These findings show how health trends are perceived, and how epidemiology and biomedicine are shaping pastoralists health perspectives while transforming people's conceptualization of life and health.
The Prevalence Of Methicillin-resistant Staphylococcus Aureus (Mrsa) Isolated From Domestic Dogs And Raw Bovine Milk In The Morogoro Municipality, Tanzania

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This study was performed to determine the prevalence of MRSA isolated from domestic dogs' nares and raw bovine milk in the Morogoro Municipality, Tanzania. Bovine milk samples (117) and 50 nostril swabs from dogs were collected and cultured to isolate S. aureus. PCR test detected 62 S. aureus identified from the coagulase-positive and two S. aureus from the coagulase-negative isolates. The susceptibility test for S. aureus on oxacillin (1µG), cefoxitin (30µg), clindamycin (2µg), vancomycin (30µg), trimethoprim-sulfamethoxazole (25µg), tetracycline (30µ) and penicillin G (10 IU) revealed a resistance of 8.52%, 4.35%, 23.91%, 5.16%, 37.33%, 44.30%, and 81.44% respectively to these antibiotics. PCR screening detected mecA gene in 9 isolates; 6 S. aureus (MRSA) from domestic dogs, 1 coagulase-negative staphylococci and 2 coagulase-negative S. aureus from bovine milk. This gives the MRSA prevalence of 12% in sampled domestic dogs; 4.17% and 2.38% of coagulase-negative S. aureus and coagulase-negative staphylococci respectively in the bovine milk samples. Molecular typing of the isolates is still in progress. This study reports for the first time the presence of MRSA and a presumptive coagulase-negative variant of MRSA in Morogoro, Tanzania. The detection of MRSA in domestic dogs and bovine milk indicates the potential public health threat in Morogoro.
Understanding The Dog Population Dynamics And Evaluation Of The Capture-neuter-vaccinate-release (Cnvr) Program In Bhutan

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In 2009 a capture-neuter-vaccinate-release (CNVR) programme commenced in Bhutan to control the dog population and to reduce the number of cases of rabies in humans and other animals. Household surveys were undertaken to describe the demographics of owned dogs. Series of field surveys were undertaken to monitor and evaluate the effectiveness CNVR programme and to assess the health status of free-roaming dogs.

More than half (53.3%) of the dogs presented to the CNVR clinic were free-roaming dogs. More pregnancies were presented from September to December. The total owned dog population was estimated at 71,245 with 24.4% of the households in the urban areas and 40.8% of the households in rural areas owning dogs. Free-roaming dog population size in Thimphu city area remained relatively constant as CNVR campaigns were regularly carried out. Neutered dogs had a significantly lower prevalence of antibodies to canine distemper virus (44.2%) and canine parvovirus (4.0%) than entire dogs (52.9 & 18.4%); and neutered dogs had higher body condition scores than entire dogs. This study indicates the need to carry out the CNVR programme on a regular basis to control the dog population in Bhutan and to address problems associated with free-roaming dogs by involvement of relevant stakeholders through one health approach.
A Survey to determine the knowledge, attitude and practices (KAP) of the communities towards the dog population and control Of rabies in Bhutan

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A cross-sectional household survey was undertaken in six districts distributed in different agro-ecological zones of Bhutan. A total of 521 participants (200 urban and 321 rural) were interviewed and bivariate analysis performed to compare their knowledge, attitudes and perceptions of rabies and dog population control between rural and urban areas.

The majority of respondents (95%) had heard about rabies, but their knowledge on the signs of rabies (60%) and method of preventing of rabies by vaccination (53%) warrants attention. Our study highlighted good treatment seeking behaviours following dog bites of people with most (97%) respondents indicating they would report to a hospital after thorough washing of the wound with soap and water. Although 90% of respondents reported that stray dogs were a problem to society and 77% believed they presented a threat to health, 58% of the respondents reported feeding of stray dogs. Most participants (84%) were in favour of dog population control with birth control as the preferred method.

It is recommended that to run a successful dog population control programme specific educational programmes on dog population management based on the findings of this study should be developed. This will encourage community participation and successful implementation dog population control programme through one health approach.
AfyaData, A mobile and web application pair for community level one health security

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We present AfyaData, A novel one-health community centric surveillance system comprised by a mobile and web application pair. The goal of the system is to provide tools that foster one health security at community level, by empowering community health workers (CHW) in (a) active disease surveillance; by using AfyaData mobile tool for reporting symptoms and clinical signs. (b) Respond to health events within their community; by receiving immediate feedback on advisable course of action in response to submitted data; and (c) equipping health experts with community submitted health events, charting and mapping tools and ability to directly interact with CHW. This completes the cycle of data submission, expert advice and feedback. At the centre of AfyaData is a One Health Knowledge Repository and intelligent analytical scoring subsystem that matches and grades submitted symptoms and clinical signs to a set of pre-configured clinical case definitions and expert authored health content. Various thresholds based on location, occurrences may be configured to trigger alerts. The surveillance system developed is linked with national human and animal health disease surveillance and response systems so that capacity for early detection and response to disease events occurring at community level are managed in near to real time.
Molecular Epidemiology Of Foot-and-mouth Disease Viruses Recovered From Southern Africa

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Foot-and-mouth disease (FMD) is endemic in most countries in Africa. The control of FMD outbreaks requires better understanding of the molecular characteristics and epidemiology of FMD virus (FMDV) involved. In this study, the genetic characteristics of FMDV recovered from cattle and buffalo were investigated. Livestock samples from Tanzania between 1967 and 2009 plus probang samples collected during 2011 from buffalo in national parks (NP) and neighbouring cattle populations in Tanzania, Zambia, Malawi and Mozambique were investigated. From the latter group, 10 isolates from buffalo and livestock around Marromeu NP in Mozambique were studied in greater depth. The investigation was undertaken using virus isolation, RT-PCR, genome sequencing and phylogeny. Phylogenetic reconstructions showed that Tanzanian type O viruses clustered into the EAST AFRICA 2 (EA-2) topotype, type A viruses into the AFRICA topotype (genotype I), type SAT 1 viruses into topotype I and type SAT 2 viruses into topotype IV. The phylogeny of 5 isolates collected from buffalo in Marromeu NP provided evidence for the presence of novel lineages for all three FMDV SAT serotypes. This RT-PCR and genome sequencing strategy could be deployed to study the extent of diversity in FMDV lineages and provide information for rational FMD control in Africa.
Antibiotic Sensitivity Pattern on Zoonotic Bacterial Proteus mirabilis as a cause of Food Borne Disease

Lucia Ratna Winata Muslimin

This study aims to accelerate zoonosis control system and secure food safety. Meat chicken breast samples, were acquired from six traditional markets in Makassar, Indonesia. The samples were implanted to bacterial growth medium inside the ice-box and carried to the lab to be inoculated with Nutrient Agar, Tryptone Soya Broth (TSB), MacConkey Agar (MCA), Salmonella Shigella Agar (SSA), Muller Hinton Agar. IMVIC test, Biochemical Test and pathogenic test with blood Agar from the suspected Proteus mirabilis result, was followed by PCR test to genetically identify the bacteria. The result was then examined for sensitivity test with antibiotics: Cyprofloxacin, Chloramphenicol, Cefotaxim, and imipenem. Among 48 samples. 13 was assumed positive with culture method and 11 was assumed positive with PCR Proteus mirabilis. The most sensitive antibiotics, Imipenem, chloramphnicol, Cefotaxime and Cyprofloxacin
Effects Of Smoking On The Vitamin Content Of Intermediate Moisture Pork Product

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This research evaluates the effect of smoking on the vitamin content of intermediate moisture smoked pork. It was carried out by curing fresh meat in two different solutions of which one contained glycerol and the other did not. The fresh meats were hot cured at 77°C for 15 minutes, in meat to pickle ratio of 2:3. After 16 hours equilibration, the samples were smoked at 70°C for 8 hours and samples withdrawn for analysis at 0, 2, 4, 6 and 8 hours. All the samples were analyzed for proximate composition, vitamins (A, B₁, B₂ C and E), pH and total phenol. The results showed that there was general increase in component of meat as moisture decreased due to concentration effect. Vitamins A, B₁, B₂ and E were found to be stable during smoking. Phenol deposition appeared to contribute to stability of the vitamins. However, smoking in excess of 6 hours led to destruction of B₁. Samples treated with glycerol gave higher moisture content (15.52± 0.42) compared to sample without glycerol (9.52± 0.19). Generally, glycerol was found to confer greater protection from thermal destruction of vitamins as shown by higher vitamin contents of samples containing glycerol compared with those without glycerol.
Global dynamics of highly pathogenic avian influenza viruses between 2005 and 2015: spread and speed analysis

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Highly Pathogenic Avian Influenza (HPAI) was the most often reported disease in terms of number of alerts submitted by countries to the World Organisation for Animal Health (OIE) between 2005 and 2015. Knowledge of HPAI viruses' dynamics is important in the prevention of their further spread. To perform such analysis, the OIE World Animal Health Information System (WAHIS) is the global reference source for confirmed information. The aim of the paper is to describe the global dynamics of HPAI viruses over the last 11 years, their capability in terms of spread and speed in order to enhance the capacity of predicting and managing epidemics. An increase in the number of affected countries and the circulating virus subtypes was observed in recent years. The analysis considered 6,546 outbreaks belonging to 289 events (epidemiologically related outbreaks) in 73 countries between 2005 and 2015. The median spread value from the index outbreak was 131 km and the median speed value was 2.4 km/day. Significantly higher median values were registered when wild birds were involved: 223 vs 131 km for spread and 11.7 vs 1.7 km/day for speed. Spread and speed results variations over time were described and discussed.
Epidemiologic Characteristics Of Patients Diagnosed With Scrub Typhus From A Hospital In Vietnam, 2013: A Case Series Study

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Vietnam is located in endemic area for scrub typhus. However, this disease is not reportable disease in communicable disease surveillance system. This study aims to add to literature by describing epidemiological characteristics of patients diagnosed with scrub typhus from a hospital. A case series study was conducted to describe epidemiologic characteristics of patients. A case-patient was defined as a person admitted to hospital in 2013 with fever and eschar or tested positive by rapid test. Data collection included face-to-face interviews of patients or caregivers by structured questionnaire, review of medical-records, laboratory test. 73 patients met case-definition, of which 59 of 66 tested(89%) positive for anti Orientia tsutsugamushi IgM. Among case-patients, 64% male, median:35 years (range:11-77years). 82% patients live in rural areas, 79% farmers, in contrast to general population, of which 76% lives in rural areas, 68% farmers. 79% patients were admitted to the hospital during the rainy months (June-August). 44% patients sought health care after seven days of symptom onset. Majority of patients presented with headache(86%), eschar(74%), high fever(56%), lymphadenopathies(47%), rash(16%). Eschars were most frequently seen in armpit and inguinal area(37%), on extremities(27%), on torso(26%). Our findings suggest control measures should target farmers living in rural, especially during rainy-season.
Promoting the Direct Human Consumption of Mutton and Sheep Offal to Benefit Human Nutrition, Environmental Sustainability and Sheep Welfare in Australia

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Two major challenges facing the global community are the widespread prevalence of diet related non-communicable disease and climate change. With the world population projected to reach over 9 billion by 2050 these issues will only heighten in the coming decades. The reduction of food loss and waste is one strategy that can assist in meeting these challenges. In 2011, 9,900 tonnes of edible offal produced in Australia were wasted and a further 19,600 tonnes of edible offal and 23,800 tonnes of mutton were used for purposes other than direct human consumption. Greater utilisation of sheep carcases and carcase parts for direct human consumption has the potential to benefit human health and the natural environment. This would be achieved through improving the micronutrient status of populations, in particular iron levels, and by increasing the yields of sheep producers, hence lowering greenhouse gas emission intensities and land clearance rates. This approach supports improved sheep health and greater gross margins in the sheep meat value chain. Quantifying and qualifying the loss of mutton and sheep offal from the human food chain, together with refining the communication pathways in the Australian sheep meat value chain, will contribute to sustainable and healthy domestic food systems.
Q fever in an endemic region of North Queensland - A 10 year review.

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Q fever is a zoonotic infection caused by *Coxiella burnetii*. This study reviews the epidemiology of patients diagnosed with Q fever in an endemic region of north Queensland, to identify risk factors for the acquisition of Q fever. We conducted a retrospective study, looking at patients in the Mackay Health district that had tested positive for Q fever by case ascertainment between 2004 and 2014. This involved the completion of a patient questionnaire targeting demographics, clinical presentation, risk factors and outcomes. 101 patients with a positive Q fever serology were identified. Of these, 4 patients were excluded and 63 patients successfully completed a questionnaire on demographic and risk factors. The highest prevalence was in the coastal region of Proserpine (42/100,000) followed by the Whitsundays region (14.8/100,000). A significantly higher proportion of patients were exposed to macropods (69.4%) and possums (66.7%) as compared to cattle (23.8%). Peak correlation with annual rainfall was also noticed. In this endemic region of north Queensland, exposure to wildlife and rainfall may be substantial exposure factors for the development of Q fever. An understanding of risk factors involved can help practitioners who see residents or returned travelers from the region, with an undifferentiated fever.
Rabies in stray dogs is a public health risk. Vaccination integrated with surgical sterilization of females was the intervention method implemented in 2013. Objectives were surveillance of stray dog population, assessment of effort and impact of vaccination and impact of surgical sterilization on population structure (PS). 8 of 29 wards were selected randomly as samples for surveillance. Maps were utilized to identify the boundaries to cover entire routes in selected wards. Counting and data collection was done using standard protocol on same time of the days. Surveillance was repeated exactly the same way after 2 years. Primary vaccination and revaccination were carried out in 29 wards from October 2013 to March 2014 and from October 2014 to March 2015 respectively. Ear notching was adopted to identify sterilized females. Estimate stray dog population was 1398. Primary and revaccination coverage were 97% and 88% respectively. 19, 1 and 0 positive cases were reported in 2013, 2014 and 2015 respectively. 725 females were sterilized. Indicators: Number of pups and lactating females showed significant changes in PS over time. Systematic multi year pre-exposure vaccination with biologic of prolonged immunity has impact on herd immunity and case prevalence. Integration of surgical sterilization makes effective impact on PS.
Health is an unstable characteristic that emerges from necessary tensions and conflicts across temporal and spatial scales, between actors with different perspectives, different powers, different rules of evidence, and with different, often conflicting, desired outcomes, embedded in diverse and often inequitable eco-social systems and cultures. In this context, all interventions have uncertain impacts, and conflict among stakeholders is a necessary characteristic of genuine One Health and Ecohealth programs. Generic One Health or Ecohealth programs that are not deeply rooted in an understanding of complexity, multiple narratives and radically different perspectives lead to technocratic tyranny and "science-based" colonialism. This will be illustrated using examples of food security, ecological degradation, and emerging diseases. One Health and Ecohealth communities can - and should - take the lead in creating policies, spaces and processes where scientists, professionals, and citizens with differing powers and goals engage in good quality, multi-level, adaptive conflicts.
The Word Organization for Animal Health (OIE) has developed a science-based approach for purpose-oriented validation, certification and registration of diagnostic tests for infectious diseases. Parameters such as analytical and diagnostic sensitivity and specificity, selection of an appropriate cut-off, repeatability and reproducibility will inform about core performance characteristics and provide an objective assessment of the assay's fitness for purpose. Fundamentally different assays, e.g. antigen, antibody or molecular tests need to be validated for the species, target population and specific sample type that they will be applied for. It can't be automatically assumed that changes in the population, species or specimen do not affect test performance (see poster from Newberry et al.). Diagnostic test results for zoonotic infectious pathogens are of particular interest for both veterinary and human laboratory diagnosticians as well as for epidemiologists and there is a need for better interdisciplinary understanding and interpretation. The "Statement for Reporting Diagnostic Accuracy Studies 2015" regulates parameters that define human accuracy studies for diagnostic tests. Although there is a high
degree of congruency between the OIE and STARD standards not all validation parameters are covered equally in both documents, e.g. Latent Class Analysis, a probabilistic approach which offers solutions for test validation when there is no gold standard available is not represented in STARD. In particular for new and emerging lethal zoonotic diseases limitations of diagnostic test validation, pitfalls and gaps and fitness for purpose(s) need to be identified and discussed with the objective to develop a better interdisciplinary understanding of test performance and to improve the quality of results interpretation and epidemiological decision making and planning.
We assessed the influence of social, institutional and environmental factors on malaria and bilharzia transmission in vulnerable communities in Botswana, South Africa and Zimbabwe using the ecohealth approach. Quantitative and qualitative data was collected through community and household surveys, epidemiological surveys, GIS and Remote Sensing tools and participatory rural appraisal workshops. Burden of malaria at one study location was very high in 2011 (218 DALYs) but reduced over years to 0.21 in 2015. We demonstrated the value of using the Maxent model to determine snail habitat suitability with small data of presence-only sampling sites. Distance of homestead from piped water collection points, distance from open water sources, religion and toilet use were key determinants of a child being infected with bilharzia. Communities were aware of malaria and bilharzia and how the diseases may be influenced by climate factors. However, knowledge on transmission of the diseases was limited thus compromising community capacity to adequately adapt. Communities claimed that they could predict rainfall based on indicators such as insect and animal behavior and abundance of plants. Engagement between the communities and researchers was very high. Factors influencing transmission of malaria and bilharzia in the context of climate change were analyzed.
Prevalence And Seasonal Transmission Of Schistosoma Haematobium Infection Among School Age Children In Kaédi Town, Southern Mauritania

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In Mauritania, human schistosomiasis transmission is more specifically to the south and southeast where the prevalence rates are higher. The aim of this study is to determine prevalence and seasonal Schistosoma haematobium infection among school age children. Children (5-15 years) provided urine samples examined using standard technique. Snails were collected in water bodies using standard snail scoops and by hand collection and were identified, intermediate host were tested for cercarial shedding. Water contact activities was studied by direct observations. Prevalence of urinary schistosomiasis was 4% (86/2162) and statistically higher in the dry season than the rainy season ($\chi^2=5.64$, $p = 0.017$). No significant differences ($\chi^2=3; p= 0.08$) in infection rate between boys (58.2%) and girls (41.8%). Three species of snails intermediate host of Schistosomiasis were collected: Bulinus truncatus ($n=154$), B. senegalensis ($n=13$) and B. forskalii ($n=144$). Naturally infection was not recorded. 10, 253 contacts were recorded during 28 observation days. Swimming (37%,
n=3788) was the main activity, followed by washing clothes (20%; n=2016) and dishes (13%; n= 1322). The average time spent in the water per person per day was 14.2 minutes. Despite low prevalence, the disease is maintained because of the frequent contact of people with the river.
Effect of Density Variation of Aedes aegypti Male Pupae in Gamma Ray Radiation Media of 70 Gy and Longevity Sterile Male Mosquitoes Aedes aegypti (Linnaeus) to The Rate of Eggs Produced Sterility

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Sterile Insect Technique (SIT) can reduce dengue vector population by irradiation. The aims was to analyze the effect of longevity sterile male mosquitoes Ae. Aegypti and density variations of Aedes aegypti male pupae in gamma ray radiation media of 70 Gy to the sterility level of eggs produced. The method was experimental research design with the post test only control group. Samples for longevity were 280 sterile male, 140 males fertile and 420 females fertile, irradiated with dose 70 Gy. Samples for density were 5,400 pairs of male and female pupae. Male pupae were irradiated with different densities of each tube vial (d=2 cm), ie 60, 120, 180, 240 and 300, each had 5 repetitions and control. The results were mosquitoes can survive until 14 days, all ages can produce the eggs. There was no difference between the age of sterile male mosquitoes to the sterility level of eggs produced (p value=0.01). There was influence between the density of irradiated pupae to adult emergence rate, the number of eggs produced and the eggs sterility rate (p value=0.01). Steril male mosquitoes can be delayed to mating up for 14 days, and irradiation should be done with pupae density was 60 pupae.
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Zoonotic Pathogens In Free Ranging Wild Mammals In Sri Lanka

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Sri Lanka is considered as one of the global biodiversity hot-spots. It is an island with dense human population with many focal points in wildlife human interface. People in wildlife conservation interfere with wild animal health through wildlife disease surveillance, treatment, translocations and wild animal rehabilitation. Wild animals can act as a reservoir of diseases transmissible to humans. Seven zoonotic pathogens were reported during last five years (2011-2015) at the laboratory of Elephant Transit Home, Udawalawe, Sri Lanka. All these pathogens were identified during post-mortem investigation of wild mammals. Histopathology, parasite morphology conventional bacteriology and PCR were used to confirm the identity of the pathogens. Identified important zoonotic agents include Mycobacterium tuberculosis among free ranging Asian elephants (Elephas maximus), Paragonimus westermani in Sri Lankan leopards (Panther pardus), Calodium hepaticum, Toxocara canis, Toxoplasma gondii, Sarcocystis sp, and Spirometa sp. in jungle cats (Felis chaus) and fishing cats (Prionailurus viverrinus). To our knowledge these zoonotic infections in free ranging wild cats and tuberculosis in elephants are the first reported cases in Sri Lanka while some of them seems reported for the first time in the world. Further investigations are currently being carried out in order to understand their host parasite relationship, ecology and risk for public health.
Social Network Analysis Of Leptospira Serovars Detected In Livestock In Thailand, 2006-2015

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The present study aimed to investigate Leptospira serovar community in livestock in Thailand during the last decade. A total of 14,636 serum samples were collected from 2,557 buffaloes, 7,925 cattle and 4,154 pigs. All samples were examined for antibodies against 24 Leptospira serovars with the microscopic agglutination test (MAT), at the cut-off titer of 1:100. An undirected one-mode serovar network was constructed based on frequency of individual host sharing. Degree centrality and K-core were measured to explore the co-occurrence of serovars in these animals. Seropositive results were found in 5,599 animals (38.3%, 95% confidence interval (CI) 37.5% - 39.0%). In the serovar network, 5,697 links were illustrated. The largest degree centrality and K-core were observed in serovar Shermani at 2,859 and 1,470, respectively. Our finding suggests that this serovar has the highest connectivity and may play an important role in the epidemiological linkage of animal leptospires. Shermani was also recognized as the most common serovar in humans in 2010-2015 (334/1990; 16.8%, 95%CI 15.2%-18.5%). To follow the One Health concept, further investigations on spatial serovar networks among animal species and humans are suggested. These studies will holistically elucidate how Leptospira community behaves among humans, animals and environment across Thailand.
Nature Connection And Psychological Wellbeing: Exploring Potential Mechanisms

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A growing body of research demonstrates associations between nature connection and a wide variety of positive health and wellbeing outcomes. Yet, the interpretation of this research is restricted because underpinning mechanisms - particularly the psychological mechanisms of wellbeing enhancement as opposed to wellbeing restoration - remain largely unexplored. Understanding such mechanisms is important for theory development across multiple disciplines and for assisting policy-makers to translate this theory effectively into practice. This presentation covers the limitations in our current understanding of the psychological mechanisms involved in the nature connection-psychological wellbeing relationship and moves the field forward through exploring two such potential mechanisms. These mechanisms have been investigated through recent a survey of Brisbane adult residents and this presentation shares the preliminary survey findings along with recommendations on how they could be used to improve the implementation of targeted nature connection interventions and policies designed to enhance psychological wellbeing among diverse urban populations with varying needs.
Effectiveness of Urban Nature Interventions in Contributing Towards Healthy Cities and Healthy Communities

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Within 30 years, 70% of people will live in urban areas. People's everyday ability to experience nature is therefore increasingly dependent upon access to urban nature. Interest is growing globally on how to use urban nature to optimise health and wellbeing outcomes for urban communities. Positive associations have been identified between presence of nature in the living environment and self-reported health as well as reduced morbidity, mortality, stress, obesity and cardiovascular and respiratory disease. Despite this evidence there is relatively little known about how these outcomes vary among different people and via diverse types of urban nature and modes of exposure to urban nature. An evidence-based review has recently been completed to help unravel the intricacies of urban nature exposures. The review sought to determine the effect of urban nature interventions on environmental condition, health and wellbeing status of urban residents as well as equity. The results of this review will be shared alongside international case studies highlighting lessons learned. Knowledge on the effectiveness of urban nature interventions provides a critical resource to be used by health practitioners and urban planners and policymakers to help create healthier urban environments for all.
EcoHealth versus One Health – what’s the difference?

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Both EcoHealth and One Health are interdisciplinary approaches combining biology, veterinary medicine and human medicine. Recent efforts to merge these approaches seem promising in order to gather resources and increase the interdisciplinary connections. However, there may be some obstacles that can hinder such a merge. Critical voices are raised that the One Health approach focuses on disease transmission but neglects the field of ecology, as there has been a strong emphasis on the fields of veterinary medicine, zoonotic diseases and public health. Furthermore, it can be argued that improved health for humans and animals, which is implied in the One Health initiative, may not be optimal for other organisms. For example, the One Health movement might argue in favour of eradication of viruses or parasites to improve human and animal health, whereas the EcoHealth movement may emphasise co-existence in order to maintain biodiversity or ecosystem values. This talk will analyse this inherent value conflict in order to specify whether there are scientific core differences between these movements, and if so, what consequences such differences may have for the scientific community.
Assessing Indigenous Food Insecurity: Psychometric Validation Of A Culturally-informed Measure Among Pregnant Inuit Women

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Globally, food insecurity is a major public health concern, particularly among Indigenous communities. Most food security questionnaires focus on purchased food. However, many Indigenous and remote communities consume a diet that combines foods from the store and traditional foods obtained from the local environment. This study describes the psychometric evaluation of a modified Household Food Insecurity Access Scale (HFIAS), which was developed for mixed economies, to assess food insecurity among pregnant Inuit participants.

A modified HFIAS was administered to 131 pregnant women in Nunavik, Canada. Data were fit to a Rasch Rating Scale Model (RSM) to estimate the construct validity. The RSM was a good fit for the data (Infit MSV = .667 to 1.313); however, items primarily assessed moderate levels of food insecurity. A scoring system was developed based on the RSM to improve the scale’s accuracy. Addressing food insecurity among Indigenous people requires rigorous, culturally adapted instruments that capture availability, access, quality and utilization of market and traditional food sources. The modified HFIAS shows potential for measuring Indigenous food insecurity. Future studies should integrate specific items about traditional foods. Accurate, culturally appropriate measurements are necessary to understand and support the sustainability of Indigenous food systems and environments.
Capacity building in Northern Uganda: improving health through intervention at the livestock-human interface using a One Health approach

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Veterinarians Without Borders (VWB) focuses on health management and capacity building using a multidisciplinary approach at the livestock-human interface applying point of care devices to improve community health. Tuberculosis, brucellosis, and trypanosomiasis are diseases that significantly affect animal source food production, human and animal health, and restrict livestock product trade. By building capacity at the community level through strengthening relationships of farmers, community animal health workers, and district veterinarians in disease recognition, improving diagnostic capabilities, and disease reporting and response, human and animal health will improve. Additionally, VWB fields teams of interdisciplinary professionals from the U.S. and Uganda working collaboratively to define the burden of these diseases; teams work to close the gap between human and livestock medicine with the purpose of improving animal and human health and producer income. The intent is to train Ugandan veterinary and human health professionals in laboratory and clinical diagnostic skills so they can recognize, diagnose, and respond to diseases at the community level, thus building their capacity to respond to and control disease outbreaks when they occur, as well as creating and implementing prevention strategies pre- and post-outbreak.
Global Health And Environmental Implications Of Informal Extractive Industries: Insights From The 2010 Outbreak Of Severe Acute Lead Poisoning In Northern Nigeria

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This presentation employs a qualitative One/EcoHealth perspective to examine long-term global public health implications of artisanal mining and other informal extractive industries in remote or resource-poor settings. In 2010, an outbreak of lead poisoning among artisanal mining communities in Northern Nigeria lead to the deaths of approximately 400 children, and permanent sequelae in large segments of the population. Recognized as the most severe acute mass lead poisoning in recorded medical history, the outbreak is a signal incident that illustrates the broader health and ecological implications of small-scale mining and other informal industrial practices done in situations of economic and social marginality. This presentation provides a summation of the outbreak and the public health and environmental insights that emerged. In recent years, rising international prices for precious minerals have led to a global boom in informal extractive industries. While sometimes portrayed as entrepreneurial and emancipatory, these activities occur at the margins of governmental influence, with little attention paid to personal or environmental protections and often in a context of exploitation. These industrial hazards can be subtle and pervasive, thus the health and environmental effects for individuals and societies can unfold imperceptibly, to emerge on a global and generational scale.
Isolating Geohelminthiasis Infection In School-aged Children Who Work In Artisanal Mining In North Kivu, Drc

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Health is closely related to the quality of the environment in which people live. Geohelminthiasis infections are among the most common infections in the world, affecting the poorest communities. The WHO recommends periodic deworming for children (1-15 years) living in areas where the prevalence of infections is estimated at more than 20%. In Democratic Republic of Congo, especially in the underserved region of North Kivu, many children working in artisanal mining may not receive necessary treatment. The goal of this study was to identify the parasite carriage in this group. We collected and analyzed 125 fecal samples from children aged 6 - 15 who work in artisanal mining. We found that 65.6% of children have Ancylostoma duodenale, 94.4% have Trichuris trichiura, and 96.8% have Ascaris lumbricoides, and many of them have never been dewormed. Our research demonstrates the immediate need for a deworming program and health education for disease prevention in the North Kivu mining region. The ultimate goal of our work is to eliminate child mining, given the risk of exposure to multiple diseases, injury, and radiation exposure common in artisanal mining, though the challenge is great given the prevalence of poverty and war in region
One Health Studies Of Pig Associated Zoonoses In Smallholder Pig Production In Lao Pdr

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Most people in rural areas of Lao PDR are living in close proximity to their livestock which may increase risk of being infected with pig zoonoses, either via direct contact with livestock, via consumption of contaminated pig products or mosquito vectors. Between 2006 and 2015 two ACIAR and one ILRI funded research projects were implemented in collaboration with animal and human health authorities of the Lao Government to study seroprevalence of pig production diseases and zoonoses. Overall 2341 human and 1356 pig serum samples were randomly collected from 81 villages in 8 provinces as well as from slaughterhouses. Pig samples were tested for zoonoses (Hepatitis E, Trichinella, Japanese Encephalitis and Cysticercosis) and some production pathogens; while human samples were tested for Hepatitis E, Trichinella, Japanese Encephalitis, Cysticercosis and Taeniasis. Results demonstrated the presence of in some cases high sero-prevalence of targeted pathogens among sampled human and pigs. Series of statistical analysis were performed to assess the risk factors and their association with any pathogens among pigs and human. The projects generated recommendations for control and future research, produced IEC materials, conducted public
awareness and communication campaigns, and implemented intervention models for some diseases, and a number of articles published.
The epidemiology of malaria in urban environments is poorly characterized and problematic. We conducted two cross-sectional surveys in urban area of Korhogo, in June 2014 and March 2015. The main purpose of this work is to investigate the potential impact of seasonal variations of urban malaria transmission. Thick drops of blood smears and malaria rapid diagnostic tests were conducted on selected subjects. Adult mosquitoes were collected during two weeks each climatic season and were tested individual for *Plasmodium falciparum* sporozoites, using Pf2A10 monoclonal antibody. The entomological inoculation (EIR) rate was calculated by multiplying the proportion of sporozoite-positive mosquitoes by the human biting rate. Overall *Plasmodium* prevalence was 12.5% (863/6868) of which 857 (99.3%) were *P. falciparum* and
6 (0.7%) *P. malariae*. Overall 306 female of *An. gambiae s.l.* were caught, 182 and 124 during the rainy and the dry season respectively ($\chi^2 = 3.38, P = 0.01$). Anopheline biting rate (BR) during the study was 167.9 bite/man/year. However, the aggression rate was high during the dry season than the rainy season ($Z = -17.38, P<0.001$). The sporozoite index was 0.024 (5/207) and the annual EIR was 3.65 infective bites per person. The seasonally distribution of EIR was similar ($Z=0.470, P=0.639$).
Humanity is at a crossroads as we seek to deliver optimal and sustainable diets for 9 billion people by 2050. Despite increases in agricultural production during the past two decades, malnutrition rates have not diminished significantly. Undernutrition remains a significant problem in many developing countries while overnutrition has become a major global issue. Historically, the domestication and increasing intensification of animal production has been a major driving force behind the emergence of infectious diseases. Currently, increased consumption of animal-source foods and nutrient-poor, energy-rich processed foods, have been linked to the rise in overnutrition and incidence of non-communicable diseases.

The nexus between disease and food security is a crucial issue best addressed using a holistic systems approach. The agriculture, health, education, natural resource and infrastructure sectors must work together closely to ensure that nutritious food is produced and utilised efficiently, effectively and safely. Sustainable agriculture, optimal animal production and nutrition-sensitive value chains can contribute to enhanced food and nutrition security. We discuss three Ecohealth research projects (being implemented in Australia, Tanzania, Timor-Leste and Zambia) supporting the production of sustainable, nutritious, ethical and safe food delivered with minimal waste and promoting improvements to human, animal and environmental health.
Fixing Broken Food Systems

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Defining and facilitating sustainable and ethical food systems that contribute to human and planetary health is amongst the greatest challenges facing our world today. Broken food systems have delivered the double burden of under- and over-nutrition, contributed to degradation of ecosystems, resulted in farming families becoming the working poor and perpetuate women's carrying the burden of health problems and poverty. By focusing on good nutrition and on nutrient cycles we can better understand and strengthen interrelationships between farmers, traders, regulators, consumers and policy-makers to determine policies and food systems that deliver appropriate, sustainable, diverse, ethical and nutritious diets nationally and globally.

To achieve sustainable food systems and adequately nourish 9 billion people by 2050, a paradigm shift is required and involves direct action from the soil level to the plate. We review options for improvements that will see sustainable, nutritious and safe food being produced and delivered with minimal waste. Such improvements will help consumers (re-) connect to the environment, with food gatherers and producers contributing to enhanced physical and mental human health and more resilient planetary health.
Prevalence And Phylogeny Of Hepatitis E Virus (Hev) In Pigs In Bhutan

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Hakze van der Honing Renate, Wim Vanderpoel, Arjan Stegeman, Willie Loeffen

HEV is the major cause of fecal-oraIly transmitted and waterborne epidemics of hepatitis in humans in the developing countries of Asia and Africa and an important public-health concern caused by non-enveloped RNA virus under the family Hepeviridae. The aim of this study was to determine the HEV seroprevalence in pig farms and genetically characterize HEV strains circulating in the Bhutanese pig population. A total of 829 pig serum samples and 431 faecal samples were obtained from three government breeding pig farms and village backyard farms between October 2011 and February 2012. ELISA test revealed that 73% [95% CI: 69 - 75%] of the pigs in the government breeding farms and 51% [95% CI: 44 - 58%] of the pigs in the village backyard farms tested positive for anti-HEV IgG respectively. HEV RNA was detected in the feces of 106 out of 431 pigs (25%, 95% CI: 21 - 29%). Through phylogenetic analysis using the ORF2 region, the Bhutanese isolates were characterized as genotype 4 with highest similarity (93.7%) with the Indian isolate IND-SW-00-01. The serological prevalence of anti-HEV IgG and genetic characterization of HEV in pigs from Bhutan was documented in this study for the first time in Bhutan.
Southeast Asia One Health University Network (SEAOHUN) - working together to Control and Prevent Infectious Diseases

huong Le Thi

Established in 2011, SEAOHUN is a consortium of 10 founding universities and 14 faculties in Indonesia, Malaysia, Thailand and Vietnam that are collaborating to build One Health capacity and academic partnerships with governments and national, regional and international stakeholders. The mission of SEAOHUN is to enhance the capacity of the current and future workforces to prevent, detect and respond to outbreaks of zoonotic and emerging infectious diseases.

The One Health approach is a trans-disciplinary philosophy that emphasizes the need for multiple disciplines and sectors to work together to create a more effective and efficient response to outbreaks of disease, and this includes the education sector. Universities play an important part in developing and preparing the future One Health workforce and in assisting governments to train the current workforce.

In the past few years the SEAOHUN network has developed and flourished, and network members have contributed significantly to building the One Health workforce in the region, in particular in the four founding countries. SEAHOUN will continue to expand the network to other countries in the region in the next years in order to prepare the ASEAN region to combat emerging infectious diseases rapidly and effectively.
Outbreak of Tularemia Related to Contaminated Well in the region Västra Götaland – first time Successful Proving of F. tularensis by PCR and Culture from Water.

Tara Wahab
Eva Lindhusen Lindhé, Marika Hjertqvist

Tularemia, a disease caused by *Francisella tularensis* (subsp. *holarctica* = type B), has been reported in Sweden since 1931. We describe an outbreak of tularemia in the region of Västra Götaland in the south-west of Sweden in spring of 2013. By isolating of *F. tularensis* from the water, we could show that consumption of well water was directly linked to the outbreak.
Effect Of Gamma Radiation On The Reduction Of Aflatoxin B1 In The Most Commonly Consumed Grains

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Aflatoxin B₁ (AFB₁) contamination of food and feed is a worldwide problem. In Egypt the maximum tolerable level for AFB₁ in cereals was set at 5 µg/kg. Since AFB₁ is stable for natural, chemical and biological decontamination methods, our study is concerned with the possible effect of gamma radiation on the reduction of AFB₁ in the three most commonly consumed grains. One group pre-post intervention design was conducted on 60 samples of maize, wheat, and polished rice. Samples were randomly collected from the local markets of Alexandria, Egypt. Each sample unit was divided into four equal subunits. The first subunit was considered as control, the second, third and fourth were irradiated using gamma radiation source from ⁶⁰Co at absorbed dose levels of 4, 6 and 8 KGY respectively. Samples were analyzed to detect AFB₁ by HPLC. Results showed that 100% of samples were contaminated with high levels of AFB₁ which exceeds the legal limit by several folds. Gamma irradiation reduced the levels of AFB₁ of all tested samples. The 8 KGY radiation dose was the most effective and removed about 60.26% of the toxin from maize, 69.29% from wheat and 64.68% from rice samples.
Bats And Viruses: A Rich Source Of One Health Lessons

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Approximately 75% of emerging infectious diseases are zoonoses. The rate of emergence of zoonotic viruses appears to be increasing and/or our ability to detect new viruses is improving. Bats are being increasingly recognised as an important reservoir of zoonotic viruses of different families, including SARS coronavirus, Nipah virus, Hendra virus and Ebola virus. Several recent studies hypothesized that bats, an ancient group of flying mammals, are the major reservoir of several important RNA virus families from which most (if not all) other known mammalian viruses of livestock animals and human were derived. Although this hypothesis needs further proof, the fact that bats carry a large number of viruses is commonly accepted. The question of whether bats have unique biological features making them ideal reservoir hosts has been the focus of research in our research group for the past few years. Our latest findings will be presented to demonstrate that the bat-virus continuum is a rich source for One Health research and there are potentially many lessons we can learn from bats to better respond to future emerging infectious disease events.
Effects of Transdermally Delivered Insulin on some selected Metabolic Parameters of Streptozotocin-Induced Diabetic male Sprague-Dawley rats

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The tight glycaemic control required to attenuate chronic complications in type-1 diabetes often requires numerous daily subcutaneous injections of bolus insulin which result in non-compliance. Therefore, methods which can sustain controlled insulin release into the blood based on topical applications may be beneficial with glycaemic control. The present study investigated whether transdermal pectin-insulin patch sustains insulin release into the bloodstream and control some selected deranged metabolic parameters in streptozotocin-induced diabetic rats. Patches were prepared by dissolving pectin/insulin in deionised water with subsequent solidification with CaCl₂. Short-term effects were assessed in animals applied thrice daily with topical pectin-insulin (3.99, 9.57 and 16.80 µg/kg) 8-hours apart. Animals treated with drug-free pectin and insulin (175µg/kg, s.c.) acted as negative and positive controls, respectively. Selected tissue samples were collected for biochemical measurements. Plasma insulin concentrations increased significantly following patch application with the highest dose eliciting the highest insulin levels by comparison with the lowest dose. The transdermal treatment significantly lowered blood glucose concentrations; and restored the reduced glycogen concentrations, expression of insulin-stimulated enzymes and facilitative glucose transporters in muscle and hepatic tissues to near normalcy after 5-weeks. The results indicate that transdermal pectin-insulin formulation delivers insulin into the bloodstream with concomitant hypoglycaemic effects.
BeneFISHiary: An ecologically-conscious phone “app” to improve community knowledge of the risks and benefits of fish consumption during pregnancy

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Confusion exists about fish consumption during pregnancy, especially the risks of long-term neurodevelopmental damage to the developing foetus when exposed to dietary mercury. On one hand, fish are lauded for their beneficial nutrient profiles, especially elevated omega-3 fatty acids, which promote healthy pregnancies and long-term childhood development. On the other, some fishes contain high mercury concentrations. Based on a 2013 mixed-methods study of Bermudian pregnant women, we concluded that while most were exposed to risk/benefit messaging about fish consumption, they primarily absorbed the negative messaging about fish. Despite communication from public health authorities on results from a different survey that indicated and recommended that Bermudian pregnant women could safely consume several local fishes daily, almost none of the women were aware of the benefits of local fish. We thus created a phone "app" entitled BeneFISHiary, which contains species-specific information on mercury, omega-3 fatty acids, and to which was added a sustainability index to extend the tool user-base. This accessible health promotion tool empowers Bermudians to make informed and sustainable choices about fish consumption during pregnancy. It is beautifully illustrated and summarizes complex toxicological information in a user-friendly language. We aim to scale it up to other coastal communities.
Ecological factors, production variables, and social network connectivity determine probability of Bovine tuberculosis infection in African cattle

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Bovine tuberculosis (bTB) is a zoonotic disease that infects wildlife, livestock and people. Using bTB outbreak data from Africa in cattle, we showed that areas with higher cattle densities and presence of African buffalo were more likely to report bTB outbreaks. Moreover, increased mammal species richness was associated with a reduced probability of bTB presence, suggesting a dilution effect. Using field data from Ethiopia we found that the bTB infection increased with the age of the cattle and decreased with body condition, but sex, lactation status and reproductive status had no effect. Transhumant herds had a higher bTB prevalence than sedentary herds. Herd size and contact with wildlife were also significant risk factors for bTB. Larger herds moved more and grazed in larger areas, increasing the chances for contact with wildlife and bTB infection. A network approach showed that the relative importance of livestock transfer by which pastoralists may receive or bestow livestock to strengthen social relationships influences the transmission of bTB. A herd's position in the social network was correlated with the risk of being infected with bTB, as herds with a higher level of network connectivity had a larger probability of being infected with bTB.
An Ecohealth Approach To Mitigating Antimicrobial Resistance: Antibiotic Use In Layer Farms In Central Java Province, Indonesia

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Imprudent use of antibiotics in both public and animal health fields raises the risk of antimicrobial resistance, a global health issue complicated by the human-animal interface. An ecohealth approach was applied to facilitate better understanding and develop potential intervention strategies. A cross-sectional survey of 40 layer farms in Karanganyar, Sukoharjo and Klaten districts in Central Java province, Indonesia, was conducted to collect baseline data on antibiotic use, accessibility, and farmer knowledge on antibiotic use and resistance. Majority of respondents were small scale farms with ≤5000 birds (62.5%) and had poor knowledge of antibiotics and resistance (53%). Antibiotics were readily available at poultry shops (60%) and technical services of pharmaceutical companies (53%). Commonly used antibiotics were enrofloxacin (60%), oxytetracycline (38%), and brand combinations tetracycline-erythromycin (38%) and oxytetracycline-neomycin (35%), for both preventive and treatment purposes. Farms have self-combined different brands of antibiotics to treat difficult cases (20%), a likely indication of antibiotic resistance. The presence of animal health services was weak in farms; only one had a veterinarian. However, 68% of respondents were open to advice from veterinarians and/or technical services. Based on these findings, intervention was focused on educating farmers and increasing access to veterinary services in farms.
Temperature-driven Changes In The Bulinus Globosus – Schistosoma Haematobium System: Potential Effects Of Climate Change On Disease Emergence

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The response of hosts and parasites to climate change may affect disease incidences and severity leading to a possible reduction or increase in disease burden. Temperature driven experiments on host-parasite interactions can be used to evaluate the potential effects of climate change on the ecosystem and disease transmission at community level.

Using a 2 × 5 factorial laboratory experimental design, we studied the effect of a range of constant temperatures (15, 20, 25, 30, 35 °C) on Bulinus globosus-Schistosoma haematobium system and the vital life history traits of Bulinus globosus snails.

The minimum pre-patent period of Schistosoma haematobium in B. globosus was three week at 31°C while at 21.2°C it was six weeks. Cercariae shedding was not observed at 36°C and 15.5°C. Infected snails subjected to 21.2, 25.8 and 31°C resulted in increased growth and laid more eggs although their survival and fecundity reduced over time.

The study observed that temperature increase may lead to shortened parasite development time and life cycle of the parasite. This may increase disease burden in non-endemic areas with intermediated host snails but with temperatures below the 15.5°C. In contrast, areas with temperatures above the 31°C may be unsuitable for parasite and hosts development.
Bringing Together Ecohealth And One Health To Address Zoonotic Disease: Participatory System Dynamics Modelling As A Convergence Methodology

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We explored One health and EcoHealth as approaches to addressing infectious disease, and whether participatory system dynamics (PSD) modelling holds promise as a convergence methodology. Taking zoonotic disease as a case study, we performed a systematic review to identify epistemological and methodological differences between EcoHealth and One Health approaches in both theory and practice. We searched Google Scholar, PubMed, Web of Science, and Scopus for papers published between 2011 and 2016, using the terms 'EcoHealth', 'OneHealth', 'ecosystems', and 'zoonotic'. We drew out epistemological and methodological themes and identified overlaps and difference between the two approaches and considered the extent to which SD modelling brings together the strengths of both. SD enables understanding of non-linear relationships in complex systems, emphasising feedback loops and changing relationships over time. Multiple perspectives can be brought together in causal loop diagrams, which can be translated into a SD simulation model to test policy options. When combined with a robust collaborative learning process, PSD could support policy formulation for zoonosis reduction, building on robust data in a One Health framework while incorporating the participatory, holistic principles of Ecohealth.
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The Victorian Rabbit Action Network: Socio-political-ecological insights from a wicked problem

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The European rabbit was introduced into Australia for hunting in the 1880s. It has since colonized the continent and the hearts and minds of its people. Alongside these emotional attachments are the ecological and economic impacts; rabbits threaten over 300 vulnerable species and cost agribusinesses more than AUD$200 million per year. These and other factors make rabbit management a pressing socio-ecological issue in Australia today. An ongoing challenge is to develop landscape-scale management strategies that have broad community support. In 2013, the Invasive Animals Cooperative Research Centre initiated a research project to support community-led action for more sustainable and effective rabbit management in Victoria. The project led to the creation of the Victorian Rabbit Action Network (VRAN). We describe the emergence of VRAN to draw out insights on political economy and collective action. We invite those working with complex problems (such as invasive species and more generally), to consider the socio-political-ecological dimensions of these problems and the implications for professional practice.
Interdisciplinary Approach To Reduce Zoonotic Transmission Of Antimicrobial Resistant Bacteria And Pathogen From Food Animal Production Chains In Community In Vietnam

HOA NGO

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Zoonotic infectious diseases, including antimicrobial resistant (AMR) bacteria in agriculture, are an emerging global public health concern. Southeast Asia in general, and Vietnam in particular, is the epicenter for zoonotic infection with several outbreaks reported and is home to rapidly growing human and animal populations. The animal production systems and food consumption habits in Vietnam put the country at high risk of zoonotic infections. The vivid example is the common infections with *Streptococcus suis* in acute bacterial meningitis adult patients. Other examples include avian influenza and food-born zoonotic (FBZ) infections. This interdisciplinary programme has investigated the prevalence of potential zoonotic antimicrobial resistant bacteria and the zoonotic pathogen, *S. suis*, in the animal food production chain in Mekong Delta. The data and results will be shared with the studied participants in the on-going qualitative study to improve awareness of the food animal occupational exposed communities towards zoonotic infections. The ultimate objective of this project is to employ local research based evident in improving perception of participants and local communities towards potential zoonotic transmission, which would initiate a change in high-risk activities in zoonotic high risk communities. This could also serve as a model to replicate elsewhere in Asia and globally.

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Surveillance information is crucial for understanding infectious disease dynamics, early warning, and formulation of prevention and control strategies. However, surveillance systems’ data quality is rarely evaluated. This applies for human, animal and interface surveillance systems. Inaccurate data, not catering for uncertainties propagates to models and interventions, creating fallacies in public health response. Previous surveillance design models have incorporated an optimal selection algorithm of surveillance networks based on the Value of Information (VoI) of reporting nodes. These are sub-networks of potential transmission networks where socio-ecological drivers move and interact leading to health patterns. To evaluate surveillance systems we explicitly assess the information received by the system and extend the evaluation beyond the network topology. Multiple criteria are used to measure VoI. A predictive information-theoretic model constructed on an entropy-based variance decomposition principle is run for different surveillance scenarios. These metrics evaluate accuracy in outbreak timing, magnitude and total cases. A stochastic Multiple Criteria Decision-Analysis (MCDA) model was applied to 2010 Haiti's cholera outbreak. VoI maximization leads to a minimum increase in prediction accuracy of 50%, 47%, and 27% for outbreak source detection, timing, and size respectively, and a 20% reduction in required surveillance nodes, compared to random surveillance.
A social ecological model of farmers’ attitudes and behaviours towards the control of animal diseases

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The aim of the research is to understand broiler farmers' opinions, attitudes, and behaviours concerning on-farm biosecurity programmes in Taiwan. This mixed-method research involves two phases aimed at identifying social and epidemiological factors influencing the uptake of recommended on-farm disease management measures. Content analysis of face-to-face interviews with 25 farmers revealed the influence of macro socio-economic conditions on farmers' attitudes. A social ecological model was then developed to explain the complexity of factors affecting on-farm biosecurity practices with multilevel social structure. Survey data were collected from 303 farmers to understand the current situation of production processes. Using categorical principal components analysis and two-stage cluster analysis, two types of clusters were identified: attitude clusters (based on 15 variables) and behaviour clusters (characterised by 30 variables), and these findings suggested it is essential to apply appropriate and specified behavioural change theories to groups of farmers. The novelty of this research lies in its wider relevance to Taiwan's poultry production industry in that it identifies the shortcomings of focussing primarily on epidemiological risk factors and not including social factors, as tends to be the case in most animal disease control activities.
Relationships among dietary animal source food intake and disease status on measures of growth in children less than 2 years in rural Uganda

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Chronic malnutrition and illness among pregnant women and children are major modifiable risks to public health and economic development. In Uganda 38% of children under 5 are stunted and most affected by communicable and other illnesses. These and other factors result in an average IQ in Uganda and SubSaharan Africa 16% lower relative to developed world norms (84 vs 100). We examined 430 Ugandan households in 3 districts to identify effects of animal source food consumption and infection on growth. ASF is consumed less than twice weekly in 50% of households with 30% not consuming fish, meat, eggs or milk in their diets. Of 70 males and 61 females under 2 years (n=131) 30% were 2SD under WHO standard for both height and weight for age. However, 54.2% were 2 SD under standard for height while 32% were 2 SD under standard for weight. Less than one percent of people had presence of Brucella antibodies. At least 50% of people older than 21 years were tuberculin test positive. Unexpectedly, 181 individuals were Card Agglutination Test for Trypanosome positive for T gambiense at a dilution of ½ or more and 366 were positive on undiluted sera (n=724).
A study of the bacteriological quality of bottled and tap waters in Cebu City, Philippines

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A study was conducted in Cebu City, Philippines with the aim of assessing the bacteriological quality of bottled and tap drinking waters. The bacteriological tests performed were: E. coli, thermostolerant coliforms, total coliforms, and heterotrophic plate counts. In addition, sanitation programs applied by bottled water manufacturers and the local water system supplier were surveyed using a questionnaire. The results indicated the presence of bacteria in both bottled and tap water samples. A number of bottled water samples from one brand were positive for heterotrophic plate count bacteria whilst positive tap water samples from one household were positive for E. coli, thermostolerant coliforms, total coliforms, and the HPC bacteria. Multivariable Poisson regression modelling indicated a significant variability in heterotrophic bacterial counts between production batches of bottled water. In regard to sanitation programs, the municipal water supplier and all except one bottled water manufacturer reported the application of Good Manufacturing Programs. Interestingly, the only bottled water manufacturer which did not respond to the survey manufactured the only brand consistently showing positive bacterial counts and failing the Philippine regulatory standards. It is concluded that a number of factors associated with bacterial contamination of drinking water require stringent monitoring systems and control programs.
Ebola virus surveillance in pigs presenting for slaughter in Uganda

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In 2008, Ebola Reston was discovered to infect pigs in the Philippines. Additionally, pigs have been experimentally infected with Ebola Zaire. Uganda has experienced five Ebola outbreaks with index cases unable to account for their source of infection. Over the past 30 years, the pig population in Uganda has increased by more than tenfold to meet growing consumer demand for pork. We are conducting research in regions of Uganda where pig keeping is an increasingly important livelihood strategy and where suitable ecological conditions exist for the emergence and persistence of pig-associated zoonotic diseases including Ebolavirus. Methods being used include repeated cross-sectional sampling of pigs presenting for slaughter during months when previous human Ebola outbreaks occurred in the country and when pig slaughter is known to increase. To determine effective locations for implementation of future surveillance and mitigation measures, pig trader network analysis to map pig trade volumes and routes is being done in conjunction with slaughterhouse surveillance. This is the first systematic, field-based study to determine if pigs are naturally infected with Ebolavirus in an area with previous outbreaks. Methods and findings to date will be shared.
Minding the Gap on Campylobacter Epidemiology and the Public Health Risk in Developing Countries: The Model of the Australian-Swedish Collaborative Research Project in Egypt

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In Egypt, Campylobacter is hyper-endemic leading cause of child diarrhea. The gap of knowledge about the epidemiology of Campylobacter in food sources hinders accurate assessment of the human health burden. Funded by the Swedish Research Council, we describe here a model for research that could be extended to other developing countries. The research is founded on a model of exchange of senior researchers, capacity building of junior researchers, and organizing technical and laboratory capacity building trainings. The project will provide the first baseline data on Campylobacter in broiler meat in Egypt, the data will be used for a quantitative risk assessment for such important zoonotic pathogen.

Partners from Sweden (the Swedish University of Agricultural Sciences and the Swedish National Veterinary Institute), Egypt (Alexandria University), and Australia (School of Veterinary and Life Sciences, Murdoch University) will be collaborating in order to generate baseline data on Campylobacter in retail chicken meat in Egypt; to study the genotypic diversity, antimicrobial resistance, and virulence of Campylobacter isolates; and to develop a quantitative model for human campylobacteriosis infection risk from consumption of broiler meat in Egypt. We present this research project as a model for providing a science based contribution toward reducing the risk of foodborne pathogens and enhancing safe food resources the developing world.
A microbial assessment scheme and statistical modelling were used to assess the control activities in five fresh produce export companies in Kenya. Generalized linear mixed models, and correlated random effects joint models for multivariate clustered data followed by Empirical Bayes estimates enabled analysis of the probability of contamination across critical sampling locations (CSLs) and factories as random effects.

*Salmonella* spp. and *L. monocytogenes* were not detected in final products. *E. coli* was detected in 5 out of 6 of the CSLs, including the final product. Amongst the environment samples, hands or glove swabs of personnel revealed higher predicted contamination with *E. coli*, and 80% of the factories were positive at this CSL. End products showed higher predicted probabilities of the lowest level of food safety compared with raw materials and *E. coli* positive in final products in instances where it was negative in initial products for 60% of the processors. There was higher probability of contamination with coliforms in water at inlet than the final rinse water. Four out of five of the assessed processors had poor to unacceptable counts of *Enterobacteriaceae* on processing surfaces. Personnel, equipment and product related hygiene measures towards improved performance of preventive and intervention measures are recommended.
Addressing Antimicrobial Usage In Asia’s Food Animal Production Industry: A One Health Approach To Preventing And Controlling Resistance

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Decades of widespread antimicrobial use in human and animal health settings is driving antimicrobial resistance (AMR). If this does not change AMR-associated human mortality is estimated to surge over ten-fold annually by 2050, leading to a formidable economic burden. Livestock production employs twenty-seven different classes of antimicrobials, many of critical significance to human health. Between 2000 and 2030, demand will soar 200% and 150% for poultry and pork, respectively, in Southeast Asia, and accelerated growth in non-therapeutic antimicrobial (NTA) use is expected in Asia's livestock sectors to deliver animal protein. Preservation of antimicrobial efficacy is a global public good, demanding local action and accountability. This paper will present data from Asia on anti-microbial usage in select terrestrial and aquatic production sectors paired with on-farm surveillance for resistance and economic analysis of eliminating NTA use. Strategies will be highlighted to enhance the institutional environment through improved awareness, strengthened regulation, and optimal usage. The work demonstrates that addressing NTA use in animal production will yield strengthened public health, food security, and more resilient livestock-based livelihoods.
Challenges and Opportunities for Wildlife Disease Surveillance for Zoonotic Disease Control in Sri Lanka

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Wildlife play a critical role in emerging and endemic zoonotic diseases. Measures for their prevention, mitigation and early warning require surveillance of wildlife mortality and morbidity, knowledge of the populations at risk and of the changing character of wildlife disease agents. Until recently, Sri Lanka lacked a central wildlife disease surveillance program. The newly created Sri Lanka Wildlife Health Center (SLWHC) brings together ministries responsible for domestic animals, wildlife, human health and the Faculty of Veterinary Medicine and Animal Science of the University of Peradeniya. A questionnaire survey conducted in 2015 and 2016 among field veterinarians, livestock development instructors and wildlife officers (n=315), indicated that a lack of trained personnel (85%), inadequate knowledge on wildlife disease (80%), strict wildlife legislation (60%), lack of sample collection and storing facilities (95%), transportation (82%) and inadequate communication between partner institutes (52%) were constraints on wildlife disease surveillance. About 70% of field officers felt they needed additional training. The opportunities for improvement highlighted by the survey included firstly, willingness by 80% of respondents to participate in wildlife disease surveillance and secondly, the ability through the SLWHC, to improve communication between partners by providing infrastructure, deliver training programs and standardize sample collection, storage and submission.
Genotype 3 of hepatitis E virus (HEV) was recently isolated from three patients with hepatitis in Cape Town, South Africa. As pigs are the reservoir of HEV genotype 3, prevalence of HEV was investigated in a cross-sectional study of 16 commercial pig herds supplying pork to Cape Town. A strain of HEV genotype 3e related to the human strains from Cape Town was identified in serum of one of the sampled pigs. A high HEV seroprevalence was found, with a median within-herd prevalence of 0.93. Preliminary analysis of factors on farms from which sampled pigs had originated identified several factors which were associated with HEV seropositivity at slaughter, including age-group mixing, increased contact between pigs and manure, inadequate pen resting times, and lack of general biosecurity measures. This is the first study to investigate the presence and epidemiology of HEV in South African pigs. The findings indicate that strategies to prevent cases of the disease can only be approached from a one-health perspective to include prevention of transmission between pigs, prevention of zoonotic spread to animal workers and pork consumers, and adequate control of farm and abattoir waste to prevent contamination of the environment.
Operationalising Transdisciplinarity: How Epidemiologists, Anthropologists And Economists Contributed To Taenia Solium Control In Northern Lao PDR

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Phouth Inthavong, Boualam Khamlome, Amanda Ash, Walter Okello, Kevin Bardosh, Tassilo Tiemann, John Allen

Suspicion regarding the existence of hyperendemic *Taenia solium* foci in Lao PDR were confirmed in 2013, when a crude taeniasis prevalence of 30.6% (95% C.I. 25.5 - 38.9%) was identified in a remote village of 300 inhabitants in the north. By early 2015, a control intervention in both the human and pigs had achieved a 78.7% reduction of adult parasite levels to 6.5% (95% C.I 3.4 - 9.5%). Whilst epidemiological studies were key to demonstrating the overall goal of parasite reduction, careful consideration of diagnostic, anthropological and socioeconomic factors was necessary to balance community acceptability with scientific rigour and economic feasibility. Anthropological assessments flagged previously unknown transmission drivers - such as the significance of raw pork consumption for sacrificial ceremonies - highlighting the need to consider social realities in the design of community-level interventions. Similarly, the requirement to optimise cost effectiveness for policy purposes was a key motive for building soil transmitted helminths and classical swine fever control into the design from the outset. Garnering advocacy and action for disease control requires foresight into not just how diseases are transmitted, but how communities function and how policies are developed and funded. This pilot intervention showcases how transdisciplinarity contributes to the design, monitoring, evaluation - and ultimately the success - of ground level interventions.
A One Health Sustainability Metric For Dairy Production

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The global production of dairy milk and related products provides a source of key nutrients needed to sustain an ever-growing global population. At the same time, concerns have been raised about the impact of dairy production on the local and global environment. Since dairy farming has critical human, animal, and environmental health aspects, the One Health approach offers a holistic perspective on what can be considered "sustainable" dairy production. Just as the LEED criteria provide an explicit method for rating sustainable building practices, we propose the development of a set of One Health criteria for dairy products that could be eventually used in food labeling to encourage consumers to support sustainable dairy food systems. Such criteria should include aspects such as life cycle analysis to calculate carbon footprint of different production systems and metrics to assess impacts on animal health and welfare, health of dairy workers and consumers and impact on local air, water, and soil environments. We report on initial work toward creating these criteria including development of a conceptual model, qualitative stakeholder assessment, formation of an international advisory board and an evaluation of existing food labels and other dairy production-related metrics.
Prevalence of TB infection in a cohort of cattle that enters the food chain in Accra, Ghana using Bovigam

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Tuberculosis (TB) is a public health problem in Ghana. There are 286 cases per 100,000 people. The contribution of bovine TB to the general TB burden is unknown. Herdsmen, livestock workers, veterinarians and the general public are at high risk of contracting bovine TB. Unfortunately, activities to check and control cattle with infection from entering the food chain are inadequate or unavailable. This study aim to determine the prevalence of TB infection in a cohort of cattle that enter the food chain in Accra, Ghana. A cross sectional study involving five major abattoirs was conducted in the Greater Accra region between September 2012 and June 2013. After routine inspection of live cattle by veterinary officials, 10 ml of blood was drawn from 94 cattle before slaughter and tested for TB infection using BOVIGAM. Six (6.4%) of the 94 cattle screened, were positive for TB infection. Although the study recorded a lower prevalence of 6.4%, all the animals tested were deemed fit for slaughter by veterinary officials and were to enter the food chain. The low sensitivity of routine abattoir inspection for infected organs and negative results of post-mortem examination reinforces the need for more sensitive screening tool such as BOVIGAM.
Overconsumption Of Energy And Excessive Discretionary Food Intake Inflates Dietary Greenhouse Gas Emissions In Australia

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Population dietary guidelines are mainly focussed on nutrition and health, but more quantifiable evidence is needed to understand the environmental impacts of food choices. This paper utilised the 2011-12 Australian Health Survey food intake data and the updated IOPC input-output model to estimate the greenhouse gas emissions (GHGe) of Australian's dietary intake, and compare current patterns of eating which vary in diet quality and GHGe to the recommended diet. The average dietary GHGe were 18.72±12.06 and 13.73±8.72kgCO 2 e/day for male and female adults respectively. The correlation between total energy and GHGe was r=0.54(p<0.001). Core foods contributed 68.4% and discretionary foods 29.4% to GHGe. Of the core foods, fresh meat and alternatives (33.9%) and discretionary foods (29.4%) were the highest contributors. The modelling of current dietary patterns showed the contribution of GHGe from discretionary foods was 121% greater in the average diet and 307% greater in the 'lower quality, higher GHGe' dietary pattern compared to the recommended diet. Reducing discretionary food intake would allow for small increases in emissions from core foods (in particular vegetables, dairy and grains), thereby providing a nutritional benefit at little environmental expense. There is synergy between messages of healthy eating and environmental sustainability, so a consistent public health message could be developed.
Prevalence Of Avian Influenza Viruses In Domestic And Wild Birds In Bangladesh: Are Poultry Or Wild Birds The Main AIV Reservoir?

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AIV are of great socioeconomic and health concern, notably in Southeast Asia where HPAI, such as H5N1 and other H5 and H7 AIVs keep endemic. Wildbirds and notably migrants are often implied in the maintenance and spread of AIVs. However, little systematic surveillance of wildbirds has been conducted in Southeast Asia to evaluate whether the prevalence of AIV in wildbirds is higher than in other parts of the world. Across Bangladesh we randomly sampled a total of 5917 wild and domestic birds to assess the prevalence of AIV and antibodies and compared these with prevalence found elsewhere. Study showed that wildbirds in Bangladesh do not have a particularly high AIV and antibodies compared to wildbirds from regions where H5N1 is not endemic. Like elsewhere, notably wildbirds of the orders Anseriformes were identified as the main wildbird reservoirs, although we found exceptional high sero-prevalence in Passeriformes, the house crow (Corvus splendens), importantly living offal from live bird markets. This finding, together with remarkably high AIV and antibodies in domestic birds, do not suggest that wildbirds are at the base of the perpetuation of AIV problems in the local poultry sector, but may easily become victim to AIV spill-back from poultry, potentially assisting in a further spread of the virus.
Humoral Immune Responses Of Rousettus Aegyptiacus To Marburg Virus

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The Egyptian fruit bat, Rousettus aegyptiacus, is a reservoir host for Marburg virus (MARV). Characterising the antibody responses of reservoir hosts may provide insights into which antibodies may be important for protection against infection, and which proteins to target for diagnosis and surveillance. Additionally, determining when juvenile bats lose maternal immunity may assist in predicting spill-over events into human and animal populations, as loss of immunity in juveniles increases susceptibility of bat populations to MARV infection. We determined the serological responses of Rousettus aegyptiacus to structural MARV proteins using enzyme-linked immunosorbent assays. In experimentally infected bats, antibodies against the glycoprotein (GP) steadily waned after peaking at 12 days post-infection, while antibodies against the nucleoprotein (NP) reached a plateau between days 12 and 42 post-infection. Results in field collected sera showed the presence of anti-NP antibody in the absence of anti-GP antibody, inferring that anti-GP immunity might have waned below detectable levels at the time of sample collection. The nucleoprotein might therefore be a better immunoreagent for surveillance studies aimed at assessing past exposure to MARV in Rousettus aegyptiacus. In juveniles, maternal anti-GP and anti-NP antibodies were lost within 3 to 5 months after birth. This information will assist in predicting and preventing future spill-over events.
Zoonotic diseases, or diseases that are transmitted from animals to humans represent a major threat to global health; accounting for more than 60 percent of all human infections over the past 20 years. The recent outbreaks of the Zika virus in Brazil, Ebola in West Africa, and swine flu in Mexico, Thailand, and Egypt, highlight the magnitude of this challenge. However, the burden of zoonoses is greater in developing countries where poverty and its conditions exacerbate risk of transmission and persistence of infectious diseases. A number of measures have been proposed to tackle zoonotic diseases by combining integrated approaches for animal, human and eco-system health, under the auspices of "One Health". However, implementing these approaches, particularly in resource-limited settings remains a challenge for health actors. In this paper, I will offer a critique of the One Health approaches and I will attempt to unpack some of the inherent assumptions that there is a 'one health' for all contexts. The paper will focus on dynamic livelihoods and associated health challenges in pastoral settings of East Africa, which I argue, make it difficult to implement a One Health approach. The goal is to offer useful insights, based on developing-country field experience, on new ways of re-thinking public health interventions for such settings.
SACIDS TechnoHealth Innovation Laboratory to support One Health disease surveillance in East and Southern Africa

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6Ministry of Agriculture Livestock and Fisheries
7Skoll Global Threats Fund

Infectious disease surveillance systems face challenges and consequently there is sub-optimal performance in detection and response to disease outbreaks. The current wide use of Information Technologies (IT) offers opportunity to improve early detection and prompt response. An Epihack event was organized in Tanzania in 2014 and attended by 59 participants who jointly planned and developed digital solutions (prototypes) to address health challenges facing the animal and public health sectors. The challenges identified were: delayed submission and incompleteness of official disease surveillance reports, inability to trace individual humans and animals as well as their locations during disease outbreaks, lack of feedback as well as failure to capture major disease events occurring at the community level. Guided by the community-level One Health security theory of change, SACIDS TechnoHealth innovation laboratory has developed IT tools to support: i) community-based participatory disease surveillance; ii) facility-based disease reporting system; iii) feedback: two-way communication
between officials and data collectors; and iv) One Health knowledge repository. The tools have been tested and deployed in different ecosystems shared by different countries in East and Southern Africa. We expect this initiative to progressively contribute to disease detection and response at community level and hence national, regional and global levels.
Socio-environmental risk factors associated to malaria and schistosomiasis in Korhogo (Northern Côte d'Ivoire)

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This study aims to describe the weakness of access to water, sanitation and hygiene (WASH) in Korhogo, a secondary city in Côte d’Ivoire, and understand their main consequences for malaria and schistosomiasis transmission. A cross sectional study was conducted respectively in the rainy and dry season in 2015 to identify the socio-environmental risk factors for malaria and schistosomiasis. We located 325 and 256 stagnant wastewater points respectively during the rainy and dry seasons. There are 10 shallows and a dam using by 7.5\% of the population for urban agriculture. That shows the existence of risk for vector borne diseases. Overall Plasmodium prevalence was 12.5\% (863/6868). Intestinal schistosomiasis prevalence was 6\% (60/1009) and 3.5\% (42/1202) in the rainy season and dry respectively. The use of traditional latrine in the households is associated to 84.44\% (38/45) cases of schistosomiasis against 15.56\% (7/45) for the households with modern latrine. 70\% of cases of malaria identified come from neighborhoods with unsafe water supply. Well water is the main source of drinking water in 63\% (912/1439) of household in the city. Understand the weakness of WASH and these consequences on the spatial distribution of these diseases can help in the development of control strategies.
Assessment Of Exposure To Toxic Metals In Children From Aquiles Lanza Ghetto-montevideo, Uruguay.

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Recently a children’s health survey showed blood lead levels of concern in Aquiles Lanza’s ghetto. The families were not well advised about this environmental problem and they were worried about their children. These families showed their concern to an NGO, Gurises Unidos that takes care of this ghetto working with the families living there, by taking actions to improve their children's quality of life. Owing to this children’s lead health risks issues, families' demanded urgent solutions, so the Toxicology Area of Chemistry Faculty, proposed a joint project with the NGO, based on EcoHealth pillars. This project’s aims were to assess lead and other toxic metals exposure, such as manganese, arsenic and mercury in children’s hair samples and their possible correlations with health, social and environmental status. Physicians, social workers, teachers, biologists, chemical toxicologists and a biochemist integrated the research team. This team prepared didactic materials to present in several workshops with this community in order to inform and prevent toxic metals exposure. In the meantime, hair samples and individual interviews were taken and laboratory analysis were carry out afterwards. We present the analytical results and statistical processing data with our conclusions and learnings to continue working on Ecohealth approach within these environmental health problems in Uruguay.
Soils Health And Agriculture Sustainability In Argentina: Nutrients Metabolism And Socio-ecological Trade-offs

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Statistical records in Argentina show that cultivated lands have increased greatly in the last century, describing a natural capital depletion process that directly impacted on soils health, pinning Argentina's future capacity for physical and economic access to sufficient, safe and nutritious food. Biophysical effects of this agricultural driven intensification account for a net loss of soil nutrients due to primary exports from agroecosystems and degradation of agricultural land. These stresses and their effects on critical ecological properties were analysed and discussed. Soil nutrients dynamics was particularly inspected through Material Flow Analysis (MFA), conducted to determine the fluxes described by the past fifty years of agricultural use. This has provided evidence of how nutrient flows are modified by land transformation under low external-input conditions, and has given MFA significant relevance as a tool for environmental accounting and quantitative description of the metabolic pattern of primary resources. Conceptualization and identification of changing gradients and trends in space and time, prove key to be applied in the emerging fields of environment administration and land management to sustain healthy ecosystems which provide services of tremendous social and economic value, and particularly relevant in nations' food security and food sovereignty actual debates.
Health Problem Analysis – Acute Respiratory Infections In Indonesia, 2012-2014

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The Acute Respiratory Infections (ARIs) Control Program in Indonesia has been implemented since 1984. This study described surveillance and program findings of <5 pneumonia control in Indonesia.

An observational study with descriptive analyses was conducted in the Sub Directorate ARIs at Ministry of Health of Indonesia. Data analyzed were provincial reports on cases detected per 100,000 children <5 years of age.

In 2012-2013, West Nusa Tenggara had the greatest <5 pneumonia prevalence with 5,924 and 5,623 cases per 100,000 children. In 2014, Bangka Belitung had the greatest prevalence at 5,637 cases per 100,000 children. Case finding was below the national target of 80% ranging between 23-29% in 2012-2014. Data on case outcome were poorly completed and could not be analyzed. The proportion of districts not reporting clinical outcomes ranged between 12-18% in 2012-2014. Some districts that report case detection >80% only 5 districts (3%) in 2012-2013, and increase became 340 districts (68%) in 2014.

Indicators for the pneumonia control program have not been successfully achieved in Indonesia. The application and reporting of pneumonia case detection and clinical management indicators are necessary to ensure that every province improves its performance to reduce morbidity and mortality associated with pneumonia.
Implementing One Health in Australia: Analyzing Expert perspectives

Chris Degeling
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To achieve optimal health for humans, animals, and their shared environments, One Health (OH) depends on collaboration between disciplines. Case reports and systematic reviews of OH success are beginning to emerge. But identifying and assessing barriers to and enablers of effective cross-sectorial collaboration have received scant attention in this literature. We conducted a 4 phase mixed-method Delphi survey with Australian practitioners and policymakers (n=52) to explore areas of conflict and consensus in: (i) how OH should be defined operationally; (ii) the potential for cross-sectorial collaboration; and (iii) the key priorities that should shape the development of a OH response to a significant elevation in zoonotic risk. We identified high levels of cross-sectorial consensus on the need for OH approaches to infectious disease prevention and control, and the key priorities for planning OH responses to outbreaks. Conflicts occurred in relation to the definition of OH and the relative importance given to animal health and welfare and economic factors in decision making. Overall the support for a OH approach across Australian governments and practitioners appears to be strong, but as participants commented, more work needs to be done to ensure cross-sectorial differences stimulate better policymaking rather than simply conflict and disagreement.
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Managing communicable disease outbreaks at the human and animal health interface

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Disease outbreaks requiring both human and animal health responses are not uncommon. While one arm may be dominant in a particular response, the other agencies often have a role to play. Over the past decade the One Health network operating in northern NSW has collaborated in large disease outbreak responses such as equine influenza (2007), anthrax (2007), babesiosis (2014), Q fever (2014) and many smaller disease clusters. In some instances, a multi-agency team has been activated, including representatives from Hunter New England Population Health, Department of Primary Industries, and Wildlife Health Australia. Although multiagency responses produce unique challenges with regard lead, roles and responsibilities they have important benefits through access to an extensive set of skills, experience and surge capacity. To facilitate effective response activities, the broader One Health Group regularly meets by teleconference and occasionally through workshops and jointly run training/emergency exercises. These interactions reinforce relationships during ‘peace time’ and provide a sound base for occasions when urgent collaboration is required. Additionally it provides a channel for notification of emerging risks and outbreaks. In this presentation, examples of responses and exercises will be reviewed with key findings, recommendations and advice for units wishing to strengthen One Health biopreparedness.
Brucellosis is one of the most common zoonotic diseases found worldwide. In Mongolia, human brucellosis first became an issue during the 1960s and since 1975, a mass vaccination strategy of small ruminants and cattle has successfully reduced human brucellosis cases from 48 cases (1974 year) to 0.23 case per 100,000 population at the end of the 1985. After 1990, human brucellosis re-emerged due to the severe decline in medical and veterinary services and lack of economic resources during the post-communist transition period. By 2003, Mongolia was ranked the second highest in terms of human brucellosis cases worldwide. It is therefore surprising, that despite the high prevalence of brucellosis, there has been hardly any genetic characterization of brucellosis in the country. In this study we characterized 58 isolates of B. melitensis and B. abortus from humans and livestock within five provinces of Mongolia using a 16 Multi Locus Variable number tandem repeat Analysis (MLVA-16). The 58 Mongolian strains were genetically more diverse when compared to Central Asian strains. Human strains were most closely associated to B. melitensis strains from sheep and goats. To the best of our
knowledge, this is the first report on MLVA-16 characterized Brucella spp. strains from Mongolia.

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The increasing interconnection between people, animals, and plants in the environment affected by the human activities is the cause of the international call for the “One Health” strategy through the holistic and integrated approach of different disease causes and risk factors with the participation of all society sectors. Since 2005, the Center for Training in Sanitary Disaster Reduction in Animals and Plants (CEDESAP) and its cross-sectoral and multidisciplinary network REDesastres (more than 400 members), have developed a continuous surveillance of the international sanitary situation and the disaster risk factors due to emerging and re-emerging diseases and pests in animals and crops of economic interest, particularly those with higher impact on food security and public health, such as the zoonotic diseases. The consequences over the pathogen-host-environment interaction due to the human activity and climate change are also observed. We propose the permanent updating of researchers, professors, productive sectors, managers and the Civil Defense, concerning the evolution of transboundary diseases, the prevention/control programs, and the state of art of vaccines, diagnostic tests, etc. Avian influenza, leptospirosis, Ebola, and African swine fever viruses, among others, have been followed. Such threats, risks and society vulnerabilities were subject of more than 2435 news/warnings in 2013-2015.
Long-term T cell immunity against influenza A virus is primarily contained in airway-associated lymph nodes of infected mice

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In order to study phenotype, function and localization of influenza virus antigen-presenting cells and virus-specific, memory T cells C57BL/6 and BALB/c mice were infected intranasally with a sublethal dose of H1N1 influenza virus (PR8). Viral RNA in different tissues was determined by RT-PCR. Infected mice were challenged with a lethal dose of homologous virus three months later. At 1 - 15 months post challenge purified T cells obtained from mediastinal lymph nodes (MLN), lungs or spleens were co-cultured in vitro with APCs obtained from syngeneic, naïve mice infected with PR8 36 hours earlier. After 45 hours of co-culture, cell-free culture supernatants were analyzed for cytokines in Gyros Bioaffy. Cell proliferation was determined by ³H-thymidine uptake at 60 hours of culture. Replicating virus was only detected in MLNs and lungs. Furthermore, infected MLN APCs stimulated a high cell proliferation and production of pro-inflammatory cytokines of immune, splenic CD4⁺ T cells whereas infected lung APCs induced a proliferation-independent production of IFN-γ by immune CD4⁺ T cells. Thus, PR8 infects airway-associated tissues where regional MLNs constitute an optimal environment for the generation of protective, long-term local immunity against PR8 primarily mediated by highly differentiated memory T cells generated after interaction with efficient APCs.
Implications Of Wild Animal Density As Predictor Of Disease Risks And Changing Cattle Breed Types For Pastoralists' Development In South Western Uganda

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This study investigated the spatial distribution of wild ungulates which pastoralist communities perceive as culprits in the transmission of cattle diseases outside protected areas in south western Uganda. It advances understanding how animal distribution might influence the cost of cattle diseases control and rangeland resource utilization for cattle production. Two datasets were collected using line transect method and interview schedules conducted in a survey design. The results showed that pastoralist households incur less cost of cattle diseases control in areas with significant decline in wild ungulate populations due to increased distance from the park boundary ($R^2 = 0.965, P < 0.001$). In turn, diseases transmitted through wildlife-livestock interactions influenced the type of cattle breed and herd size. The mean population of indigenous cattle decreased while those of exotic breed increased with increasing distance away from the park boundary. The spatial distribution of wild ungulates is an important factor that needs monitoring for predicting disease prevalence, types of cattle breed and vulnerable households. Finally, these findings advance knowledge that should enable land use planners, conservationists and development partners working with pastoralists, to apply an ecohealth approach to ensure 'healthier and prosperous communities' in the Lake Mburo Conservation Area.
Towards zero antibiotic use in agriculture

Mark Bryan

VetSouth Ltd

The New Zealand Veterinary Association has made an aspirational goal that 'by 2030, NZ Inc will no longer use antimicrobials for the maintenance of health and welfare of animals.' This goal was set with the focus of helping mitigate the risk of antimicrobial resistance firmly in mind. New Zealand agriculture already has one of the lowest rates of use of antimicrobials globally, with a recent paper identifying it as the third lowest of those countries with reliable data. However, to achieve the 2030 goal a shift in mindset of the agricultural industry towards a more sustainable approach to production is required.

This paper will report on the current state of the industry in New Zealand with regard to antimicrobial use. In particular, it will discuss monitoring programmes that are being considered, the steps that may be required to achieve the 2030 goal, and the problems that may impede progress. This goal is unique from a global perspective and the journey that New Zealand is starting could provide a valuable template for other agricultural countries.
Improving food security in Africa by enhancing resistance to Newcastle disease and heat stress in chickens: Genomics to improve poultry

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Homestead and small-scale poultry production has tremendous potential for alleviation of malnutrition and poverty in climate-stressed rural communities in Africa. Poor animal health and husbandry practices limit village poultry production throughout Africa. Newcastle disease (ND) is the number one constraint of raising poultry in Africa, causing mortality as high as 80% among village flocks. The goal of this USAID-supported program is to utilize deep phenotyping combined with advanced genomic selection to sustainably enhance innate resistance to ND and heat stress in indigenous African chickens to improve production. Genes and signal pathways associated with genetic resistance to NDV infection and heat stress were identified by RNA sequencing in well-established ND-resistant and susceptible inbred lines in the US by challenging chickens with a lentogenic ND virus strain in temperate or hot environments. Six African chicken ecotypes and one commercial layer line widely used in Africa were challenged. The chicken 600K SNP chip was used to identify SNP or regions associated with resistance to NDV and heat stress. Enhanced resistant birds will be selected and bred for distribution to smallholder farmers and households. The expected results will help achieve the USAID Feed the Future Program goals to reduce hunger and strengthen food security.
Positive Changes In KAP Of Rural Women On SRH Through Awareness Raising Programmes

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The situation of reproductive health of females is not satisfactory especially in the rural areas of developing countries like Nepal. The project "Chetana" was conducted in 5 Village Development Committees of Lalitpur and Bhaktapur districts of Nepal for 4 months in 2015, with the objectives of providing information about different sexual and reproductive health issues to the women there. Participation and partnerships with local women's group in planning, implementation and monitoring are key approaches adopted by the project. Awareness classes were given to "Aama Samuhas" (Mothers Groups) along with dramas. The findings of end-line survey as compared to baseline survey demonstrate the positive changes due to awareness raising programmes. The comparative analysis shows that the use of Family Planning related words without hesitancy increased from 26% to 69%; awareness on availability of FP services increased from 40% to 72%; awareness about provision of Safe and Legal Abortion also increased. Involvement of local women was a key to the success of the project. Capacity building and feeling of ownership motivated the women to learn more. Awareness raising programmes from the grass root levels are really essential to change the KAP of women in rural areas on SRH issues.
Wildlife Health Australia and One Health: What’s Working and Why?

Rupert Woods¹

¹Wildlife Health Australia

Australia has one of the best biosecurity systems in the World. Wildlife is part of that system. Wildlife Health Australia Incorporated (Wildlife Health Australia; WHA) is an initiative of the Australian government comprising a network of stakeholders across Australia with an interest in wildlife health. The core business activity is coordination of wildlife health surveillance information that can be used to improve decision making, management and policy development to protect Australia's natural environment, trade, human health, livestock health, biodiversity and tourism. Funding is primarily from the Australian Government Department of Agriculture and Water Resources (DAWR) through the Caring for Our Country (CFoC) program, with the understanding that, with other funding, WHA could also become more involved with biodiversity, human health and environmental issues. However, most of WHA's programs and activities function within a One Health space. This paper presents some of the activities that are working well and explains why. It discusses the future for wildlife health in Australia, opportunities for potential collaboration, and concludes that though much good work has been done, much is still to do and there is the need for sustained direction and focus.
Wildlife are increasingly recognised as the source of emerging diseases with potential impact on human health, domestic animal health, trade and biodiversity. Detection of wildlife disease events present a number of challenges; with reliance on observation of sick and/or dead wildlife e.g. by a member of the public, field researcher, ranger or hunter, and then on the observer deciding to, and knowing how to, report the event. Once reported, sample submission and diagnostic investigation may ensue, with further hurdles to overcome. The key to early detection of emerging diseases is surveillance, coupled with an integrated system for reporting disease investigations and data capture. Australia's national system for wildlife disease surveillance is co-ordinated by Wildlife Health Australia (WHA). WHA's approach aims to engage stakeholders across the environment, agriculture and human health spectrum to ensure greater awareness of wildlife disease. Coordination of the surveillance systems includes dedicated partners based in both government and non-government organisations. This presentation will explore further the challenges of wildlife disease surveillance and how being in the relationship business is at the core of surveillance.
Wildlife Networking in a One Health Space

Victoria (Tiggy) Grillo¹
Rupert Woods¹, Keren Cox-Witton¹

¹Wildlife Health Australia

With increasing concern of disease spillover from wildlife to humans, and wildlife being the most common global source of emerging infectious disease; there is a need for a One Health approach to engage stakeholders across the environment, agriculture and human health spectrum. Wildlife Health Australia (WHA) coordinates a growing national network of over 600 members from a range of disciplines to ensure greater awareness and management of wild animal disease. WHA’s connected wildlife health surveillance and knowledge network is facilitated through circulation of a weekly electronic Digest of wildlife health information of relevance to Australia. The Digest is produced through scanning of web-based, publicly available information (publications, grey literature and media stories) on wildlife diseases of relevance to domestic animal, human health and biodiversity. It provides current and relevant information to members allowing them to maintain awareness of diseases with wildlife as part of their ecology that may be of significance in Australia. It provides the basis for a One Health network of interested individuals and is a key outreach and awareness mechanism for wildlife health.
Australia’s Bat Health Focus Group – One Health in Action

Keren Cox-Witton

Rupert Woods, Victoria (Tiggy) Grillo

Wildlife Health Australia

The One Health concept has grown out of the recognition that human health, domestic animal health and wildlife health are strongly interlinked with each other and the environment. Recent disease outbreaks have raised the profile of bats within this paradigm. Wildlife Health Australia (WHA), the national peak body for wildlife health, is an example of One Health in action, coordinating a growing network of over 600 wildlife health professionals around Australia from a range of disciplines. WHA’s Bat Health Focus Group is a successful illustration of this approach. Members include representatives from commonwealth and state/territory government agencies dealing with public health, agriculture and environment, university researchers, ecologists, virologists, epidemiologists, veterinarians, wildlife/bat carers, cavers, and the Australasian Bat Society. Using a collaborative One Health approach, the group considers bat health issues in relation to the broader context of public health, biosecurity, livestock health, biodiversity and environmental impacts in Australia. Focus is on endemic zoonotic diseases such as Australian bat lyssavirus and Hendra virus, as well as preparedness for exotic diseases such as rabies and white-nose syndrome. Improved communication and collaboration across sectors allows for a more coordinated approach to investigation and management of wildlife health in Australia.
Developing a global food security programme that values animal welfare

Mark Bryan¹

¹VetSouth Ltd

The long term sustainability of an agricultural industry requires the role of animals to be recognised as critical, and their worth respected. The welfare of animals is therefore key. But animal welfare can be a slippery concept with many facets and interpretations. It is also important that animal welfare is seen in the context of a holistic agricultural system, rather than in isolation.

WelFarm is an animal health and welfare programme which has been developed for dairy farms in New Zealand, and has been successfully operating for three years on around 80 farms in a limited scheme nationwide. More recently, WelFarm is about to be expanded to the inclusion of a far greater number of farms, with the aim of it becoming an integral part of all dairy farms and, possibly, all farms. WelFarm incorporates some global dairy welfare indices, and has been developed to also capture data such as antimicrobial and anti-inflammatory use, as well as benchmarking aspects of calf health and welfare. Ultimately, WelFarm will aid in pasture to plate security.

This paper will elaborate on the WelFarm programme and identify its role in a globally sustainable agricultural industry that values food safety and animal welfare.
Meteoranxiety: the worry about the weather

Neville Ellis

1Oceania EcoHealth Chapter/Murdoch University

The term 'ecoanxiety' has emerged as a concept used to describe the anxiety felt by some people in relation to the changing state of the environment. Though gaining widespread media attention over recent years, ecoanxiety remains a concept in need of further theoretical development and empirical scrutiny. The aim of this presentation is to situate ecoanxiety within the emerging climate-mental health field and to describe a specific type of ecoanxiety felt in relation to changing weather patterns - an experience labelled here as 'meteoranxiety'. Drawing upon findings from a qualitative community-based case study located in the Western Australian Wheatbelt, this presentation describes family farmers' lived experiences of meteoranxiety as they grapple with the stresses associated with farming in a profoundly climate-changed environment. The research findings highlight the mediating role played by weather forecast technologies in farmers' emotional experiences of weather, as well as how personally observed patterns of climate change affect farmers' confidence about the future. Implications for mental health practice in rural Australia and the broader climate-health field are discussed.
A place-based approach to farmers' mental wellbeing in an era of abrupt climate change: notes from the Western Australian Wheatbelt

Neville Ellis\textsuperscript{1}

\textsuperscript{1}Oceania EcoHealth Chapter/Murdoch University

Climate change poses a significant mental health risk to Australian family farmers. Previous research examining linkages between climatic adversity (e.g. drought) and farmers' mental wellbeing have tended to highlight economic and social pathways of risk, while overlooking the significance of farmers' place-related attachments and identities for their overall wellbeing. In response, the purpose of this presentation is to highlight place-specific approaches to protecting/enhancing farmers' mental health and wellbeing in the context of abrupt climate change. The presentation draws upon a qualitative community-based case study located in the Western Australian Wheatbelt that sought to understand climate change impacts on family farmers' sense of place and mental wellbeing. The research findings indicate that farmers' sense of place is a significant determinant of farmers' psychological wellbeing, and that interventions that enhance farmers' place-based attachments and identities may deliver co-benefits for community and farmland health. Specific interventions discussed include: 1) negotiating the 'home-work tension', 2) cultural awareness training for new rural health practitioners, and 3) place-sensitive approaches to rural agricultural policy formation. The research findings contribute novel understandings of the determinants of farmers' mental health and highlight the centrality of place in climate change-public (mental) health interventions.
Importance of Ecological Education for Anti-dengue Efforts: An Outreach Exercise at Japanese Primary Schools in Singapore

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Mosquito-borne dengue virus infection is an increasing public health risk of global concern. Contributory factors include global warming, people movement, urbanisation, and the diminishing effectiveness of traditional vector control methods. Despite a well-established national dengue control programme, including comprehensive mosquito control and rigorous public health education conducted in all four official languages, the disease is endemic in Singapore - a vibrant business hub and tourist destination. Our recent investigation amongst a segment of the Japanese residents in Singapore, have revealed insufficiency in both knowledge of the disease and frequency of preventative actions taken. It is possible that the abundant information disseminated by the Singapore government has neither reached this demographic, nor been properly understood. We thus conducted outreach efforts in January 2016, involving 1,105 Japanese schoolchildren, to highlight the important linkage between ecology and public health. Our ecological education included the life cycle of mosquitoes in relation to the environment, and the effects of environmental parameters and climate change, employing talks, posters, videos and live mosquito exhibits. Such education is imperative for raising environmental awareness, and encouraging schoolchildren to become advocates of anti-dengue measures, to thus share the importance of source reduction and the role that each individual can play.
Understanding dog movements in remote indigenous communities in northern Australia to inform rabies incursion planning.

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Australia is underprepared for a potential rabies incursion: there is little knowledge of how rabies would spread and which control strategies would be the most effective. The close human - dog interface in remote indigenous communities would provide ideal conditions for rabies transmissions. To understand how to control rabies, we need to understand how rabies would spread within susceptible canine populations, which can be done using disease modelling. The need for information on dog movements is vital for parameterising such models. Cape York Peninsula in northern Australia is a high-risk rabies incursion area, with a complex human - dog interface. Not only are there large populations of both owned and un-owned dogs, humans have a major effect on dog movements. These movements include allowing owned dogs to roam within their communities and the practice of wild pig hunting, in which dogs from a range of owners and communities congregate and also potentially come into contact with wild dogs. These dog movements have been explored through questionnaire surveys, sight - re-sight population estimates and GPS tracking. The complex nature of dog movements found in these studies is being used to increase Australia's preparedness for a rabies incursion via ongoing development of a rabies-spread model.
The Seroprevalence Of Q Fever In Sheep, Goats And Cattle In Victoria

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Q fever is a zoonotic disease caused by *Coxiella burnetti*. Infection in humans can cause debilitating, chronic illness such as chronic fatigue syndrome. Domestic ruminants are often the source of human infection. Several recent outbreaks in humans have occurred in Victoria suggesting that it is a growing threat. Q fever is known to be endemic in Australia, but surveys to determine the prevalence in domestic ruminants in the state of Victoria is lacking. Such epidemiological information regarding the amount of disease present in animal reservoirs is important to determining disease risk and to effectively devise preventative and control programs for humans and livestock.

1500 serum samples are collected, 500 each from major livestock species - sheep, goats and cattle. Samples are collected by convenience and include a range of sources: farms, abattoirs and local laboratories. Serum is tested using a commercial ELISA kit that has been validated for sheep, goats and cattle in Australia. Information for each animal is linked to a herd and location so that herd prevalence, within herd prevalence and the spatial distribution of cases can be analysed. Preliminary results indicate patchy distribution of risk, approaching freedom in some areas.
Emerging Infectious Diseases: How can probabilities for predicting spill-overs be enhanced and what can current models contribute for an improved understanding of complex interdependencies and economic assessments?

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We present and discuss 3 published models, which visualize different perspectives on complex interdependencies leading to spill-over events of new and emerging infectious diseases. Model 1 (modified) focusses on pathogen, wildlife and ecohealth with examples. Model 2 includes the human factor, domestic and livestock animals where arrows indicate key factors as drivers for emergence. Model 3 identifies hot spots for spill-over events. We hypothesise that understanding and comparison of models based on different purposes and perspectives may lead to new insight by visualising multiple layers and interdependencies from different angles.

At AAHL Next Generation Sequencing (NGS) methods and NGS-based molecular tests are developed for outbreak investigations of emerging pathogens, for example for new henipaviruses in bats and results are discussed at weekly face-to-face meetings. It is the complexity of these interactions in wildlife and livestock which turns economic evaluations such as cost-benefit estimates for prevention of spill-over events in wildlife into a challenging task.
Using A One Health Framework To Promote Food And Nutrition Security In United Arab Emirates (Dubai)

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Abstract

Achieving food and nutrition security in the United Arab Emirates (UAE) is a major challenge. Water and arable land scarcity is a significant problem. Agricultural land is also limited; it does not exceed 6.5% of total land area. Ground water is mostly used in irrigation. The UAE government it is taking planning for the future seriously in order to develop special programs and projects at federal and local levels to maintain domestic food and nutrition security. At the federal level, the UAE government is now co-ordinating with each Emirate to develop their own specific plans regarding food and nutrition security. The Emirate of Dubai has established a dedicated committee to develop specific plans which comply with the overarching federal plans for the food and nutrition security. In this paper we discuss how the Emirate of Dubai can maintain and improve food and nutrition security using available resources. Facilitating the inclusion of local livestock and their products (from both commercial and family farms) into the domestic food chain will be explored as one component of a sustainable food system. In addition, we will also highlight options for improving the nutritional status and food insecurity among UAE nationals in Dubai.
Strengthening of Regional Laboratory Networks in South East Asia through Proficiency Testing and External Quality Assurance

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Capacity building extends beyond the life of a project, and the implementation of strategies to ensure sustainability, preparedness and resilience in response to disease threats, is part of the long-term partnership process. In a laboratory context, this has been achieved by providing support to develop a South East Asian Regional Laboratory Network (RLN), spanning animal and human sectors. A primary objective has been to strengthen the capability of the national laboratory diagnostic services in Asia to contribute effectively to early disease detection, especially for emerging zoonotic diseases. Since 2010 the provision of External Quality Assurance in the form of Proficiency Testing (PT) has continued to demonstrate improvement in RLN performance and provide confidence in test competency. PT now covers 2 zoonotic (Avian Influenza and Rabies) and 4 animal health diseases (Newcastle disease, Classical swine fever, African swine fever and porcine reproductive and respiratory syndrome) across 20 laboratories in 14 different countries. Deviation from median results is used to identify technical issues, which are followed up through dedicated reporting and subsequent laboratory visits. PT coupled with the implementation of harmonised testing protocols, in-country review and backstopping missions, has helped prepare the region for harmonized targeted surveillance and response to priority trans-boundary zoonotic diseases in South East Asia.
A Novel Henipavirus In Bats, Australia

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Bats are the natural reservoir of a number of important viruses causing zoonotic diseases, including Ebola virus, Hendra virus (HeV), Nipah virus (NiV) and Severe Acute Respiratory Syndrome (SARS) coronavirus. Within the Henipavirus genus (family Paramyxoviridae), there are only three established species: HeV, NiV, and Cedar virus (CedPV). Two of them, HeV and NiV, are highly pathogenic, causing serious and often lethal diseases in humans and other animal species. Here, we report the detection and identification of a novel henipavirus from pteropid bats in Australia. The virus was first detected by a HeV PCR assay from spleens and kidneys of pteropid bats that died suddenly, possibly due to heat stress, in 2013 in Adelaide, South Australia, during routine diagnostic testing for HeV and Australian Bat Lyssavirus (ABLV). Virus could not be isolated in cell culture. Further analysis of partial genomic sequences demonstrated that the virus shares common genetic characteristics of henipaviruses. The virus is genetically more closely related to HeV, with 86%-88%, 78%-80%, and 70% nucleotide sequence identity to HeV, NiV and CedPV, respectively. This virus is potentially a new species of the Henipavirus genus. The biological and pathogenic characteristics of this virus remain to be determined.
An invitation to speak: using social science methods to dig deeper into complex invasive species issues

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Invasive species in Australia have economic, environmental and agricultural impacts. They take hold in landscapes that are segmented by land tenure boundaries, fragmented governance regimes and short-term planning cycles. Current management and control approaches are informed by technical expertise in species ecology, however successful implementation also requires sustained and coordinated collective community action. This paper emerges from a multi-disciplinary research program that integrates behavioural science, institutional analysis and community engagement scholarship to build more effective and equitable strategies for invasive species governance. The program seeks to augment technical and scientific knowledge with social science that explores the human dimensions of invasive species management. Specific pest vertebrate species such as feral pigs and wild dogs are highly mobile in the landscape, creating disputes over where responsibility for control should lie. Using narrative interview and analysis techniques, case studies uncover stories of success, complexity and trade-offs, particularly in relation to biodiversity and agricultural productivity. Analysis shows that land managers hold diverse and nuanced perspectives about invasive animal control, the role of collective action and the barriers and opportunities for improvement in management practices. This paper presents empirical data and makes suggestions for application of these findings in front-line community engagement practice.
Association between air pollution and respiratory symptoms in children in Ulaanbaatar, Mongolia 2015

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While World Health Organization (WHO) ranked Ulaanbaatar as the second most polluted city in the world, there was very little country information on the effect of air pollution and respiratory symptoms in children. This study examined the association between outdoor air pollution and the incidence of respiratory symptoms in children of Mongolia. In April, 2015, we studied 1200 children from 4 elementary schools districts in urban and suburban districts of Ulaanbaatar. Urban apartment dwellers were compared with urban and suburban traditional Mongolian Ger dwellers. The survey tool was based on the American Thoracic Society standard questionnaire. The environmental pollution indicator sulfur oxide (SO₂) and nitrogen dioxides (NO₂) was measured using Ogawa passive sampler. The seasonal measurement showed higher levels in autumn and winter, exceeding the environmental standard of Mongolia and is comparably higher in Ger districts. This is probably due to high use of coal burning stove in Ger dwellings. The result showed that the prevalence of persistence cough symptom was higher among children living in Ger (34%) than in apartment (21.6%). SO₂ was found to be significantly associated with persistence cough symptom (p=0.02) in our study. There were no other respiratory symptoms significantly associated with SO₂ and NO₂.
Food In The Basket Of Different Socio-economic Groups

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Food prices have a critical impact on households' food choices, food security and health. Attaining healthy food baskets for market analysis will ultimate enable government interventions and policy alignments towards sustainable, available and accessible diets that emphasise healthy and economical options. This project's main aim is to obtain the necessary background information to compile a list of foods to be included in National Nutritious Food Baskets. Secondary analyses on all dietary intake studies from 2000 to June 2015 and food expenditure data from StatsSA Income and Expenditure Surveys for 2010/11 were done to determine the food in the baskets of the South African population. The most frequently consumed items were added sugar, tea, maize porridge, bread, milk, coffee, and margarine. Expenditure on sugar, sweets and cold drinks contributed to > 10% of the total food expenditure. The most commonly deficient food groups observed are fruit and vegetables, and dairy. This has been attributed to high prices and lack of availability of these food groups in poorer urban areas and townships. Because affordability affects the food we eat, a national nutrition monitoring system is recommended in order to identify dietary deficiencies and to monitor the cost and affordability of healthy eating.
Escherichia Coli Population Structure And Antibioresistance At A Buffalo/cattle Interface In Southern Africa

Alexandre Caron
Mathilde Mercat, Olivier Clermont, Méril Massot, Etienne Ruppé, Michel de Garine-Wichatitsky, Eve Miguel, Hugo Valls-Fox, Daniel Cornelis, Antoine Andremont, Erick Denamur

At a human/livestock/wildlife interface, Escherichia coli populations were used to assess the risk of bacteria and antibioresistance dissemination between hosts. We used phenotypic and genotypic characterization techniques to describe the structure and the level of antibioresistance of E. coli commensal populations and the resistant Enterobacteriaceae carriage of sympatric African buffalo (Syncerus caffer) and cattle populations characterized by their contact patterns in the southern part of Hwange ecosystem in Zimbabwe. Our results 1) confirmed our assumption that buffalo and cattle share similar phylogroup profiles, 2) identified a significant gradient of antibioresistance from isolated buffalo to buffalo in contact with cattle and cattle populations; 3) evidenced the dissemination of tetracycline, trimethoprim and amoxicillin resistance genes (tet, dfrA, blaTEM-1) in 26 isolated sub-dominant E. coli strains between nearby buffalo and cattle populations that led us 4) to hypothesize the role of the human/animal interface in the dissemination of genetic material from human to cattle and towards wildlife. The study of antibiotic resistance dissemination in multi-host systems and at anthropised/natural interface is necessary to better understand and mitigate its multiple threats. These results also contribute to attempts aiming at using E. coli as a tool for the identification of pathogen transmission pathway in multi-host systems.
Bridge Hosts, A Missing Link For Disease Ecology In Multi-host Systems

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In ecology, the grouping of species into functional groups has played a valuable role in simplifying ecological complexity. In epidemiology, further clarifications of epidemiological functions are needed: while host roles may be defined, they are often used loosely, partly because of a lack of clarity on the relationships between a host's function and its epidemiological role. Here we focus on the definition of bridge hosts and their epidemiological consequences. Bridge hosts provide a link through which pathogens can be transmitted from maintenance host populations or communities to receptive populations that people want to protect (i.e., target hosts). A bridge host should (1) be competent for the pathogen or able to mechanically transmit it; and (2) come into direct contact or share habitat with both maintenance and target populations. Demonstration of bridging requires an operational framework that integrates ecological and epidemiological approaches. We illustrate this framework using the example of the transmission of Avian Influenza Viruses across wild bird/poultry interfaces in Africa and discuss a range of other examples that demonstrate the usefulness of our definition for other multi-host systems. Bridge hosts can be particularly important for understanding and managing infectious disease dynamics in multi-host systems at wildlife/domestic/human interfaces, including emerging infections.
A One Health approach to antimicrobial resistance surveillance: Is there a business case for it?

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Antimicrobial resistance (AMR) is a complex global epidemiological problem, affecting humans, animals, food and the environment, and calls for an integrated One Health (OH) approach. A conceptual framework for OH surveillance, incorporating this complexity, is presented with a literature review. Since policy decisions rely on scientific and economic evidence, the business case for OH surveillance is made. Additional costs from integrating surveillance need to be compared to benefit streams of reduced healthcare costs and improved health generated from lower AMR levels. Current estimates of AMR impacts are human-centric. A OH assessment includes wider societal costs of lost labour, changes of health-seeking behaviour, impacts on animal health and welfare, the higher production costs and reduced consumer confidence in safety and international trade of animal-origin food. Benefits from surveillance are often delayed and dependent on effective and accepted interventions. Less tangible benefits, such as improved synergies and efficiencies in service delivery, and more timely and accurate risk identification should also be recognised. These less tangible benefits to society, along with benefits from animal welfare, ecosystem health and resilience and the savings and efficiencies through shared resources and social capital building, provide a strong business case for a OH approach to AMR surveillance.
Impact of Climate Change on Dengue Haemorragic Fever Epidemics in Surabaya

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The Study of Impact of climate change with dengue haemorraghic fever (DHF) epidemic in Surabaya East Java Province Indonesia to correct data with climate data in 10 years ago (2005-2015) with rainfall intensity number of raining days and temperature by maximum - minimum temperature and relative humidity data of Aedes aegypti and dengue haemorraghic fever incidence of dengue morbidity rate from data report in 10 year ago (2005-2015). Result that rainfall intensity and number of raining days correlation with dengue morbidity rate (F=160.00 p<0.05) R =56 and 0.60. R² adj =030 and 0.355 Standar error (SE e=x) =0.38 and 0.76 model of incidence rate of rainfall intensity =0.17 + 0.35 rainfall intensity and model incidence rate of raining days= 0.05 + 0.76 number of raining
Influence Of Human Behaviour On The Spread Of Avian Influenza Through The Bangladeshi Poultry Trade Network

Guillaume Fournié
Dirk U Pfeiffer, Ahasanul Hoque, Nitish Debnath, Paritosh Biswas, Mohammad Giasuddin, Natalie Moyen, Erling Hog, Tony Barnett, Suman Das Gupta, Joerg Henning, Mehedi Hossain, Punam Mangtani, David Harper, David Heymann, Mahmudur Rahman, . BALZAC project consortium

Several strains of avian influenza viruses (AIVs), including H5N1, are endemic in Bangladesh, with poultry trade being a major transmission route. This project aims to explore the way in which some features of the Bangladeshi poultry trade network result in particular risk environments promoting AIV spread and persistence. An inter-disciplinary approach was adopted, combining epidemiological and ethnographic surveys, an experimental study design derived from behavioural economics, mathematical modelling, and policy consultations. Interviews of 2500 poultry production stakeholders allowed the mapping of poultry trade networks, and the identification of socio-economic, cultural and epidemiological factors shaping them. Demand and availability of poultry greatly varied between poultry breeds, resulting in different trading patterns. Despite differences in trade network structures between poultry breeds, the networks were all linked, thereby epidemiologically connecting regions that otherwise may have remained isolated. During an outbreak, economic risks faced by farmers meant that local reconfiguration of these networks is likely to further promote AIV spread. Moreover, decreasing levels of biosecurity along the transaction chain promoted viral contamination of markets, as confirmed by virological results, and exposure of humans to these viruses. Interventions aiming at reducing the risk of AIV infection in poultry and humans through behavioural change are described.
National One Health Strategy Development in Bangladesh, Myanmar and Thailand

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We describe national One Health (OH) strategy development in Bangladesh, Myanmar and Thailand. In Bangladesh, OH grew from zoonotic avian influenza (AI) work. The remit broadened to consider implementing OH with other emerging infectious diseases (EID). The 2008 OH Bangladesh platform followed formal/informal stakeholder consultations. The subsequent National OH Strategic Framework and Action Plan are now implemented by government and others. In Thailand, zoonotic AI also provided OH impetus, particularly human cases 2004-06. A OH Epidemiology Team was established following 2008-09 OH Forum Meetings. Later, OH Epidemiology and Response teams were deployed in five Provinces. Thus, OH strategy grew from disease response. The Provincial OH Network was formally expanded to national level with the inter-Ministerial Thailand OH Network, launched 2013. Currently the National Committee on EID/Zoonosis coordinates OH as secretariat, supported by Bureau of EID and OH Coordination Unit. Building on Thai and Bangladeshi experience, the Food and Agriculture Organization (FAO) facilitated national OH policy development in Myanmar. Representatives from key Ministries (mandates covering environment, public health and veterinary services) formulated a time-bound OH roadmap in 2016, with priority diseases. Agreed milestones are: First Consultation; three-staged strategy drafting; and final, endorsed Myanmar OH Strategy. The three case studies demonstrate successful OH strategy facilitation despite challenges such as resource availability.
Areas Of Potential Zoonotic Disease Emergence In Africa Related To Livestock,
Wildlife Diversity And Human Density, With Projections To 2050 Based On Shared
Socioeconomic Pathways

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The interface between livestock and humans may play a large role in zoonotic disease emergence. This work aims to understand how differences in Africa's potential future pathways of development may affect infectious disease emergence through intensification of livestock production. Zero-inflated Poisson (ZIP) models of emerging infectious disease (EID) events were developed based on past events, socioeconomic and environmental variables that span human, livestock, and wildlife populations. To represent demand for protein, Shared-Socioeconomic Pathways (SSPs) projections were produced for volume of meat and eggs using projections of human population and GDP to 2050. ZIP results highlight the importance of pig density, wild mammal diversity, and forest cover change to explain zoonotic disease emergence. Sheep and goats are also important livestock groups. Emergence hotspot countries were identified, such as Cameroon and Uganda. The largest increases in projected meat and eggs occurred in SSP5 (high challenges to mitigation and adaptation to climate change) followed by SSP1 (low challenges to mitigation and adaptation). An SSP case study analysis showed areas in Chad, Ghana, and Kenya with high probability for EIDs relating to projected increased pig and human population density. This work may provide direction for scenario development and zoonotic EID preparedness.
Exploring primate diseases in the context of natural ecosystems: what defines a reservoir for human infection?

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Central to the 'One Health' approach and any disease eradication program is whether or not a pathogen has a nonhuman reservoir. This has been shown for the eradication of small pox as well as the Guinea worm disease (Dracunculiasis). The acceptance or rejection of a nonhuman reservoir for a disease, however, is often controversial. We think that a critical discussion about the definition and use of the term "natural reservoir for human infection" is necessary. The question arises, which degree of genetic similarity qualifies a pathogen to be regarded as the same? Most likely, the question here is not only about genetic similarity of the genome, but also where exactly the similarities and differences are located and what impact they have on the biology of the microbe and its pathogenicity in humans. Given the high genetic similarity of human and nonhuman primate treponemes of the *pallidum* complex, we will use the bacterium that causes human yaws and syphilis as one example and human and nonhuman primate malaria infection as another example. Our work may provide a basis for a discussion on a common understanding on the acceptance of a nonhuman reservoir and a critical review in multidisciplinary infectious disease research.
Seroprevalence of Q fever, Brucellosis and Bluetongue in selected provinces in Lao PDR

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This study has determined the proportional sero-positivity of zoonotic diseases, Q fever and brucellosis and non-zoonotic, bluetongue virus in seven provinces of Lao PDR. A total of 1,089 samples from buffalo, cattle, pigs and goats were tested, with sero-positivity of bluetongue virus (96.7%), Q fever (1.2%) and brucellosis (0.3%). The results shown Q fever sero-positivity in cattle in seven villages in four districts of Xayaboury province that share a border with Thailand. Further studies are required to determine if Xayaboury is indeed an epidemiological hotspot of Q fever. There is an urgent need to determine the levels of economic loss and human health-related issues caused by Q fever, brucellosis and bluetongue virus in Lao PDR.
Downstream effects of globalization and agricultural policy on human risks to scrub typhus and tick-borne diseases

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Globalization can lead to abandonment of farms in countries with higher costs of agricultural practice, and may have important implications for human health. We evaluated how extensive desertion of rice paddies in Taiwan after joining World Trade Organization, and how periodic plow, an agricultural policy targeting for farm pests, can unexpectedly influence ticks and larval trombiculid mites (chiggers). Flooded rice fields were assumed to sustain very few ticks and chiggers. Striped field mice, main hosts for both vectors, harbored 6 times more ticks, and 3 times more chiggers in abandoned (fallow) than in plowed plots. The proportion of ticks infected with *Rickettsia* spp. (etiologic agent of spotted fever) was 3x higher in fallow plots, while that of *Orientia tsutsugamushi* (scrub typhus) in chiggers was similar in both treatments. Moreover, ticks and chiggers were dominated by species known to infest humans. We conclude that ticks and chiggers proliferate after rice paddies are abandoned, but periodic plowing may mitigate vector burdens. An unexpected consequence of globalization may be elevated disease risk in the face of economically-induced changes in agricultural practices, although this may be unintentionally mitigated by agricultural policies, calling for further research on vector-borne diseases and their control from broader perspectives.
Coxiella Burnetii Herd Seroprevalence, Associated Herd-level Factors And Farmers’ Practices Risk For Zoonoses Exposure In Small Ruminant Owning Households In Rural North Western Kenya, 2015

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The study aim was to estimate *C. burnetii* seropositivity in small ruminant herds, determine herd-level factors associated with seropositivity and farmers’ practices risk for zoonoses exposure in Baringo County, an area where acute cases of Q fever had been detected in humans. A cross-sectional survey in 140 randomly selected households was conducted where *C. burnetii* IgG antibodies were measured by ELISA assay in serum from 840 small ruminants randomly selected from the households. In addition, herd epidemiological information was collected using a questionnaire. Of the 140 households enrolled, 92 (66% 95% CI: 57.6 - 73.2) had at least one animal seropositive. Households practicing nomadic pastoralism were more likely to be *C. burnetii* seropositive compared to those practicing mixed farming system (OR= 7.6, 95% CI: 2.3-34.1), p = 0.0023. Of the 140 humans interviewed, 120 (86%) reported to have assisted animals giving birth, 115 (82%) during removal of retained placenta and 78% (n=109) had contact with aborted fetuses. Only 4 (3%) reported to have used personal protective equipment during contact with animals. In conclusion, *Coxiella burnetii* exposure in animals and potential risk of exposure to humans was demonstrated. We recommended integrated animal-human epidemiological surveillance, prevention and control strategies for Q fever in the region.
Is there a business-case for One Health? The Network for Evaluation of One Health (NEOH) can provide a price tag on One Health work.

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One Health (OH) aims at approaching zoonotic diseases from a multi-complex thinking perspective, encompassing local to global implications, a continuum of time-scales and the interactions between different sectors influencing the occurrence of such diseases. The Network for Evaluation of OH (NEOH), funded by the European Cooperation in Science and Technology (COST), is an open network that brings together experts, researchers and policy makers from diverse backgrounds interested in the subject. NEOH aims at responding to: "does OH work" and "is OH worthwhile". It targets the generation of a standardised evidence-base framework and guide on the added-value of addressing zoonotic diseases from a OH perspective. This effort to put a price tag on OH work will allow the comparison of results between different interventions on zoonotic diseases and point out the most cost-effective alternatives, helping the decision-making process and public health policy formulation. NEOH will deliver 1) A science-based, standardised framework for the evaluation of interventions on zoonotic diseases; 2) a suite of example evaluations following the framework developed through NEOH; 3) a networked community of experts collaborating to assess the value of OH; and 4) a pool of early-stage researchers trained in performing evaluations of One Health activities.
Using Interdisciplinary Literature Searching Promotes a One Health Approach in Research and Practice

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Research and publications from a one health, interdisciplinary perspective are increasing. A key challenge in effective literature searches for one health topics and clinical questions are discipline-specific information silos that separate the literature and other published evidence about veterinary, human, and ecological health. Literature research tools are often presented as broad discovery tools, most often a single search box identifying information in more than one database simultaneously. In addition to the articles typically retrieved by these tools, identifying and searching other specialist source silos and grey literature are necessary, including government reports, white papers, data sets, and clinical reports. Search results are enriched by the inclusion or exclusion of primary literature databases and grey literature. This presentation offers practical strategies illustrated by specific examples that cover resources and approaches to searching, and illustrate the general principles presented above. The recommendations offered not only support the success of one health and interdisciplinary approaches to searching but also improve the quality and comprehensiveness of the search results.
A novel tool to guide health policy decision-taking: Disease-Specific Health Vulnerability Indicators to Climate Change

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Social and environmental determinants of health (SDH) are the first acknowledged root-causes of infectious diseases. They are systematically highlighted in PAHO/WHO regional prevention and control strategies. Controlling for SDH would reduce disease burden. How can we determine which non-health sectors contribute the most and how much to health vulnerability? No tool has yet been devised to address, from a complex-systems perspective, the degree of responsibility non-health sectors have in disease occurrence. This is particularly important in a climate change scenario. Health Vulnerability Indicators to Climate Change (HVICC) translate the SDH discourse into a tangible tool. Following multi-criteria decision analysis for variable prioritization, a mathematical formula was developed to cater for the direct and indirect vulnerability factors. Two IPCC climate change scenarios were considered. HVICC are fed from secondary data, are disease-specific, and focus particularly on vector-borne diseases (VBD). Results obtained map, categorize and quantify the degree of responsibility of non-health sectors on vulnerability to a specific disease. The use of HVICC in regional and/or national VBD control strategies would help in swiftly identifying the most vulnerable locations and target technical cooperation actions towards those non-health sectors acknowledged as responsible of such disease-specific vulnerability.
Health at the sub-catchment scale: typhoid and its environmental determinants in Central Division, Fiji.

Jenkins Aaron

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The impact of environmental change on transmission patterns of waterborne enteric diseases is a major public health concern. This study concerns the burden and spatial nature of enteric fever, attributable to *Salmonella* Typhi in Central Division, Republic of Fiji at a sub-catchment scale over 30-months (2013-15). Quantitative spatial analysis revealed relationships between environmental conditions of sub-catchments and incidence and recurrence of typhoid. Average incidence per sub-catchment for Central Division was high at 205.9 /100 000, with cases recurring in each calendar year in 26% of sub-catchments. Numbers of cases were highest within dense, urban coastal sub-catchments, but incidence was highest in low-density mountainous rural areas. Significant environmental determinants at this scale suggest increased risk of exposure where sediment yields increase following runoff. Small populations living near small, erosional, high-energy headwaters and small streams unconnected to large hydrological networks, appear at reduced risk compared to large systems that broaden into meandering mid-reaches and floodplains with alluvial deposition. This study indicates that anthropogenic alteration of land cover and hydrology (particularly via fragmentation of riparian forest and connectivity between road and river networks) affects the transmission of typhoid and that environmental (long-cycle) transmission of typhoid is important in Fiji.
A training concerning dengue hemorrhagic fever (DHF) eradication conducted to the students and teachers to enhance their skill and knowledge as larvae monitors. A total of 25 from 57 the fourth and the sixth grade students of State of Elementary School Number 6, Banda Aceh were trained in order to improve knowledge and skill in monitoring larvae. The students also trained to practice in the field to monitor larvae by using flashlights, dippers and forms prepared by team. Before and after training, pretest and posttest were conducted with the similar 15 total of questions. Survey on larvae was conducted weekly at houses and environment surrounding the schools students live. Data collected was type of container both inside and outside house by the amount of larvae in every container. Forms fulfilled by students every week were verified by each class teacher which already trained by the team, then submitted to the researcher team. There were 26 types of container found during the survey with 773 total of larvae. Potential containers as larvae-breeding places were mostly found at channels (19.7%), used tires (13.5%) and bath tubs (11.4%). The paired- t-test used showed there was no change of students' knowledge in DHF eradication.
In October 2015, an unusual, acute mortality event, affecting thousands of bats, was reported from a cave in Kanchanaburi, Thailand. A team comprising wildlife, public, domestic animal and environmental health expertise was dispatched, collecting both bats and environmental specimens for analysis. Cave water was within the standard range for heavy metals. Water, soil, and bat tissues were negative for Geomyces destructans, the fungal etiology of white-nose syndrome. Samples from 53 bats were tested against 6 viral families, including coronaviruses - and specifically MERS-CoV - paramyxoviruses, influenza viruses, lyssaviruses, rhabdoviruses, and filoviruses using degenerate, consensus PCR protocols. Coronavirus were detected from 7 fecal samples, and paramyxoviruses from 4 urine samples. Sequence analysis provides no evidence suggesting these viruses cause death in bats nor pose threats to human health. While inconclusive, mortality from acute asphyxiation following rapid cave flooding from heavy rains is plausible. Dialogue with the village proximal to cave site was undertaken throughout the investigation, and results communicated to enhance understanding of such events and relative risk. This report exemplifies the use of "One Health" approach to address unusual events, and the importance of rapid investigation in pre-empting pandemic emergence, with benefits to public and environmental health, livelihoods, and social stability.
Differential Evolution of Antiviral Immunity in Bats as Revealed by APOBEC3 Gene Complexity

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Bats have attracted attention in recent years as significant reservoirs of viruses deadly to humans and other mammals. These infections typically produce no clinical symptoms of disease in bats raising questions about what innate immune differences might exist between bats and other mammals. The APOBEC3 gene family encodes antiviral DNA cytosine deaminases, which are restriction factors with important roles in the suppression of diverse viruses and genomic parasites. Here we characterize the megabat (family Pteropodidae) APOBEC3 genes and show that pteropid bats possess the largest and most diverse array of APOBEC3 genes identified in any mammal reported to date. Pteropid bats (Pteropus vampyrus and P. alecto) have four phylogenetically distinct catalytic/pseudocatalytic Z domains while other mammals encode two or three. The A3Z1 subtypes demonstrated strong and broad DNA deaminase activity in vitro. Hypermutation analysis of the endogenous retroviruses of P. vampyrus supports a role for APOBEC3-mediated restriction of ancient bat retroviruses, and a molecular clock analysis indicates that the expansion of APOBEC3 genes coincides with the
extinction of pteropid LINE-1 retroelements. These findings reveal the first group of antiviral restriction factors identified in bats with extensive diversification and divergence relative to homologues of other mammals.
Impact Of Flood On Waterborne Bacterial Pathogens. A Study In Anambra River:
South East, Nigeria

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Under conditions of climate change, heavy rain and flood would increase the risk of fecal contamination of surface and ground water which is used as drinking water. A cross sectional and retrospective study was carried out to assess the impact of flood on waterborne bacterial pathogens in Anambra River. Bacterial load and isolation of *E.coli* and *Salmonella* were performed following the standard microbiological technique. Questionnaire survey of residents of the communities of Oto-ucha regarding the periods of flood of Anambra River showed that Jun/July marks rising of flood; Aug/Sept peak; Oct/Nov receding and Dec/Jan back to normal water level. There were a significant difference in the mean Total Viable Bacterial Count (TVBC) (cfu/ml) and mean Coliform Counts (CC) between Aug/Sept and Dec/Jan at point of water collection for household purposes and for washing of meat at slaughter slab. Furthermore, the mean TVBC and CC of meat after washing were significantly higher than before washing. Verotoxigenic *E.coli* and *Salmonella* were isolated from the flood water and meat. As to the retrospective study, the result revealed that out of a total of 433 confirmed diarrheic cases registered in two hospitals, 228(52.66%) were registered in 2012 when Nigeria experienced the worst flooding, including the Anambra River.
Outcomes of the 2016 European OneHealth/EcoHealth workshop

Hans Keune

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The importance of human health interlinkages with nature and the environment in general has gained attention in science, policy and society at large. In the European OneHealth/EcoHealth workshop we aim to support these ambitions. The workshop will bring together people from different communities in science, policy and practice to exchange experience and views, and discuss opportunities and challenges for integration and practice. The workshop partly builds upon a survey that will precede the workshop in which a wide range of relevant experts from science, policy and societal practice will be consulted to give their perspective on the OneHealth ambition. Together we aim to formulate key lessons learned and key steps forward messages. This presentation will present main outcomes of this European workshop, including outcomes of the survey.
Breaking socio-cultural barriers of Ebola virus disease through appropriate communication strategies

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African societies strongly rely on cultural behaviors especially those that characterize particular communities. In relation to disease management, many of these cultural behaviors favor either the introduction or the expansion of several diseases including highly infectious ones such as Ebola. These cultural determinants are causes of the persistence of several diseases well controlled in the Western world. The experience from the seven Ebola outbreaks in DRC revealed that disease control strategies, at least at the beginning of the control management on the ground, are not always welcome by the local communities. The more complex the community is the more difficult it appears to bring people together through the same communication approach. Isolated small and well structured communities respond better to cultural changes provided the leader get involved early in the process. Modern communities have weak cultural barriers and respond better to changes. However big and complex rural communities are most difficult to penetrate. Understanding the community structure and how sub-communities are structured is essential to bring up the involvement of the true leaders who can vehicle the message. In this context, the contribution of and collaboration between anthropologists, psychologists and communication experts have been strongly acknowledged.
Application of One Health approach in the context of Ebola disease control in the Democratic Republic of Congo

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Implementing One Health in various organizational structures remains a big challenge. This concept has been misunderstood by several bodies. The truth is that if clinicians are strongly needed to heal a patient, breaking the transmission channels of several diseases requires particular sectors or disciplines to get on board. Preventing malaria, cholera, Ebola, trypanosomiasis, rabies etc is beyond medical consideration. The issue is how to bring such various experts working on different disciplines and in different sectors of activities? From the first outbreak in 1976 where disease control was mostly undertaken by medical staff, the composition of the DRC response team evolved and several bodies such as anthropologists or psychologists have been involved along the way. Veterinarians are the last body to get on board in 2012 although in DRC, Ebola outbreaks in animal generally precede human cases. The strategies put in places to achieve this went through several steps with indeed many obstacles. Currently both sectors of animal health (environment and livestock) are involved especially on the ground. Progress in this collaboration was fast during the response phase of Ebola outbreak. Several efforts are currently being put in place to establish an integrated surveillance network for Ebola and related diseases.
The Impact of Working Equids on the Social Determinants of Health: Evidence from Rural Nicaragua

Jennifer Lane

Congressional Hunger Center

The importance of working equids (horses, donkeys, and mules) to economic survival and human livelihoods in poor and rural communities around the world is indisputable. There are approximately 112 million working equids in the developing world; in some countries populations are increasing. A strong case exists for the impact of working equids on the social, economic, and cultural determinants of health. Working equids are essential for goods transport and contribute to economies and food security locally and globally. Working equids may enable access to health services or social support networks. Working equid owners are often lower in the social gradient, under social and economic stress, and may be socially excluded. If a working equid is unable to perform, a child or woman may replace that labor, which can adversely affect childhood development. This may also translate into unemployment, lost income and time. Using evidence from a cross sectional survey of working equid owners in rural Nicaragua and the existing literature, the interdependence of livelihoods and health on working equids is illustrated. Understanding how livelihoods and health depend on a working equid's contributions to a household has broad reaching policy and development implications.
Livestock focused agricultural development has the potential to improve household resilience and food security while reducing malnutrition. Households keep livestock to produce food, generate income, provide draught power and manure, act as financial instruments, and enhance social status. Livestock activities are often integrated at multiple levels making the roles they fill in the wellbeing of a household complex. Limited access to livestock extension information and animal health services as well as poor animal husbandry and feeding practices all contribute to high livestock mortality rates. Evidence from a livestock for resilience project in central Malawi indicates that by improving the capacity of and access to animal health and livestock extension services through community animal health workers, households can increase herd and flock size. However, increased herd or flock size did not immediately translate into increased consumption of animal source foods. Pairing the livestock component with a consumption smoothing mechanism such as Village Savings and Loan Association access was integral to project success. Understanding how livestock health and transfer activities impact gender dynamics, household consumption patterns, and shock elasticity is imperative to better design approaches while integrating nutrition-sensitive programming.
Challenges Of Livestock Transfer In Global Development: An Undiagnosed Disease
Outbreak In Local Chickens In Rural Malawi

Jennifer Lane

Livestock transfer or donation programs are relatively common types of interventions in the livestock development sector. Many programs cite the potential impact of livestock, especially small livestock including chickens and small ruminants, to improve livelihoods, food security and nutrition as justification for transfer of livestock. Local chicken transfer projects are inherently risky from a disease and animal welfare perspective and are less sustainable than well-organized Newcastle disease vaccination campaigns. However, livestock transfer remains popular and lends itself to well to catchy advertising for fundraising efforts. Implicit in the safety, short term success and long term sustainability of such programs is the provision of adequate veterinary support throughout the project lifetime. This relies on the capacity of the local and national government, private enterprise, implementing organization and/or donor agency to provide animal health extension, veterinary services and disease surveillance. When competent services are lacking, and things go "wrong," a program that intended to help communities achieve improved resilience and food security not only jeopardizes farmer's livelihoods but can potentially threaten national biosecurity. A recent experience with a local chicken transfer project in central Malawi exemplifies the risks involved while considering the response the implementing organization took.
Endoparasites And The One Health Approach: A Systematic Review

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Zoonotic endoparasites are transmitted through complex systems that require consideration of environmental, animal, and human domains. We conducted a systematic review to identify whether researchers have applied a One Health (OH) approach to the study of zoonotic parasites by simultaneously sampling people, animals and the environment. We searched the English and Chinese peer-reviewed and grey literature to identify community-based research where endoparasites were simultaneously characterized from the three domains of the OH triad. Of the more than 1807 studies evaluated, 32 assessed all three domains. The majority of the studies evaluated gastro-intestinal and blood-borne protozoa (59%), followed by trematodes and nematodes (20% each), and lastly, cestodes (3%). These studies were based in 23 countries, and were investigated by interdisciplinary and multilateral author groups. Approximately half of these studies used molecular techniques for species identification in all OH domains. None identified parasites beyond the species level, and few demonstrated a high quality of reporting. Despite the need for integrated pathogen surveillance, we found relatively few parasitology studies that evaluated human, animal, and environmental components. Multidisciplinary, integrated approaches paired with rigorous methods are necessary to study complex zoonotic transmission cycles.
Impacts of invasive urban mosquitoes on resident species: Differences in the outcome of competition among habitats affects vector populations

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Invasive species and infectious disease are signature topics in coupled natural-human systems research. But the social and ecological mechanisms underlying natural-human coupling can be complex and poorly understood. This talk will examine how the outcome of larval resource competition between disease-vector mosquitoes varies across habitats associated with socioeconomic and natural gradients in urban landscapes. As an example, this talk will focus on a study that tested whether competition from the competitively superior invasive mosquito, the Asian tiger mosquito, *Aedes albopictus*, on the resident mosquito, *Culex pipiens*, differed among managed containers from residential yards versus trash containers from re-wilding vacant lots in Baltimore, Maryland, USA. Collectively, *Ae. albopictus* and *Cx. pipiens* vector a range of arboviruses, and their distributions influence human disease risk. Field surveys showed a greater proportional decrease of *Cx. pipiens* in trash versus managed containers from early to late summer, when the densities of *Ae. albopictus*, and associated competition, increased. An accompanying laboratory experiment showed greater decreases in *Cx. pipiens* survival and development with increasing *Ae. albopictus* density in trash versus managed container treatments. The results of this study demonstrate how an ecological process, resource competition, is both influenced by human behaviour and affects human health.
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Grow where you've never grown before!

Lindsey Vold
Wanda Martin

Many cities have built environments that provide access to low quality food, especially in lower income neighbourhoods, which results in growing health inequities. Urban agriculture (UA) contributes to a positive built environment by increasing local food and thereby improving food security and community health. This study aimed to understand the effect of participating in UA to begin to understand how to build capacity for urban growing. This qualitative study of seven interns used interpretative description analysis to explore participation in a UA project in Saskatoon, Saskatchewan, Canada. Some interns formed deep interpersonal and land connections while increasing conscious shopping. Some interns were planning to take their knowledge back to their home reserves. The gardens had an impact on the community as people talked with the interns, and some community members volunteered. UA can instill pride and be a source of empowerment while contributing to social change. Experiential knowledge of collaborative local food production and selling at a farmer's market provides transferable life skills. Healthy built environments that provide green space, food, and potential for income can contribute to better health by providing easy access to fresh foods, social cohesion, and opportunities for physical activity.
A place to cook: a scoping review

Lindsey Vold

There has been a growing concern with health equity in public health systems worldwide. It is suggested that the primary drivers shaping health are not medical treatments or genetics, but the living conditions that interact with or are imposed upon us. Food and housing insecurity are pervasive problems in North America, but the relationship between both is not well understood and is often targeted in silo interventions. To identify literature gaps in housing and food as a combined area of concern. This will inform research and public health interventions to target both determinants together, which may help to address health inequity because of multiple determinants. A scoping review using a Social Determinants of Health conceptual framework is choice methodology. Food security and housing are often not researched together and their relationship is not well understood. Silo interventions are ineffective in achieving health equity and addressing the social determinants of health. Pathways to address food and housing insecurity require coordinated efforts. Housing and food are basic determinants and are intrinsically linked. There is growing need to address the bounding effects of housing and food insecurity with coordinated efforts. Intersectionality and intersectoral collaboration are required to achieve health equity.
Hendra Virus, Horses And Flying-foxes – Managing The Risk

Hume Field

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Hendra virus (HeV) causes fatal infection in horses and humans in eastern Australia. Pteropid bats (flying-foxes) are the natural reservoir. We undertook extensive fieldwork to elaborate key aspects of the infection and transmission dynamics in flying-foxes. Viral RNA was detected primarily in two of the four endemic species (Pteropus alecto and P. conspicillatus). Virus was most frequently detected in urine, less so in faeces, and minimally in saliva, nasal discharge, and blood. Spleen and kidney were the tissues most likely to yield virus. Geographically, HeV prevalence was highest in flying-foxes in southern Queensland/northern New South Wales. Viral RNA was detected in all months, with a marked winter peak in southern Queensland and central and northern NSW, paralleling the spatiotemporal clustering of equine cases. GPS data-loggers showed that flying-fox foraging was repetitious, with a preference for non-native plant species and a resultant increased activity around rural infrastructure. Further, horses used different areas of the paddock night and day, which could contribute to HeV exposure risk. Satellite telemetry illustrated the mobility of flying foxes and the connectivity of their roosts. Our detailed findings elaborate key aspects of HeV disease ecology, and allow risk mitigation strategies, including vaccination, to be more effectively targeted.
One health concerns in social-ecological systems and opportunities for building resilience

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Social-ecological systems are considered as 'coupled' human and ecological systems, in which people and their environments interact at multiple scales, individual to global. In these complex adaptive systems, processes are not linear, and there is no 'control' or 'determinants'. Rather, one seeks to understand important patterns and risks, and to build adaptive capacity and resilience. This presentation canvasses the opportunities of thinking about One Health concerns in a social-ecological systems way, and what a 'resilience' goal might entail. It canvasses the influences of globalisation, which has altered people's customary relationships with wild animals, livestock and companion animals through increased world trade and travel and land clearing; and of poverty, which can involve high dependence on natural resources, high vulnerability to disease and low resistances, high impact of control measures and particular communication challenges. Ecological resilience focuses on the ability to withstand shocks, and social resilience on the strengths that assist a society to do so. What cultural, cognitive and institutional strengths do we need to consider to build resilience and adaptive capacity in relevant societies and environments, and in One Health's preparation and response systems?
Center for Molecular Dynamics Nepal (CMDN), established in 2007, is a non-governmental organization dedicated to promoting research in Nepal. CMDN is recognized as the leading public health and wildlife research organization in the region. CMDN strives to introduce appropriate, effective and innovative solutions to address many challenges in the areas of epidemiological studies, disease surveillance, health, environmental and biodiversity research. We have conducted numerous studies on some of the world's most endangered animals and introduced conservation genetics research in Nepal, as well as developed molecular diagnostic tools for disease detection in wild animals. Additionally, we are engaged in numerous human health related disease surveillance, monitoring and diagnosis in Nepal. Some of our One Health-related work includes assessment of detection techniques for M. tuberculosis and M. bovis in Asian elephant of Nepal and USAID's Emerging Pandemic Threats Program-building a global early warning system to detect and reduce the impacts of emerging diseases that move between wildlife and people.
Evidence based design and the socio-ecological determinants of health: Findings from user experiences accessing hospital gardens in Australia

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At the interface of rapidly growing interest in evidence based healthcare design is the recognition that the socioecological determinants of health are intrinsically interconnected. Applicable to this context is the need for green open space within healthcare settings. Addressing a lack of Australian data exploring this topic, a phenomenological study was conducted across three hospital campuses in Melbourne, Victoria to explore user experiences of passive/ quasi passive access to hospital gardens. The contemporary findings from this study report on the experiences of 72 users who were staff, patients and visitors. Thematic analysis established 10 key themes around a connection to a restorative setting. Themes illustrated how participants drew on this connection to cope with the individual challenges of a hospital setting. Other key findings related to the ABI context and garden features impacting experiences have been presented. The cumulative value of this research lies in its ability to contribute to the evidence base as well as the implications of these findings for designers, planners, policy makers and hospital administrators who aim to create and support socially and ecologically sustainable, health promoting settings.
Survey For Avian Influenza Among Crows In Bangladesh

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Earlier studies have demonstrated that domestic poultry sold in the live markets throughout Bangladesh carry a wide range of avian influenza virus (AIV) strains. Poultry sold at the market are usually slaughtered on site, and the offal is disposed of without any containment. As a result, crows get exposed to this potentially infected waste. Our objective was to assess the presence of AIV among crows associated with these markets. We sampled crows from April through May, 2014 from Dhaka, the capital of Bangladesh. We collected 5000 crow fecal environmental swabs and made a pool of 10 (total 500 pool) in viral transport media for testing of AIV using real time reverse transcriptase polymerase chain reaction. Partial sequencing of all eight segments of AIV was conducted for strain identification. A single pool was tested positive for AIV and the sequence data identified it as H9N2. From 1998 to 2016, 28 laboratory confirmed human cases of H9N2 virus was reported to WHO of which three were from Bangladesh. As this strain has the potential to reassort with H5N1, H7N9 and H10N8 viruses, and can cause human infections, presence in a ubiquitous bird(s) as crows can potentially be a significant public health risk.
Socio-economic determinants of manure management practices and risk behaviours among urban and peri-urban livestock-keepers in Cambodia

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Despite many benefits of urban and peri-urban livestock production, such as improved food security and higher household incomes, keeping livestock in densely populated areas may be associated with sanitary issues and public health risks. This study aimed to identify possible associations between socio-economic determinants, risk behaviours and manure management practices among urban and peri-urban livestock-keepers in Cambodia.

In total, 204 households keeping pigs and cattle were included in the study. Semi-structured questionnaires were used to gather information on socio-economic status, disease awareness and manure management practices, and putative associations were investigated using logistic regression models. Around 45% of households reported that they did not collect or use the pig manure. For cattle manure corresponding figure was 7%. Poor management practices, such as discharging manure to the environment, were associated with a lower socio-economic position (P<0.001). Around 45% were not aware of that diseases could transmit from animals to humans, and nearly half did not use any sanitary precautions when handling animals or manure. The latter households tended to have a lower socio-economic position (P=0.08). In conclusion, resource-poor households were more likely to adopt poor management practices, why these households are an important target group for interventions for improved manure management.
One Health In Finland: Supporting Transdisciplinary Communication And Collaboration

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Many public and private sector One Health efforts have emerged globally. In Finland, several entities are working in this field, but the need for a common One Health space is not yet widely recognized.

At the same time the One Health approach is increasingly turning into a holistic paradigm that handles topics from the social determinants of health to humanity's relationship with animals and nature. In order to grasp the whole potential of the movement and to ensure effective transfer of knowledge and collaboration between disciplines, a uniting force is required.

The main objective of the One Health initiative in Finland is to build a network of professionals and stakeholders representing a large variety of disciplines. New approaches to community involvement, such as utilizing swarm intelligence and using systems thinking are used to build this community. Faculties, student associations, trade unions, political parties, non-governmental organizations and public health institutes are among potential collaborators.

This effort is built on the fundamental values of One Health: communication, collaboration, and open information sharing across disciplinary boundaries.
Leprosy in red squirrels in the British Isles; a newly identified wildlife reservoir

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Leprosy, once an endemic human disease in the British Isles, arises from infection with Mycobacterium leprae or the recently discovered Mycobacterium lepromatosis, and remains a public health problem in certain low and middle-income countries with ~220,000 new cases reported annually. In 2014 we reported a novel mycobacterial dermatitis of red squirrels (Sciurus vulgaris) in Scotland, associated with infection with Mycobacterium lepromatosis, and histologically comparable with human diffuse lepromatous leprosy. Since then there have been increasing British reports of red squirrels presenting with leprosy, which we have investigated using genomics, histology and serology. We have now detected and genotyped leprosy bacilli in both overtly diseased and seemingly healthy squirrels from Scotland, England, and Ireland, including a large cluster from Brownsea Island, England where historic evidence indicates observation of affected animals for over forty years. Our findings show that red squirrels are a potential zoonotic source of leprosy and demonstrate that a pathogen can remain undetected in the environment centuries after its clearance from the human reservoir. Further surveys of animal reservoirs of leprosy bacilli are warranted since they may contribute to the inexplicably stubborn plateau in the incidence of the human leprosy epidemic despite effective and widespread treatment with multidrug therapy.
Assessment Of Epidemiology Capacity In One Health Team At Provincial Level In Thailand

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The provinces with implementing One Health approach and without One Health approach had been conducted an assessment of multi-sectoral units' core epidemiology capacity. Four provinces from 19 provinces with implementing One Health approach were sampled and four provinces without One Health approach, which had a border adjacent to those four provinces with One Health approach, were sampled. Provincial officers in zoonotic activities were interviewed. The average scores of epidemiology capacity in the provinces implementing One Health approach was 66.45% compared to the provinces did not implement One Health approach was 54.61%. Capacities of surveillance system in the provinces implementing One Health approach has much higher scores when compared to the provinces not use of One Health approach (75.00% vs. 53.13%, p-value 0.13). Capacity of data report, the provinces implementing One Health approach has lower scores (59.38% vs. 65.63%, p-value 0.60) and there were no much difference in areas of outbreak investigation between two groups (60.71% vs. 50.00%, p-value 0.36). We found evidence that provinces implementing One Health approach was higher scores in both surveillance and outbreak investigation capacities. It could be guidance for capacity development by using One Health approach to prevent, protect and response threats in the communities.
Engendering Ecohealth

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The ecohealth approach is a core concept integrating environmental aspects with human and animal health (domestic and wild animals). Zoonotic and emerging diseases affect human health and impact negatively on food security. Firstly this presentation discusses the socially defined roles including social, economic, cultural, legal and political factors that often determine which place men and women occupy in society, which animals and plants men or women have accumulated knowledge of, which they have control of and which they benefit from and consequently the impact men and women have on the environment due to these specific roles. Secondly, it analyses the gender differences in risk of infection. It also analyses cultural differences that influence practices connected to animal, plant and human diseases and discusses respective preventions and treatments. Thirdly, it also identifies the ways men and women are impacted by the diseases of humans, plants and animals in different ways. Lastly, we assess the biological factors that influence the differences in exposure, infection rates and mortality rates between men and women during their life cycle. These four factors contribute to gender variations in relation to animal, human, plant and ecological health.
Bovine TB Control in New Zealand: The convergence of human, animal and conservation medicine.

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New Zealand has had a long history of *Mycobacterium bovis* (TB) infection in cattle, and latterly deer, herds. This has been largely driven by wild animal infection, primarily possums, an introduced pest into New Zealand which is also responsible for extensive flora and fauna damage. New Zealand has been able to control its bovine TB problem through the targeted control of these infected wild animal populations and at the same time achieve significant collateral benefit to flora and fauna protection. The New Zealand TB control strategy provides a working example of the convergence of human, animal and conservation medicine. This paper will describe the history of the introduction of mammals (wild and domestic) into New Zealand which has led to the establishment of a complex ecological and epidemiological web of bovine TB in man, domestic animals and particularly wildlife species. The same introductions have led to large scale destruction of native flora and fauna. The paper will describe the various plans and strategies implemented over a seventy year period to successfully control bovine TB in New Zealand, including the final phase of the TB eradication programme, recently approved by the Minister for Primary Industries, through to 2055.
Bayesian Belief Networks and water public health in Vietnam

David Hall
Quynh Ba Le

Bayesian Belief Networks (BBNs) model cause and effect relationships between deterministic and probabilistic variables. We developed a BBN using data gathered from 600 small scale integrated farmers in Vietnam to examine relationships between predictive variables and levels of E. coli in drinking water from wells and rain water. Sensitivity analysis of the model revealed that choice variables were particularly likely to influence endpoint values, reflecting the highly variable and impactful nature of preferences, attitudes, and beliefs relating to mitigation strategies. This BBN model of SSI farming in Vietnam was helpful to the understanding the complexity of small scale Vietnamese agriculture as well as for identifying and estimating impact of policy options. The BBN model also provided insight to the influence of subjective choice variables and deterministic factors including preferences for learning, understanding of public health concepts, livestock, income, and years of farming on the likelihood of contaminated drinking water. Attention to rural water public health management policies in Vietnam has been limited in scope. This BBN and other policy tools can assist in understanding the role policy can play in helping SSI farmers understand options for engaging in water public health mitigation strategies that do not disrupt their chosen livelihoods.
Water public health on small scale farms in Vietnam

Quynh Ba Le
David Hall

We examined the relation between water public health, small scale integrated farming, and mitigation of emerging infectious diseases (EIDs) using a transdisciplinary participatory approach in Vietnam. Data were collected using participatory methods from 600 farms in North and South Vietnam (Thai Binh and An Giang provinces) using questionnaires, semi-structured interviews, and water quality testing procedures (E. coli, turbidity, and pH). Water samples were collected from participants' wells or rain water cisterns and analyzed in government laboratories using WHO standardized methods. Probit analysis was used to investigate the association of demographic variables with levels of E. coli in drinking water and EID mitigation strategies. Farmers raised fish, poultry, a few pigs or cattle, and some crops. Most participants had basic awareness of avian influenza prevention, but limited knowledge of water-borne diseases. More than 80% of samples contained unacceptable levels of E. coli (10 to several thousand cfu's). Variables significantly associated with unacceptable levels of E. coli included age (p<0.01), presence of and number of livestock on farm (p<0.01), history of vaccinating poultry against H5N1 (p<0.05), and declared interest in public health training (p<0.01). Increased transdisciplinary approaches to increasing awareness of water public health and livestock waste management is recommended.
Demand for Online Education in One Health

David Hall
Mary Zhou

This study examined the demand from health professionals for online One Health education topics, preferred formats for electronic learning, and available communication and knowledge exchange technologies. A combination of 20 semi-structured interviews and an online questionnaire completed by 500 participants across Canada were used for data gathering. The topics highest in demand were quantitative epidemiology and statistical methods. Although definitions of One Health were provided, limited understanding of the concept of One Health (as opposed to integrated health disciplinary studies) may have biased those results. The majority of respondents (65%) had at least an undergraduate degree in a health science field. More than 50% of respondents were planning to take a Continuing Education course in the next 12 months and of those, more than 85% were willing to pay more than $150 for the online course in One Health. More than 65% of respondents expected some form of certification from the course. The study provided some insight to learner stated preferences for online One Health education course format, engagement with online learners, and monitoring and evaluation.
Avian Influenza Surveillance In Chicken And Nomadic Duck Flocks In Subang Indonesia

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A surveillance were conducted to estimate the prevalence of HPAI in the different sectors of the poultry industry. Surveillance was conducted in duck flocks, broiler farms, poultry collecting facilities/poultry slaughterhouses (PCFs/PSHs) and (grand)-parent farms in Cipunagara Subdistrict, Subang District, West Java Province. Surveillance took place over two time periods by taking tracheal swabs from all kind of poultry, blood samples from duck and (grand)-parent farms flocks, and environmental swabs from inside PCFs/PSHs, trucks and crates. Swab samples were analyzed with a M-PCR and a H5 PCR, and serum samples were analyzed with ELISA and HI test. H5 virus was detected in broiler and back yard poultry flock. Three HPAI cases occurred in broiler farms. Surveillance in the duck flocks showed that 15% during the first period and 6% during the second period had antibody titres against H5 antigen. M-PCR test showed the positive result in 42% of the duck flocks in the first period and 60% in the second period. Movement of the duck flocks was confined within Subang District or to or from a neighbouring district and rarely moved to or from outside of West Java. The same was observed for the origin of poultry consignments delivered to PCFs/PSHs.
Living off the land – the role of wild foods in food security

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It is estimated that more than a billion people rely on wild foods as a source of protein, nutrients and income, all contributing to food security. However, because wild foods are not considered food commodities, and therefore don't appear in food balance sheets, their contribution to food security is often overlooked. We reviewed >80 studies focusing on wild foods across agriculture, nutrition, social and environmental disciplines to identify how wild foods contribute to the four pillars of food security (availability, access, utilisation and stability). We assessed the location (i.e. country, climatic zone), methodology (i.e. survey, observational) and motivation (i.e. conservation, human health) for each study to identify trends in wild food research. Wild foods directly contribute to food security, particularly 'stability'. Wild foods also indirectly contribute to food security in a number of ways which are synonymous with One Health, such as biodiversity improving nutritional security and human health outcomes. Presently, our understanding of wild foods in a food security context is limited by lack of data on harvest/production, consumption/dietary habits and nutritional value of many wild foods. We propose a multidisciplinary framework to address these gaps, allowing better assessments of wild foods and food security in the future.
Are birds diluting Australia’s most common arbovirus? Investigating a dilution effect for Ross River virus

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Arboviruses account for 17% of the estimated global burden of infectious disease. In Australia, the most common and widespread arbovirus in humans is Ross River virus (RRV), with ~4800 RRV cases reported each year across all states and territories. RRV is a significant public health burden. In 2001, the estimated cost of RRV infections to the community was between $2.8 and $5.7 million annually. RRV is maintained in enzootic cycles, and comparatively few studies have focused on identifying how species contribute to spread and amplification. Results of experimental infection studies, serosurveys and mosquito blood meal analyses suggest marsupials are more efficient amplifiers of RRV than other mammals, which are more efficient than birds. In fact, birds are considered dead end hosts for the virus and thus may negatively impact viral transmission by "diluting" the pool of reservoirs. This "dilution effect" occurs when a greater diversity of dead end hosts for a virus in the reservoir population reduces the number of infective human mosquito bites. We present preliminary evidence to support this hypothesis and a OneHealth research framework to further investigate and identify management strategies, following dilution effect studies undertaken for West Nile virus, another arbovirus with an enzootic cycle.
Identification of a lineage D betacoronavirus in cave nectar bats (Eonycteris spelaea) in Singapore and an overview of lineage D reservoir ecology in Southeast Asian bats

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Coronaviruses are a diverse group of viruses that infect mammals and birds. Bats are reservoirs for several different coronaviruses in the Alphacoronavirus and Betacoronavirus genera. They also appear to be the natural reservoir for the ancestral viruses that generated the Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) and Middle East Respiratory Syndrome coronavirus (MERS-CoV) outbreaks. Here we detected coronavirus sequences in next generation sequence data created from Eonycteris spelaea feces and urine. We also screened urine samples, fecal samples and rectal swabs collected from six species of bats between 2011 and 2014, all of which were negative. The phylogenetic analysis indicates this novel strain is most closely related to Lineage D Betacoronaviruses detected in a diverse range of bat species. This is the second time that coronaviruses have been detected in cave nectar bats, but the first coronavirus sequence data generated from this species. Bat species from which this group of coronaviruses has been detected are widely distributed across SE Asia, South Asia, and Southern China. They overlap geographically, often share roosting sites and have been witnessed to forage on the same plant. This study will allow us to better understand coronavirus evolution and host specificity.
Infectious Agents in Indian Flying Fox Pteropus medius in Sri Lanka

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Pteropid fruit bats are recognized hosts for emerging pathogens such as Hendra virus, Nipah virus, and Ebola virus. The Indian flying fox, Pteropus medius (formerly Pteropus giganteus), occurs in several southern Asian countries, including Sri Lanka where it is the most abundant among the four fruit bat species on the Island. To better understand pathogens and diseases affecting this species, 100 dead P. medius carcasses were collected from the ground under a large urban roosting colony located in the Kandy district in Sri Lanka, from January 2014 to December 2015. Each bat was subjected to complete postmortem examination. Five of 70 bats tested were found to be infected with a new Lyssa virus. One of 55 bats had pathogenic Leptospira sp. in the kidney. Fifteen out of 100 bats were infected with at least one Toxocara pteropodis, an intestinal nematode. Advanced molecular techniques are now being applied to assess Lyssavirus-free bats for other potential zoonotic viruses.
Controlling Q fever through a series of coordinated investigations and interventions focused on humans, goats and the farming environment in Victoria, Australia

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Q fever, a zoonotic disease with a complex epidemiology involving farmed and wildlife reservoirs and environmental persistence, threatens human health and an emerging industry in Australia, dairy goat farming. A Q fever outbreak involving a 6000-head goat and sheep dairy enterprise in 2012-2014 required a collaborative interdisciplinary approach into the determinants that rendered this ecosystem vulnerable. A diverse outbreak investigation and management team was constituted including human, animal, environmental and public health agencies, researchers, local government and the affected enterprise. We undertook a series of interviews, risk assessments, site visits and epidemiological studies focused on humans, goats, wildlife and environmental impacts, and implemented coordinated interventions to prevent and control impacts on human and animal health, social well-being and productivity; and to reduce lasting environmental impacts. Several farming and occupational practices were identified as having contributed to the outbreak; some similar factors precipitated the large outbreak in the Netherlands. Local and wide-ranging outcomes of this intervention have included an intensive vaccination program for farm workers, development of a goat vaccine, improved on-farm management, environmental and biosecurity practices, validation of human diagnostics for ruminants and revised regulation of the dairy goat industry. Whilst human cases have ceased; source control interventions are ongoing.
Seroprevalence And Associated Risk Factors Of Brucellosis In Camels Kept Under Pastoral Management In Fafen Zone, Somali Regional State, Ethiopia

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A cross-sectional study of brucellosis was conducted on 261 camels from November 2013 to May 2014 to estimate the seroprevalence and to assess potential risk factors in Fafen zone, Somali regional state, Ethiopia. The study animals were selected using systematic random sampling method. Information regarding proposed risk factors like sex, age, herd size, parity and abortive history of each sampled camel was recorded. Blood samples were collected from the jugular vein and sera were extracted afterwards. Rose Bengal Plate test and Complement Fixation Technique were used as a to screen and confirm the reactors. The overall seroprevalence of *brucella* in camels in Fafen zone was 1.53%. Higher seroprevalence was observed in female and adult camels with seroprevalence of 2.5% and 2.34% than seroprevalence of 0% observed in both male and young camels, respectively. However, the difference between sex and age categories was not statistically significant (*P*>0.05). Higher seroprevalence of *Brucella* (25%) was also recorded in adult female camels with history of abortion, significantly different (*P*<0.05) from adult female camels with no history of abortion. The findings show that brucellosis is a potential hazard for public health in the pastoralist community and efforts should be in place to create awareness.
Epidemiology Of Dog Bite Cases Presenting To A Zonal Hospital In Nepal

Nitesh Shrestha

Rabies, endemic in Asian countries, is a fatal zoonotic viral disease, transmitted to humans through bites of infected animal, especially dogs. This study aims to describe epidemiology of dog-bite cases presenting to Dhaulagiri Zonal hospital, Baglung by time, place and person. Baglung is a rural district of Nepal, with moderate risk for rabies. Cases who presented from July 2014 to June 2015 were included in this study. Data were collected from registers maintained at emergency department. Interviews were held with relevant personnel. Finally, data were analyzed using Excel. The total cases were 195, age ranging from 1 to 82 years (Mean age 26 years, standard-deviation 20 years). The highest cases fell in 5-10 age group. Males were more affected than females (1.77:1 ratio). Municipality with the hospital confronted maximum cases of 55%, followed by 36% in villages of Baglung district and rest 9% in neighboring districts. Cases were seen every month, with highest frequency in April. All cases received wound cleaning, anti-rabies vaccine, tetanus-toxoid and analgesics. However, there was no mandatory precaution taken by vaccinating and regulating the domesticated/stray dogs. In summary, dog-bite, the most common cause of rabies transmission, highly affects young boys in this region of Nepal.
Evidence of canine parvovirus transmission to a civet cat (Paradoxurus hermaphrodites) in Singapore

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Cross-species transmission can often lead to deleterious effects in incidental hosts. Parvoviruses have a wide host range and primarily infect members of the order Carnivora. Here we describe juvenile common palm civet cats (Paradoxurus hermaphrodites) that were brought to the Singapore zoo and fell ill while quarantined. The tissues of two individual civets that died tested PCR-positive for parvovirus infection. Phylogenetic analysis revealed this parvovirus strain falls in a basal position to a clade of CPV that have infected dogs in China and Uruguay, suggesting cross-species transmission from domestic to wild animals. Our analysis further identified these viruses as genotype CPV-2a that is enzootic in carnivores. The ubiquity of virus infection in multiple tissues suggests this virus is pathogenic to civet cats. Here we document the cross-species transmission from domestic dogs and cats to wild civet populations, highlighting the vulnerability of wildlife to infectious agents in companion animals.
Knowledge, Attitudes and Practices Relating to Brucellosis among owners of small ruminants in Dohuk, Northern of Iraq: A venue for One Health Education

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Brucellosis continues to be a major One Health challenge at the human-animal interface throughout the Middle East, as well as in Iraq. No data on the local knowledge, attitudes and practices (KAP) of Brucellosis in Iraq exist although such information is required for prevention and control measures. We conducted a cross-sectional survey in six districts of the Dohuk Province, in Kurdistan region, Northern Iraq between March and April 2016. We collected information on the socio-demographic characteristics of 72 small ruminants' farmers and captured data on their knowledge, attitude and practice regarding Brucellosis using a structured face-to-face questionnaire.

Only 15% of the farmers had a good knowledge about Brucellosis. We captured some risky practices, as all of the farmers were found to sell unpasteurised milk directly to consumers, and all did not object feeding the aborted foetus to their dogs. It was remarkable that all of the interviewed farmers showed the same attitude of not separating the animals that had an abortion from the rest of the flock. The knowledge of the small farmers' community in Dohuk, northern Iraq about Brucellosis was very low. Therefore, massive awareness programmes are urgently required to protect the health of people and to limit the economic burden of Brucellosis on their animals.
Important resistance genes carried in non-pathogenic Escherichia coli in Australian piglets.

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The Australian pig industry often uses antibiotics at weaning for treatment of diarrhoea in piglets caused by *Escherichia coli*. Our aim was to isolate *E. coli* from healthy and sick piglets to determine resistance to third generation cephalosporin antibiotics (3GC) used in veterinary medicine (e.g. ceftiofur). A survey was conducted in 22 commercial piggeries in South Eastern Australia (New South Wales n=9; Victoria n=10; and South Australia n=3) from September 2013 to May 2014. From each herd, 10 pre- and 40 post-weaned piglet faecal samples were spread onto Sheep blood agar and CHROMagar Orientation to isolate *E. coli*. A total of 325 *E. coli* isolates (15 from each herd) were tested for resistance to 17 veterinary antibiotics (CLSI and EUCAST guidelines) and enterotoxigenic (ETEC) genes (F4, F5, F6, F18, F41 and STa, STb, LT) commonly associated with piglet diarrhea. Phenotypic resistance to 3GC e.g. ceftiofur (≥8 µg/mL) was identified in 5% (17/325). Of the 17 resistant isolates 14 lacked ETEC genes suggesting that 3GC resistance is circulating at higher proportions within non-pathogenic *E. coli* isolates at the farm level. Further analysis of 3GC resistance patterns in finisher pigs is essential, due to their relevance to potential zoonotic transmission.

**Keywords:** Antibiotic resistance; *Escherichia coli*; third-generation cephalosporin; piglets; Australia
What is the role of migratory birds in the global spread of pathogens?

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Migratory birds are thought to play an important role in the long-distance dispersal of pathogens, including zoonotic diseases. However, the extent to which they contribute to the global spread of pathogens is unknown. Critically, the susceptibility of migrants to novel microbes is strongly influenced by the gut microbiome, which is the primary site of interaction between the immune system and microorganisms that enter the body. The gut microbiome is linked to the diet and environment of the host, and is remarkably stable within sedentary species. However, migrants experience drastic changes to their diet and environment over the course of their life history. The resilience of the microbiome to such changes is unknown, yet has important implications for the susceptibility of the host to novel infections. Here we aim to explore the resilience of the microbiome in a long-distance migrant, the Red-necked stint (Calidris ruficollis), by comparing microbiome composition between non-breeding populations around Australia, as well as temporally over the non-breeding season within one population. Determining the resilience of the gut microbiome to change in migratory birds is critical to understanding their susceptibility to infections as they traverse the globe, and thereby their role in the long-distance dispersal of zoonotic pathogens.
Global Health True Leaders: Strengthening Interprofessional Collaboration Among One Health Workforce Through International Leadership Training Series

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The forces of globalization have made it possible for diseases and other threats to spread anywhere which require strong health system with collaboration across sector in international level. It motivated Universitas Indonesia and the Indonesia One Health University Network to start a program called Global Health True Leaders (GHTL) to equip prospective future health workforce with global health knowledge and leadership skill to work multi sector. The GHTL program is an international leadership and health training program which is open to students and young professionals. It gives them exposure to a range of highly relevant international and local health issues, and pushes them to raise the level of their leadership and soft skills. The program is a combination of in-class training, field work and leadership training. INDOHUN has conducted GHTL in 2014 and 2015 with 322 participants came from ten countries with various education backgrounds. The event was held in Indonesia, Thailand, Vietnam, and China and granting selected participants with seed funding for their one health projects. It has
improved understanding and implementation of multidisciplinary collaboration among the participants to cope with one health problems.
Quantitative Relative Risk Characterization of Campylobacter Contamination in Chicken Meat from Formal and Informal Urban Markets in Alexandria, Egypt

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The foodborne pathogen Campylobacter is one of the top leading causes of diarrheal illnesses worldwide, as well as in Egypt. Infection in humans is considered to occur mainly via foods of animal origin, especially consumption of contaminated chicken meat. The informal wet markets continue to be a major source for selling live birds and fresh chicken meat in urban Egypt. This study provides the first quantitative microbiological food safety assessment of Campylobacter contamination levels in chicken meat sampled from informal wet markets (n=92) versus those from retail supermarkets (n=138) across the metropolitan city of Alexandria, northern Egypt.

Campylobacter was detected in 72.17% (166/230) of the chicken samples. Campylobacter was detected in 77.78% and in 68.57% of chicken meats from informal wet-markets and retail supermarkets, respectively. Campylobacter contamination count was \( \geq 1000 \text{ CFU/g} \) in 35.5% (32/90) of chicken from informal wet-markets as compared to only 10% (14/140) in samples from retail supermarkets. The contamination levels with Campylobacter in chickens sold at informal markets were significantly higher than retail supermarkets and this is could be the driver behind much of the foodborne exposure to such important zoonosis. In the future, more microbiological data combined with consumer practices will be gathered to achieve a better health risk assessment.
Characterization Of Escherichia Coli Harboring Mcr-1 Isolated From Livestock In Japan

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Soon after initial reports from China, the colistin-resistance gene mcr-1 was detected in Enterobacteriaceae around the world, mostly in swine, chickens, or related foods. We identified mcr-1 in five Escherichia coli strains from dairy cows with mastitis in four different Japanese farms. Because colistin is rarely used in mature cows, we investigated the plasmid and chromosomal sequences of these five isolates. All had identical IncI2 plasmids carrying mcr-1 that were almost identical to pHNSHP45 from China. All five strains belonged to ST457, previously reported only in humans and stray dogs. The cow isolates also harbored the IncF plasmid with blaCTX-M-27. CTX-M-27 producers have not been identified in livestock isolates, but are detected with increasing frequency in human isolates in Japan. In addition to colistin, the five isolates were resistant to cephalosporins, aminoglycosides, and quinolones. In Japan, E. coli isolates from cattle are rarely resistant to these antimicrobials, whereas resistance to these drugs among human clinical isolates has increased dramatically over the last decade. The five isolates harboring mcr-1 shared many characteristics with human isolates, implying that they were accidentally imported into dairy farms and maintained under selection pressure from antimicrobials other than colistin that are used for treatment of mastitis.
Brucellosis is one of the major zoonosis in the world. A cross sectional study was conducted to determine prevalence and risk factors of bovine brucellosis in Morogoro Region, Tanzania. Questionnaire survey and blood sampling were conducted in cattle farms in urban and agro-pastoral areas in 2015. Rose Bengal Plate Test and competitive-ELISA were conducted for serum diagnosis. Univariate and multivariable analyses were performed for all farms at farm level, and female cows in agro-pastoral areas for individual cows using generalized linear models (GLM) and generalized estimating equations (GEE). Animal level prevalence was estimated using Bayesian inference. Farm level prevalences were 0.9% (1/106) and 52.9% (9/17), and adjusted animal level prevalences were 0.1% (95% CI: 0.0-0.4, 1/667) and 7.4% (95% CI: 4.8-10.8, 28/673) in urban and agro-pastoral areas. Farm level risk factors were grazing ($p = 0.07$) and abortion in the farm ($p < 0.01$). Animal level risk factors were age ($p = 0.02$), abortion ($p = 0.02$) and bought-in ($p = 0.05$) in GLM, and age ($p = 0.04$), abortion ($p = 0.03$), and indigenous species ($p < 0.01$) in GEE. Brucellosis was maintained in agro-pastoral area, through grazing and sales of cattle experienced abortion.
An Evidence-based Approach To Improving Cost-effectiveness Of Rabies Post Exposure Prophylaxis In High Risk Areas Of Bhutan

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Post exposure prophylaxis (PEP) is essential for rabies control, but expensive - comprising 6% of Bhutan's medicines expenditure. Only a few of these people would have been exposed by a rabid dog. Rabies incidence in people in the high risk area adjoining India was 3.14/100,000, whereas without PEP it was predicted to be 19.24/100,000. PEP administration practices by clinicians in high rabies-risk areas were investigated to target PEP more precisely to people with a genuine risk of rabies exposure, avoiding excessive precautionary use. Health workers used a structured questionnaire whilst observing clinician-patient interviews to assess 276 suspected rabies exposure cases by 52 clinicians within 13 district and sub-district hospitals. This provided evidence of the risk of rabies exposure associated with different forms of dog exposure, leading to development of a classification system which can be used to guide decisions on which patients should receive PEP. The national PEP guidelines will now be revised and training materials developed for clinicians. Savings from reducing PEP expenditure can potentially be diverted to reducing exposure of people through enhanced rabies
control effort in dogs in the high-risk areas, further reducing the need for PEP by adopting an integrated One Health control policy.
Recent expansion of the human population, international trade and travel has enhanced the risk of being exposed to virulent pathogens in humans and animals. The frequent outbreaks of emerging and re-emerging diseases in recent years have raised concerns over the preparedness of the animal-health and human-health communities in responding to outbreaks of novel infectious diseases. The biosafety and biocontainment in laboratories required to handle infectious agents is presently well recognized as a necessary infrastructure in infectious diseases preparedness and response. The requirement on biosafety and biocontainment in microbiology laboratories and animal facilities raises the need to assess the capacity and to identify key areas that require action to enhance laboratory capacity to appropriately and safely handle pathogens. Since 2010, FAO has coordinated a biosafety enhancement program for national veterinary laboratories in countries of South and Southeast Asia. The activities under this program are supported by the USAID Emerging Pandemic Threat (EPT) program. The FAO Regional Biosafety Program has focused on the development of Core and Biosafety capacity assessment tools, training in risk perception and identifying implementation gaps as well as providing assistance to Southeast Asian countries to develop their diagnostic capacity in terms of equipment and buildings.
Genomic characterization of Human Parainfluenza Viruses types 1 - 4 from Vietnam

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Human Parainfluenza Viruses (HPIVs) are non-segmented negative strand RNA viruses within the Paramyxoviridae family. They are responsible for around 15% of all acute respiratory viral infections with a majority of infections occurring in children. Symptoms include croup (laryngotracheobronchitis), bronchiolitis and pneumonia. Despite its prevalence and clinical significance, genetic variability and transmission patterns are largely unknown.

We here sequence HPIV types 1, 2, 3, and 4 in clinical samples obtained from hospitalized children in Ho Chi Minh City, Vietnam in 2009 and 2010. The addition of new sequence data to the existing limited number of HPIV sequences in public databases will ultimately allow more comprehensive analysis of HPIV genetic variation and circulation patterns.

Full-genome or near full-genome HPIV sequence data from public databases were aligned with the newly obtained sequences using MAFFT software. Maximum likelihood phylogenetic trees were inferred from the alignments using PhyML software.

Full-genome sequences were generated for each HPIV type and additional partial genome data is available. The newly obtained sequences from pediatric patients in Vietnam form a distinct cluster in the phylogenetic tree.

Regional and temporal clusters can be observed in the phylogenetic tree analyses, suggesting endemic circulation of HPIVs.
“bijak-antibiotik” Cadres: A Community Participation Model For Antimicrobial Resistance Prevention Program In Central Java Province, Indonesia

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Antimicrobial resistance is a complex issue with many contributing factors, such as easy access to antibiotics and poor knowledge on prudent use and antimicrobial resistance. An Ecohealth approach was used to develop a community empowerment program which aims to increase local participation in antibiotic resistance control efforts. This program was conducted between August 2015 and July 2016 in 3 districts in Central Java Province, Indonesia. Steps in the program consist of defining the problem, reaching an agreement on establishing cadres/volunteers, capacity building, and monitoring and evaluation. Methods used in the program were focus group discussions, in-depth interview, class presentation, simulation, role-
plays, and outcome mapping for program evaluation. In collaboration with local health services, we trained 95 "BIJAK Antibiotik" cadres on human and animal health issues. Cadres were tasked to educate the public and document cases of imprudent antibiotic use in the community. Key messages for public society and livestock owners were made from the word BIJAK (prudent) and disseminated through existing social channels. This program can become a participatory model for increasing public awareness on prudent antibiotic use and antimicrobial resistance. It builds public capacity, empowers the community to become antibiotic stewards, and brings the people closer to health services.
Small Ruminants, Household Food Security And Gender Dynamics: Insights From The Gambia

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In the Gambia, undernutrition in children remains problematic with 23.4 percent of children being moderately or severely stunted. Sixty percent of the population live in rural areas and are dependent on agriculture for their livelihoods. The raising of small and large ruminants, donkeys and village poultry is crucial due to poor cropping conditions. Generally, women have responsibility for small ruminants and village poultry with men taking most interest in large ruminants and donkeys. In a mixed methods study of a survey and focus group discussion, involving 120 households in the Kiang East District, competition between livestock species for pasture, fodder and crop residues was well recognised. Our research also highlighted the associated competition between men and women in relation to which animals could access crop residues and how these animals were used within households. Both men and women tended to rear small ruminants for the purpose of household consumption and finance. Other problems raised by women include inadequate access to grazing land, lack of capital to purchase feed supplements and lack of adequate know-how. Our findings demonstrated that despite women’s significant role in small ruminant production, they still lack adequate support to improve their contribution to household food security.
Previous studies conducted by us with rural communities living in the vicinity of four wildlife habitats in the low-country dry zone region of Sri Lanka revealed that several zoonotic diseases transmitted from wildlife pose risks to human health and livelihoods in those locations. We report here the results from two participatory workshops conducted with field officers employed by the state in the same region (n=41 in Ratnapura and n=57 in Mahiyangana), who are directly involved in providing regulatory and support services to these communities in village administration, wildlife conservation, livestock development and human health. The important zoonotic diseases identified by the participants were rabies, leptospirosis, Japanese encephalitis, tuberculosis, leishmaniasis and typhus (rickettsioses). A major limitation highlighted during the discussions was the lack of an inter-sectoral communication mechanism between the wildlife, domestic animal and human health sectors for reporting and responding to zoonotic disease outbreaks. The participants recommended setting up a network involving all stakeholders at the village level for communication on wild animal diseases and deaths. It was concluded that the recently established Sri Lanka Wildlife Health Centre can play a key role in coordinating activities between these sectors for surveillance, diagnosis, reporting and appropriate response to zoonotic diseases.
Detection of Emerging Bacterial Pathogen Elizabethkingia in Culicoides

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Elizabethkingia in recent years has been associated with outbreaks typically occurring as nosocomial infections. Occurring globally, Elizabethkingia has been detected in the environment in water sources including rivers, reservoirs and soils. However, outbreaks of Elizabethkingia in America in 2016 question possible transmission sources. Elizabethkingia can cause, among others, meningitis and has been seen to have a high fatality rate in America and China, with a recent case reported in Australia. Previous studies identified a high presence of Elizabethkingia in the mosquito genus Anopheles and Aedes. We used a 16S rRNA amplicon next generation sequencing approach to determine the presence of Elizabethkingia in Culicoides predominately collected in Australia. Three Culicoides species were screened, C. brevitarsis (n = 21), C. victoriae (n = 23) and C. multimaculatus (n = 21), with Elizabethkingia seen to infect all at 81, 70 and 5 % occurrence respectively. Elizabethkingia species identified shared 98.5 - 99.1 % sequence similarity to Elizabethkingia anophelis isolated from recent outbreaks in Hong Kong, China. This is the first study to highlight the presence of this emerging bacterial pathogen in Culicoides species, which should be further investigate for their vectoring or reservoir capability of this emerging bacterial pathogen.
Strengthening One Health capacity in China as part of veterinary and medical field epidemiology training

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Two Field Epidemiology Training Programmes for veterinary and medical professionals (CFETPV and CFETP) aim to assist the Chinese government in training epidemiologists in support of zoonotic disease control and prevention in animals and humans. While both programmes are run separately, each has a curriculum with a strong One Health (OH) dimension. In addition, joint training sessions are conducted regularly involving trainees from both programmes. These include an introductory course on OH and joint workshops on the zoonotic diseases epidemiology and control. During both training programmes, professionals from both sectors are involved and are involved in discussing and exchanging ideas, and collaborating in field work whenever possible, based on a common understanding of OH concepts and approaches gained from the trainings. Through 'learning by doing', the two programs also facilitate and synergize resources for joint field investigation and intervention for trainees and graduates. As a result, cross-sector cooperation will become more effective, also facilitated by the professional and personal relationships established during the training programme. These joint approaches are necessary for dealing with the continued emergence of high impact zoonotic diseases that have national, regional and global impact.
Rabies is a zoonotic disease that has long impacted human and animals, about 400,000 people seek for rabies vaccine per year due to dog bites in Viet Nam during the last five years. A considerable proportion of dog bite victims seek treatment from healers instead of health centres. In Viet Nam, most healers inherited their family business as well as healing skills from their previous generations. They gained the community trust thanks to their long-term treatment history as well as affordable cost compared to modern medicine. Unfortunately, not all of the healers understand the concept of immunization and infectious diseases prevention which resulted in wrong advices and treatment. The healers, however, are often neglected and left out from rabies prevention and control plans. Realizing this gap, FAO Viet Nam, in partnership with Ministry of Agriculture and Rural Development and Ministry of Health, implemented an outreach initiative in 2014 in Phu Tho and Thai Nguyen provinces to train 150 healers on key preventives measures in both animals and human such as vaccine and correct wound washing. Thanks to the outreach contribution of the healers, the two provinces witnessed 50% increase of people got rabies vaccines in 2015 compared with 2014.
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Promoting One Health in China through United Nations Theme Group on Health (UNTGH)

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The United Nations Theme Group on Health (UNTGH) is a multi-agency technical group under the UN umbrella with a focus on specific health problems in member countries. The 'Working Group (WG) on Diseases at the Human-Animal Interface' was formed by the UNTGH in China in 2010. The main aim is to promote OH approaches in China. It is chaired by Food and Agriculture Organization (FAO) in collaboration with the World Health Organization (WHO) and comprises UN agencies, bilateral and multilateral donors, government agencies and non-government organizations (NGOs) working in health/veterinary/wildlife/environment fields, including five Chinese ministries. The working group was convened to answer the need for more integrated and multi-disciplinary approaches to address health risks at the human-animal-ecosystems interfaces. It has made considerable efforts to achieve that goal by facilitating dialogues and sharing, such as large-scale national conferences and theme-focused workshops on rabies, avian influenza and Antimicrobial Resistance (AMR). Numerous OH examples have been collected by the WG ranging from science to policy and legislation, from emergency response to education and training. Despite the progress made, there is a need for greater application of OH approaches at all levels in China.
Eco-bio-social Approach Towards Sustainable Dengue Management In Malaysia.

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Dengue has become a major public health issue in many parts of the world, particularly those in the tropical regions. In Malaysia, the rising rate of dengue cases has been alarming to both the public and the authorities. Despite the existence of legislations and control activities, number of dengue cases keeps on increasing every year. This study aims to review and assess the existing environmental and health policies/strategies towards prevention and control of dengue in Malaysia. Eco-bio-social approach was applied and in-depth interviews among 10 key-informants was carried out based on their role as the policy maker, middle managers and practitioners in dengue control. The interviews were voice recorded and terminated once data saturation was achieved. The data was analyzed using Atlas.ti software. Three themes identified and emerged as the key contributing factors in sustainable dengue prevention and control were i) adequate implementation and practice of the existing health policy, ii) good integration and coordination between agencies and iii) commitment from political and community leaders. Local data showed that areas without these domains became hotspots for dengue. It is vital that the relevant authorities and communities focused on these domains for effective and sustainable dengue control and management.
From H5 N1 To Hx Nx: Using Algorithmic Approaches To Refocus The Surveillance And Diagnostic System To Detect Novel Avian Influenza Viruses In Indonesia

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Indonesia came to prominence in the Global Outbreak Alert and Response Network (GOARN) on account of a series of human spillover cases of Avian Influenza (AI) H5N1 in 2005. Since then, the Government of Indonesia (GOI) has implemented effective disease control measures and spillover events from poultry to humans are now uncommon. However, the possibility that Indonesia may encounter a new zoonotic HPAI virus of another undefined AI subtype (HxNx) has motivated the development of preparedness measures. The challenge is that the exact HxNx cannot be recognised beforehand; to address this, the GOI is working with FAO and WHO to implement a generic approach for surveillance and diagnostics through formalised decision making using predefined "algorithms". Currently these are most advanced for molecular diagnostics where a regional algorithm for detection of HxNx subtypes using RRT-PCR has been adapted to the Indonesian situation. However, this can only identify known HxNx circulating viruses, and to allow for the identification of new and emerging highly pathogenic AI viruses, we are developing a new algorithmic approach which incorporates decision rules to identify "test failures" followed by next-generation sequencing. The wider application of this innovative approach is discussed.
The first interdisciplinary MOOC (Massive Open Online Course) on Global Health at the Human-Animal-Ecosystem Interface

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MOOCs bring a new dimension to teaching and learning. Some of world's best Universities use MOOCs to share their knowledge with a global community of learners, opening unprecedented opportunities for career development. MOOCs are increasingly used for dissemination of policy recommendations, as seen during the climate crisis or the Ebola epidemic. The Institute of Global Health (IGH) has produced several MOOCs with an innovative interdisciplinary approach, part of International Geneva's identity (e.g. MOOC on Ebola involved 38 experts from 20 institutions). This approach has a potential added value in terms of the diversity of roles and perspectives needed for these complex global health challenges. In December 2016, we launch on Coursera a new MOOC on Global Health at the Human-Animal-Ecosystem Interface: Interdisciplinary Overview. It is co-produced by the IGH and Institut Pasteur involving also a diversity of experts from other academic institutions, international organisations (e.g. WHO) etc. It will be free and open, targeting primarily an interdisciplinary audience interested in human-animal-ecosystem health interface. Besides its primary educative objective, the MOOC will become a platform for interdisciplinary discussions, encounters online but also offline in different parts of the world (e.g. Meetup, Hackathon), as well as participatory research (Massive Open Online Research).
Free-grazing Mallards As The Sentinel Model For Influenza A Virus Surveillance In Wild Birds In China

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Wild birds are considered as natural reservoirs of influenza viruses and play an important role during the global transmission of influenza viruses. To better understand the complex interactions among wild birds, poultry and human through a One Health view, surveillance of avian influenza virus in free-grazing mallards sentinel model has been conducted for about three months. IAV subtypes H10N1 and H4N6 were isolated from sentinel mallards. Phylogenetic analysis and genetic characterization of the isolated IAVs indicated that all IAVs were clustered in the Eurasian lineage and pose low pathogenic avian influenza characteristics. HA gene of the H10N1 isolate were close related with other H10 subtype viruses detected in wild birds in Mongolia, indicating the virus was imported to the sentinel mallard flocks by wild birds migrated from the north. In summary, our results indicate that the free-grazing mallards can be infected with influenza viruses through frequent movements in habitats they share with wild bird, thus routine IAV surveillance in free-grazing mallard flocks can be beneficial for influenza prevention and control strategies.
Epidemiological Study Of Hydatidosis In A Rural School In Santiago Del Estero, Argentina

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Hydatidosis is a parasitic disease caused by the cestode *Echinococcus granulosus*. The aim of this work was to study the presence of cystic echinococcosis (CE) in a population of students from a rural school of Tintina, Santiago del Estero, Argentina, as well as to evaluate the risk of infection by *E. granulosus* to which this population was exposed. A sanitary survey was conducted at the school, which included abdominal ultrasound inspection and collection of blood samples that were then processed by Indirect Hemagglutination assay and ELISA to detect antibodies against *E. granulosus*. Dog fecal samples were taken from the surrounding area of participants' residences and processed for coproantigen detection by means of copro-ELISA and Western blot techniques. The students were interviewed about their involvement in activities related to livestock rearing and domiciliary slaughter, degree of knowledge about the disease and other known risk factors for CE. The results of ultrasound and serological tests \((n = 53)\) were 100% negative. *E. granulosus* was detected in canine feces in 13.5% \((5/37)\) of the analyzed samples. The analysis of the interviews revealed the existence of practices that favor the parasitic cycle of hydatidosis and a poor knowledge of the disease.
One Health in Practice: Viet Nam’s Five Year Strategic Plan for One Health
Approaches to Zoonotic Diseases

Thu-Trang Dao
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Viet Nam has been one of the leaders in Asia in adopting One Health approaches for control of zoonotic diseases especially those with pandemic potential. Viet Nam has recognized the value of adopting One Health approaches building on work done with SARS and Influenza A(H5N1) and has broadened to include wildlife, environmental health, AMR and other issues. Viet Nam recently formed the One Health Partnership for Zoonoses. The One Health Partnership subsequently developed The One Health Strategic Plan for Zoonotic Diseases for 2016 - 2020 that outlines how zoonotic diseases in Viet Nam will be addressed, weaving together the various activities and programs that are in place or are expected. This plan not only emphasizes the need for on-going building of One Health capacities but also demonstrates how and why One Health approaches will be conducted for specific diseases or groups of diseases in Viet Nam and the expected gains over the next 5 years. The plan takes into account key regional and international activities and provides estimates of likely costs of activities and sources of funds. This presentation will present information on how One Health is being "operationalized" in Viet Nam and provides a model for consideration by other countries.
A Decision-Focused Information-Centric Model For Infectious disease Forecast: An Example of Cholera in Haiti

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Most current modeling techniques do not cater for other socio-ecological drivers of cholera other than climatic factors; neither produce a portfolio of optimal cost-efficient interventions. We propose a Decision-Focused, Information-Centric, and Technology-prone (DIT) model for cholera forecast and optimal management. The model aims at (i) mapping endemic and epidemic areas, identifying fundamental socio-environmental drivers and their interactions, and determine the universality of these drivers; (ii) identifying potential recurrence time of outbreaks and performing multi-scale predictions over space and time; and (iii) defining optimal controls for decreasing population incidence by quantifying the budget to be allocated to different ecosystem controls that consider health outcomes. The model is constructed on an entropy-/network-based variance decomposition principle. It is built for maximizing prediction accuracy in cholera dynamics. It predicts spatiotemporal weekly patterns of incidence with an average accuracy - for two weeks before the outbreaks occurrence - of 92%, 85%, 84% and 72% for the peak timing, geographical distribution, total cases, and peak magnitude, respectively. The model carries a Value of Information that is superior to current models. It enables the prediction of triggering criteria for public health control strategies with increased accuracy. The DIT model is effective for both science and public health decision-making.
Experiences and Challenges of Antimicrobial Susceptibility Testing in Uganda

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This paper presents preliminary results, experiences and challenges of antimicrobial susceptibility testing conducted in a World Health Organization funded project in Uganda. A total of 50 samples of beef were collected in May and June 2015 from butcher shops in suburban areas of Kampala, the capital city of Uganda. The samples were cultured for E.coli and Salmonella organisms using standard laboratory methods. E. coli was isolated in 46 out of the 50 samples tested. Salmonella organisms were not isolated in all samples. E.coli isolates were tested for antibiotic susceptibility using Kirby-Bauer technique. Multiple drug resistance was recorded in 43% (20/46) of E.coli isolates. All isolates were resistant to erythromycin. Least resistance of 0.02% (1/46) was found for gentamycin. Resistance to other antibiotics was recorded as follows: ampicillin (24%, 11/46), ceftriaxone (0.04%, 2/46), chloramphenicol (13%, 6/46), nalidixic acid (11%, 5/46), tetracycline (35%, 16/46) and trimethoprim/sulphamethoxazole (22%, 10/46). The major challenges of antimicrobial susceptibility testing in Uganda are: inadequate laboratory infrastructure, disconnected reporting systems in human and animal health sectors and lack of enabling policies. We conclude that One Health approach should be promoted to generate inter-sectoral data required to fight antimicrobial resistance in Uganda.
Food Safety Working Group in Vietnam – an One Health Approach to improve the food safety.

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In Vietnam, food safety is of increasing concern to consumers and national policy makers. The Food Safety Working Group (FSWG) has been established since late 2015 as the result of interactions between research intuitions, NGOs, private sectors, international development partners (World Bank, Food and Agriculture Organization (FAO), Japanese International Development Agency, Canadian International Development Agency, Embassy of New Zealand and Asian Development Bank, some international NGOs and private sectors) and the government of Vietnam (ministry of Agriculture and Rural Development, Health, Trade and Industry and Science Technology and their agencies) on food safety. The overall goal of FSWG is to contribute to the improvement of food safety and increased competitiveness of food products for domestic consumption and international trade. The meetings of FSWG, taking place every 3 months, have become a good forum for information sharing, prioritizing exercise and preparing for high-level policy dialogues on selected food safety concerns and issues. A Food safety Risk Assessment has been conducted recently by FSWG members under the lead of the World Bank and report to be available for sharing in about July 2016.
Quantitative Assessment Of Antimicrobial Resistance In Livestock During The Course Of A Nationwide Antimicrobial Use Reduction In The Netherlands

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We quantified associations between antimicrobial use (AMU) and acquired resistance in indicator Escherichia coli over a decade (2004 to 2014) during drastic sector-wide antimicrobial use reductions (~50%) in main livestock sectors (broilers, pigs, veal calves and dairy cattle) in the Netherlands. We used national data reported annually for the resistance surveillance and AMU program. Two multivariate random-effects logistic models per animal sector were used to relate total and class-specific AMU (as defined daily dosages/animal-year, DDDA/Y) with the probability of E. coli resistance to a panel of 10 antimicrobial agents. Positive dose-response relationships (statistically significant ORs between 1.02 to 1.40) were
obtained from all models. In all sectors, total AMU was more associated with resistance phenotypes than class-specific AMU. Resistance to historically widely used antimicrobials (e.g. penicillins, tetracyclines) was, in relative terms, less influenced by AMU changes over time than resistance to newer or less prescribed antimicrobials (e.g. 3rd/4th generation cephalosporins). Thus, drug use history and co-resistance selection were shown as key elements for perpetuation of resistance. The most robust associations and positive prevalence predictions related to further AMU reductions were found in pigs and veal calves. The impact of Dutch policies on dairy cows and poultry was more modest.
Local Ngo In Nepal Builds Capacity In Rabies Prevention Using One Health Approaches

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The control and prevention of rabies in Nepal is fragmented and requires improved coordination and enhanced access to post exposure prophylaxis in rural areas. A local non-government organisation, Himalayan Animal Rescue Trust (HART) has set up bases on the premises of the District Livestock Service Office (DLSO) in Pokhara and Bharatpur to generate interest and form collaboration with the authorities, whose primary concern is livestock, in rabies prevention and dog population management. Mobile phone applications have been developed to enable dog census and mass anti-rabies vaccination data to be captured and assessed, ensuring over seventy percent of the dog population are rabies vaccinated. Currently HART is working with the Nepalese Animal Health Directorate and Veterinary Public Health Office to transfer this field surveying technology and expertise to local DLSO's enabling rabies prevention programs to be coordinated by the government. Additionally, World Veterinary Services are working with HART to train Nepalese veterinary students in companion animal sterilisation surgery, building capacity in population management and animal welfare. HART has considerable experience and operational knowledge in rabies control which can help both the human and animal health sectors to build a National Rabies Strategy for Nepal to eliminate dog-mediated rabies.
Case-control Area Study Of Risk Factors For Exposure Of Village Residents To Nipah Virus In Bangladesh

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Nipah virus (NiV) causes almost annual disease outbreaks in Bangladesh, due to drinking raw date palm sap contaminated by infected fruit bats (\textit{Pteropus giganteus}) prior to collection by sap collector/sellers (gacchi). In two Nipah-affected areas (Faridpur, Rajbari) and two unaffected areas (Jessore and Jhinadoha), a structured questionnaire was used to investigate sap collection, marketing and consumption practices used by gacchi (n=324) and consumers (n=40), and to assess the monetary value of sap when traded in the local area. Control areas have more date palm trees and gacchis than case areas, and in control areas more sap is processed commercially into jaggery (traditional sweetener) than locally consumed, whereas in case areas most sap is sold and consumed locally. In case areas, owners of date palms share collected sap equally with the gacchi, increasing their risk. Gacchi in case areas are more aware of the disease risk, but the available protective device to prevent bat access is not widely used. It will be necessary to develop a one health strategy to control this disease, involving changes
in gacchi practices and development of effective easy-to-use devices to prevent bat access to sap collection sites on date palms.
Sero-prevalence And Risk Factors Associated With Brucellosis Sero-positivity In Cattle, Goats And Humans In Makuutu Sub-county, Iganga District, Uganda

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A cross-sectional study was conducted in Makuutu sub-county, Iganga district, Uganda in the period from June to September 2014. The main objective was to establish the sero-prevalence of brucellosis and risk factors associated with its sero-positivity in humans, cattle and goats in smallholder farmers. A structured questionnaire was administered to the head of each study household. A total 451 human blood samples were collected. Furthermore, a total of 345 blood samples of cattle and 351 blood samples of goats were collected. The samples were tested using a commercial indirect-ELISA kit. The overall sero-prevalence of brucellosis in humans was 4.4% (20/451). The sero-prevalence was slightly higher among males (6.4%, 11/173) than in females (3.2%, 9/278). In cattle, the sero-prevalance was 1.2% (4/345), while in goats it was 0.3% (1/351). People who consumed locally made dairy products were 4 times more likely to be Brucella sero-positive than those who did not. No risk factors were found to be associated with Brucella sero-positivity in cattle and goats. We conclude that the sero-prevalence of brucellosis in cattle and goats in smallholder households was low.
Investigation of Antimicrobial Resistance in Escherichia coli Isolated from Wild Animals presented to a Regional Wildlife Health Centre in Sri Lanka

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Resistance to antimicrobials is a worldwide problem in both human and veterinary medicine. Exposure to antimicrobials is commonly attributed to maintenance of resistance in bacterial populations and commensals like Escherichia coli (E.coli), can easily acquire and transfer resistance genes. Even though significant resistance cannot be expected in wild animals, confirmation is important. The present study was conducted to identify antimicrobial resistant profiles of E.coli isolated from fecal samples of wild birds, mammals and reptiles (n=53) over the 6 months period starting from December 2015. Antimicrobial susceptibility testing (AST) of all E.coli isolates was performed according to standard operating protocols of the Clinical Laboratory Standard Institute (CLSI). Based on the results, 33% of the isolates were susceptible to the 12 antimicrobials tested. The susceptibility of the isolates for ampicillin, tetracycline and trimethoprim+sulfamethoxazole was 33%, 45% and 70% respectively. Nevertheless, two isolates have shown a very high resistance. Accordingly, the isolate from the jungle Cat was resistant to 9 antimicrobials whereas isolate from the Jungle fowl was resistant to 6 antimicrobials. Although majority of the isolates were susceptible to tested antimicrobials, the resistant isolates indicate the possible environmental contamination with resistant genes.
An unusual rate of abortion was reported in one of the cattle farms. Paired sera samples were collected 14 days apart soon after the abortion (n =7) and subjected to microscopic agglutination test against the panel of *Hardjo, Pomona* and *Lai like* serovars. A total of 183 human sera with history of complain of fever and chill were collected and tested using IgM ELISA. These samples included 26 individuals working in the cattle farm that reported abortion. Second set of paired sera revealed ≥ 4-fold rise in MAT titre against at least one serovar. Among human samples 10.93% (20/183) were found positive for IgM antibodies against *Leptospira* spp. The male-female positive ratio was 3:1. The mean age group affected was 33.95 ± 3.88 (mean ± SE) (95% CI = 25.83 - 42.07). Two of the farm workers also had high level of IgM antibodies. Findings on the exposure of farm workers clearly suggest importance of farm biosecurity and occupational health safety.
Multidisciplinary teams bring help and hope to farmers in Nepal following the 2015 earthquakes

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Immediately following the 25th April 2015 major earthquake in Nepal local non-government organisation (NGO), Himalayan Animal Rescue Trust, suspended all rabies associated programmes to help communities in devastated districts. One base focused on Dhading, Nuwakot, Lamjung and Dolakha districts reaching 164 farmers during May and the second base focused on Gorkha and Sindupalchowk reaching 322 farmers between May and June. Australian and New Zealand veterinarians came to assist providing medicines and expertise especially in treating fractures and recumbent cattle. Multidisciplinary teams consisting of: driver, first aid personnel, local NGO and overseas veterinarian, were formed and went to the worst affected remote villages, at times walking to gain access. The teams were often the first help to arrive, handing out food, clothing and delivering veterinary care. Over-all 1531 animals were treated including multiple fractures in 18 cattle and buffalo, and rabies vaccinating dogs. Livestock are the mainstay of subsistence farmer’s economies so the teams brought hope to families where every animal is precious. The Sindupalchowk district where the second earthquake hit was visited four times to recheck cases with many recovering due to twenty-four-hour care given by farmers. Contingency planning with appropriate multidisciplinary teams is recommended for post-disaster responses.
Exploring Animal Rabies Endemicity To Inform Human Control Programs: A Case Study In The Punjab, India

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Recent estimates suggest that one-third of the annual global burden of rabies (~20,000 cases) occurs in India. With >95% of cases due to dog bites, surveillance of animal cases is important to assess the risk to humans and the efficacy of control strategies. We analysed passive surveillance data on 556 samples submitted from 2004 - 2014 to GADVASU in Punjab, India. Most (320; 57.6%) were confirmed rabies cases, including dogs (40.6%), buffalo (29.7%) and cattle (23.1%). Of cases in dogs in which bite history was recorded, 50.7% had shown biting behaviour. Regression analysis of monthly cases in dogs showed seasonal variation with significant increases in March and August. Although monthly case numbers in buffalo decreased, no long-term temporal trend was detected in dog and cattle cases. Time-series models identified significant cross-correlations between dog and buffalo cases. Significant spatio-temporal clusters were not identified (SaTScan) and mean geographic centres of cases were stable (un-weighted and weighted by species and year). These results demonstrate that overall, the number of rabies cases in animals was temporally and spatially stable during 2004 - 2014. The endemic nature of rabies transmission in this region demands a coordinated and sustained control program based on a One Health approach.
Use of antimicrobials in the livestock production industry for therapeutic, preventative, and growth promotion purposes is widespread in the region. Weak regulatory frameworks in antimicrobial use, low levels of anti-microbial resistant (AMR) awareness, and inadequate commitment to responsible antimicrobial stewardship are driving development of AMR in Vietnam and elsewhere. FAO/ECTAD Vietnam, in collaboration with Ministry of Agricultural and Rural Development, has developed a National Action Plan for addressing AMR by reduction of antibiotic usage in livestock productions. The Action Plan addresses major focus areas: improve awareness and advocacy on AMR and related threats, develop capacity for surveillance and monitoring of AMR and Anti-microbial Usage (AMU) in agriculture, strengthen governance related to antibiotic usage in food and agriculture and promote good practices in food and agricultural systems and the prudent use of antimicrobials. With the complexity of the situation, a work plan for tackling AMR is a good One Health Approach to mobilize the multi-sectoral dimension of AMR and encouraged key stakeholders to archive the
antibiotic reduction in country. The experience and lessons from this work can be applied to
other countries in the region.
Using Ecohealth Approaches To Identify Health Challenges : Case Study Of Communities In And Around Queen Elizabeth National Park

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One of the greatest challenges to improving health in Africa has been a lack of long-term and systemic engagement of various stakeholders in vulnerable communities. Interventions are often vertical and intermittent and, often instigated by a crisis. Community capacity is impeded by persistent exposure to complex public health problems not addressed by vertical interventions, including food and water insecurity, the effects of climate change, unsustainable natural resources, and political conflict and mobile populations. The One Health Central and Eastern Africa (OHCEA) network of universities is building on this model of long-term engagement to establish a regional network of One Health Demonstration Sites in six countries to address complex health problems faced by communities. The presentation will show community identified priorities and ranked for future interventions in Queen Elizabeth National Park (QENP) in Uganda. Priorities were identified using an Ecohealth approach whereby communities participated in identifying, ranking and prioritizing health and environmental challenges in their population(s), as well as the variables that drive poor health in humans and animals and/or contribute to environmental degradation. In QENP, traditional pastoralist communities have been forced to become semi-sedentary and, in some places, completely displaced and forced into national parks and other conservation areas because of lack of
pastures, watering points and loss of land to agriculturists. Fishing communities have stayed in and around national parks to exploit lakes within these conservation areas. This has led to a perceived increase in human-wildlife conflict in these areas. Interaction between wildlife-domestic animals and humans is relatively higher within fishing enclaves than in surrounding communities. This scenario leads to increased zoonotic diseases, environmental degradation and global change.
Isolation and characterization of the mosquito-borne Inkoo virus in Västerbotten, Sweden

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Inkoo virus (INKV) belongs to family Bunyaviridae, genus Orthobunyavirus, California serogroup. INKV was first isolated from Aedes communis in Inkoo, Finland. Antibodies against INKV have been detected in northern Europe. In Sweden, INKV has a sero-prevalence of 40.9% and its RNA has also been detected in Aedes communis larvae. Although the pathogenesis of INKV is unclear, research studies indicate that INKV infection is mainly asymptomatic but may cause encephalitis. In Sweden, paucity of genetic data on INKV exists hence this study aimed at characterizing INKV isolated during a mosquito-borne virus surveillance in Västerbotten. About 5,200 mosquitoes were processed for virus isolation using cell culture, electron microscopy, reverse transcriptase polymerase chain reaction and sequencing. Two INKV positive isolates were detected from two pools each consisting of 100 mosquitoes. The Small, Medium and Large segments of the isolates were amplified using specific primers and their corresponding sequences obtained. Phylogenetic analysis indicate that the INKV isolates were closely related to INKV strain KU681435.1 obtained from Aedes communis larvae in Västerbotten. The findings highlight the need of focused surveillance and complete characterization of virus strains to elucidate the present and future potential of mosquito-borne viruses as pathogens not only in Sweden but the entire Europe.
Is One Health Working In Afghanistan

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The current status of One Health (OH) in Afghanistan was assessed in Kabul from June-July 2015. The aim was to find the OH strategies, policies and/or programs for zoonotic disease control and evidence of collaboration among animal and human health, environmental and wildlife sectors. Fifteen key informants working at policy level in key organizations were interviewed and a desktop review of existing OH related policy and strategy documents was conducted. The study found that a One Health Committee is established at the national level but is not functioning adequately and a MOU exists between the Ministry of Public Health (MoPH) and the Ministry of Agriculture, Irrigation and Livestock to collaborate on zoonotic diseases but has not been effectively implemented. Communicable Disease Control department of MoPH developed a draft OH strategy for rabies. WHO country office developed guidelines for establishing collaboration between animal and human health sectors at the country level for zoonotic diseases. In conclusion despite the collaborative mechanisms that have been formed and the OH rabies strategy, integrated OH policies have not been adopted by the government, with poor awareness even amongst the key officials at the central level. More key findings will be presented in the conference.
Are Humans And Unique Wildlife At Risk Of Glanders Infection In Wakhan District, Afghanistan?

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Glanders is a zoonotic disease infecting horses, donkeys, mules, humans, dogs and cats, and may also threaten the health of unique wildlife species (such as the snow leopard) living in close proximity with livestock. A cross-sectional study was conducted during 2012-2013 to determine if glanders is present in horses and donkeys in Wakhan District, Afghanistan where some animals had shown clinical symptoms of glanders. Randomly selected horses and donkeys were blood sampled, mullein PPD tested and purulent nasal discharges were swabbed. All 89 blood samples tested negative to the cELISA at Central Veterinary Research Laboratory (CVRL) Dubai. An additional 26 serum samples collected in another occasion from horses and donkeys were also negative to the cELISA but inconclusive for CFT at CVRL. The two swab samples collected from equines with purulent nasal discharge were negative to PCR and to Burkholderia mallei culture at CVRL. The Mullein PPD skin test was negative for 231 randomly selected equines. These combined negative results provide evidence for the absence of glanders risk for human and wildlife in Wakhan district. The Streptococcus equi ssp. cultured from both swab samples is not zoonotic and affected animals can be treated with antibiotics.
Knowledge, Attitude And Practices Of Health Care Providers In Kabul Province Of Afghanistan With Respect To Diagnosing And Treating Zoonoses

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Zoonotic diseases are neglected in Afghanistan and are believed to be under-diagnosed despite many people suffering from them. A cross sectional study of 200 health care providers selected from 38 public and 27 private randomly selected health facilities in Kabul province was conducted during February to March 2016. Up to 5 health care workers who were diagnosing and treating outpatients on the day of the visit were randomly selected in each study facility and interviewed to collect data on knowledge, attitudes and practices regarding diagnosis and treatment of zoonoses using a standardized questionnaire. The results show that a majority of health care providers are not aware of the zoonotic diseases in Afghanistan nor they have enough knowledge about clinical signs and symptoms or about appropriate treatment and case management of people with brucellosis and Q-Fever. Most of the health facilities cannot diagnose these diseases because they are either not familiar with the tests used for diagnosing the diseases or the tests are not available in many health facilities. The main results of the study
will be presented during congress and how the results can be used to inform one health policies for controlling zoonoses in Afghanistan will be discussed.
Evaluation Of Integrated Policies To Control Brucellosis In Humans And Animals In Afghanistan

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Brucellosis is a neglected zoonosis in Afghanistan, largely undiagnosed in humans due to a lack of awareness of zoonoses amongst health care providers. Provincial-level animal health and public health staff collaborate in brucellosis outbreak investigations and meet under the provincial Zoonotic Diseases Control Committee in a few provinces. The Ministry of Agriculture, Irrigation and Livestock has implemented a national brucellosis vaccination program in ruminants in the last two years with support of the World Bank. However, there is a lack of integrated policies to control brucellosis in humans and livestock. Major factors contributing to this include the lack of functional multi-sectoral coordination between the main stakeholder organizations together with a lack of evidence on the impact of brucellosis in humans. Participants in the One Health Epidemiology Fellowship program implemented by Massey University with EU funding are collaborating with policy staff in the General Directorate of Animal Health and Production, the Afghan National Public Health Institute and the General Directorate of Preventive Medicine to design and evaluate integrated policies to control brucellosis in humans and animals, building both capacity and relationships to support a One Health approach in Afghanistan. Details of the collaborative policy evaluation approach and outcomes will be presented.
One Health Initiatives For Prevention And Control Of Zoonoses In The Kingdom Of Bhutan

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Bhutan is located in near the Indo-gangetic plains that is notorious for being the hot-spot for emerging diseases such as the Highly Pathogenic Avian Influenza (HPAI) H5N1, Anthrax, and Rabies. Bhutan has experienced clinical cases of HPAI H5N1 in poultry; rabies in dogs and cattle; Brucellosis, and Leptospirosis in cattle; and seropositivity against Crimean Congo Haemorrhagic Fever (CCHF) virus in goats thus proving to be a potential indicator for these diseases in the region. Since 2012, Bhutan embarked upon consolidating its One Health Initiatives through a collaborative investigation project funded by the EU and implemented by Massey University. The project strengthened the technical capacity in epidemiological skills; and strengthened local, regional and global collaboration. Disease control documents for HPAI H5N1, Rabies, and Anthrax have been prepared through One Health Approach. The successful control of HPAI H5N1, Rabies, and Anthrax has been possible owing to the success of One Health Initiatives. Bhutan has come up with its One Health Strategic Plan (2016-2020) that consist of key strategies such as institutional set up, disease surveillance, preparedness and response, capacity building, collaborative research, communication, wildlife and environment for implementation of its One Health Programs.
The Cull Of The Wild: Can Wild Plant Foods Contribute To Healthy And Diverse Diets And Food Systems?

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Despite poor attention to wild foods in food and nutrition policies and strategies they do play an important role in people's diets and livelihood strategies. One reason for this neglect by policy and decision makers is believed to be the limited knowledge on the value and contribution of wild foods to food security and nutrition. There are also many other barriers preventing the wider use of wild foods for food security. The Biodiversity for Food and Nutrition (BFN) Project, a multi-country project, has been working to address these challenges by improving the enabling environment for wild plant foods by: improving the evidence base for wild plants by undertaking composition analysis of about 150 prioritized species, based on their nutritional and socioeconomic potential; strategically targeting public policies and markets with the greatest potential for mainstreaming these species e.g. by diversifying public food procurement and school feeding; and, improving national capacity, partnerships and awareness through alliances with universities, governments, civil society, nutritionists and dieticians, chefs and national food movements. This presentation will demonstrate the benefits of a diversified diet that includes wild, nutritious species as well as how these species can be a source of work and income for family farmers.
Adverse Birth Outcomes Among Women Exposed To Household Air Pollution: A Population-based Prospective Study In Odisha, India

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Preterm births (PTB) and low birthweights (LBW) are major determinants of neonatal mortality and morbidity and has long-term adverse consequences for health. Most of the women in rural India used solid biomass fuel for cooking which produces hazardous air pollution in homes. Exposure to household air pollution could be a potential risk factor for preterm births and low birthweights. A population-based prospective study was designed to investigate the association between household air pollution and adverse birth effects in rural settings of India. Eligible pregnant women (n=1056) were recruited and followed till birth. Household PM2.5 concentrations was measured using portable air samplers. We found a higher PM2.5 concentrations in biomass burning households (24-h average, 165±72 µg/m³). In the multivariate-adjusted model, PM2.5 (β: 24; 95% CI: 10.5 - 42.6) emerged as the most significant predictor for birth weights. Household combustion of solid fuels was associated with higher risk of preterm births (OR= 2.18, 95% CI 1.51 - 4.87); and low birthweights (OR= 2.13, 95% CI 1.45 - 3.83), regardless of socioeconomic status of mother, maternal age, and maternal education (p < 0.01). Air pollution exposures at home increases the risk of adverse birth outcomes. Access to clean household energy should be prioritized for improving public health.
Integrating OH approaches into education programs is now recognized as a way to cut across the silos of disciplines. The goal of this study was to provide an overview of the status quo of academic teaching activities in OH in Southeast Asia in 2015, and identify possible room for improvement under the new OH program InterRisk. Courses related to OH or Ecohealth concepts were identified, and contacts were taken with people involved into these programs to implement in depth interviews. Questionnaires were structured in 3 sections addressing (i) pedagogic objectives (ii) modules' structure and (iii) funding scheme. Twelve educational programs were identified in Thailand, Vietnam, Indonesia and Cambodia, and 21 interviews were conducted. The majorities of the courses (8/12) are very broadly open to different disciplinary branches, relating to health, ecological or environmental sciences. Only the ones of short duration are attracting diverse disciplines. Environmental modules are well represented, while economic and social sciences are present only in half of the programs. This study provides a first overview of OH academic training in Southeast Asia. It can bring ways of improvement about the need for teachers' training, the promotion of interdisciplinarity and a better integration of social sciences in education.
Rabies In Northern Australia: Preparedness And Response

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The risk of exotic disease incursion is an increasing problem, driven by human-mediated transport of animals. Rabies is endemic in Indonesia; Australia’s extensive and remote northern borders are difficult to regulate, and a rabies infected (but non-clinical) dog on a fishing vessel or pleasure craft poses a risk. The impact of a rabies incursion on domestic dog and dingo populations could be enormous, and would cause health impacts and social disruption within indigenous communities.

Beginning 2012, a research program was initiated to investigate how rabies might spread to northern Australia and its potential impact. It has focused on incursion pathways and risk assessment in PNG, the Torres Strait and Cape York Peninsula. The demographics of free roaming dog populations within indigenous communities on the tip of Cape York Peninsula have been studied intensively, using sight-resight methods, GPS and video collars, genetics and questionnaire surveys. Estimation of the size and distribution of surrounding wild dog and dingo populations has recently commenced, using motion-activated cameras and genetics. To inform plans for response and control, risk assessment and disease spread models are being developed. This decision-support system will facilitate planning for a worst-case scenario - a rabies incursion in remote northern Australia.
Elucidation Of The Dynamics Of Coxiella Burnetii Infections In Goats And Possible Vaccination Options To Control The Disease On A Large Dairy Enterprise In Victoria, Australia

Michael Muleme

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Coxiella burnetii causes Q fever, a zoonotic disease commonly associated with exposure to infected animals. We elucidated the dynamics of C. burnetii infections in kid goats on a dairy enterprise in Australia where 24 human cases had occurred since 2012. An indirect immunofluorescence assay was validated for use in goats then implemented in a longitudinal study following 95 kids for 14 months. Maternally-derived antibodies were detected in 86% of kids after feeding colostrum, these subsided within 9 weeks and new infections occurred soon afterwards. As kid goats were infected very early in life, we evaluated a formaldehyde-inactivated whole-cell autogenous vaccine in 9-week old goats. Two doses of vaccine, administered 4 weeks apart produced specific immune responses in all vaccinated goats (n=11), no antibodies were detected amongst controls (n=22). Swelling at the site of inoculation occurred in all vaccinates and receded after 3 weeks. The seroconversion and putative exposure of kids at an early age and the new vaccine's immunogenicity suggest vaccination of kids in addition to pre-breeding does would be a better strategy for reducing the number of goats shedding C. burnetii which may consequently reduce the risk of human and animal C. burnetii infections on affected intensive goat farms.
The Development of Ecohealth Thinking and Research in Japan

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In recent years, the term Ecohealth, transliterated from English, has gained currency in Japan, as reflected in the establishment of the Japanese Association for Ecology and Health in 2013. The use of this English term suggests a development based on the import of ideas, but in fact, the term "Ecohealth" in katakana was coined independently in 1979 by Suzuki Shosuke. More importantly, Japan has a long history of grappling with the health effects of industrial pollution. This started in the late 19th century, when Tanaka Shozo, perhaps the world's earliest environmental activist, devoted his life to the struggle against the pollution from the Ashio copper mine. In the mid-20th century, the "Four Great Pollution Diseases" (due to cadmium, methylmercury, and air pollution) became prominent. These gave rise to research on the complex interactions between environmental pollution and human health, but also to a profound sense of social injustice. This poster traces this history to the present day when "Ecohealth" is based in human ecology and also includes research on infectious diseases, an orientation towards global health, and a search for environmental understandings of human health that can encompass the range of health experiences around the world in the 21st century.
Economic Impact Of T. Solium Cysticercosis On Pig Farming In India

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Cysticercosis caused by \textit{Taenia solium} is an endemic disease affecting pig production in India. The infection remains asymptomatic, but results in either total carcass condemnation or selling of pork at a reduced price. This study was conducted to estimate the economic impact of \textit{T. solium} cysticercosis on pork production during the year 2012 in India. We sourced abattoir based prevalence from the peer reviewed literature and official Indian pig population data. The sensitivity analyses were conducted to determine the impact of important parameters. In 2012, \textit{T. solium} cysticercosis was responsible for causing a loss of Rs. 1064.0 million (uncertainty interval [95\% UI] Rs. 527.30 - 1896.0 million) equal to US$ 16.37 million (95\% UI US$ 8.11 - 29.17 million) in the pig industry in India. The infection with \textit{T. solium} leads to a loss of Rs. 103.40 (95\% UI Rs. 51.22 - 184.20) equal to US$ 1.59 (95\% UI US$ 0.79 - 2.83) per pig being reared in the country. The losses per pig were highest in the South followed by northern, eastern and western parts of the country. The sensitivity analyses indicated that parameters such as disease prevalence and reduction in meat price directly impact the overall outcome of economic losses.
The Epidemiology Of Esbl/ Ampc Genes And Plasmids In Human, Animal And Environmental Reservoirs: A Meta-analysis

Alejandro Dorado-Garcia

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Several animal, food and environmental sources have been suggested to be involved in transmission of extended-spectrum beta-lactamases producing *E.coli* (ESBL-*E. coli*) to humans. We did a systematic search of studies containing collections of ESBL-*E. coli* or plasmid mediated AmpC beta-lactamases in the Netherlands between 2000-2015. A total of 27 selected isolate collections were used for data extraction. A meta-collection of isolates was constructed with data on ESBL/AmpC genes (n=3646 isolates), plasmid replicons (n=808) and strain types (n=364) across 19 reservoirs representing humans (in clinical setting, open population and farming communities), livestock and derived meat products (poultry, veal calves, pigs and dairy cows), companion animals, wild birds and environmental water samples.

Two meta-analyses were done at gene and at plasmid replicon type levels per reservoir in 4
steps: i) description of relative frequencies for molecular types; ii) pairwise quantification of the associations between the previous frequency profiles through Proportional Similarity Index; iii) Principal Component Analyses (PCAs) to visualize clusters and proximities between reservoirs according to their frequency profiles; iv) rarefaction analysis to evaluate diversity of molecular types. We offer a simple snapshot on ESBL/AmpC molecular proximities between different sources that might help in the investigation of attributable risks.
Molecular Characterization Of Mycobacterium Avium Subspecies Hominissuis Isolated From Cattle With Pulmonary Disease Using Variable Number Of Tandem Repeats Analysis

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*Mycobacterium avium* subsp. *hominissuis* (MAH) strains are genetically diverse and cause infections in pigs and humans. MAH has the ability to cause granulomatous lesions in the lymph nodes of the digestive tract in pigs, whereas its infection to humans gives rise to pulmonary tuberculosis-like disease. In contrast to the tendency, we experienced a clinical case of cattle with pulmonary disease recently. To elucidate genetic diversity and ecological background of the causative agent, we performed variable numbers of tandem repeat (VNTR) analysis targeting 15 loci for the clinical strain. The VNTR type indicated low degree of genetic relatedness with previous isolates from infected pigs, humans or their living environment in Japan. The source of the infection is unclear, but the dominant lesions in the lungs suggest it was airborne. The zoonotic risk of MAH infection should be considered with the possibility of its airborne transmission and close contact with infected animals.
Risk Factors For Occupational Brucellosis Infection In Veterinary Personnel In India

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This study was conducted to determine the risk factors associated with occupational brucellosis in India. A total of 296 veterinary personnel working in the public sector in Ludhiana district of Punjab state were enrolled in the study. Blood samples were collected from 279 participants and tested using Rose Bengal plate test (RBPT), standard tube agglutination test (STAT), and both IgG and IgM ELISA. Information about participant demographics, zoonotic disease perceptions and infection control practices was collected using a self-completed paper questionnaire. Logistic regression analyses were conducted to understand risk factors associated with occupational brucellosis. Of all the participants, 61 (21.9%), 67 (24.0%), 55 (19.7%) and 150 (53.8%) were positive in RBPT, STAT, IgM and IgG ELISA test, respectively. The level of education, handling parturitions, retained placentae, aborted foetuses or stillbirth, years in practice and personal protective equipment use were important factors significantly associated with brucellosis in veterinary personnel in univariable analyses. The multivariable models further confirmed that being a veterinary nurse or animal handler and using adequate personal protective equipment when attending to sick animals was associated with greater likelihood of having a positive brucellosis test. The study results provide evidence for developing science-based policy to control the disease.
Veterinary Public Health Is One Health!

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Following Rudolf Virchow's groundbreaking statement that human and animal medicine are one and the same, the One Health (OH) approach gradually lost visibility and only came back into vogue following the avian influenza outbreaks of 2004. The threat of a global pandemic stimulated different professions to work together to respond to outbreaks of emerging zoonoses, and the One Health approach was subsequently endorsed by FAO, WHO and OIE. Despite the continuing emergence of new infections, the barriers between the veterinary and medical professions have remained, and in many countries ministries of health and agriculture often fail to work together. Although the veterinary profession has enthusiastically embraced the OH approach, the medical profession is less interested in sharing outbreak response responsibilities. The reasons for this are unclear, however one explanation may be that the One Health philosophy, with its focus on animals, humans and the environment, is exactly the foundation that veterinary public health is built upon, and therefore it has taken little effort for veterinarians to get on board. This paper will explore the issues and make recommendations as to how public health practitioners from all disciplines can truly work together.
Survival Of Salmonella And Fecal Indicator Bacteria In Small-scale Biogas Units In Vietnamese Pig Farms.

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Pig slurry is commonly applied to biogas digesters and biogas effluent being used to fertilize field crops, vegetables and fish ponds. The objective of this study was to evaluate the survival of Salmonella spp. and the faecal indicator bacteria, enterococci, E. coli, and spores of Clostridium perfringens in biogas digesters operated by small-scale Vietnamese pig farmers. The serovar and antimicrobial susceptibility of the Salmonella spp. isolated were also established. The study was conducted on 6 farms with and 6 farms without toilets connected in Hanam province, Vietnam. Pig slurry and biogas effluent sampled during summer and winter showed concentrations of enterococci, E. coli and Cl. perfringens spores only slightly reduced (by 1-2 log units) by biodigestion as compared with the raw slurry. Salmonella spp. was found in both raw slurry and biogas effluent. A total of 19 Salmonella serovars were identified, e.g. S. Typhimurium (55/138), S. enterica serovar 4,[5],12:i:- (19/138), S. Weltevreden (9/138) and S. Rissen (9/138), all showing similar antimicrobial resistance patterns to those previously reported from Vietnam. Thus when promoting biogas, farmers should be informed that effluent
should not be used for crops consumed raw and that indiscriminate discharge of effluent can contaminate different types of water.
Control Of Food-borne Diseases – The Need For A One Health Approach

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Food-borne diseases (FBD) caused by viruses, bacteria and parasites result in incalculable human suffering and economic globally, with no respect for international boundaries, ethnicity, gender or other demographic. However, despite hundreds of millions of dollars being spent annually, control of FBD is remarkably unsuccessful. While not all food-borne pathogens are zoonotic, many involve animal reservoirs, spread through animal products such as meat or milk, or through contamination of water and vegetables by animal faeces. Control measures for animal-derived food-borne pathogens have changed over the past 20 years, with quality control of the end product replaced by quality assurance using food safety systems such as HACCP. It is now recognized that a holistic approach to control is essential, with 'farm-to-fork' programs to identify risks and measures to reduce pathogen burdens along the whole value chain. These approaches involve multiple stakeholders and are a good example of One Health in action, where knowledge and skills of many different participants are essential to reduce the risk of human illness. Using examples of emerging food-borne zoonoses, roles and responsibilities of these diverse groups will be examined to emphasise the need for countries to adopt a fully integrated One Health approach to FBD control.
A major reduction in the use of antimicrobials for livestock in the Netherlands since 2009: the critical success factors

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In 2008 joint initiatives by the Dutch Government, livestock sectors and the Royal Dutch Veterinary Association (KNMvD) resulted in a covenant describing measures for prudent use of antimicrobials in animals. The Netherlands Veterinary Medicines Authority (SDa) was founded to collect the antimicrobial usage (AMU) data of Dutch livestock, define benchmark targets for AMU in livestock, report annual trends and identify frequent prescribers or misusers. Reduction targets were set by the government at 20%, 50% and 70% reduction in 2010, 2013 and 2015, respectively, with reference to 2009. Continuous monitoring of resistance in commensal E. coli had already been set up in livestock from 1998 onwards. The total reduction of AMU (in mass sold) between 2009 and 2015 was 58.4% and 65% reduction compared to 2007. The use of antimicrobials defined as "critically important for human health" (fluoroquinolones and 3rd and 4th generation cephalosporins) in livestock has been strongly
reduced. As a result of the enforced 1-to-1 relationship of farmers and veterinarians, it was possible to develop the Veterinary Benchmark Indicator allowing to compare prescription levels between veterinarians. Parallel to reduction of AMU there was a reduction of AMR in livestock observed.
Using One Health Student Clubs To Shape The Future One Health Workforce

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Recent zoonotic disease outbreaks in Africa have underscored the need for multiple disciplines to work collaboratively in addressing such threats. However, the education system in many Africa countries produces graduates that think and operate in disciplinary silos. One Health Central and Eastern Africa (OHCEA) is a network of 17 schools of public health and veterinary medicine from 8 African countries. OHCEA uses One Health Student Clubs (OHSC) as a strategy for pre-service training. OHSC activities include educative lectures, community outreach activities, field-based training, research, and club meetings. We conducted an evaluation covering 122 participants from Rwanda, Uganda and Tanzania to assess OHSC's contribution in improving student skills and how these affect their work after leaving school. On a scale of 1(strongly disagree) to 7(strongly agree), participants reported that their skills were raised in the following areas: critical thinking (mean 5.74), collaboration (mean 5.62), communication (mean 6.01), system thinking (mean 6.10), working with diverse groups (6.00). Currently employed OHSC alumni indicated that they found One Health approach useful to their work. OHSC offers an opportunity for students to gain hands-on skills necessary for addressing health challenges using One Health approach. OHSC is effective in breaking disciplinary silos.
One Health And Systems Thinking - How The Complexity Of Zoonotic Diseases Requires A Multidisciplinary Approach For Control

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Many countries have adopted the One Health (OH) approach to support timely and effective responses to outbreaks of emerging or re-emerging diseases. While this has helped to overcome institutional silos, current workforces are still not sufficiently trained in the skills and competencies required to work across sectors and disciplines. Systems thinking, the ability to unravel complex interactions involved in outbreaks of infectious diseases and to use that knowledge to develop appropriate measures to combat infections is a vital competency for OH practitioners. It is thus essential that they understand the complex adaptive systems involved in causing and solving public health problems in order to respond effectively to emerging diseases. Vector-borne diseases (VBD) result in millions of infections and deaths annually, and complex life cycles make them extremely difficult to control. Involvement of multiple vector species with a diverse range of animal hosts, able to transmit a wide range of pathogens, emphasizes the need for multidisciplinary teams with synergistic scientific specialties to prevent, detect and respond to such threats. This talk will illustrate how understanding the complex ecological relationships maintaining VBD in nature necessitates a OH approach, and how skills and knowledge from diverse disciplines are essential for their control.
Climate Change Trends Potential Effects On Malaria And Schistosomiasis Transmission In Korhogo (Northern Côte D’ivoire)

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The aim of this study is to analyze potential links between past time-series data for climatic parameters and for malaria and schistosomiasis in Korhogo (Northern Côte d'Ivoire). Clinical malaria and schistosomiasis cases records were collected from health facilities over the decade 2005-2014. Rainfall, temperature and normalized difference vegetation index (NDVI) data over the same decade were obtained from the moderate resolution imaging spectroradiometer (MODIS) satellite images. Patterns of time series were explored by boxplots. The link between the variables was studied using quasi Poisson regression models. Each 1 cm-increment in rainfall of two month before was on average associated with a 1.0% (95%-CI: 0.4% to 1.6%) increase in malaria incidence. Moreover, each 1 centigrade increment in average monthly temperature was on average associated with a change of -4.2% (95%-CI: -7.6 to -0.7%) in malaria incidence. Also, a 0.1 unit increase in NDVI of three months was associated with a -11.2% (95%-CI: -21.59 to 0.6) decrease in monthly malaria count. 46.24% (r²=0.46, p=0.016) of monthly schistosomiasis cases was associated to the temperature of the 2 months before. Preparing appropriate adaptation plans to climate changes will be an important component in the development of strategies for increasing the resilience of communities.
Free-grazing duck production and the risk of avian influenza in Vietnam

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Moving free-grazing ducks (FGD), which can be transported across provinces over extended periods of time, are considered to play an important role in highly pathogenic avian influenza H5N1 persistence and long distance virus transmission in Vietnam. FGD farmers and transporters were interviewed during a survey conducted between September and December 2015. The production system was found to be associated with highly heterogeneous movement patterns and journeys of up to 700 km per production cycle. Farmers reported a variety of contacts between their own flock and other FGD flocks, both directly at grazing sites and during transport. Cleaning and disinfection of the transport vehicles was inconsistent. The risk of influenza A presence in moving FGD flocks was found to be significantly associated with the origin of the ducklings and with the consistency of the journey over time. The majority of the spent ducks were not sold at live poultry markets in Vietnam but exported for consumption. This study provides a more detailed understanding of the moving free-grazing system and how its characteristics facilitate highly pathogenic avian influenza H5N1 virus maintenance and spread.
Pneumonia risk for people living close to intensive animal farms – taking GPS derived mobility patterns into account

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We previously observed an increased incidence of pneumonia in persons living near goat farms, using animal presence around the home to define exposure. However, it is unclear to what extent individual mobility contributes to this increased risk. We aimed at evaluating pneumonia-risk by assessing mobility patterns, considering exposure to goat farms based on movement patterns, compared to exposure assessment based on home address. In a rural Dutch
cohort, 667 members logged their mobility using GPS trackers for 7 days. Pneumonia was diagnosed in 68 subjects (self-reported and general practitioners-data, 2011-2014). We used logistic regression to evaluate pneumonia-risk by presence of goat farms within 1000m around the home and around GPS-tracks (only non-motorised mobility) or in standard deviation (SD) ellipses (spatially generalized areas around GPS-tracks corresponding to areas where people spend most time). Presence of goats within 1000m of homes was associated with pneumonia (OR 2.7 (95%CI 1.5-4.7)). For buffers around actual tracks, the OR was 3.5 (1.1-11.3), for 1-SD ellipse it was 1.6 (0.9-2.9), and for 2-SDs, the OR was 2.8 (1.2-6.5), with N=22, N=65, N=50 and N=62 exposed cases, respectively. We will further evaluate whether using mobility patterns instead of just the home address may improve exposure assessment.
A protocol for a systematic literature review: Comparing the impact of seasonal and meteorological factors on acute respiratory infections in Indigenous and non-Indigenous peoples

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Acute respiratory infections (ARI) are a leading cause of morbidity and mortality globally. Indigenous peoples may bear a disproportionately higher burden of ARI compared to non-Indigenous peoples. This protocol outlines our process for identifying and analyzing existing research to investigate whether associations between meteorological factors and ARI differ between Indigenous and non-Indigenous groups residing in the same geographical region. A systematic literature review methodology will be used to identify and analyze published literature and reports related to ARI. A search string will be used to search PubMed, CAB Abstracts/CAB Direct, and Science Citation Index aggregator databases. Articles will be screened using inclusion/exclusion criteria applied first at the title and abstract, and then at full article levels by two independent reviewers. Articles maintained after full article screening will be critically appraised and data will be extracted. Descriptive statistics and a risk-of-bias analysis will be performed on the extracted data. A screening flow chart, heterogeneity tests, meta-analysis, and forest and funnel plots will be used to synthesize the results of eligible studies. The proposed systematic review will synthesize evidence of associations between ARI and meteorological factors for Indigenous and non-Indigenous peoples globally, to explore the possible effect modification of Indigeneity on these associations.
Instructional Design: A Key Tool in One Health Workforce Transformation

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One Health Central and Eastern Africa (OHCEA) university network supports workforce transformation and realization of the Global Health Security Agenda vision by driving needed change in culture and competencies in the One Health Workforce, through collaborative action of multidisciplinary teams. University faculty lack of knowledge and practical skills in systematic instructional design in lesson and course creation has impacted on the quality of health professionals in Africa. Their perceptions on the best way of learning have not been translated to their teaching methodologies. Faculty need to produce future professionals with required skills and competencies to combat emerging infectious diseases. During two five-day instructional design training workshops of 35 faculty and 10 in-service professionals, small participants' groups were instructed to rank the way that they learnt best from nine given ways ranging from active to passive learning. Collected group results were tabulated and analysed using excel. Majority reported that they learnt better by "doing". Active learning is more effective than passive learning, confirming Dale's Cone of Experience. Through group discussions, learners learn better using different ways. Course improvement in universities is critical to generate wholesome, all-inclusive and relevant learners who utilize the One Health approach in infectious disease control.
Reflecting on Challenges and Solutions In Building an EcoHealth Community of Interest using the IDRC EcoHealth Pillars

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Graduate students at the University of Guelph have built a strong EcoHealth Community of Interest (EHCoI) based on the International Development Research Centre's (IDRC) EcoHealth pillars: systems thinking, transdisciplinarity, participation, sustainability, social and gender equity, and knowledge-to-action. To apply the systems thinking pillar, we deliberately consider the interplay between challenges, solutions, and informative content. We apply the pillar of transdisciplinarity by using EcoHealth, One Health, and Planetary Health schemes to increase engagement and break down silos among departments. The participation pillar is demonstrated by the group's "by students, for students" design. Recently, the pillar of sustainability has been a concern and has resulted in the appointment of an executive team to manage the group. The gender and social equity pillar has been difficult to apply; however, every intention is made to include voices from across campus and the community. Finally, knowledge-to-action is an important pillar practiced by the EHCoI at the University of Guelph, and is intentionally applied as we engage in discussions about application of new knowledge to graduate research. The application of these pillars in building an EHCoI provides an important example for students at other institutions interested in building a similar network.
Mapping the evidence: what has been studied about the linkages between nature conservation and human health and wellbeing?

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Millions of dollars are spent on nature conservation activities, and on new research. But is this money well invested? While there is a growing acceptance about the mutual interconnections between healthy environments and healthy people, less is known about the specific links between activities and human wellbeing outcomes. We conducted a systematic mapping review of research done in low and middle income countries that investigated these links. More than 1000 articles were identified and categorised. The map provides an overview of what activities have been studied, in which countries and biomes, and which human impacts have been measured, as well information about the type of research undertaken. The map shows were there are gluts and gaps in the evidence, and provides useful direction for investment in future practice and research. We found there is still a predominance of research looking at economic impacts and surprisingly few measuring actual human health outcomes. Moreover, much of the research uses less robust study designs. This presentation will outline the project and its findings and introduce an online searchable database, which allows researchers and practitioners to filter findings according to specific areas of interest.
A National Strategy for Climate, Health and Well-being

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Climate change poses both risks and opportunities for population health. Depending on the level of ambition and strategies chosen by governments, climate policy can either negatively or positively drive health outcomes.

The recent [global climate] Paris Agreement obliges signatory countries to consider their citizens' "rights to health" in the development of climate policies.

To date, human health has been largely ignored in Australia's national climate mitigation and adaptation policies and actions. As such, Australia's health sector is under-prepared to deal with the health risks associated with climate change, the health of Australians is being compromised, and the population missing out on the benefits of mitigation actions.

Australians face serious and increasing climate change related health risks, including heat-related illnesses and deaths, outbreaks of infectious diseases, impacts from food and water insecurity, occupational health impacts, mental illness and stress associated with environmental damage and concern about climate change, and increased respiratory and cardiovascular diseases.

A National Strategy for Climate, Health and Well-being is proposed to assist Australia in meeting its international obligations in signing the Paris Agreement, and in addressing its national interests in protecting population health from the impact of climate change.
The benefit of central nodes for EcoHealth networking among graduate students

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Over time, research has evolved from primarily individual, institutional, and national level research groups into international collaborations between research groups. Graduate students at the University of Guelph's EcoHealth Community of Interest (EHCol) aim to emulate this transition to international collaborations through effective networking across multiple disciplines. Participation in local and international conferences, courses, and workshops has enabled individual group members to build personal EcoHealth-related networks. The EHCol provides a point of intersection in which all of these networks merge into a complex and useful web. As such, members of the EHColI benefit from the networks that their colleagues are building within and across various EcoHealth circles. These collaborative and transdisciplinary networks can result in more effective and meaningful research questions, methodology, and knowledge dissemination tools. This poster will demonstrate the extension, complexity, and mixing of networks built through the EHColI platform with a detailed web-like schematic. Further, the international extent of this network will be demonstrated on a choropleth map.
Domestic dogs as a potential bridge-host between wild and domestic/urban habitats: OneHealth implications

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Domestic dogs, humans' best friend, are an emerging problem in many developing countries. Free ranging dogs, which may invade a wide range of natural areas, have an impact on wildlife (e.g., predation, competition, disease transmission) and a role in many zoonotic diseases. Dogs may be a subsidized bridge between wild and urban environments, or between wild and domestic cycles of diseases. In this study, we explored the potential role of dogs as bridges between bat-borne rabies and humans in Chile, which reports only a few canine-borne cases of rabies in the last decades, and maintains an endemic wild-cycle in bats. For this, we developed a spatial analysis, using ecological niche models of bat-reservoirs, dog density, and the reported cases of dog rabies in the last 30 years. Previous studies have determined that the threshold for dog-rabies maintenance is 4.5 dogs/km². Based on this, we developed a risk map for bat-borne rabies in dogs at a national scale, and evaluated it considering previous cases. Our risk-map revealed that the spatial approach is a useful tool for targeting strategies plans to control bat-borne rabies in Chile. Dog overpopulation needs a multidisciplinary approach, as it involves social, environmental, ecological and public health elements.
An Assessment Of The Zoonotic Disease Transmission Risk Associated With Wildlife Trade In Markets In Lao Pdr

kongsy khammavong¹
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The SARS coronavirus outbreak, involving a Chinese wildlife market, highlighted the role of wildlife trade in zoonotic disease transmission. In Lao PDR, wildlife trade is common and represents a significant threat to wildlife populations. To assess the zoonotic disease transmission risk associated with wildlife trade, visits were made to markets selling wildlife across Lao PDR from 2010 to 2013. Observational data were collected, including information on volume, form, species and price of wildlife; market biosafety and visitor origin. The potential for traded wildlife to host zoonotic diseases that pose a serious threat to human health was then evaluated at seven markets identified as having high volumes of trade. At the seven markets, during 21 observational surveys, 1,937 alive or fresh dead mammals (approximately 1,009 kg) were observed for sale, including mammals from 12 taxonomic families previously documented to be capable of hosting 36 zoonotic pathogens. In these seven markets, the combination of high wildlife volumes, high-risk taxa for zoonoses and poor biosafety increases the potential for pathogen presence and transmission. The combined risks of wildlife trade in Lao PDR to human health and biodiversity highlight the need for a multi-sector approach to effectively protect public health, economic interests and biodiversity.
A systematic review of attention restoration theory: can nature help you concentrate?

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Attention Restoration Theory (ART) suggests people's ability to concentrate may be restored by exposure to natural environments. This may be particularly important in an increasingly urbanised world. Although widely cited, it is unclear how much empirical evidence supports this. We conducted a systematic review about the impact of exposure to natural environments on attention. Seven electronic databases were searched. Studies were included if (1) they were natural experiments, randomized studies, or recorded 'before and after' measurements; (2) compared natural and non-natural/control settings; and (3) used objective measures of attention. Screening of articles for inclusion, data extraction and quality appraisal were performed by one reviewer and checked by another. Where possible, random effects meta-analysis was used to pool effect sizes. Thirty-one studies were included. Meta-analyses provided some support for ART, with significant positive effects of exposure to natural environments for three outcome measures (Digit Span Forward, Digit Span Backward and Trail Making Test B). The remaining 10 meta-analyses did not show marked beneficial effects. This review highlights the diversity of evidence around ART in terms of populations, study design and outcomes, and identifies limitations in study reporting and conduct.
When looking at the principles of OneHealth, the problem of free ranging dogs (FRDs) fits as a perfect example. FRDs are an invasive species, and an emerging and neglected problem in many developing countries, which involves humans' health, wildlife conservation, and pets/domestic animals' welfare. FRDs are basically a human-based problem, involving cultural aspects. In this presentation, I give a general and updated global view of the problem, contributing with original findings, particularly data concerning the origins of FRDs. In Chile, we conducted face-to-face interviews, exploring the reasons of people to do not confine their dogs; in addition, we explored the attitudes towards these FRDs. Among several variables, we found that the number of dogs, attitudes toward FRDs, having a pure-breed dog, and the perception of their own dog as a threat to others are major basis for dog-confinement. In many developing countries, dogs are basically managed unconfined, even thought people tend to dislike the presence of FRDs. This may be an example of "the tragedy of the commons". To protect public health, wildlife conservation, and animal welfare, we need to search for strategies to enhance dog-confinement. This presentation contributes with data that may be useful for further regulations and educational programs.
Determinants of the effectiveness of mass dog vaccination to eliminate rabies in African cities

Jakob Zinsstag

Swiss Tropical and Public Health Institute, University of Basel

After polio, dog transmitted rabies is one of the most promising viral diseases to be targeted for elimination. Two consecutive dog mass vaccination campaigns in 2012 and 2013, which were co-funded by the Chadian government and external donors, were sufficient to interrupt transmission for more than two years in N'Djamena, Chad. A deterministic dog-human rabies transmission model, fitted to routine weekly data on rabid dogs and exposed human cases demonstrated the elimination, and it was confirmed by a phylo-dynamic estimation of the reproductive number from dog related rabies virus (RAV) genetic sequences. Similar small scale mass vaccinations in Bamako, Mali did not reach sufficient coverage to interrupt transmission. The low coverage in Bamako was assessed by a unique mixed method effectiveness model showing that the lack of information in households was a main factor for the poor vaccination coverage in the study area. These results show that dog rabies can be eliminated in African cities with currently-available dog vaccines provided that the communities are well informed and engaged.
Gender, Race, Poverty And Nutrition

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Gender, 'race/colour/ethnicity' and poverty frame access to resources and possibilities to have an adequate diet. The existence of "food deserts" in rural or urban poor settings both in developing and developed countries has detrimental implications on the health and welfare of the residents. The intra-household unequal distribution of resources and gender discrimination also contribute to explain the existing disparities in terms of health status. By identifying gender, age, 'race/colour/ethnicity' and poverty as influencing the nutritional status of an individual we can better understand how social structures determine inequitable access to resources. Often the lack of adequate, diverse, nutritious and high-quality food co-exist with situations of plenty in the same region. It is crucial to develop whole food chains in a holistic and trans-disciplinary manner in support of sustainable livelihoods and nutrition systems (including child care, health, water and sanitation). This presentation briefly highlights some work done to date on these issues, and outlines future research needs. Approaches need to include political will to coordinate and implement policies involving all stakeholders, including the food industry, and tackling issues such as the access to land and work, support to agriculture
and marketing, decent salaries, addressing gender inequities and supporting people facing hunger.
Building strong one-health collaborations in academia: Key building blocks.

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Increasing disease burdens with human-animal-ecosystem interface calls for robust approaches to deal with intertwined nature of diseases. While one-health approach gained prominence globally, the art of multi-disciplinary collaboration among health professionals is still a challenge with minimal efforts during outbreak response. Successful multi-disciplinary collaborations are needed now than ever to handle recurrent disease burdens. This abstract is about a successful one-health collaboration in higher institutions of learning "One Health Central and Eastern Africa (OHCEA)" working across human and animal health disciplines in diverse geographic areas. It enumerates key building blocks behind OHCEA model focusing on "soft elements". OHCEA is a mega coalition model going by Canadian Coalition for Global Health Research. It is a complex collaboration involving southern, northern institutions of learning working to re-construct learning and teaching at universities. Key building blocks for its success are: strong belief in common goal as a shared responsibility by leaders; mutual trust among individuals behind the initiative; unwavering support and conviction from sponsors of the pivotal positioning of universities in producing new cadre of health professionals; all backed by strong personal conviction and effort by founder member(s) in making the complex collaboration a success.
Building One Health University Education Systems: A Sustainable Approach To One Health Workforce Development By The Ohcea Network

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The One Health approach is a strategy to promote multi-sectoral collaboration across disciplines to advance human health, animal health, and ecosystem health. This synergism is needed to achieve more rapid, mutually beneficial and effective responses to potential or existing risks that originate at the animal-human-ecosystems interface. Driven by the primary target and passion to have communities healthier, wealthier and safe, the One Health Central and Eastern Africa (OHCEA) network has embarked on developing One Health Higher Education Systems in her 17-member university institutions. The objective is to produce a One Health graduate having transformative knowledge, ability, attitude and networking skills to prevent and mitigate risks that originate at the animal-human-ecosystems interface. To produce this graduate, universities are building four pillars, namely: A One Health university policy framework / strategy and implementation plan; One Health curricula through massive curriculum reviews to incorporate One Health competencies; One Health curriculum delivery mechanism; and One Health trainers - trainers capacitated in terms of One Health skills and facilities. This paper will provide a framework for building One Health curricula pillar and propose strategies on how the revised curricula can be delivered from a One Health perspective.
Treatment of human and animal helminth infections at Lake Chad: awareness, access, common practice and content of active ingredient in available drugs

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In the Lake Chad region, mobile pastoralists face challenges in accessing quality health care and medications for managing human and animal diseases. A transdisciplinary One Health process using interviews and focus group discussions to identify mobile pastoralist health priorities revealed concern about inadequate outcomes in treatment of human and animal helminth infections. The perception was that locally available drugs were of low quality. Urine (N=401) and stool (N=228) samples from randomly selected people and stool samples from cattle (N=534) were analysed using standard parasitological methods. A total of 33 locally available human and veterinary anthelmintic drugs were purchased at health centres, pharmacies and markets and analysed for the active pharmaceutical ingredient as a proxy for drug quality using a high pressure liquid chromatography-UV method. Schistosoma haematobium was the most prevalent helminth infection in humans (16%), while Fasciola gigantica (31%) and Schistosoma bovis (20.4%) were the most prevalent cattle helminth infections. Pastoralist disease awareness was high, and self-mediated therapy was common practice. Most tested medications contained albendazole, between 91-159% of the labelled amount. While access to anthelmintic treatment exists, the medications of choice were unavailable. The perceived unsatisfactory treatment outcomes are likely due to empiric diagnosis and use of inappropriate medications.
Seasonal Dynamics and Environmental Determinants of Retinol Status in Chadian Mobile Pastoralists

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Vitamin A deficiency is a central health issue in developing countries, and livestock milk is the primary source of vitamin A in mobile populations. This study investigated seasonal dynamics of retinol status in mobile pastoralists through three repeated cross-sectional assessments near Lake Chad. Portable flourometry was used for rapid analysis. Mean human retinol was 606 μg/L in rainy, 282 μg/L in cold and 501 μg/L in dry season. Retinol deficiency was found in 15% of study participants in dry, 25% in rainy and 32% in cold season and varied according to season and ethnic group. Human retinol levels varied according to level of milk consumption and pooled cattle milk retinol level. The trend in percentage of people not deficient reflected the trends in grazed pasture mean Normalized Difference Vegetation Index, mean livestock milk retinol value and milk consumption. This study establishes seasonal variation in human blood and pooled cattle milk retinol levels in Chad, showing linkages from animals to humans through grazed pasture and milk. Our work demonstrates the added value, through cost savings and improved health, of a One Health approach in populations highly interdependent with livestock. Retinol deficiency is a prevalent, important public health problem near Lake Chad.
Sustainable production of chicken in the ecosystem of Barind in tropical Bangladesh

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Chittagong Veterinary and Animal Sciences University

Title: Sustainable production of chicken in the ecosystem of Barind in tropical Bangladesh

The research was conducted in the draught environment of Barind area in Bangladesh to investigate growth and survivability of chicken. To adapt and fighting against harness of draught new genotypes were developed to make it sustainable by crossbreeding between Naked neck (NN) female, posses gene of high egg production and growth compared to other local chickens and Aseel male; a strong stout and heavy weight game bird which, posses growth gene. Further crossbred was upgraded using the same cock. The genotypes were subjected to nutritional management under free range, semi scavenging and confined rearing systems. Results showed that mean body weight (1.2 kg) and survivability (80%) was increased by 40% and 10% in crossbred, respectively and female obtained higher weight (1.3 kg) in semi scavenging at 5 months of age. Although there was variation in season, sex and rearing systems, insignificant difference between the crossbred and upgrade chicken were observed on the study parameters. It may be concluded that the crossbred and 1st generation upgrade chicken would be healthier, superior and sustainable in productivity and food security at free range system with nutritional supplement in the ecosystem of Barind in Bangladesh.
The Role Of Non Government Organizations (NGOs) In The Process Of Eradicating Dog Mediated Rabies From Sri Lanka

Ganga de Silva

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Sri Lanka, a rabies-endemic country, has been trying to control this fatal disease for more than 100 years. Historically the emphasis of control programs have been on Post Exposure Prophylaxis (PEP) though over the past decade new comprehensive intervention measures have been implemented including the successful Colombo City project. This project initiated in 2007 by the NGO, Blue Paw Trust (BPT) together with Colombo Municipal Council and World Society for the Protection of Animals involved mass dog vaccination, sterilization, education and dog managed zones. During five year project period dog rabies cases decreased from 35 to 03. In 2011, the BPT initiated the process together with WHO to develop a National Rabies Strategy with the involvement of Ministry of Health and others. Currently the BPT is assisting the government vets to plan and implement a dog rabies control program for Sri Lanka with a pilot in Eastern Province. The BPT plays the role of mediator and also provides independent monitoring and evaluating to overcome the intrinsic limitations in government managed programs to increase mass dog vaccination coverage from 40% to the recommended 70%. As a result of inter-sectoral collaboration Sri Lanka has become the SAARC lead country to eradicate rabies.
Leptospirosis In Rural Sri Lanka: A Case-control Study Of Environmental And Occupational Exposures

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Sri Lanka has one of the highest incidences of human leptospirosis worldwide. Outbreaks of this zoonotic infection are related to the monsoons and flooding. The present study investigates risks associated with environmental, animal and occupational exposure. Data was obtained from structured interviews with 483 patients (276 cases and 207 controls). Risk exposures were studied for the entire population and for two stratified occupational groups, the non-paddy workers and the paddy workers. A higher odds ratio (OR) of leptospirosis transmission for paddy workers was observed compared to non-paddy workers (OR=1.907, 95% CI 1.274-2.856). Rat exposure was not associated with a significant higher risk for any of the groups. Instead cattle and household animals seemed to be important for transmission of leptospirosis to humans, especially among non-paddy workers (OR=10.655, 95% CI 1.213-93.582). Leptospirosis in paddy workers was associated with environmental factors linked to contamination and wetness in paddy fields. Interestingly abandoned paddy fields were found to have a protective effect against transmission to paddy workers (OR=0.421, 95% CI 0.237-0.748). Keeping animals on these dryer fields may act as a boundary for contamination of paddy fields with infectious animal urine. This finding could be considered in public health interventions targeting leptospirosis among paddy workers.
Turning bad news into good – Analysing and addressing antimicrobial usage patterns in livestock in Indonesia

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Antimicrobial resistance is a global One Health problem, threatening the foundation of our health systems. There has been an upsurge in interest from politicians and the media, but most of the news is bad - ever increasing resistance with apparently uncontrolled inappropriate usage in many parts of the world. This paper uses unprecedented antimicrobial usage (AMU) data from Indonesia's new integrated animal health information system (iSIKHNAS) to examine the patterns of AMU in livestock. As in many other developing countries, the analysis reveals high levels of inappropriate use of antimicrobials. Nevertheless it also offers major hope for successful interventions. In Indonesia, reporting of AMU data is not mandatory, but voluntary reporting levels using iSIKHNAS are exceptionally high. Fully disaggregated allows a detailed analysis of who is using what treatments, where, when and for what species and diseases. This ability to analyse a comprehensive dataset offers new opportunities for interventions to combat inappropriate AMU. For example, rather than resorting to mass education campaigns for the ten thousand or more animal health workers, the problem could be more than halved by contacting fewer than twenty individuals. Clever use of detailed data from effective surveillance systems can rapidly turn the bad news to good.
Assessing The Impact Of Treating Commercial Piglets With A 3rd Generation Cephalosporin Injection On Cefotaxime Resistance Of Commensal Faecal E. Coli

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Antimicrobial resistance (AMR) poses a complex threat to the human-animal-environment interface. Global use of antimicrobials (AMs) in human medicine, veterinary medicine and plant agriculture compromises antimicrobial efficacy. To safeguard the correct use of antimicrobials WHO and OIE have created lists of antimicrobial classes according to their importance in treating infections; third-generation cephalosporins (TGCs) are included in both lists as critically important AMs.

In Irish pig production TGCs are mainly used in piglets to treat infections such as meningitis. Faecal samples from 38 three-days old piglets (12 untreated piglets in control pens, 14 treated and 12 untreated piglets in treatment pens) from a commercial farm with no previous use of TGCs were investigated to evaluate the impact of a long-acting TGC injection (Ceftiofur) on cefotaxime resistance in commensal E. coli. Faecal swabs were collected at 7 time-points over a 22-day period from piglets, their dams (8 sows) and environment. Samples were screened for the presence of cefotaxime-resistant E. coli using TBX agar supplemented with cefotaxime according to EUCAST guidelines.

All E. coli isolates screened during the trial were cefotaxime-susceptible suggesting that single use of TGC on a naïve farm does not increase the number of cefotaxime-resistant E. coli detected.
Understanding Eco-bio-social Determinants Of Dengue Transmission In Dhaka, Bangladesh

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Among vector borne diseases, dengue has become most prominent example as characterized by a complex epidemiology, resulting from the underlying biotic and abiotic determinants in the human-environment system. Dengue resurgence reflects the failure of disciplinary approach in explaining transmission and in controlling vectors. This research proved that the understanding of dengue transmission requires a holistic epistemology that can assess the eco-bio-social determinants and their interactions with human action and vice versa. The study has four components: i) evaluation of dengue virus prevalence and seroconversion, ii) determination of vector distribution and density; iii) association of social-ecological and human factors with vector density; and iv) enhancement of community capacity. A total of 1200 households were surveyed for three years to determine vector density, seroprevalence and seroconversion. For in-depth understanding, Focus Group Discussions, Mental Model construction, and Key Informant Interviews were conducted with 30 representatives stakeholders; 300 community members; 12 policy-makers, and 24 ward representatives. The findings have revealed high vector density with high seroprevalence and ongoing dengue-specific seroconversion. Community members are well aware of vector infestation; however, very few have taken specific measures to control them. It is suggested that more community ownership will be required to make Aedes control a success.
Pork is widely consumed meat in Vietnam, making up 56% of total meat intake. While delivering significant benefits to smallholders who supply 80% of the market, pork could also cause substantial health consequences due to poor hygiene along the pork chain. To identify feasible interventions along the pork chain, a better understanding of disease risks is needed and addressed in an ongoing research project (PigRISK) presented here. PigRISK uses an interdisciplinary research approach, bringing together livestock economic, animal health, risk assessors, environmental and public health expertise targeting smallholder pig value chains in Hung Yen and Nghe An provinces, Vietnam. Selected technical achievements include value chain maps, hazard estimates (>40% of pork Salmonella contaminated) and health risks which will be presented. From an interdisciplinary research perspective and documented using outcome harvesting/mapping, PigRISK builds capacity on assessing health risks, value chains and also enhances collaboration among teams. This was achieved through providing the opportunity for researchers to work "day to day" across disciplines and institutions, a new experience for most of them. Challenges include high turnover of team members or analysis and synthesis of results outside the team member's common expertise. Interventions, currently developed, will be piloted in a second project phase.
Importance Of Parasitic Foodborne Diseases In Rural Areas Of Southern Laos – A Long Term Case Study Using An Integrated Approach

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Parasites foodborne diseases (PFBD) are expected to be widely distributed in Laos and can have a significant impact on health but also on economy and livelihood. Detailed information on their distribution is lacking and risky food consumption habits exist (e.g. consumption of raw or rare meat/fish). The objectives of this ongoing study are to assess PFBD distribution and risk-related practices in 3 provinces of southern Laos (Savannakhet, Khammuane and Champasak), and establish a cross-sectorial collaboration platform which aims to develop and promote feasible control options addressing needs of affected communities and stakeholders. To facilitate and monitor community involvement and cross-sectorial collaboration among stakeholders integrated approaches such as companion modelling (ComMod) and One-Health are used synergistically. A multidisciplinary research team consisting of vets, public health, environmental, social and participatory modelling scientists has been established and jointly implemented activities using quantitative (e.g. serological sampling) and qualitative methods such as PRA and Participatory Epidemiology. Villagers had lowest PFBD knowledge while para-meds and teachers had highest. Flood or lack of irrigation were ranked highest by villagers.
while PFBD were never considered as important issues. Serological data on Trichinelloses and Cysticercoses in pigs are currently analysed. Policy engagement and feedback is facilitated through quarterly meetings.
An EcoHealth framework for bridging the gap between research and practice through effective knowledge dissemination

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Today’s world is faced with complex health challenges, as rates of many infectious and chronic diseases increase and we gain insight into the intricacies and interplay of environmental and human factors contributing to negative health outcomes. Conducting research to inform evidence-based policy and decision-making is vital to addressing these issues; however, it is often noted that there is underutilization of research findings, creating a gap between research and practice. EcoHealth research may aid in addressing these criticisms and maximizing uptake of research-derived knowledge (i.e. knowledge-to-action) as it follows a framework where transdisciplinarity and participation are central pillars of the research. Transdisciplinary research engages academics, stakeholders, and community members, and incorporates multiple perspectives to create a network for effective communication and information sharing. Participation establishes a collaborative relationship between researchers and community members in order to identify relevant research questions and generate an open platform for ongoing communication. These pillars of EcoHealth research contribute to effective communication and knowledge dissemination, creating knowledge that is more readily taken up by community members and decision makers, thus helping to reduce the gap between research and practice. An infographic poster will be used to demonstrate alternative and effective means of knowledge dissemination.
Child obesity and sugar-sweetened beverage advertisement: Effects on school children's beverage purchasing behaviour and preferences in Dhaka, Bangladesh

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Although obesity is a multifactorial disorder, one of the strategies to reduce childhood obesity involves decreasing the energy intake from added sugars in beverage consumption. The influence of social media, television advertising on beverage preference and drinking behavior in children is the focus of this study. In a baseline survey, city corporation zone of Bangladesh encompassing 4,140 school children were surveyed to evaluate the prevalence of obesity. In the next step, four schools were selected from Dhaka where all children from Grade 5 to Grade 6 will be surveyed with a 72-hour Beverage Intake Questionnaire focusing on a 72-hour advertisement recall data specific to sugary drinks. Four semi-structured focus group discussions will be developed to discuss with parents to understand the children's beverage purchasing requests stemming from the television advertisements. For each focus group discussion participant, a socio-economic questionnaire will be filled out. Besides, we will perform 10 key informant interviews including teacher and policy makers who have detailed knowledge about local beverage environment, marketing strategies of different beverage companies. This study will contribute to understand the advertising impacts on children's beverage purchasing requests, beverage intake, and children's and their parent's knowledge, attitudes, and practices towards sugary beverage consumption.
Understating school children’s knowledge and perception of beverage consumption patterns in Dhaka, Bangladesh

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In the low income countries like Bangladesh, a school based country wide study in 2014 has been demonstrated that among children, 9.6% were overweight and 3.5% children were obese. Children in Dhaka city were two times more likely being obese than children living in other cities in Bangladesh. The aim of the current research is to understand the risk factors associated with 'beverage consumption pattern' among schoolchildren in Dhaka in combination of 'sugary drinks consumption behavior' and 'environmental influences'. In a baseline survey, seven divisions of Dhaka City Corporation encompassing 4,140 school children were surveyed to evaluate the prevalence of obesity. In the next step, a quantitative questionnaire survey will be performed among all obese children. Semi-structured focus group discussions will be developed to discuss the information that parents and teachers share with children about sugary drink consumption, and their opinions on beverage consumption. Besides, we will perform key informant interviews to focus more on knowledge about local food environment, attitude of their children and students towards healthy food from their perspective. The research will have influence to understand the need for establishing rules and regulations that promote non-sugary healthy drinks consumption by schoolchildren.
Predictive Modelling Of The Change In Spatial Distribution Of Japanese Encephalitis In Nepal Due To Climate Change, And The Benefit Of Modifying National Control Policies In Response

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A vaccination program targeting children has reduced the incidence of Japanese encephalitis (JE) in endemic areas of Nepal. However JE risk is expanding from the lowland terai regions into higher altitudes, exposing new human populations to the mosquito vector, *Culex tritaeniorhynchus*. Pigs are important amplifying hosts, but their distribution within Nepal is influenced by the religious and ethnic composition of local communities. Movement of viraemic pigs into areas where there is sufficient density of the mosquito vector may contribute to the expansion of JE risk areas. Spatial data on pig density, altitude, precipitation, humidity, temperature and land use were combined to create a JE risk map which identified the expanded areas in which JE was likely to occur. The variation in risk was then used to adjust disease transmission in a spatially explicit stochastic model of JE in HandiSpread, which models virus transmission in pigs and vectors, and the exposure of people to the virus. Model parameters were informed through a social network analysis of pig movements conducted in an example area of Nepal where risk of JE is increasing. Cost-effectiveness analysis was used in conjunction with epidemiological predictions from the model to assess potential changes in current control policies.
Practical Experiences With A One Health Approach In Dairy Farming: International Collaboration Towards Responsible Antibiotic Use And Improved Milk Quality

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Dairy farming is regarded as one of the ways to satisfy the growing demand for high-quality animal protein worldwide. Growing intensification of dairy production systems has also led to increased use of antibiotics and other chemicals. This negatively affects food quality and the environment, while AMR (Anti Microbial Resistance) is rapidly becoming one of the main challenges for human and animal health. Since 2014 Dutch Farm Experience is collaborating with international partners on improving milk quality and responsible use of antibiotics in dairy farming. Organized as the international Natural Livestock Farming (NLF) network farmers, veterinarians and other experts are developing practical solutions, combining the expertise from four countries: India, the Netherlands, Ethiopia and Uganda. After two years of successful exchange programs the so-called NLF five-layered approach was developed: improved animal health practices, strategic use of local breeds, herbal medicine, milk quality control and extra payment to farmers for residue-free milk. Based on a One Health Approach a joint initiative was formulated for the coming years: "Healthy Cows - Healthy Food - Healthy Environment: Developing the One-Health approach to reduce the use of antibiotics and other chemicals in dairy farming through the implementation of the Natural Livestock Farming five-layered strategy"
From functional ecology to human risk of infection

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Environmental and epidemiological data that can feed into ever more elaborated quantitative models of the association between environmental factors and the risk of infection by vector-borne and zoonotic disease are booming. We discuss two associated implications of this current context. First, the profusion of results, that are sometimes contradictory, suggests that an organism-centered approach, in a perspective of functional ecology, would usefully support broad conceptual approaches such as Ecohealth and One Health. Focusing on the pathogen as the organism of study, elements of humans (as an ecological resource for the vector or the pathogen), including in terms of land use and risk behavior, can be introduced in the conceptual approach. Second, the very diverse ways in which pathogens, vectors and hosts can use environmental resources need to be accommodated in environmental proxies used to represent them. We propose to explore these two ideas based on diverse concrete examples of zoonotic and vector-borne diseases and the environmental data and models used to represent them, with a view on how disease ecology, in the broad sense of the term, can make optimal use of the potential of current data and models.
Risk Factors For Pneumonia In An Area Of Intensive Animal Farming In The Netherlands

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Previous research identified living close to poultry or goat farms as risk factors for pneumonia in humans. As the Q-fever epidemic might have affected these findings, this study aimed at re-testing these associations. In 2014/15, 2494 adults living in a livestock-dense area completed a questionnaire. For 2426 (97%) participants additional information from electronic medical records (EMR) was available. The outcome was self-reported, physician-diagnosed pneumonia or pneumonia recorded in the EMR in the previous three years. Exposure to livestock was defined as presence of a farm within 500m intervals around the residence, and number of animals (cattle, goats, horses, pigs, poultry, sheep) close to the home. To quantify associations we used odds ratios adjusted for demographics, behaviors and comorbidities (aOR). The three-year cumulative attack rate was 186/2426 (7.7%). Residents within 2000m of a goat farm had an increased risk of pneumonia, which increased the closer they lived to the farm (2000m aOR 1.9, 95%CI 1.4-2.6; 500m aOR 3.7, 95%CI 1.6-8.6). We found no significant associations for other animals. Living close to goat farms is still a risk factor for pneumonia. We recommend
identifying causes of pneumonia by using molecular diagnostics on farm-exposed cases, and investigating the role of non-infectious agents.
Spillover Of Antimicrobial Resistance In The Greater Gombe Ecosystem, Tanzania: A Threat To Chimpanzees?

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We determined the prevalence of genes conferring resistance to sulfonamides and tetracycline in fecal specimens collected from human, livestock, and non-human primate populations within the Greater Gombe Ecosystem, Tanzania to examine overlap in resistance genes across groups as a proxy for pathogen spillover. Extracted DNA was tested for sul1, sul2, tetA and tetB genes. Prevalence of sulfonamide resistance was highest among humans (74.3%), followed by wildlife (42.6%), then domesticated animals (16.9%). Genes encoding tetracycline resistance were detected at much lower frequencies: humans (13.9%), wildlife (3.3%), and domesticated animals (5.6%). Differences in sul gene frequencies did not vary by location in humans nor in chimpanzees, suggesting that humans are the reservoir for antimicrobial resistance genes that spread to wildlife, regardless of human density. Among chimpanzees, sex and age were not found to increase ones odds for sulfonamide resistance. The prevalence of resistance genes observed in chimpanzees is concerning; both as an indicator of pathogen spillover and as a challenge to treatment when antimicrobial administration is desired. Sustainable interventions, including promotion of safe water and hygiene activities, drug resistance monitoring and prudent antimicrobial use are needed to minimize spread of antimicrobial resistance in this community.
Can the Sustainable Control of Gastrointestinal Parasites in Small Ruminants Contribute to Improved Child Nutrition in Smallholder Households in Tanzania?

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Animal-source foods are some of the best sources of high-quality protein and micronutrients needed for healthy physical and cognitive development, especially among children. Animal health interventions have great potential to improve human nutrition because they can increase income and food security. However, livestock contributions to health and nutrition are complex; the dynamic nature and multiple dimensions of nutrition security require an integrated approach. A system dynamics model was developed to explore the links between gastrointestinal parasites in small ruminants and child nutrition within rural smallholder households in central Tanzania. To quantify the model, household-level data on small ruminant ownership and food security is coupled with individual-level data on parasite burden in livestock and nutritional status in children under 24 months of age. There was widespread evidence of gastrointestinal parasites in sheep and goats; 42% having a heavy parasite burden and associated clinical disease. Despite this, only 7% of farmers reported controlling parasites in their flock. Model simulations of parasite control strategies predicted reduced livestock morbidity and correspondingly increased household food security and child nutritional status. The results demonstrate proof-of-concept for the utility of system dynamics in the evaluation of the complex linkages between animal health interventions and child nutrition.
An Evaluation Framework For Extra-organizational Communities Of Practice

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Communities of Practice (CoPs) are groups of people with common interests who share knowledge to build a common practice. The ecohealth field, early on recognized the value of supporting CoPs in ecosystems approaches to health (CoPEHs). This study aimed to develop an evaluation framework for extra-organizational CoPs (e.g. CoPEHs) to improve understanding of potential achievements. Framework development involved a review of empirical research on CoPs and a scoping review of evaluation frameworks for CoPs and knowledge networks. The framework highlights different forms of value that can be produced by a CoP and the level at which impacts can occur. The types of value are motivation and participation, relational, tangible, learning, knowledge and cognitive, applied, realized, and transformative. The levels of impact are individual (core and peripheral), collective (cop), organization, external stakeholder, and the field. The framework can be used to assess the value fostered by CoPs, as well as to understand the connections between the different forms of value, and how CoP activities relate to the different types of values. The evaluation framework can be a resource for CoPs in the one health and ecohealth fields looking to inform their evaluation or incorporate evaluative thinking.
Intersectoral municipal leadership for an EcoHealth based interventions for prevention and control of public health priorities in Latin America

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Ecosystems approach considers that both causes and interventions for public health priorities are a complex interrelation amongst determinants (from molecular to macro-politics) as well as of sectors (health, education, infrastructure, agriculture, economy, environment, etc.). We evaluated the hypothesis that municipality is the political scenario to design and implement multisectoral participative interventions for prevention and control of public health priorities in two Latin-American countries: Given the current situation of Aedes aegypti transmitted infections (dengue, chikungunya and Zika viruses) and the increasing problem of NCD, we chose two municipalities in Venezuela and one in Colombia to work for VBD and one in Colombia for NCD.

A diagnosis of the current situation is being carried out to design and to implement interventions. In each of the four municipalities a multisectoral committee has been established with participation of the local administration (mayor, health, education, social development, and infrastructure) community leaders, private sector (tourism, entrepreneurs) and NGOs. Results from Colombia show that number of pupae per person decreases by 71% with the intervention and the municipality has agreed on scaling up the intervention up to 5,000 households. Incidence in policy is documented as well as the achievements of the intersectoral committee.
Implications For Surveillance In Wild Birds And Poultry Following Recent Highly Pathogenic Avian Influenza Activity In Europe

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During 2014-2016 changes to patterns in detections of Highly Pathogenic Avian Influenza (HPAI) in Europe showed altered epidemiology affecting the performance of surveillance programmes. Incursion of a new lineage of H5 HPAI (clade 2.3.4.4) from East Asia caused multiple outbreaks in various poultry species and wild birds across six countries with an apparent reduction in mortality rates in domestic and wild waterfowl. This impacts the role and efficiency of scanning surveillance in poultry and surveillance of wild birds found dead. Significant antigenic variation was also observed on serological tests for this lineage of virus affecting test performance. Haemagglutination inhibition testing of sera from ducks with standard EU-recommended antigens suggested much lower sensitivity than when the homologous antigen was used. Results of a Bayesian analysis of these data will be presented. A separate outbreak of European lineage H5 virus in France affected over 90 farms with multiple Neuraminidase subtype combinations detected (H5N1, H5N2, H5N3 and H5N9). Infections were detected most often in domestic ducks, often in the absence of clinical signs of infection. The increasing availability and power of molecular epidemiology and genotyping has potential to rapidly inform on likely transmission pathways and identify strains or mutations of particular concern.
Proximity of private water wells to water public health test facilities in Alberta

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More than 400,000 rural Albertans use well water for domestic purposes. In contrast to municipal water supply systems which undergo routine testing and treatment, the responsibility of rural well water testing is left to private owners. Fewer than 10% of well owners in Alberta routinely test their well water. Distance to water testing facilities may be an important factor limiting well water sample submissions. This study describes the proximity of water wells to public health test facilities in the province. Using service area analysis, we determined the proportion of domestic wells within five impedances (15, 30, 45, 60, and >60 min) of test facilities. There were 19,102 water wells drilled for domestic use within Alberta during the period examined (2006-2015). One hundred and nine water public health test facilities were identified within the province. 7843 (41%), 7666 (40.1%), 2069 (10.8%), 437 (2%), and 1087 (6%) water wells were located within one-way travel times of 15, 30, 45, 60, and >60 minutes respectively of a water public health test facility. Based on one-way travel time, we concluded distance may be a barrier to voluntary water sample submission for testing.
Social Network Analysis Of Poultry Movement And Contact Patterns To Assess Transmission Potential Of Exotic Subtypes Of Avian Influenza In Poultry- Dense Districts Of Bangladesh.

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Bangladesh is at risk of introduction of the recently emerged subtypes of avian influenza which are circulating in Asia, having already been affected by the H5N1 subtype. Movement and contact patterns to and from broiler flocks, layer flocks and backyard flocks were investigated in a district of Bangladesh with predominantly commercial flocks, and one with predominantly backyard flocks. Density of poultry in both districts is very high, and they would be severely affected if a novel subtype entered the district. Movement patterns differed in a number of respects between the two districts, and this information has been used to inform the movement parameter settings in a simulation model of avian influenza incursion built in the spatial disease simulation model HandiSpread. The findings provide guidance on control strategies which would be appropriate in the case of an incursion of a novel subtype into each of the types of populations represented by the two study districts.
Competent To Collaborate: Towards A Competency-based Model For Developing One Health Curricula

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Although the importance of interdisciplinary and cross-sectoral collaborations were widely recognized in zoonoses research and in disease control projects, how to operationalize One Health (OH) beyond the conceptual remains challenging. Implementing OH approach demands skilled manpower who is capable of promoting and implementing OH collaborative efforts. Hence, it is essential to develop interdisciplinary training and career development that break traditional educational boundaries in health training. Despite an increase number of OH programmes, no systematic analysis has been done to understand what competences are needed for desired OH behaviour/performance in order to achieve better zoonotic disease prevention and control in different contexts. Our systematic study uses an adapted Delphi methodology via questionnaires and focused-group interviews to incorporate the opinions of stakeholders (experts, policy makers, educators & trainees, etc.) in different countries. Hierarchical Task Analysis will be applied to identify key training content (knowledge, skills and attitudes). As a result, this study shall develop several unique context-specific OH competency framework(s) that are most relevant for particular group(s) who need to urgently carry out specific OH tasks that are linked to their current work or roles in the near future and have globally positive impact on zoonotic disease prevention and control.
Between-roost contact and population size are essential for maintenance of European Bat Lyssavirus type 2 infection in Myotis daubentonii: ‘The Swarming Hypothesis’

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Understanding the dynamics of zoonotic pathogens in their reservoir hosts is crucial to inform spill-over risk, yet our understanding of these dynamics is frequently insufficient. A particular challenge is presented by viral infections in bats as host-pathogen interactions may differ from other mammals. We investigated viral persistence in a wild bat population by combining empirical data and in-silico analyses to test hypotheses concerning methods of viral persistence. This study investigates a fatal zoonotic virus, European Bat Lyssavirus type 2 (EBLV-2), in the Daubenton's bat. A total of 1800 bats were sampled for evidence for antibody and virus excretion during a nine year serial cross-sectional survey. Multivariate statistical models demonstrated age-related differences in seroprevalence, with significant variation in seropositivity over time and between roosts. An approximate Bayesian computation approach was used to model the infection dynamics, under multiple scenarios incorporating the known host ecology. These results demonstrate that EBLV-2 is endemic in the study population, and suggest that seasonal mixing between roosts during swarming events is necessary to maintain EBLV-2 in the population. These findings contribute to understanding how bat viruses can persist despite low prevalence of infection, and why infections may be constrained to certain bat species in multispecies roosts and ecosystems.
EcoHealth Scaling up in Latin America: Lessons Learned from six Vector-Borne diseases projects

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The Initiative for Leadership in Ecohealth for Vector Borne Diseases (VBD) in Latin-America supported scaling up experiences for prevention and control of dengue (Colombia and Mexico), Chagas disease (El Salvador, Guatemala, Honduras), and Malaria in Venezuela. We identified factors associated to the process of scaling up. Interviews were conducted to investigators, governmental officers, community leaders and NGOs and private sector. In the analysis we included 1) political context, 2) financing, 3) Stakeholders participation.

In the political context, constraining factors were the instability of the political system, turn over of decision makers and program officers and the difficulty of intersectoral coordination because responsibility is left to the health sector only.

One positive factor was the nature of ecohealth based interventions, because they were addressed not only for the control of the vector but went farther to increase quality of life by improving the dwelling.
Communication about the evidence of results of the intervention and participation of different stakeholders were factors facilitating the scaling up. In addition diffusion of results of intervention strengthens social mobilization that in turn was a way to make pressure to local governments to scale up the interventions to achieve political will and allocation of financial resources.
Economic Analysis Of Vaccinating Cattle Against Rabies In Bhutan: Preliminary Evidence

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Rabies has been eliminated from northern Bhutan but still remains endemic in the south. Elimination programs are challenged by the porous border with India. Cross border animal movement results in rabies outbreaks in cattle and other livestock along the border. While rabies control in dogs is implemented through regular mass vaccination and sterilization, no prevention measures are advocated for cattle. Consequently, outbreaks in cattle are increasingly reported resulting in direct and indirect economic losses due to loss of animals and costs of human post exposure treatment. In this preliminary study, we evaluated the economic benefits of vaccinating cattle in two high risk sub-districts located in southern Bhutan. The benefit cost ratio (BCR) ranged from 2.1 to 9.8 for various case scenarios. We calculated BCR for three scenarios: BCR = 2.1 for vaccinating cattle at Government expense; BCR = 5 when farmers are willing to bear vaccine costs; and BCR = 9.8 when farmers bear vaccine costs and delivery combined with other vaccination campaigns. Therefore, we conclude that vaccinating cattle against rabies can be economically beneficial in high risk areas of Bhutan and thus can be advocated as a measure to prevent rabies in cattle. However, further work is required.
Advancing Ecohealth in Southeast Asia and China: findings and lessons from the Field Building Leadership Initiative

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The Field Building Leadership Initiative (FBLI), supported by the International Development Research Centre (IDRC), has been working to understand and address intensive agricultural practices and associated health risks in Southeast Asia and China. Developed jointly by research centres in China, Indonesia, Thailand and Vietnam, and launched in 2012, this five-year initiative allows researchers and their partners to carry out research, capacity building, and knowledge translation to inform practice and policy. After 5 years of implementation, we report here the results of four research case studies conducted in 4 countries using a transdisciplinary approach involving stakeholders from the design phase to implementing interventions. Researchers and partners undertook research on a number of issues i) Pesticide use and its impact on human health and agricultural ecosystems in China; ii) Human and animal waste management in Vietnam; iii) Rubber plantations and vector-borne diseases in Thailand; and iv) Small-scale dairying in Indonesia. For capacity, a critical mass of teaching materials have been developed, students and ecohealth practitioner trained, in particular ecohealth future leaders trained widely in the region. Finally, we present how knowledge translation has been implemented to bring research evidences into policy and actions to improve health and environment.
A One Health approach to develop messages to enhance rabies surveillance and response strategies in indigenous communities in northern Australia

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The proximity of rabies-endemic islands in Indonesia makes development of timely and sensitive surveillance and efficient response strategies for canine-rabies in northern Australia a priority. To develop messages to enhance rabies preparedness, semi-structured interviews were conducted with stakeholders in a range of indigenous communities in East Arnhem Land, Cape York Peninsula and the Torres Strait. Stakeholders included community members, biosecurity officers, animal and environmental health workers, and human health professionals. Prepared questions and an interactive map guided discussions about themes relevant to prevention and control of rabies in dogs and humans in northern Australia, should an incursion occur. We found that dogs have cultural, economic (hunting) and companionship value. Barriers to reporting sick dogs included insufficient veterinary services, strong cultural connection to dogs, fear of shame and recrimination, acceptance that sick dogs are a normal daily occurrence, and lack of trust of authorities. Human health professionals were supportive of modification of hospital triage systems to clean bite-wounds according to World Health Organisation guidelines. Based on stakeholder feedback, dissemination of information should focus on radio and community meetings. We discuss messages that have been developed from this study and the feasibility of using dog-mortality data for community-led surveillance for canine-rabies incursions.
Climate change and malaria transmission in Korhogo

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The city of Korhogo in northern Côte d’Ivoire, has suffered during the last decade the throes of climate. It recorded a severe drought between 2004 and 2005 and torrential rains in 2006, causing extensive damage. The present study aims to access the influence of these variations on malaria transmission. Meteorological data were extracted from the database of the International Research Institute for Climate and Society. As for the malaria data, they were collected in public and private health facilities in the city of Korhogo. The analysis of rainfall and temperature data related to the number of malaria cases permit to establish the link between climate and malaria. The correlations (r) are relatively average between rainfall and the incidence of malaria of same month (r = 0.30), of first month (r = 0.42) and of second month following (r = 0.50). The registered determination coefficients (R² between 9% and 25%) indicate that in addition to the climate, other factors are involved in malaria transmission. The temperature maintains a negative relationship with malaria and explains 10.89% of malaria cases (r = -0.33 and R² = 10.89%). These observations could help decision makers anticipate the importance of mortality attributed to malaria in Korhogo.
Policy options for mitigating rabies in cattle in Bhutan

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Bhutan has eliminated canine rabies from its northern region although the disease remains endemic in the south. Control measures targeted at canine population have been largely successful in controlling rabies in dogs. However, no prevention and control measures are advocated in cattle and other livestock. Rabies in livestock are still reported causing economic losses with loss of animals and cost associated with post exposure treatment. Further, due to enhanced trade in livestock, growing complexity in the human-dog relationship, and increased animal transportations across Bhutan, the risk of re-introducing rabies to the northern region is of high concern. Preliminary risk assessment has shown that there remains a risk of rabid stray and pet dogs crossing the southern border with India and also the public health risk from rabid cattle cannot be neglected. Examining the risk pathways we suggest intervention options including vaccination, enhanced disease surveillance along the southern border and raising the level of awareness among the dairy farmers in the endemic region. We also aim to understand the gaps in people's knowledge in order to plan effective educational programs. This work can help inform policy makers on the development of appropriate disease prevention and control measures in cattle.
Increasing the impact of One Health through training in systems thinking: Experiences from Australia and China

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One of the key questions that limits the impact of One Health is the lack of knowledge of how to make it work in practice. To address this a postgraduate course in One Health was developed as an intensive mode (5 day workshop) elective within the Master of Public Health program. The course is designed to deliver competencies in systems thinking as it is applied to zoonotic disease management/prevention, which is a core competency domain identified for One Health. Participants use systems thinking to build conceptual models to describe complex biosocial/bio-economic systems associated with human populations that lead to the zoonotic diseases. An essential activity is the interdisciplinary/transdisciplinary group work exercise to draw "How to Make Toast" that demonstrates the principles of systems thinking. The course has evolved since its inception and our experiences running it in Guangzhou, China with Sun Yat-sen University where a field trip to a One Health "case study" provided the realisation of how to create an experiential foundation for the course. The field trip has now become a core part of the curriculum. This talk will describe the iterative process taken to evolve our One Health course and illustrate the benefits of the new design.
Human Leptospirosis In Fiji: An Eco-epidemiological Approach To Understanding Zoonotic Disease Transmission And Informing Public Health Interventions

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Leptospirosis is an emerging infectious disease in the Pacific Islands. Disease transmission is strongly driven by humans-animal-environment interactions, which in turn are mediated by broader socio-demographic, cultural and environmental factors. In Fiji, two successive cyclones and severe flooding in 2012 resulted in outbreaks associated with 7% case-fatality. A field study was conducted in 2013 using an eco-epidemiological approach to integrate survey data with geospatial environmental and census data, and quantify the relative importance of risk factors at different ecological scales. *Leptospira* antibodies were found in 19.4% of 2152 participants from 81 communities on the 3 main islands. On multivariable logistic regression modelling, significant individual-level risk factors included male, ethnicity, poor access to water, and working outdoors. Significant environmental predictors of infection included living in rural areas (OR 1.43), poverty rate (OR 1.74 in communities with ≥40% poverty), living ≤100m from a major river (OR 1.41), pigs in the community (OR 1.54), high cattle density in district (OR 1.04 per head/sqkm), and rainfall in wettest month (OR 1.003 per mm). Predictive accuracy of the model highlights that broad-scale environmental and socio-demographic
factors play crucial roles in disease transmission, and the importance of an ecological approach to public health intervention strategies.
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Sero-prevalence And Risk Factors For Q-fever Among People With History Of Fever Of Unknown Origin In Helmand Province, Afghanistan

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Q fever is a significant zoonosis in Afghanistan with high sero-prevalences in small ruminants and people. A serological survey of 100 patients with fever of unknown origin admitted to Lashkargah hospital, Helmand province in October 2014 found a sero-prevalence of 40%. Comparison of phase 1 and phase 2 ELISA titres showed that 93% of these cases were chronic and only 7% were acute. Assisting animal parturition, keeping livestock, lack of proper awareness, drinking unpasteurized milk, eating meat and handling livestock products were found to be significant risk factors. This study showed a similarly high level of exposure of rural people to Coxiella burnetii as a study in Herat province which found sero-prevalences of 43- 53% in small ruminants and 64% in people owning livestock, with significant exposure of children. These studies indicate that Q-fever can be transmitted through risky practices like helping with animal parturition and drinking unpasteurised milk and most likely through contaminated environmental dust. The studies indicate Q fever has a significant impact on rural people’s health and recommends an integrated one-health approach by the government and its partners to reduce human cases through controlling the disease in livestock and awareness of risk reduction measures amongst rural populations.
Promoting dog and reducing dog-related human health issues in Nunavik by combining One Health and EcoHealth approaches

Andre Ravel

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In Nunavik, Northern Canada, rabid dogs are reported each year and dog bites occur frequently, especially in children. Such dog-related threats to human health are exacerbated by the presence of free-roaming dogs, canine overpopulation and the general lack of veterinary services in the 14 remote Inuit villages of Nunavik. In this region, massive dog slaughter policies in the 50s' have had a profound and enduring social and emotional impact on community residents, making interventions on dogs a sensitive and complex issue. Since 2008, we have set up an action-research project driven by the One Health and EcoHealth approaches with Nunavik communities and the multiple stakeholders involved in the management of rabies risks. By combining Inuit knowledge and a western scientific approach (veterinary medicine, human medicine and socio-anthropology), we aim to better understand the links between dogs, the environment and the welfare and health of community members. We aim to jointly generate, implement and evaluate a set of interventions to reduce health risks at the human-dog-environment interface, while promoting human welfare and dog health. Progress, success, impacts and challenges in implementing the project combining One Health and EcoHealth will be presented and discussed.
Integrative Approach To The Control Of Malaria And Schistosomiasis In The Northern And Southern Fringes Of The Sahelian Belt In A Context Of Climate Change

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Ecohealth methodology was implemented from 2013 to 2016 in two cities of the Sahel belt to understand the complexity of hazards, vulnerabilities and exposures to malaria and schistosomiasis and identify sustainable solutions for resilience. In each city, following a multi-stakeholder engagement process, two cross-sectional surveys were done in dry and rainy seasons, namely, household questionnaire, blood, feces and urine analysis, entomological, malacological and geographical surveys. Additionally, weather and climate data were generated and analysed. In Korhogo (Côte d’Ivoire), intestinal schistosomiasis is predominant
(4.6%) while urinary forms predominate in Kaedi (4%) and are statistically higher in the dry season ($\chi^2=5.64; p=0.017$). Malaria prevalence was 12.5% and 0.3% respectively in Korhogo and Kaedi with a predominance of *P. falciparum*. Dissolved oxygen has a positive significant correlation with the presence of *Anopheles gambiae* larvae (OR=1.20; $p=0.029$). Rainfall of the preceding two months was associated to an increase of malaria incidence of 1%. The most important assets of communities to face the diseases are the individual and social capitals. Results allowed the identification of capacity building activities for community resilience. Preliminary results are proving usefulness of Ecohealth methodology for a sustainable adaptation of malaria and schistosomiasis-affected communities to climate change and/or variability.
We present only the second known case of a prosthetic joint infection due to *Capnocytophaga canimorsus*. *C. canimorsus* is an established zoonotic pathogen, most commonly causing bacteraemia, with an associated mortality rate of 30%, and meningitis.

Our patient presented subacutely, with 18 months of increasing hip pain prior to development of a large hip effusion. Microbiological diagnosis was made from enrichment hip fluid culture after a surgical wash out. Due to patient frailty, an one-stage prosthesis exchange was performed, concurrent with aggressive intravenous antibiotic treatment, followed by lifelong oral antibiotic suppression.

Species in genus *Capnocytophaga* are known to play a role in the pathogenesis of periodontitis and human *Capnocytophaga* species cause opportunistic infections in immunocompromised patients. Although the patient had a pet dog, he possessed none of the traditional high risk factors of invasive *Capnocytophaga* infection, splenectomy or high alcohol intake.

*C. canimorsus* colonise canine and feline oral cavity. It is catalase positive, in contrast to other *Capnocytophaga* species, which are generally catalase negative. We reviewed the literature and describe unique mechanisms *C. canimorsus* use to evade killing by the innate immune system that result in invasive infections.
High Prevalence And Intensity Of Infection With Fasciola Hepatica Among Domestic Animals In The Prepuna Region Of Argentina

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Fasciolosis, caused by the trematode *Fasciola hepatica*, is emerging as a major zoonosis and is considered to be a serious health problem in some countries. Hyperendemic regions for human fasciolosis have been described in high altitude Andean regions in South America. The aim of this study was to evaluate the prevalence and intensity of infection with *F. hepatica* in domestic animals in the Prepuna region of Argentina in an area of 3200 m.a.s.l. where goat deaths had been previously reported due to *F. hepatica* infection. Faecal samples were obtained from 139 animals of four different species for coprological analysis. The prevalence of *F. hepatica* infection was 97.1% (n=35, 95% CI: 86.4% - 98.6%) in cattle, 92% (n=25, 95% CI: 76% - 96.8%) in sheep, 90.3% (n=31, 95% CI: 75.8% - 95.9%) in goats and 52.1% (n= 48, CI: 31% - 57.5%) in horses. Sheep held the largest faecal egg counts per gram, followed by cattle and goats. Snails collected from water courses in the same area were identified as *Lymnaea viatrix* using mitochondrial 16s and COI markers and ITS2 nuclear marker. Further investigations are needed to elucidate if *F. hepatica* has a significant impact in human health in this region.
Canaries in the bird cage: Snake envenomation events in domestic dogs and cats as an indicator of snake bite risk in humans

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Each year in Australia approximately 3,000 humans are bitten by venomous snakes and around 6,000 cases of snakebite in dogs and cats are treated annually by veterinarians. The fact that envenomation events in domestic pets are relatively common allows animal envenomation data to be used to identify risky snake bite periods and locations with greater precision, and to monitor for trends indicative of ecosystem changes. If the general public (particularly children) and pet owners are aware of delimiting dates of the ‘snake bite season’ and locations where snake bites are common, steps can be taken to modify their activity and activity of their pets to reduce the likelihood of the debilitating (and sometimes fatal) sequelae of envenomation. This was a case series analysis of envenomed dogs presented to the U-Vet Animal Hospital of the University of Melbourne between October 2014 and December 2015. Snake bite events in this population clustered in both space and time and the shorter the distance to a river or stream the higher the density of envenomation events. We propose that raising awareness of small animal snake bite risk periods and risk areas will help reduce the number of envenomation events in both humans and animals.
Healthy Family, Healthy Forest: Practical Solutions for Long-term Conservation Outcomes in Papua New Guinea

Mikal Nolan

1Tree Kangaroo Conservation Program - PNG

A Category VI IUCN Protected Area, the YUS Conservation Area is the only protected area of its type in Papua New Guinea - landscape scale, wholly owned by local people, with the support of the PNG Government for long-term protection. YUS is home to a number of human settlements as well as rare and endemic flora and fauna. The Tree Kangaroo Conservation Program-PNG strives to harmonize the co-existence of human activity and habitat protection for endemic and endangered wildlife within the protected area. This is especially important given the remoteness of the communities and their dependency on natural resources.

TKCP-PNG's Health Family, Healthy Forest project offers a practical solution that seeks to relieve local pressures on the forest ecosystems without degrading the biodiversity of the protected area. The project utilizes the integrated Population-Health-Environment (PHE) approach. The key to the success of the project is providing the training to the appropriate members of the community in order to carry out adult and youth peer-education. TKCP-PNG incorporates the PHE approach into livelihood activities, land-use planning, and youth programs. This proposal would explore the project as an example of an integrated and practical solution for promoting both a healthy environment and a healthy population.
Recent advances in defining the role of specific bat species as wildlife reservoirs for Hendra virus - and implications when using serology to determine reservoir status

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Hendra virus (HeV) was first discovered in southeast Queensland over 20 years ago and has served as an ongoing model for One Health / Ecohealth approaches to bat-borne zoonotic disease investigation and control. Based on serological and virological investigations, all four of the Australian flying fox species have traditionally been considered reservoirs for HeV. Recent work - some of it carried out on a colony of grey-headed flying foxes (GHFF) in Geelong - points to this species actually being a "spillover" host and not a primary "reservoir", and this is despite the GHFF being the first bat species in which HeV was isolated. This finding, if shown to be more generalised, has important implications, as traditionally sero-positive status by itself has been used to associate wildlife species as zoonotic reservoirs. Rather our finding indicates that showing sero-positive status is "necessary but not sufficient" when identifying reservoirs, with viral excretion and plausible contact needing to be demonstrated to confirm reservoir status. The need to reassess other zoonotic diseases where multiple bat species have been suggested as reservoir hosts - including MERS-CoV and Ebola - are explored.
One Health Approach – The way forward to mitigate emergence and re-emergence of Bairnsdale ulcer

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The "One-Health concept was to bring together multiple disciplines to work in collaborative effort to attain optimal health for people, animals, and our environment. One area which needs to incorporate this concept but has not, is research regarding the disease Bairnsdale ulcer. Bairnsdale ulcer (BU) is a necrotising subcutaneous skin infection caused by Mycobacterium ulcerans. The mode of transmission is unknown. However aquatic bugs, mosquitoes and possums have being suggested. Currently, the disease is on the ascendency in Victoria. There is concern that with increasing new settlements in the area more cases shall be reported. We propose "One-Health" approach, working with mapping and spatial distribution analyst, Microbiologist, clinicians, epidemiologist, ecologist, and veterinarians etc, to help research efforts. Basic explorative and descriptive analysis were run on patient data to understand patterns in BU cases against age, place of residence and seasons. We used geographic information system (GIS) data of Australia for the spatial mapping of BU cases in Victoria. Basic descriptive epidemiological study using BU cases across Victoria revealed a mean and median ages of 53.6 and 57.5 years respectively. July was the month with highest cases. We shall also perform sero-epidemiological study to determine the extent of exposure in Victoria.
Making One Health Work Across Sectors: Scale And Hierarchies In Indonesia

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Since 2006 FAO has partnered with the Government of Indonesia (GOI) to implement programmes to control highly pathogenic avian influenza (HPAI). The autonomous nature of Indonesia's sub-national government administrations since 2001 required novel engagement methods to ensure local ownership of central government-led animal disease control programmes. The participatory disease surveillance and response (PDSR) system was established in 31 of Indonesia's 34 provinces to detect, report and respond to HPAI. A One Health (OH) approach was successfully fostered between animal health PDSR staff and human health service district surveillance officers to collaborate in joint investigation of HPAI outbreaks and monitor human exposures near animal cases; however lack of sufficient district animal health staff hampers this. While cross-sectoral engagement worked well at the district and sub-district level, the collaborative relationship proved more challenging at the higher provincial and central government hierarchical levels. The function of coordinating zoonotic disease control across line ministries was assigned to a National Committee on Pandemic and Avian Influenza / zoonoses control. In order to make One Health work more effectively in Indonesia closer hierarchical alignment of the Ministry of Agriculture and Ministry of Health zoonotic disease control entities and higher investment in veterinary authority are required.
Persistence of low pathogenic influenza A virus in water: A systematic review and quantitative meta-analysis

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Phill Cassey, Steven Delean, Sarah Heinrich

Avian influenza (AI) viruses can persist in the environment in-between the transmission of the virus among its’ natural hosts. Quantifying factors that affect the persistence of AI virus in water is an important component in our ability to predict future outbreaks and target surveillance and control methods. We present the first systematic review and quantitative meta-analysis of the environmental factors that affect the decay of low pathogenic AI virus (LPAIV) in water. Despite almost 40 years of study, available data was produced by only 26 quantitative studies and have been conducted by a small number of principal authors (n = 17) investigating a narrow range of environmental conditions based in laboratories with limited reflection of natural conditions. We were only able to extract effect-size estimates for approximately half (50.4%) of the reported experimental outcomes. Temperature was the most influential variable for both strength, and magnitude of the effect-size and salinity and pH were also important factors. Future work is required to broaden the range of abiotic factors examined, including diurnal variation and greater environmental realism generally. We recommend a minimum set of quantitative reporting to be included in all studies, which will allow robust assimilation and analysis of future findings.
A 'One Health' concept is being applied in developing biosecurity and public health diagnostic infrastructure in New Zealand. New Zealand is currently investing $87 million in the National Biocontainment Laboratory at Wallaceville, 30km north of Wellington. This facility will be unique in New Zealand, as it will operate at enhanced physical containment level 3, and with a gross floor area of more than 3,400 square metres, it will be much larger than any other comparable facility in the country. With only one facility of this type in New Zealand, a key consideration is versatility. It must be able to screen suspect high risk samples and also handle high throughput testing during large scale emergencies. Frequently, emerging human diseases have an animal origin, and discovery of foreign zoonotic disease in animals has clear ramifications for public health. Health and veterinary staff at Wallaceville have a long history of collaborating and this has been carried over into the design and planned operations of the new facility. This presentation will outline the development work to date, and the planned approach to laboratory operations including the collaborative advantages and challenges of a veterinary and medical diagnostic laboratory working closely together.
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How ecofeminist theory can contribute to ecohealth

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The Ottawa Charter for Health Promotion in 1986 mentioned "a stable eco-system" as one of eight prerequisites for health. By the early 1990s, however, critics were already suggesting that health promotion was not addressing environmental issues. In the 2000s, Australian public health researchers, such as Hancock, called for ecological approaches to health, recognising that we are part of an ecosystem. Others, such as Townsend and Maller, began to investigate the benefits of 'contact with nature' for health. Some Australian researchers, such as Patrick and Kingsley, have recently begun to take an 'ecohealth' approach to health promotion. In my current research I have been looking at factors that help or challenge health promoters in Victoria in promoting both environmental sustainability and health equity. My findings show that gender is important, but it remains largely invisible and under-researched in health promotion and ecohealth. Ecofeminist theory can help to explain this, and also explain why the economist paradigm that privileges competition and use value of natural resources is politically dominant in nations such as Australia. My presentation will explain why it is important and valuable for ecohealth to recognise the significance of gender and the historical legacy of patriarchy.
Substantial research occurred on *Echinococcus* spp. in the U.S. throughout the 1900s, however, current distribution data are lacking. This study addresses these data gaps through molecular examination of fecal samples from wolves (*Canis lupus*) in three U.S. National Parks across multiple years - Yellowstone (YELL) (2012-2013), Isle Royale (ISRO) (2004-2014), and Voyageurs (VOYA) (2012-2015). Results showed *E. canadensis* present in all parks. Complete demographic data was known for all wolves in ISRO. Of 196 fecal samples examined from 85 wolves in ISRO, 32 (38%) individual wolves shed *E. canadensis* eggs for at least one year, and four wolves were infected over multiple years. Prevalence ranged from 0% to 43% depending on the year. Of 99 samples collected from YELL wolves, *E. canadensis* was present in 24 samples (2012:32% and 2013:16%). *Echinococcus canadensis* was also confirmed in 11 of the 74 VOYA samples (2013:40%, 2014:39%; 2015:0%). Our research demonstrates that *E. canadensis* is cycling in the wildlife populations of the contiguous U.S., thus indicating the need for additional investigations examining the abiotic and biotic factors of disease transmission between humans, wildlife, domestic animals, and additional reservoirs in adjacent areas.
Livestock rearing is an important income source for farmers in Myanmar, but zoonotic animal diseases are a constraint to successful production and they are an occupational risk to farmers. A study was conducted in the Central Dry Zone of Myanmar (a major hub for livestock production) to identify attitudes, traditional beliefs, perceived barriers and farmer's disease prevention self-efficacy on zoonotic livestock diseases. A total of 614 small-scale farmers owning cattle, small ruminants and/or village chicken were interviewed using a Health Belief Model framework. Approximately 17% of farmers indicated that ruminants are able to transmit diseases to humans, while 52% of farmers considered chickens as a potential source for zoonotic diseases. Perceived barriers for the prevention of zoonotic disease are a lack of knowledge on these diseases (51%) although 11% of the farmers received disease information from the livestock department officials. Although strategies such as sanitation, quarantine of sick animals and not consuming meat from diseased animals were identified by farmers as preventive measures, many farmers (45%) do not practice any of these. Our study highlights that the development of strategies and policies to control zoonotic diseases has to address farmers' perceptions towards zoonotic diseases in order to be successful.
Australia is considered a 'food secure' nation because food is available, accessible, acceptable and affordable, and, Australia has the capacity to produce enough food without a reliance on imports (an indicator of 'sustainable'). However, two in three Australian adults (~60%) have a food-related chronic disease (cardiovascular, diabetes, cancers). Therein lay the anomaly: how can Australia claim 'food secure' status when its population is not healthy? I set out to investigate beginning with the definition of food security and its historical context. In this presentation, I walk through the steps from 'food security' then and now, in particular the application of 'food security' to high-income nations, and the 'gap' this has created in our logic to make clear connections between the food supply and health. The proposition is: food security is a function of 'sustainability' and 'health'; where 'sustainability' means a balance between supply and demand for [healthy] food and there is little waste, and 'health' is assessed as premature death and disability from a food-related disease. This work is to offer a first step to 'measuring and reporting' the connection between 'health' and the 'food supply' in a language government can accurately respond to and use in policy analysis.
Knowledge, Attitudes And Practices (Kap) Relating To Brucellosis In Smallholder Farmers In Pakistan

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The aim of this study was to assess the extent of knowledge and understanding of brucellosis in smallholder dairy farmers in Pakistan and identify practices at the farm and household level that might pose a risk for humans contracting brucellosis. Between February and June 2015 a cross-sectional study was conducted among smallholder farms (n = 420) in the seven districts of Pakistan. Farmers were interviewed using a questionnaire to obtain information on farmers' knowledge about brucellosis and the potential risks for contracting brucellosis that are present for dairy farmers and their families. Logistic regression and ordinal logistic models were used to investigate potential predictors for risky behaviours. All farmers regularly performed at least one risky practice for brucellosis transmission from animal to human and animal to animal. From the multivariable model, it was demonstrated that the level of education and having heard about brucellosis were associated with prevalence of risky practices. In general, respondents with no formal education and those who had not heard of the disease displayed greater risky behaviour. Poor knowledge, wrong perception and attitude towards treatment, supports the need for including "one health" education in rural communities for any future control programmes in the country.
What's In Your Chicken Rice? Characterising Food Supply Networks To Improve Food Safety In Singapore

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Effective, risk-based surveillance of food safety and investigation of foodborne outbreaks is hampered by limited understanding of food distribution networks. In Singapore, hawker stalls are owner-operator businesses that are arranged in hawker centres and provide popular and affordable food choices. In July-August 2015, we interviewed 103 of 159 (65%) stallholders at three hawker centres to obtain information on food ingredient suppliers and stallholder-supplier relationships. Most stalls had 2-3 individual suppliers. Stallholders ranked price and product quality as the most important supplier attributes. The median length of stallholder-supplier relationships was 5 years (range <1-40). Although supplier contracts and credit arrangements were uncommon, most respondents stated that they would be uncomfortable switching suppliers. Trade network analysis indicated that the egg supply is highly centralized within each centre, facilitating product traceability. Supply networks for chicken, pork, and seafood are highly diverse, suggesting that targeted surveillance that considers traceability and potential for distribution of contaminated products might be warranted. Ongoing data collection from a wider range of food centres will yield valuable information to guide these activities and improve food safety and traceability.
Seroepidemiology and Risk Factors for Rickettsia Felis Infections in Australia

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Rickettsia felis, causing flea-borne spotted fever (FBSF), is a global zoonosis of understated public-health significance. Prior to the availability of specific immunofluorescent antibody testing (IFAT), serological cross-reactivity with Rickettsia typhi confounded diagnosis. Our studies describe 1) missed cases of FBSF in archived patient sera and 2) primary risk factors for exposure to R. felis in healthy individuals in Australia.

Patient sera (2010-2013) stored at the Australian Rickettsial Reference Laboratory was reassessed with an R. felis-specific IFAT. In a separate retrospective cohort study, serum samples were screened from individuals surveyed for potential rickettsial exposure.

Of 136 archived sera, 21 had R. felis titres four-fold or greater than R. typhi, sufficient for confirmation of FBSF infection. This allowed classification of fourteen previously screened patients as FBSF cases, with five seroconverting, indicating recent infection.
A logistical model was developed to determine the occupational, environmental, pet-ownership and management-associated risks of exposure to R. felis.

This represents the first epidemiological investigation of FBSF in the Australian population, with fourteen clinically-ill misdiagnosed patients identified. Widespread human R. felis exposure reflects a ubiquitous presence within cat-flea populations. Considering risk factors bringing the cat-flea vector into contact with susceptible individuals is imperative amongst medical, laboratory and veterinary professionals.
Fostering community resilience through conservation and economic opportunities in the YUS Conservation Area

Benjamin Sipa
Mikal Nolan

Tree Kangaroo Conservation Program - PNG

Tree Kangaroo Conservation Program-PNG strives to harmonize the co-existence of human activity and habitat protection for endemic and endangered wildlife within the YUS Conservation Area. Supporting livelihoods serves to enhance the productivity of already cleared land, thereby mitigating the need to clear existing forests for agriculture. The YUS communities are nestled into the rugged landscape, inaccessible by road, non-industrial and generally lacking market access for cash crops. TKCP-PNG views investment into building the capacity and productivity of small-scale farmers as a critical step toward sustainability. TKCP-PNG partners with the private sector and PNG institutions to support a Conservation Livelihoods Program (CLP). Through direct trade agreements, farmers have exported 20 tonnes since 2011, receiving nearly triple the price received on the local market. The revenue from these sales encourages farmers to reinvest into education, health, and community development projects. Coupled with community-based land-use planning, biodiversity monitoring, and capacity building on sustainable resource management, CLP aims to alleviate the pressures on the protected area, and lead to enhanced quality of life.

This presentation shall highlight facilitating alternative livelihoods across a landscape protected area in order to support conservation outcomes, removing basic barriers to local socio-economic development, and improving the well-being of people.
Australia’s zoos and veterinary clinics contribute to One Health through the national wildlife disease surveillance system

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1Wildlife Health Australia

Wildlife disease surveillance provides valuable information on existing and emerging diseases that may have significance to human and domestic animal health, global trade and biodiversity. Surveillance programs which make use of existing operations can provide a cost-effective, reliable method of gathering surveillance data, thereby increasing the nation's capacity for early detection of emerging diseases. Wildlife Health Australia (WHA), the country's peak body for wildlife health, coordinates the national system for wildlife disease surveillance. WHA and the peak body for zoos in the region, the Australasian Zoo and Aquarium Association, coordinate a program to integrate zoo-based wildlife disease data into the national wildlife disease database. A similar program is run concurrently to collect data from 'sentinel clinics' (veterinary hospitals with a high/dedicated wildlife caseload), and a pilot project has commenced to incorporate universities into the surveillance system. Every year, over 35,000 free-ranging wildlife cases are treated at the ten major Australian zoos and four sentinel clinics in the program. These zoos and clinics employ full-time vets with expertise in wildlife diseases and diagnostics, and a high level of awareness of emerging, significant and zoonotic diseases. The programs provide Australia with an important addition to the framework for capturing wildlife surveillance data.
Political Commitment And Active Community Involvement Are Essential For A One Health Approach: An Anthrax Outbreak Case Study In South Sulawesi, Indonesia

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Sporadic anthrax outbreaks have occurred in South Sulawesi, Indonesia for years. Anthrax incidence increased recently and the disease has been detected in new areas. Reported outbreaks in Pinrang District, South Sulawesi in January 2016 killed over 48 cattle and five hospitalized human cases were registered. The disease caused alarm in the community and adversely affected the local economy. A joint anthrax investigation and control team, comprised of human and animal health professionals was established by the District Head in response to the outbreak. This team was successful in controlling the outbreak and preventing further spread. The Directorate of Animal Health, Ministry of Agriculture and the FAO team carried out multi-stakeholder focus group discussions and in-depth interviews with key persons in the outbreak area to capture lessons learned from this event. The results showed that the key to success of outbreak control was not just forming a joint investigation team to control the disease and monitor human exposures, but also to create political commitment at the district level and foster active community involvement. Expanded activities using a One Health approach are needed to increase community awareness about anthrax to prevent and mitigate future outbreaks.
Research trends and drivers in infectious diseases at the wildlife-livestock interface

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Despite a growing interest in applying knowledge synthesis methods to trace and quantify zoonotic origins of human diseases, comparatively less research has been directed toward animal diseases, in particular at the wildlife-livestock interface. A better understanding of where research in this area has been focused as well as drivers, constraints and biases involved will help to refine investment and research priorities. Using data generated from a scoping review of published research on infectious diseases at the wildlife-livestock interface, time series for two well-characterized diseases, avian influenza and bovine tuberculosis, were examined to explore potential drivers of research. Cross-correlation analysis was applied to assess the degree to which public outcry, political responses and research investments influenced the number of publications over time. Temporal trends correlated strongly with media interest and research funding, highlighting the influence of specific disease events as well as socio-political and economic drivers of research in this area. Investments have largely been proportionate to the perceptions of disease at the wildlife-livestock interface, rather than actual costs or impacts. Targeted, proactive surveillance and animal health programs may yield better returns long-term than reactive, ad-hoc approaches applied so far.
Achieving impact using One Health: The governance of leptospirosis in Fiji

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Fiji has one of the highest leptospirosis burdens in the Pacific region with over 45 cases per 100,000 population and approximately 31 deaths each year. Leptospirosis is preventable. However, responsibility for control measures for reservoirs (and possible solutions) lies with institutions and individuals outside the health sector. These strategies include education and targeted awareness campaigns for specific risk groups, environmental modification and control in reservoir populations such as rodents and livestock. To address this, in 2013-4, the Fijian Ministry of Health and Medical Services (MOHMS) initiated the development of a national strategy that involved two multi-sectoral consultation workshops to define issues and identify solutions. Consultation around the national strategy used institutional advocacy to develop a governance structure and interventions to meet the needs of the different stakeholders. A University of Queensland research collaboration, funded by the Bill and Melinda Gates Foundation, undertook a series of interviews with stakeholders to identify measures of disease impact that would facilitate multi-sectoral planning. Despite demonstrable inter-sectoral impact, their conceptualisation of the problem focused only on human morbidity and mortality. Recognising the perceived legitimacy of MOHMS leadership, the final workshop used the research evidence to structure a 5-year multi-sectoral action plan to reduce leptospirosis mortality.
The Checklist for One Health Epidemiological Reporting of Evidence (COHERE)

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As the One Health scientific literature expands, a number of systematic reviews have found considerable heterogeneity in the studies authors self-define using the keyword "One Health," and many researchers fail to integrate data from all three domains of human, animal, and environmental health. This points to a critical need to unify guidelines for One Health studies. We report on the development of the Checklist for One Health Epidemiological Reporting of Evidence (COHERE) to guide the design and publication format of future "One Health" studies. Analogous to existing guidelines like STROBE (http://www.strobe-statement.org/) that seek to improve the quality of reporting of observational epidemiological studies, the aims of COHERE are 1) to improve the quality of reporting of observational or interventional epidemiology studies that integrate data from humans, animals and/or vectors, and their shared environments; and 2) to promote the concept that One Health studies should collect and integrate data from these three domains. The COHERE criteria has been developed by a core writing group with ongoing review by an external, international panel of One Health experts. This presentation will report on the process of guideline development and COHERE criteria using examples that demonstrate the use of the checklist.
Biocontrol of invasive vertebrates with viruses: the need for a release strategy to ensure optimum effectiveness and minimum adverse consequences

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Common carp (*Cyprinus carpio*) is an important species of farmed fish, but also an aggressive invasive species in some countries. Currently, it is the dominant fish species in much of Australia’s Murray-Darling Basin, being associated with substantial adverse effects on native fish and other aquatic life. A lethal and highly contagious virus, Cyprinid herpesvirus 3 (CyHV-3), is being investigated as a biocontrol agent. It is highly specific to carp, and unable to infect Australian native fish species that have been tested in susceptibility trials. A release of the virus is anticipated in the coming years, but to maximise its impact as a biocontrol agent, and minimise environmental impacts arising from the anticipated massive kill-off of carp, detailed hydrological, demographic and epidemic modelling is being undertaken. This indicates the importance of a staged release of the virus, supplementary measures to complement the virus, and an integrated "clean-up" of dead carp from the rivers. This will be the first attempt we are aware of to use modelling to inform a "release strategy", and if successful may have important lessons for biocontrol of invasive vertebrates in other countries.
Isikhnas Reporting To Support Rabies Control Program In Indonesia: One Health Approach

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iSIKHNAS is Indonesia's new integrated animal health information system where the development is carried out under Australia-Indonesia Partnership for Emerging Infectious Diseases (AIPEID). One of philosophy of iSIKHNAS development which is to help the work of field staffs, had been felt by the fields staffs. Currently, the reporting has been received from more than 400 districts throughout Indonesia. The information system which starts from only to report disease signs and priority syndromes, is now managing the various reports in the field of animal production and animal health, including massive treatment and animal movement report, follow up case report, disease investigation and response, livestock slaughter, vaccination, surveillance, population, artificial insemination and many more.

Based on iSIKHNAS, until mid-June 2016 there has been reported 985 cases of rabies priority syndromes from 17 provinces. iSIKHNAS with real-time feature can help in rapid response, and iSIKHNAS feature to notify users can improve communication between villagers, animal health and human health.

The health sector provides information to the animal health when there are biting cases, visa versa, and animal health sector can perform early and rapid response in response to the animals in order to isolate cases and protect people from the threats of rabies.
The Stop Transboundary Animal Diseases And Zoonoses (STANDZ) initiative against rabies in South-East Asia

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1OIE Sub-Regional Representation for South-East Asia

A Grant Agreement between the Government of Australia and the World Organisation for Animal Health (OIE), the STANDZ initiative includes a component addressing dog-mediated rabies in South-East Asia. Under this, STANDZ developed the South-East Asia Rabies Elimination Strategy which was later used as the base document for the joint ASEAN Rabies Elimination Strategy (ARES), and subsequently, the Global Framework for rabies elimination. STANDZ also developed potentially landmark documents relevant to dog rabies elimination including: "Strategic prioritization for mass dog vaccination", "Enhancing animal rabies surveillance through participatory approaches", "Rabies post-vaccination monitoring (PVM)" and "Benchmarking Document for Rabies and Rabies initiatives in ASEAN Member States". STANDZ also supported rabies control initiatives in the Sub-Region with about one million doses of rabies vaccines procured through the OIE Regional Vaccine Bank. STANDZ also supported select countries in implementing mass dog vaccination, public awareness, case investigations, enhanced surveillance, One Health coordination, and political engagement. Other regional and national initiatives include rabies diagnosis capacity building, rabies research, and inter-sectoral coordination. Concluding by the end of December 2016, the STANDZ rabies component will leave South-East Asia with a legacy of materials, capacity, and mechanisms that are all critically relevant in progressing towards rabies-free ASEAN by 2020.
Re-emerging foci of brucellosis represent an ongoing challenge worldwide. In NSW, 33 human notifications have been reported since 2010, roughly half of which were acquired domestically following contact with feral pigs infected with *Brucella suis*. Although human notifications are low, there is potential under-reporting due to patchy GP awareness. Simultaneously, there has been an increase in the reported number of dogs infected with *B. suis* - 72 notifications between 2011-2015 - most of which were linked to pig hunting or feeding of raw feral pig meat. Infected dogs may pose a risk to hunters, household contacts and other dogs and there is a need for better scientific evidence to underpin sound, risk-based policy responses. In particular, knowledge of the natural history of infection and underlying ecological/sociological factors driving transmission is needed as well as more accurate diagnostics for use in dogs. A team of animal and human health authorities and scientists is working together to advance knowledge and enhance cross-disciplinary communication to monitor this emerging risk. This presentation will outline the context of swine brucellosis in NSW, the structural barriers that make this a challenging disease to manage and discuss the outcomes so far.
AA Amyloidosis in Hens as a Concern of Food Contamination

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Avian amyloidosis occurs most frequently in waterfowls, particularly Pekin ducks. A condition in chickens, where the disease is known as amyloid arthropathy, is associated with infection by Enterococcus faecalis.

Outbreaks of fatal AA amyloidosis in growing hens were observed in a large-scale poultry farm. The occurrence of the disease in the farm was observed within about three weeks after vaccinations. To access the fate and risk of amyloid deposition, the severity of amyloid deposition in aged hens which survived an outbreak of AA amyloidosis and were kept until retirement.

The status of AA amyloidosis in the hen farm was surveyed after a long interval after outbreaks of the disease. The survived hens, which had been kept as layer hens till around 2-year-old, had various degrees of amyloid depositions in the spleen and the pectoral muscle in aged hens. Amyloid deposition in chickens previously exposed to AA amyloidosis may tend to regress when causative factors such as vaccinations and/or chronic inflammation are absent. The amyloid deposition in hens may remain for a long time in some organs and tissues such as the pectoral muscle, which might cause a certain concern on contaminations in the meat.
Bat-human Interactions In Human Populations Highly Exposed To Bats In China: Implications For Zoonotic Disease Transmission

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Nowadays bats have been proposed as major reservoirs for diverse emerging zoonotic diseases. To explore the relationship between human-bat interactions and virus infection, a survey with standard questionnaire was conducted in July 2014 and January 2015 in Xianning, Hubei province in China. Blood and oropharyngeal swabs were also collected. Of 1098 respondents with an average age of 56 (range: 4-93), 564 (51.4%) lived in Taiyi Dong near the bats cave, 647 (58.9%) were women, and 84.2% were farmers. Animal exposures in the past year included seeing bat around house [13.5%]; having bat fly into house [27.8%]; going to bat cave for fun [13.8%]; hunting or getting bite by bats [2.8%]. In the past half year, influenza-like illness were described by 380 (34.6%) participants. Individuals who lived near the bats cave have a higher rate of contacting with bats (including seeing bat around house, having bat fly into house, going to bat cave for fun) than those who are not ($\chi^2$ were 19.6, 10.5, 89.8, P value were <0.001, 0.001, <0.001 respectively). For virus detection, no bat-Coronavirus infection was found. Sharing of living spaces may lead to higher chance of human - bat interactions. But exposure to zoonotic pathogens has not yet found. Long term of surveillance of pathogens circulating in both highly-animal-exposed human and animal population is still needed.
Zoonotic Risk Of Human Leptospirosis Among Febrile Patients In Kaski District Nepal.

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Abstract

Leptospirosis is an important zoonotic disease in Nepal; however there is a lack of information on the sources of leptospirosis infection for people and associated risk factors. We implemented a case control study to investigate zoonotic risk factors for leptospirosis in 239 patients with fever of unknown origin recruited from hospitals in Kaski district during April-September 2013. Microagglutination testing of paired serum samples showed an incidence of 7% acute clinical leptospirosis cases amongst the recruited fever patients which were three times more likely to have conjunctivitis than non-cases. This One Health study assessed the risks directly associated with animals that were in the households of study participants. Owning goats was the most significant animal-related factor, increasing the risk of leptospirosis in owners by 3 to 5 times for seronegative and seropositive goats respectively, compared with not owning goats. Male participants had odds of being a case 5 times higher than females and working in rice fields also significantly increased leptospirosis risk. The leptospira serovars identified in humans were most similar to those identified in ruminants and least similar with rodents. The results suggest ruminants are more important source of leptospirosis than rodents in this study population.

Keywords: Leptospirosis, case control study, Nepal, One Health, MAT, risk factors
Case Study: One Health Approach In Endemic Area Of Poultry Highly Pathogenic Avian Influenza (HPAI) In Cibeureum Village, Majalengka District, West Java Province, Indonesia

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Preparedness toward pandemic influenza still important because poultry Highly Pathogenic Avian Influenza (HPAI) still happens in Indonesia until now. Understanding one health approach is important for prevention control program. The aim is to describe the one health approach of influenza in endemic area. The study was approved by the Ethical Committee, Faculty of Medicine, Universitas Padjadjaran.

A cross-sectional study was conducted from July-August 2014 by direct interviewed and observed the environment. The population was all households in the radius of 200meters from index case which reported the dead poultry with positive HPAI rapid test. Human sample obtained from nasopharyngeal and animal samples obtained from cloacal.

Transdisciplinary research team consisted of human health and veterinary surveyed 130 households, 63% household raised backyard poultry, found 32.5% dead out of 765 poultries. Most of dead disposed to the yard/gutter and villagers slaughtered the sick poultry, sold/given the rest of poultry. Seventy seven human samples obtained, Real Time-Polymerase Chain
Reaction (RT-PCR) showed 4 Influenza A unsubtypeable and 1 Influenza B unsubtypeable, came from healthy and households with sick/dead chickens. Thirty eight animal samples obtained, RT-PCR showed 3 Influenza A H5.

Better understanding of outbreak achieved by one health approach.
A comparison of homogeneity and stability of proficiency testing samples: frozen liquid or lyophilised?

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A constant source of concern for any Proficiency Testing (PT) programme is avoiding degradation and maintaining the stability of the samples; especially during transit from the PT provider to the recipient participating laboratories. The CSIRO Australian Animal Health Laboratory (AAHL) in Geelong, Australia conducts an ISO 17043 accredited PT programme in the South East Asian region in collaboration with the Food and Agriculture Organisation (FAO), supporting Australian pre-border biosecurity and One Health. Degradation of samples due to temperature fluctuation during transit is especially present in countries where maintenance of cold-chain and transit times vary greatly. Samples for AAHL's PT programme are frozen liquid shipped on dry-ice. Shipping samples on dry-ice is not only expensive, but causes logistical issues and can have downstream effects on PT results. One way to eliminate issues associated with the shipment of frozen liquid samples is lyophilisation. This study presents a comparison of lyophilised versus frozen Influenza A virus samples. The samples were tested using a standard molecular diagnostic assay for the detection of Influenza A Matrix gene and the homogeneity and stability of each sample treatment compared over time at -20°C, 4°C, 24°C, 37°C and 56°C. Lyophilisation of biological proficiency testing samples offers significant advantages in maintaining stable samples despite logistical challenges.
Applying Outcome Mapping to Sustain a Participatory One Health Disease Detection System in Chiang Mai Communities

Ekkachai Laiya
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Piloting of a digital community level participatory one health disease detection system (PODD) was piloted in Chiang Mai, Thailand from 1 August 2014 through 31 July 2016 in which community volunteers send reports via predefined epidemic events in animals and humans plus environmental events such as forest fires. Automated analysis of reports and notification of relevant stakeholders and other authorities allowing local government agencies to rapidly deploy contingency plans. Outcome mapping was used to identify boundary partners and their expected outcomes as well as progress markers for partners. 300 volunteers from 300 villages representing 74 sub-districts were selected to operate the surveillance system. Brainstorming by transdisciplinary research teams plus focus groups with boundary partners determined expected outcomes and associated progress markers. Strategic action plans to assist partners achieve expected outcomes were developed. Achievements of partners were assessed at 6 and 18 months after reporting started. Evaluation of results showed boundary partners achieved significant progress. After 18 months, 25% of volunteer reporters and 24.3% of sub-districts evidenced high levels of performance and capacity to integrate the PODD surveillance system into their local one health operational centers.
Implementing a One Health approach to emerging infectious diseases: Understanding public priorities and values using a Discrete Choice Experiment

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There is increasing consensus within the scientific community that a One Health approach is the most effective way of responding to threats from emerging and re-emerging infectious diseases (EIDs). However, statutory reviews of past EID events have consistently shown that successful implementation of policies for managing EID outbreaks and risks actually depends on how well these policies align with public values. That is, despite its empirical merit, a One Health approach will not succeed if it does not take into account how it will be understood, interpreted and judged by the public; a One Health approach needs to reflect what most Australians will accept as fair, and good for public health. This paper will report on a Discrete Choice Experiment (DCE) involving 2000 Australian citizens, designed to test what members of the public are willing to trade-off to prevent and control outbreaks of EIDs. These results have the potential to inform and improve the implementation of One Health approaches; this paper is the first report of our findings.
Burden of diarrheal diseases from biogas wastewater exposure among smallholder farmers in Ha Nam province, Vietnam

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Livestock production has developed rapidly in Vietnam in recent years, particularly at the small-scale which account for 65% of the total livestock production. Biogas systems are commonly used to treat livestock waste, however, the health risks from biogas wastewater exposure at smallholder farms are not yet well understood. A quantitative microbial risk assessment approach was applied to estimate the burden of diarrheal diseases from biogas wastewater exposure among 451 smallholder farmers using biogas systems in Ha Nam province. A total of 150 biogas wastewater samples were collected and analysed for E. coli, Giardia, and Cryptosporidium. The study showed that farmers faced diarrheal disease risks due to exposure to biogas wastewater at different exposure scenarios. The calculated annual risk of diarrheal disease by E. coli ranked from 0.15 to 0.21; by Giardia ranked from 0.022 to 0.095; and by Cryptosporidium ranked from 0.006 to 0.015. The estimated diarrheal diseases burden from pathogens in all exposure scenarios largely exceeded the reference level of health outcome target of 10⁻⁶ DALYs loss per person per year recommended by WHO. The results suggest the importance in reducing concentrations of pathogens in biogas wastewater before use in the fields as a means for mitigating public health impacts.
Nature relatedness: A psychological orientation with potential to foster concurrent human and ecosystem health

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Increasing urbanisation is leading to reduced contact with biodiverse environments, with fewer opportunities to gain health benefits from contact with nature, as well as emotional disconnection from natural systems. This paper considers the relevance of ‘nature relatedness’ to ecohealth. Nature relatedness refers to individual differences in the way people view their natural world and their connection with nature, and has been associated with benefits including psychological well-being and pro-environmental behaviour. We present findings from two Australian studies investigating the relationships between nature relatedness and health. A study of 1538 participants in a community sample in Brisbane, Queensland considered the relationship between nature relatedness and depression, anxiety, stress and overall health, controlling for a wide range of socio-demographic effects. People with higher nature relatedness had reduced anxiety and better overall health. A study of 251 residents in Cairns, Queensland investigated perceptions of flying foxes including both health risks and ecological benefits of this keystone species. Those with higher nature relatedness were more likely to engage in high risk behaviours such as handling bats, but also indicated greater support for flying fox conservation. We discuss the potential for nature relatedness in public health initiatives to foster both human and ecosystem health.
Building One Health Capacity for EID and Zoonoses control and prevention at local government level: a pilot project in three districts in Indonesia

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Whereas it is widely accepted that the control and prevention of zoonoses and emerging infectious diseases (EID) in the world requires a One Health approach, One Health capacity building and implementation at local government (field) level is often challenging. We described development of a training curriculum and practical approaches to One Health-focused zoonoses and EID control and prevention in Indonesia. The training targeted sub-district level staff from animal health centres (puskeswan), human health centres (puskesmas), and forestry field officers (polhut) in three districts in Indonesia, identified as potentially having a higher EID risk profile. Previous lessons learned from integrated disease detection, control and prevention activities between human and animal health officers on highly pathogenic avian influenza (HPAI) and rabies were included in curriculum development. This EID training also targeted district staff from the wildlife and forestry department to detect high mortality and unusual events in wildlife at an early stage. It was concluded that for early detection and control of zoonoses and EID an appropriate coordination, integration and information sharing mechanism between the Ministry of Agriculture, Ministry of Health and Ministry of Environment and Forestry is needed at district, provincial and central level.
A Novel Option For Control Of Bovine Brucellosis In Nepal

Suraj Subedi

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Brucellosis is an important zoonosis in Nepal, but control options are limited by the inability to slaughter infected cattle as part of the control strategy, although buffalo can be slaughtered. It is not economically feasible to operate "cow retirement villages" as is done in some parts of India. As part of a wider economic and policy evaluation of control options for Brucella abortus in Nepal, a previously untried option is being assessed. All districts would progressively undergo surveillance, for classification into high and low prevalence districts. Beginning with high prevalence districts and districts with a high level of cattle and buffalo trading, adult females and calves would be vaccinated with Strain 19 in the first year, and new calves and imported female stock in subsequent years. All animals would remain in the milking herd, and owners would be compensated for abortions induced by Strain 19 vaccine, if cows were at a susceptible stage of pregnancy. Prevalence would fall steadily in these districts and vaccination would be expanded over time to lower prevalence districts. Initial economic analysis suggested this was worth investigating further, and results of HandiSpread modelling of the epidemiological and economic effects of the policy will be presented.
Reducing The Risk Of HPAI H5N1 Transmission To Humans In Live Bird Markets Using A One Health Approach By Strengthening Capacity And Raising Awareness Of Traders, Market Managers And Consumers

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Abstract

This paper presents the intervention activities conducted jointly between the Ministry of Agriculture and the Ministry of Health in ten live bird markets in ten districts in Indonesia with the purpose of improving the understanding, skills and awareness of traders and market managers to implement appropriate cleaning and disinfection activities. The interventions also aimed to enhance food safety inspection, improved hygiene and good sanitary behaviour to reduce the risk of H5N1 highly pathogenic avian influenza (HPAI) virus transmission to humans associated with live poultry trading. The interventions were implemented over an eight...
month period. The integrated activities were conducted through activating a market communities working group, building capacity of traders and market managers, improving market facilities and raising public awareness. Interventions included cleaning and disinfection training, food safety inspection training, repairing hand washing facilities and installing a radio broadcasting system in the market to disseminate key health messages to traders, market managers and consumers. Following interventions in these ten markets 329 market communities developed their own healthy markets' programme. The joint intervention of both the Ministry of Agriculture and the Ministry of Health was key to achieve this behaviour change.
Prevalence and risk factors associated with MRSA carriage in humans working at a pig farm

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This cross sectional study estimated the prevalence of methicillin-resistant *S. aureus* (MRSA) carriage and determined the potential risk factors associated with MRSA carriage among staff members in a piggery in regional Australia where MRSA infection with a community associated MRSA has been identified among employees. Nasal swabs were collected from all workers (n=52) on farm.

MRSA was identified in 31/52 farmworkers (59.61%). Pig workers' role, pig contact and contact rate (hours per week) were identified as significant risk factors (p<0.05) for MRSA carriage among pig workers. Overall, significantly (p<0.001) higher prevalence of MRSA carriage was found for those who had animal exposure, compared with those who did not (OR=23.6; CI=5.2, 172.8). Number of week hours worked in direct pig contact on the farm was also significantly associated with MRSA carriage in piggery workers (p<0.001). Median hours of pig work per week for all piggery staff who returned MRSA positive (n=31) were 18.5 whereas for those who returned MRSA negative (n=21) was 0.

This study shows that, on a single piggery where MRSA human infections had occurred, risk of MRSA carriage was associated with close contact with pigs and the number of hours worked with direct pig contact.
Prospects For Community-based Monitoring Of Ecosystem Health Using Small Drones And Water Analysis Kits

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Rapid and often unplanned urbanization and periurbanization processes in the Global South pose enormous challenges for maintaining ecological health while improving human well-being. In Latin America, Mexico is one of the countries with the highest rates of rural out-migration linked with urban and periurban growth. As a result, in many urban and periurban areas of the country there has been widespread ecological degradation, which has disproportionately affected the poor people settled in them. In this study we assess the prospects for community-based monitoring of ecosystem health using a case study in an informal periurban settlement of a mid-sized city (Morelia, central Mexico). The settlement is adjacent to a Ramsar site (La Mintzita) that is also a natural protected area, which sources about 40% of the water Morelia consumes. Specifically, we evaluate the potential of community monitoring of water (quality, use and availability), forest cover condition and periurban growth, by means of using small unmanned aerial vehicles (drones) coupled with other tools such as kits for field water analysis. We argue that the design and implementation of these community monitoring programs may trigger social and environmental innovations that foster cooperation with public agencies and improve ecosystem health and social justice.
A survey on assessment of One Health workforce training needs in Vietnam

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Prevention and control of infectious and zoonotic diseases requires involvement of multiple stakeholders and One Health (OH) training plays a vital role in the success of disease prevention activities. However, information on the OH workforce and training needs is not available in Vietnam. A questionnaire-based survey was developed to assess training needs at the provincial level and was administered to 480 leaders and employees of Sub-Departments of Animal Health, Centers for Preventive Medicine, and Department of Natural Resources and Environment in 12 provinces across Vietnam. Participants were asked to indicate their knowledge, skills and training needs on disease prevention and One Health. Three hundred and nineteen government officers responded to the questionnaire (66.6% response) and most (86%) thought the OH approach was essential, however leaders indicated that the workforce needed to increase by 10%-40%. Knowledge and skills for disease prevention of staff in human, animal and environmental health sectors were evaluated as inadequate; 81% of respondents indicated that training is needed in OH core competencies and 60% indicated the need for training in OH technical areas. Findings suggest that training in OH is important to improve response to infectious and zoonotic diseases and appropriate programs should be developed.
Chlamydia Pecorum In Koalas: Growing Evidence Of Spill-over From Domestic Livestock?

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Chlamydia pecorum infection is a significant threatening process impacting koalas. Infection in female koalas is associated with reproductive tract changes which lead to infertility, and is widely regarded as a key driver in population declines of this iconic species. Recent research has identified some overlap between C. pecorum sequence types (determined through a multi-locus sequence typing scheme) detected in koalas in northern koala populations and livestock in those regions, particularly from sheep. In our own research, we recently identified C. pecorum infection in a previously pathogen free population of koalas. The sequence type of the C. pecorum detected was novel, but most closely related to a C. pecorum of porcine origin. Subsequent typing of C. pecorum (n = 29) from a range of Victorian koala populations has further highlighted close links to livestock origin strains, and highlights the potential interspecies transmission of C. pecorum. Considering the presence of C. pecorum in livestock in numerous countries, and its ability to infect a wide range of host species, it is an organism which must be considered in relation to the potential impact of agricultural land use on native wildlife species.
Environmental And Demographic Risk Factors For Scrub Typhus: An Emerging Disease In Bhutan

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Scrub typhus is an emerging zoonotic disease first detected in Bhutan in 2008, with an increasing annual incidence significantly impacting human health. Given an absence of evidence regarding major risk factors in Bhutan, we conducted a case-control study, recruiting 125 cases and 375 controls from 11 districts mainly located in southern Bhutan during October-December 2015. For each case two controls were matched by village/location and a third was randomly picked from people visiting the same hospital. Data on environmental exposures in the previous one month and demographic risk factors was collected by interview using a standard questionnaire. Rural residents had a higher risk of scrub typhus, particularly farmers who worked in agriculture fields (e.g. maize) and those who went into the forest for cattle herding, fodder or leaf litter collection. Interestingly, cases were less likely to own cats. The
significant findings from this research will be used to make recommendations to the Department of Public Health regarding cost-effective scrub typhus control and prevention measures. The outcomes will also contribute to designing future multi-disciplinary One Health environmental and wildlife studies to investigate risk factors for transmission of the pathogen from wildlife reservoirs and vector species to humans.
Whole genome based comparison of Escherichia coli O26 serogroup isolates from New Zealand dairy calves

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New Zealand has a relatively high incidence of human disease caused by Shiga toxin-producing Escherichia coli (STECs) compared to other countries, with 4.1 STEC cases per 100,000 population reported in 2014. A New Zealand case-control study carried out in 2013 identified contact with animal manure and the presence of cattle in the local area, along with contact with recreational waters, as significant risk factors for human STEC infection.

As part of a national cross-sectional study of 102 New Zealand dairy farms in 2014, sixty nine O26 serogroup bacteria were isolated from 52 dairy calves. Whole genome sequencing of isolates was performed and genomes were evaluated for within-animal, between animals on farm, between farm, and between region variations. SNP analysis revealed two distinct lineages. Virulence gene profiles of isolates were compared with in-depth epidemiological data of the dairy calves, their environment, and management factors.

A BEAST (Bayesian Evolutionary Analysis Sampling Trees) analysis was performed using the sixty nine calf O26 isolates, in addition to historical O26 isolates isolated from cattle and the dairy farm environment. This analysis was used to compare the evolution and proposed time of introduction of O26 into New Zealand with the O157 serotype.
Lead a horse to water: Contributions of veterinarians to discourse around zoonotic disease

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Communication approaches adopted by veterinarians during zoonotic disease outbreaks contribute to their clients' adoption or rejection of recommended protective strategies. Using Hendra virus in Australia as a case study, in-depth interviews were carried out with veterinarians in areas of previous Hendra virus cases. Transcripts of the recorded interviews were organised using NVivo and thematically analysed. Themes included concerns about lack of transparency in the behaviour of and communication by the company that manufactured the vaccine and the need for greater reflexivity in veterinary practice and communication. How different sources of knowledge are included in the discourse around zoonotic diseases, together with a lack of awareness of how decisions around risk are made were found to contribute to divisive risk discourse. Acknowledgement of lay sources of knowledge and an increased awareness by veterinarians of the factors involved in decision making would contribute to a more productive and engaging zoonotic disease risk discourse.
Rabies Awareness Rising for Children in Nias Island, Indonesia: Investment for the Future

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Rabies was confirmed in Nias Island, North Sumatera, Indonesia in 2010. This incident caused a public concern due to the huge impact of rabies to the community. Up to present 61 human deaths was recorded in 5 (five) districts in Nias Island, and many of that cases occurred in children. In addition to mass dog vaccination activities to control the disease, public awareness campaign on rabies transmission and prevention for children are employed to increase the knowledge and awareness of school age children on rabies. Since June 2014 to May 2016, a total of 176 schools were visited and 24,325 students had participated in this program. To see the effect of program, a pre- and post-test was conducted, and resulted in a 75.8% increase of knowledge in participated children. Participated children also showed higher awareness on animal welfare in dogs and responsible pet ownership. It's concluded that rabies awareness campaign for children is vital and can contribute to a reduction of rabies cases in both adult and children in the long term.
Association Between Biosecurity Measures and Environmental Contamination with Avian Influenza Viruses in Live Bird Markets, Bangladesh

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Live bird market (LBM) environments can be contaminated with avian influenza (AI) viruses. To determine if certain biosecurity practices could mitigate AI contamination in LBM settings in Bangladesh, during March 2015 we enrolled 10 randomly selected shops from each of 80 LBMs. We collected information about biosecurity practices and swabbed surfaces (e.g., cages, floors, slaughter area and waste bins) in each shop. Pooled samples testing positive for AI RNA were subtyped for H5 using rRT-PCR. We performed a multivariable logistic regression analysis to measure the association between biosecurity practices and environmental contamination with AI using prevalence ratios (PR). Samples from 205 (26%) of the 800 shops were positive for AI viral RNA; 60 (8%) were positive for H5 RNA. Shops that slaughtered poultry (PR 1.8, CI: 1.2-2.5) and/or those that did not sell all of their poultry every business day (PR 1.5, CI: 1.2-1.7) were more likely to have detectable AI RNA. Daily cleaning and weekly disinfection of poultry areas without a poultry-free rest day were associated with non-significantly decreased AI detection. Our study provides evidence of LBM contamination with AI and suggests that slaughtering and/or keeping poultry overnight increases the risk of contamination and could be targets for interventions.
In the Mpumalanga Province of South Africa, bordering the Great Limpopo Transfrontier Conservation Area, agro-pastoralist communities reside and are characterized by a high degree of poverty and chronic infections, including HIV. To begin to address the health challenges at this human-domestic animal-wildlife interface, we developed an innovative One Health Training and Leadership program that utilizes a comprehensive biosecurity curriculum to teach the concepts of pathogen transmission, risk assessment, and risk mitigation. Local facilitators who receive pedagogical and leadership training implement the curriculum to promote community participation and sustainability. The curriculum uses an experiential learning model and has participants conduct an integrated One Health risk assessment of their household and environment. Participants photo-document high-risk interfaces to facilitate the development of an individual, actionable risk mitigation plan. In its first implementation, nearly 90% (69/78) of participants completed the multi-week training. Mean scores on pre/post written assessments for facilitators and participant cohorts improved by 17% (p = 0.0015) and up to 9% (p = 0.0509), respectively. Qualitative analytics revealed the early adoption of learned concepts, including improved hygiene practices and enhanced livestock housing. The program's model is scalable, allowing for adaptation and implementation in resource-poor, high-risk communities around the world.
Sustaining regional animal and human health cooperation: a case study on the application of a One Health approach in ASEAN

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The region of Southeast Asia has a rapidly growing economy, underpinned by a well-developed regional political organization - ASEAN. ASEAN Member States (AMS) recognized the need for a regionally driven and sustainable coordination mechanism, including multi-sectoral collaboration, to deal with TADs and zoonoses. Hence, in 2011, ASEAN Ministers of Agriculture and Forestry endorsed the proposal to establish the ASEAN Coordination Centre for Animal Health and Zoonoses (ACCAHZ). ACCAHZ will be a platform to facilitate multi-sectoral coordination among AMS. Considering the immediate need to coordinate relevant undertakings, FAO, in collaboration with the ASEAN Secretariat, formed an ASEAN Regional Support Unit (RSU) in 2011. The ASEAN RSU supports AMS to strengthen capacities and to institutionalize One Health networks and platforms while ACCAHZ establishment is ongoing. Other notable achievements include Development of strategies and establishment of networks on epidemiology, laboratory, and communication to support TADs and zoonosis control, with emphasis on One Health, as well as joint activities between the ASEAN animal and human health sectoral bodies. The capacities of AMS in One Health coordination have been strengthened. ACCAHZ Establishment Agreement will be signed by 2016 to signify appropriate financial, technical, and political commitments from AMS, which will ensure sustainability of ACCAHZ.
The One Health Triad In Public Health Interventions In Latin America: A Systematic Review

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The One Health (OH) paradigm has developed and gained popularity in response to novel disease outbreaks in various regions of the world. In Latin America (LA), little is known about how scientists or policy makers have integrated the OH concept into their research, and which frameworks or approaches have been used to improve public health. The objectives of this review were (i) to identify and describe public health interventions that integrated all three sectors of the OH triad, (ii) to report current trends of OH research in LA, and (iii) to develop policy-level recommendations for improved OH strategies. We conducted a systematic review by searching four peer-reviewed databases (ISI Web of Science, PubMed, Scopus, Scielo), the OIE Bulletin, and conference proceedings of the One Health Commission. Our search identified 49 interventions that fit our inclusion/exclusion criteria. Sixteen different diseases were covered and the majority of OH interventions were undertaken in Brazil y Peru. Interventions were focused on zoonotic diseases (46 articles), antimicrobial resistance (2 articles) and food safety (1 article). The review demonstrates that the OH framework is under-utilized and misunderstood in several contexts in LA. We provide recommendations for improved uptake among veterinary, environmental, and public health professionals.
The sometimes unexpected benefits of laboratory data interchange

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Direct, electronic interchange of information between laboratories and key laboratory stakeholders plays a vital supporting role in laboratory operations. Enabling these communication channels supports high volume testing in outbreak situations while at the same time increasing efficiency. Our experience over many years of developing and maintaining such systems has also shown that the underlying technology can be utilised for a much wider range of purpose than was originally envisaged, bringing unexpected benefits across the system. We have repurposed our core technologies to support, for example, distributed laboratory networks, proficiency testing schemes, national and trans-national surveillance activities and quarantine operations. Some of the challenges, successes and lessons learnt from these experiences will be discussed, as will the opportunities to support and extend these technologies into the future.
Metagenomic studies of infection transmission between multiple species in rural Uganda

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Transmission of infections between species can contribute to significant outbreaks of disease in human and animal populations. Factors required for infectious disease transmission to occur between species are usually inferred after serious outbreaks but typically go unnoticed and rely on observable disease and its notification. We investigated populations on the border of Bwindi Impenetrable Forest in southwestern Uganda where endangered mountain gorillas, human and livestock interactions have resulted in transmission of zoonoses and reverse zoonoses, sometimes with serious consequences such as with scabies mortality in critically endangered gorillas. Faecal samples from mountain gorillas, regional cattle and clinically-unwell humans were analysed by next-generation sequencing to evaluate for viral, bacterial, protozoan and parasitic pathogen presence. We hypothesized that pathogens would be shared between these populations, but that particular host (e.g. relatedness) and pathogen traits (e.g. occupying the gastrointestinal tract niche) and ecological processes (e.g. contact rates) would drive different infection-sharing patterns. Preliminary analyses using k-mer based motif searches revealed similar pathogen signatures in samples from humans, mountain gorillas and cattle. Putative pathogen motifs were either shared between humans and cattle or humans and gorillas, suggesting both contact rates and host phylogeny may be important factors in facilitating pathogen sharing.
Increasing opportunities to accelerate broad environmental considerations in health exist. The World Health Organisation now recognises 25% of global burden of disease as environmental in origin and commitment to managing the environmental determinants of health is becoming increasingly urgent. The poorest of the poor are most vulnerable to environmental degradation but countries striving to lift their population from poverty through industrialisation are finding themselves at high, even extreme, environmental health risk. Even the developed world is not immune to the global consequences of externalising the environmental cost of prosperity. Promoting ecosystem health through a purely human health lens does risks distorting the integrity of ecosystems, however ecosystem and biodiversity destruction is critical and such triage is already recognised by conservation agencies. Nevertheless, as our knowledge grows on the links between destabilised and simplified ecosystems and disease emergence, reduced climate resilience, immunological, nutritional and mental health disorders, urban environments and other non-communicable diseases, our anthropocentric view of ecosystem health is growing in complexity also. Promoting complex, multi-issue, multi-stakeholder health-environment agenda is further assisted by the UN Sustainable Development Goals. Australian examples will be presented to illustrate opportunities to reap the increasing synergies of environmental and health policy.
Predominance of adults among Japanese encephalitis cases in Bangladesh, 2007 to 2015: Implications for vaccine introduction

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During 2003-2005, Japanese encephalitis (JE) was confirmed as a cause of encephalitis in Bangladesh through hospital-based surveillance. Several JE vaccines have since been prequalified by the World Health Organization, and we initiated hospital-based surveillance to provide policy makers with data to consider possible immunization strategies for Bangladesh. From October 2007 through October 2015, study physicians at four tertiary level hospitals throughout Bangladesh collected demographic and clinical information, and obtained two serum samples and cerebrospinal fluid (CSF) from patients hospitalized with fever and signs of acute encephalitis. We enrolled 6,013 patients and 514 (9%) of these had IgM antibodies against JE virus in their CSF or serum. The median age of JE positive case-patients was 30 years (range: 1-99 years) and 325 (63%) of them were male. Overall, 65% of the JE positive case-patients were aged above 15 years. The age distribution of JE case-patients in Bangladesh is different from most other endemic countries in Asia, where JE primarily affects children. JE vaccine should be introduced into the routine immunization program to prevent infections; however, mass vaccination for JE should also be considered to protect adults in high incidence areas.
Scrub Typhus: An Unrecognized Zoonotic Disease Of Huge Burden In Bhutan’s Population

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Scrub typhus was first identified in Bhutan in 2008. However, its actual burden and spatio-temporal distribution in the population was not described. Therefore, the aim of this study was to estimate its burden and describe its epidemiology. The data on scrub typhus cases were collected from all the district hospitals (twenty) of Bhutan for 2015. The cases were diagnosed
either by rapid diagnostic tests or ELISA. Data on the time, place, person and clinical features of scrub typhus was collected from the respective hospitals. The southern districts of Bhutan with subtropical and larger areas for farming were mostly affected. Although few cases were reported throughout the year, cases mostly peaked from July to September coinciding with high rainfall and agricultural activities. The rural residents were mostly affected compared to urban residents. The typical clinical features observed were prolonged fever, headache, myalgia, rash or eschar with few cases presented with multi-organ involvement. In conclusion, this study indicated that huge scrub typhus burden observed in Bhutan remained unrecognised. The outcomes of the study will be used to create awareness and educate policy makers and clinicians, and develop its comprehensive control policies taking the One Health approach.
Decline in human brucellosis following Rev1 livestock vaccination in Azerbaijan: an interrupted time-series analysis

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Livestock vaccination remains one of the most effective methods for controlling brucellosis in both humans and animals. Despite the human health benefits of animal vaccination, there is a paucity of evidence on the effectiveness of these campaigns in low and middle income countries. The purpose of our study was to evaluate the impact of a Rev1 small ruminant brucellosis vaccination campaign on the risk of human brucellosis in Azerbaijan (1995-2013). We used an interrupted time-series framework with an A-B-A reversal design to estimate the effect of the livestock vaccination policy on human risk. To identify geographic variation in the impact of the control program, we analyzed data from seven regions in Azerbaijan. Our results showed a post-vaccination decline in human brucellosis, nationally, of ~1% per month. Overall, human brucellosis was reduced by 34% by 2013. Regional analyses showed variation in the decline of brucellosis from 2-65%. In conclusion, our findings support the human health benefits of livestock vaccination. We documented a decline in human brucellosis following an intervention campaign aimed at decreasing brucellosis in small ruminants and humans; however, we found spatial variation in the impact of the control program that can be used to target future efforts.
Human Outdoor Defecation And Time-spatial Patterns Of Human Activity In Endemic Area Of Liver Fluke In Savannakhet Province, Lao Pdr

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Human feces containing embryonated eggs released outdoors played an important role on liver fluke transmission. To determine how time-spatial patterns of human activity influenced their Outdoor Defecation (OD) behavior, the authors recruited 30~63 adult villagers to participate in a seven-consecutive-days survey in farming, semi-farming and off-farming season in 2010 and 2011. Methods: Data collection and analysis included: (1) using portable GPS to record activity and farmland position of participants; (2) recording self-reported day-time activity log; (3) using self-reported defecation times to obtain defecation sites from GPS records; (4) using spatial analysis tools to determine the activity range of participants. Results: (1) Percentages of males' ODs were more than females; (2) in farming and semi-farming season males conducted OD more frequently than females (t-test, P<0.05); (3) in farming and semi-farming season, outdoor work time correlated with OD frequency significantly. Discussion: (1) the times spent outdoors influenced frequency of OD behavior (2) to alleviate potential pollution from OD, it is necessary to take more preventive measures (e.g., education) to control OD behaviors, especially among male villagers; (3) the authors recommended to develop simple-safe toilet in wild area or safer OD method, since the local villagers have to spend longer time outdoors.
The Ripple Effect: Understanding culture and responding to suicide stigma in Australian farmers.

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Australian farmers live and work in cultural and social conditions that affect their wellbeing, and their ability to access appropriate support services. Farming men have an increased risk of suicide and are exposed to the suicidality of others. Self-stigma arising from an experience of suicide is common. Stigma - actual or perceived - can lead to feelings of isolation, weakness, shame, a sense of rejection, an ongoing risk of suicide, and poor health outcomes.

Validated survey tools - the Stigma of Suicide Scale (SOSS) and the Literacy of Suicide Scale (LOSS) - will be used pre and post intervention to measure changes in stigma and literacy. The target population is 473 farming community males aged 30-64 years with an experience of suicide. The digital intervention comprises 5 chapters comprising digital stories; means for telling their own story; personal goal setting; information about suicide, stigma, health and wellbeing; and, links to support. The website will launch June 30th 2016 and run until January 2017.

This presentation will discuss the first wave of participants and early analysis.

This digital intervention recognises the social and cultural context of farming life and work, particularly farmers' willingness to help others while often avoiding seeking help themselves.
A One Health Approach for Surveillance of Antimicrobial Resistant Bacteria

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Antimicrobial resistance (AMR) is a major public health concern that merits international surveillance using harmonized approaches across matrices from animals, people and the environment. This interdisciplinary team has identified multiple resistant bacteria using robust and practical methodologies for laboratories across the globe. Wastewater treatment influent and effluent, hospital and community wastewater, recreational waters, livestock, and people were examined for the presence of Methicillin Resistance Staphylococcus aureus (MRSA), Vancomycin-resistant Enterococcus (VRE), Extended Spectrum β-Lactamase Enterobacteriacea (ESBL) and Carbapenem-resistant Enterobacteriaceae (KPC). Relative abundance and AMR properties are measured phenotypically by Kirby-Bauer disk diffusion, isolated with differential and selective agars, and by molecular characterization. Specific results from the enumeration and characterization of AMR strains shared across sample medias and collaborating global sites suggests possible sources and persistence in the environment and community. For example, our preliminary analysis of ESBL showed a 24.06% positive detection of total coliform in waste water influent compared to 0.03% positive detection in post treatment waste water effluent. The significance of these findings to veterinary science and human medicine, including agricultural food production, has wide reaching implications for establishing a global One Health surveillance scheme. Funding support provided by Colorado State University One Health Institute.
A Community Participatory Intervention Model To Reduce The Health Risks From Biogas Wastewater In Hanam Province, Vietnam

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In Vietnam, using biogas to treat livestock waste is common, in particular on small holder farms. However, most small holder farms do not know how to use biogas correctly and wastewater can affect health and the environment. Using a participatory approach with farmers and other stakeholders we developed and implemented a set of interventions in Hanam province to reduce health risks from biogas wastewater. Twenty-four pig farmers were selected as a "core group" to be instrumental in developing the interventions and training other farmers to correctly use biogas. The intervention model was piloted for 6 months. Several outputs were obtained including i) approval and enforcement of a "huong uoc - village law" on environmental protection; ii) training of 24 farmers from the core group in communication skills to share information on using biogas; iii) development of a 6-step program of pig cage cleaning to limit waste loaded to biogas to improve the efficiency of biogas production; iv) a health monitoring books for humans and animals for use by families in the community. The results provided evidence that applying the participatory approach can lead to improved knowledge and practices of farmer using biogas and can reduce the health risks from biogas wastewater.

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Despite nearly two decades addressing zoonotic influenza in production systems and live bird markets (LBM) in Asia, substantial gaps persist in understanding the effectiveness of adopted risk management/disease control measures. A collection of methods - from altering marketing practices to surveillance/culling and vaccination - have been employed to various effect. We describe a dual track methodology to elucidate effective, actionable zoonotic influenza risk management strategies, conducting both a systematic review of available information (formal and informal) and a qualitative and quantitative analysis of measures as adopted in specific geographic areas in China, Indonesia, and Vietnam through case studies. The study covers elements under three broad approaches: exposure avoidance, enhanced immunity/vaccination, and controlling viral load via reduction of infected animals, plus other supporting measures. Risk reduction of specific interventions under each approach - including, vaccination; market rest days; stamping out; and bans on keeping poultry overnight in LBM - is articulated, each with reference to applicability, constraints and cost efficacy across varied conditions. A suite of proven, targeted, cost effective risk management options for avian influenza is provided. Collectively, these approaches outline options for governments, industry, and value chain stakeholders toward reduced zoonotic influenza risk, improved food security, enhanced livelihoods, and protecting global public health.
One Health Reinvented: Can veterinarians be used as sentinels to determine the distribution of brucellosis in dairy animals?

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Brucellosis is a neglected zoonotic disease causing huge health and economic impact in developing countries. Surveillance for this disease in dairy animals is expensive and logistically difficult. This study was conducted to investigate if veterinarians and para-veterinarians - who acquire infection by repeatedly coming in contact with secretions and excretions of infected animals - could be used as sentinels to determine the distribution of the disease in dairy animals. Serum samples were obtained from 296 veterinarians and para-veterinarians in a brucellosis endemic district of India and tested using ELISA. SaTScan analyses were conducted to identify spatial clusters with high and low prevalence of IgG and IgM antibodies. The analyses identified one significant (P=0.0091) cluster of high IgG positives; additional non-significant clusters with either more than or less than IgG and IgM positives than expected were also identified. The results confirm that brucellosis is spatially clustered among veterinarians and para-veterinarians, probably reflecting the bovine prevalence in the region in which they are working. The use of veterinarians as sentinels to target brucellosis control is being further investigated based on the testing of bulk milk samples obtained from village clusters. Implications of the results for brucellosis control in developing countries will be discussed.
Integrating market chain assessments with porcine zoonoses risk analysis in two cross-border value chains in Lao PDR

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Integration of market chain and zoonoses risk analysis methodologies has the potential to improve our understanding of risk mitigation for transmission of human and animal diseases, including zoonoses. In this study, information gained from smallholder pig farmer/trader interviews was integrated with serological surveys for pig-associated zoonoses such as hepatitis E virus, *Taenia solium* and *Trichinella* to identify potential linkages between disease risk and pig production/slaughter in low input systems across the country. *Trichinella* and HEV exposure was high in both humans and pigs in both study areas, significantly associated with pig slaughter and the subsequent consumption and handling of raw pork products. *T. solium* demonstrated a strong geographical and ethnic association with the northern study area bordering Vietnam. With the right knowledge and accessible, affordable inputs, the majority of smallholder farmers indicated a willingness to increase economic investment in pig production, which could simultaneously improve livelihoods and decrease disease exposure through increased access to formal markets and improved slaughter processes. Assessing risk in this way highlights the importance of a systems-based approach to improving the understanding of the Lao PDR livestock sector in accordance with the country's recent accession to the World Trade Organization.
A model to estimate the impacts of future agricultural production scenarios on human health associated with micronutrient intake

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A number of studies have modelled effects of future agricultural production scenarios on 'nutrition' in order to estimate the impacts of the relationship between agricultural production, environment and human nutrition. These studies largely focus on energy intake and/or intake of carbohydrates, proteins and fats. Micronutrient deficiencies are responsible for stunting and wasting in numerous parts of the world with Vitamin-A and Iron Deficiency being leading causes of morbidity and mortality. Inclusion of micronutrients in nutritional models will enable more holistic assessment of the health impacts of future diets. The Nutrition Integration in Sustainability Analysis (NISA) model is designed to couple with existing agricultural models that provide forecasts and scenarios of future commodity availability. NISA provides estimates of the intake of food groups and micronutrients as well as the amount of dietary related health (deaths, DALYs) and economic (losses to economy and productive capacity) burden attributable to insufficient/inappropriate intake. The process behind NISA is described so it may be performed in any country setting provided there are locally representative food composition databases and food surveys. NISA allows a deeper evaluation of the impacts of sustainable diets and the interactions between the agricultural industry, the environment and human health.
The Zoonotic Risks Presented By Novel Australian Swine Influenza A Viruses: Impacts At The One Health Interface

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Bidirectional spillover transmission of influenza A viruses (IAV) occurs worldwide between human and domestic swine populations. Introduction of human seasonal IAVs into domestic pigs contributes to the diversity of swine influenza viruses due to the propensity for IAV genes to reassort in pigs. IAV strains tend to subclinically circulate in swine herds, undergoing minimal change for decades, and thus pose an ongoing pandemic risk to the human population that may be immunologically naïve to swine strains of virus. Following the 2009 emergence of the reassortant pandemic H1N1 (pH1N1) in people, together with the potential for reassortment of avian, human and swine influenza viruses in pigs, there has been an urgent call for increased global surveillance of IAV strains in pigs. In Australia in 2012, reassortant strains of H3N2 and H1N2 with pH1N1 genes caused respiratory outbreaks in Australian piggeries, indicating the likely endemic presence of novel swine IAV in Australian domestic pig populations. The One Health impacts of potential zoonotic transmission events involving these emergent reassortant swine influenza viruses, an assessment of the potential for new pandemic risk, and the need for better understanding and monitoring of IAVs circulating in domestic pig populations in Australia and globally are discussed.
Watershed Diagnostics for Improved Adoption of Management Practices: Integrating Biophysical and Social Factors Across Urban and Agricultural Landscapes

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The Chesapeake Bay situated on east coast of the United States has undergone considerable water quality degradation over the past 60 years. There has been little improvement in water quality with the focus of previous research and intervention on technological or social components alone. We propose a shift away from discipline-specific research and intervention towards an integrative research, extension, education approach that embraces both biophysical and social dimensions of pollution transport and Best Management Practice (BMP). We describe an inter-disciplinary project that has developed next-generation GIS-based assistive tools that integrate biophysical and social factors to target pollution hot spots and prescribe appropriate BMPs in urban and agriculture watersheds. It used social research to evaluate stakeholder attitudes and behaviours towards watershed health and BMP adoption, and combined these results with biophysical research within a Diagnostic Decision Support System (DDSS) to strengthen the technical abilities of community, State, and Federal partners at precisely targeting effective BMPs. Ecosystem-orientated education programs and technology transfer were applied in cooperative partnership with community associations and State officials in study watersheds to improve effective outreach strategies and lower BMP adoption thresholds so that greater advancements and actions can be made towards watershed sustainability.
Efficacy Of Commercial Vaccines For Highly Pathogenic Avian Influenza H5n1 In Indonesia: A Systematic Review

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The recent upsurge of HPAI-H5N1 (H5N1) in Indonesia highlights the importance of ongoing evaluation of avian vaccines. We conducted a systematic review of the efficacy of commercially available vaccines for H5N1 in Indonesia. Seven databases were scanned to identify relevant studies published up to January 2016, yielding 11 publications. Two references were also reviewed (13 publications). 'Classical' low-pathogenic and 'Indonesian' (Clade 2.1.3.2) influenza vaccine seeds were tested in 12 studies involving chickens, and one in ducks. Classical-seeded vaccines showed limited immunogenicity in chickens against clade 2.1.3.2 antigens (GMT<8). Accordingly, two days post challenge virus shedding was observed (with full survival), but only 30% of birds survived to day 14 post-challenge. Clade 2.1.3.2 seeds induced sero-protective (GMT >32) titres in chickens, preventing viral shedding and mortality over 2 weeks following homologous challenge. Poor cross-reactivity of these vaccines was observed against new dominant duck-origin clade 2.3.2 viruses. Only 50% of chickens developed titres deemed sero-protective, and no ducks showed evidence of cross-immunity. Surprisingly, only ducks (67%) survived subsequent viral challenge. Efficacy of classic vaccines against new circulating viruses is limited, while assessment of new vaccine seeds remains incomplete. Continuous re-evaluation of vaccine efficacy is warranted, to aid control of H5N1 in Indonesia.
Differences In Occupational Risk Exposure To Brucellosis In Veterinary Personnel In India

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Brucellosis is a serious zoonotic disease transmitted by many species of animals. Previous work in India found that veterinary nurses and animal handlers were at greater risk of brucellosis infection than veterinarians despite adjustment for personal protective equipment use. This study aimed to investigate differences in occupational exposure risk among the three cohorts. Responses of 67 veterinarians, 134 veterinary nurses and 95 animal handlers from the Punjab state of India to a cross-sectional survey performed in 2015 were analysed using binary logistic regression and Kruskal-Wallis Tests. Compared to veterinarians and handlers, nurses handled more retained placentas in one month prior to the survey (p<0.001). Stillbirth cases were handled mostly by nurses, followed by handlers, with both exposures significantly greater than exposure for veterinarians (p<0.001). Age-adjusted odds ratios indicated that nurses and veterinarians were 2.5 times and 8.9 times less likely to drink raw milk, respectively (95% CI: 1.1-5.5 and 2.4-58.8; p=0.001) and 5.5 times and 8.0 times more likely to have previously been tested for brucellosis, respectively (95% CI: 2.6-10.7 and 3.9-17.3; p<0.001), compared to handlers. The results suggest that control and education programs targeted at veterinary nurses and animal handlers should be developed to reduce their level of exposure.
Knowledge Attitudes And Practices Of Clinicians Concerning Administration Of Post-exposure Prophylaxis In Low Risk Areas For Rabies In Bhutan.

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Bhutan has an area close to the Indian border where canine rabies occurs sporadically and causes some human deaths, and a much larger hilly and mountainous area where rabies is considered absent, although one case occurred in the capital in 1992 due to movement of a dog. Yet substantial numbers of people in low risk areas are given post-exposure prophylaxis (PEP) following dog bites, and most of the cost of PEP has been incurred in districts with no reported cases of rabies for at least a decade. Clinicians at 30 hospitals and basic health units in these districts who prescribe PEP were interviewed concerning their knowledge and practices. Those interviewed comprised 60% health assistants, 30% medical graduates, and 10% diplomates. Training in the use of PEP has only been undertaken by 30% of respondents, and only 5% could correctly classify the rabies risk of patients as in the National Rabies Management Guidelines. No clinicians administered rabies immunoglobulins. Less than 10% of clinicians advised local livestock officials when they had examined a possible human rabies case. Over 80% of clinicians who saw a person after a dog bite administered tetanus toxoid. There is a need for expanded training in rabies prophylaxis.
Village Chicken Ownership, Irrespective Of Location Of Overnight Housing, Has A Positive Impact On Height-for-age Z-scores Of Infants And Young Children In Central Tanzania

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Scavenging poultry transform environmental feed sources into highly nutritious foods for human consumption, of particular value for intrauterine and early postnatal growth and development. Current research is assessing the potential for vaccination programs against Newcastle disease in village chickens to contribute to sustainable improvements in children's nutrition. A total of 510 children <24 months of age from eight communities in a semi-arid area of Manyoni District, within the Rift Valley in central Tanzania, were randomly selected to participate in a cluster-randomised controlled trial beginning in May 2014. Six-monthly data on health and nutrition, household characteristics and livestock ownership, and fortnightly data on chicken numbers and the occurrence of diarrhoea in children, were analysed jointly to assess
their impact on height-for-age Z-scores (HAZ). Children from households owning chickens had significantly higher (improved) HAZ than those from households without chickens (-1.76 vs. -1.90; p=0.03). Higher HAZ was also associated with improved toilet facilities (-1.67 vs -1.99; p=0.02) and reduced incidence of diarrhoea (p=0.004). Separate analysis found no association of diarrhoea in children with chicken ownership (p=0.9), or with the practice of keeping chickens within human dwellings overnight (p=0.2). These findings support the potential of poultry-based interventions to improve nutrition in resource-poor settings.
One Health Actions in a small nation of Bhutan: Sharing its experiences

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Bhutan is a small country sandwiched between India and China; known for its unique development philosophy of Gross National Happiness and as the only carbon-negative country in the world. Bhutan has started implementing this holistic One Health activities, which is in close consonant with its unique development philosophy since the first report of H5N1 outbreaks in 2003-2004. Since then number of initiatives including policies, institutional and organization set up of One Health, integrated (multi-sectorial) disease prevention and management plans (e.g. Avian and Human Pandemic Influenza Preparedness and Response Plan), Prevention and Control Guidelines of Rabies, Anthrax, etc were developed jointly. Furthermore, number of One Health collaborative research on zoonotic diseases (e.g. rabies, anthrax, scrub typhus, etc) including evaluation of effectiveness of implementation of One Health approach on zoonoses management were carried out. Bhutan One Health Strategy has been adopted to institutionalize the coordination and One Health capacity building. To train future leaders and sustain One Health capacity building, medical and veterinary doctors are being trained in One Health Epidemiology Fellowship with support from the EU and Massey University currently. This presentation will share Bhutan's experiences (success and challenges) of implementing One Health activities at policy decision making to field levels
Strengthening disease intelligence through One Health field epidemiology capacity development

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Disease intelligence is based on an understanding of epidemic patterns, and the application of this knowledge to disease control and prevention. Without good-quality epidemiological information, it is not possible to determine the protective and risk factors associated with the frequency and distribution of diseases in a population. Field epidemiology has become a major principle in human health and animal health services. Field epidemiology training programs (FETP) includes exposure of health professionals to real-life health problems, whereby the principle is training by providing services. Problems often times require multidisciplinary problem solvers; hence, FETP train professionals with background on medical, veterinary medical and other related health sciences. FETP can be a practical means of actualizing the One Health approach based upon shared needs and mutual benefit. One such model for sustainable, joint capacity development in field epidemiology under a One Health approach has been initiated in Thailand. Regional FETP for veterinarians (FETPV) is a living branch of a mature International FETP, which could support the development of wildlife and ecosystem needs under a broad One Health canopy. The model is being adopted in and expanded to other countries in Asian region.
Social Network Analysis Of Poultry Related Movements In Purbalingga District, West Java, Indonesia.

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Poultry movement is considered an important means through which highly pathogenic avian influenza (HPAI) H5N1 virus spreads within the poultry sector. We use a Social Network Analysis (SNA) approach to understand the interconnectivity of farms and live bird markets, as the result of poultry-related movements in Purbalingga District, West Java Province, Indonesia. A poultry census of poultry enterprises including backyard poultry and commercial farms, live bird markets, poultry collector yards and traders was conducted in early 2016 in Purbalingga District. The objective of the census was to obtain baseline information on poultry enterprises as well as production practices and poultry movements that could potentially affect the persistence of HPAI H5N1 within the district. Movement-related details captured from each enterprise selected included source and destination of poultry and related products, frequency of movements, the quantity of commodities moved and the history of any HPAI H5N1 occurrences. The resulting network of movements between enterprises was analyzed using SNA methods to determine the main components and transmission potential, as well as risk factors for historical H5N1 virus persistence. We discuss the study findings and implications for targeting avian influenza control measures.
"Knowledge is power" – using social science to understand horse owner behaviour on Hendra virus

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Hendra virus (HeV) causes periodic and frequently fatal disease in horses and humans in Australia. Spillover occurs from flying foxes - the natural reservoir - to horses to humans. Prevention and risk mitigation strategies, such as vaccination of horses and property management measures, are widely publicised, but hinge on initiative and action taken by horse owners as they mediate management, care and treatment of their animals. Hence, a qualitative approach was used to investigate key determinants and decision-making processes of horse owners related to the adoption of recommended HeV mitigation measures. Semi-structured face-to-face interviews were conducted with 27 horse owners in HeV risk areas, covering experience with HeV, risk perception and mitigation, attitudes and HeV information-seeking behaviour. Interviews were recorded, transcribed verbatim and analysed with NVivo using thematic analysis. Identified key elements included HeV risk perception and modifying factors, applied risk mitigation measures and perceived barriers and benefits. Different perceptions of risk, as well as barriers and benefits, resulted in different behaviours evidently associated with equine management, animal welfare, social and financial issues. These findings facilitate a better understanding of horse owner perspectives driving preventive health measures for horses.
and provide valuable feedback to stakeholders in refining effective risk communication strategies.
Agrichemical exposure in Victorian farmers – Is there a human cost to maximising food production?

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In-field Personalised Cholinesterase Assessment Project (PCAP) is identifying the effect on cholinesterase (ChE) inhibition in Victorian farmers caused by the application of organophosphates (OPs) and ChE inhibiting insecticides. Accurate field assessment is particularly important for remote rural communities and current available measurement does not accurately estimate individual risk.

Funded by the Shepherd Foundation and commencing in April 2016, this work trials an innovative, transportable assessment tool, identifying farmers with reduced ChE activity, who are at risk of neurological symptoms and/or chronic exposure. Using oxime regeneration to stimulate recovery ChE in vitro - a more accurate and meaningful estimate of the percentage inhibition of cholinesterase - is generated for the farmer. This new approach will provide farmers with instant results from a measurement tool using their own ChE inhibition range.

Currently being validated across 10 time points in 5 Victorian locations, the study involves 61 farmers and agricultural workers (crop and/or livestock) aged between 20 - 75 yrs. This presentation will discuss the first 6 months results generated using this novel, objective and portable field test.
Minimising exposure through engagement and education, this research is providing farmers with evidence and fast, individual results, resulting in practice change, attitude shift and prevention of further exposures.
Antimicrobial resistance poses a serious threat to medicine and safe food production. The number of deaths from antimicrobial-resistant infections is expected to rise to 10 million p.a. by 2050 of which 3 million p.a. are predicted to succumb to infections caused by multi-drug resistant \textit{Escherichia coli}. Intensive food animal production practices are a large consumer of antibiotics. There is a pressing need to gather genomic surveillance data on the emergence and spread of antimicrobial resistance in food animals and monitor the effects on microbial populations in the environment that are impacted by the release of the waste they produce. AUSGEM (Australian Centre for Genomic Epidemiological Microbiology), a joint initiative between the NSW Department of Primary Industries and the ithree institute at the University of Technology Sydney (UTS), is generating genomic surveillance data of multi-drug resistant \textit{E. coli} from humans and food animals and the environment and examines the phylogenetic relationships they may share. Antimicrobial resistance and virulence gene cargo carried by multi-drug resistant \textit{E. coli} are catalogued and the genetic elements that mobilise resistance and virulence genes are characterized using long read sequencing technology. The datasets provide an unparalleled insight into the composition of genetic elements responsible for the capture and mobilisation of antimicrobial resistance genes and facilitate the development of diagnostic assays to track their movement.
Successful collaboration for joint control of avian influenza in Indonesia using a One Health framework

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Cross-sectoral collaboration to control avian influenza (AI) was pioneered between the animal health and public health sectors in Indonesia since the first human case was recorded in June 2005; human cases peaked in 2006 and have been significantly reduced each year in parallel with a reduction in highly pathogenic avian influenza (HPAI) in poultry. Based on the identification of risk factors for spread of H5N1 subtype HPAI from poultry to humans, either through direct contact with infected poultry or indirectly via contaminated live bird markets, collaborative AI control activities were established. Key factors in enabling this successful outcome were: 1. Cross-sectoral networking between Participatory Disease Surveillance and Response (PDSR) animal health staff with public health District Surveillance Officers (DSO) to rapidly detect, report and respond to AI cases in poultry and suspect avian influenza cases in humans; and 2. Improved diagnostics and development of an influenza virus monitoring (IVM) network and IVM web-based platform to characterise H5N1 viruses both antigenically and genetically; H5N1 viruses’ characterisation informed national vaccination policy, contributing to more effective control. The importance of these components - and the lessons to be learnt for controlling zoonotic diseases - will be highlighted and discussed.
Combining climate data with drought declarations to create a definition of drought for human wellbeing research.

Ivan Hanigan
Luciana Porfirio, Michael Hutchinson

Droughts are times of extreme water scarcity easily recognised by people experiencing them, but difficult to define objectively. Delineation of spatial extent, duration and intensity of droughts is particularly problematic and this hinders research on the impact to human wellbeing. Various studies have correlated indicators of drought with measures of human wellbeing however results have been inconsistent and show droughts were associated with decreased wellbeing in some contexts but not others. This may be due to the use of improper definitions of drought that may not be sensitive to variations that are socioeconomically important in determining impacts on humans. Common drought definitions range from rainfall based approaches to complex integration of natural, socioeconomic and subjective factors such as those used in drought declarations by governments. Our method combined a monthly climatic drought index computed from over 100-years of rainfall records with 25 years of government declared droughts. We aimed to determine starting and ending criteria for discrete periods of climatic drought that show best agreement with government drought declarations. With droughts predicted to increase in some regions due to climate change it is important to develop a richer understanding of what drought is and how it may affect human wellbeing.
One Health – One Assay? - Guidelines For One Health Studies When Using Serological Assays For Infectious Diseases In Different Species And Populations.

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One Health studies often involve sampling different species, with objectives such as detecting wildlife reservoirs or 'dead-end' hosts. When detecting the presence of infectious agents, the same test system (e.g. viral isolation or PCR) can be applied with a common protocol. However, when testing for serological evidence of infection, the situation is more complex, and when a single assay is applied across different species, factors such as genetic differences, history of exposure to target and non-target antigens may affect the quality and confidence for the result. For similar reasons, there can also be differences in the significance of results generated from intra-species testing on populations, particularly influences from the infectious agent milieu. We refer to antibody assays for Influenza A, Japanese encephalitis, Nipah and MERS to present examples in the application of serology tests for across animal species and populations to highlight pitfalls and guide the valid representation of data. For the non-serologist, we suggest advice from expert sources should factor in planning; an awareness of assay limitations in the context of intended use should guide selection; the use of use alternate confirmatory assays; the application of statistical tools for comparison of data sets and inclusion of appropriately qualified results.
Equine Neurological and Acute Respiratory Syndromes - Targeted zoonotic viral testing - Australian horses as sentinels for emerging infectious disease.

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Over 1200 horses are tested annually for Hendra virus (HeV). Many of these display acute neurological and or acute respiratory symptoms and many die or are euthanased due to their illness. In the majority of these cases no causative diagnosis is reached and many have indication of infectious cause. A similar phenomenon is well appreciated in human medicine where no causative diagnosis is reached in approximately 70% of human encephalitic deaths in Australia - most of which feature hallmarks of infectious cause. In this study we aim to further examine samples from horses already tested for HeV (not detected by PCR) and in which no other causative diagnosis was reached. Further serological and molecular testing was undertaken in an effort to diagnose infecting agents. Next generation sequencing will also be utilised. Initial results from the study will be presented at the congress. This pilot study represents the first results of a five-year research collaboration investigating Australian clinical horses and horses with defined exposure to bats and mosquitoes as sentinels for emerging infectious disease.
Brucellosis; A review of Brucella submissions in Australia

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Brucellosis is one the most economically important zoonoses globally with 500,000 reported cases per year. \textit{Brucella} affects a wide host range including humans, livestock and wildlife. Australia is free from three of the four main zoonotic terrestrial \textit{Brucella} species. In Australia, \textit{Brucella suis} infection in humans usually arises from hunters coming into contact with infected wild pigs either directly or via the owners dogs. Since its eradication in the early 1990s, \textit{Brucella abortus} incursion has mainly been associated with travellers from endemic regions. Despite freedom from specific \textit{Brucella} species, over the years there has been many cases of both human and animal brucellosis in Australia. We are presenting a review of submissions made to the Australian \textit{Brucella} Reference Laboratory at the Australian Animal Health Laboratory and discuss the requirement for further development into diagnostic assays for detection and identification of isolates.
Rabies has been endemic in Nepal since time immemorial and outbreaks are reported throughout the year with an estimated 100 - 200 human deaths yearly. Rabies circulates in two epidemiological cycles, namely urban and sylvatic cycle with predominance of the urban cycle in Nepal. We did a descriptive epidemiological study on the secondary data on animal and human rabies in Nepal. Data on animal rabies was obtained from the Veterinary Epidemiology Center from year 2003 to 2014 which were collected through the passive reporting system. Official reports from the Department of Health on human rabies and post-exposure prophylaxis and several peer-reviewed articles on animal and human rabies in Nepal were reviewed. Temporal and spatial analysis was performed to review the trend of animal and human rabies in Nepal. Graphs and maps were generated with identification of rabies risk areas in the country. The results showed a higher number of cases occurred in January and July, although cases were seen all year round. On average, 17 districts recorded outbreaks of rabies every year. This information will contribute towards developing an integrated human and animal rabies control program in Nepal.
Modelling habitat suitability and connectivity of feral pigs for exotic disease surveillance in northern Australia

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4CSIRO Health & Biosecurity

Exotic animal diseases pose a significant threat to Australia's livestock industries and biosecurity system, potentially impacting animal health, trade and biosecurity spending. Risk-based early detection surveillance typically considers the likelihood of disease introduction, establishment and spread. For many diseases, feral animal hosts such as pigs (Sus scrofa) are a well-known risk factor, facilitating both establishment (in locally growing populations) and spread (through dispersal). Yet, spatially-explicit knowledge of feral pigs at the regional scale remains limited. We modelled habitat suitability for feral pig breeding and connectivity between habitat patches for dispersal across northern Australia under two seasonal (wet and dry) scenarios. Our modelling approach combined (a) expert-elicited Bayesian networks of habitat requirements allowing extrapolation to the regional scale, (b) spatial analysis for integrating landscape-scale mobility within local populations, and (c) network graphs for measuring patch connectivity across multiple dispersal pathways. Validated models showed feral pig habitat to vary between seasons, retracting to core "sources" under dry conditions and expanding widely during the Wet. Our research provides, for the first time, coherent regional-scale knowledge of at-risk areas for disease establishment and spread in feral pigs. Results could be incorporated as improved parameters into surveillance frameworks and help to effectively target resources.
Wide variety of clinical presentation of human poxvirus infections

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Although smallpox has been eradicated more than 30 years ago, several other poxviruses have been causing zoonotic human infection in various regions of the world. Monkeypox viruses are endemic in Africa, Vaccinia-like viruses in South America and Buffalopox virus in India. In Europe the most prominent orthopoxviruses are cowpoxviruses. Originally known as the virus Edward Jenner used for his pioneering vaccination trials, these viruses are today characterized as having the largest genome of all orthopoxviruses, with the broadest host range and a usually mild clinical outcome in immunocompetent humans. Both animals and humans show local exanthema on arms and legs or on the face. Individual combinations of cowpox variant and host species can be fatal, as well as infections in immunosuppressed patients. However, since physicians often fail to consider poxviruses and the clinical presentation of human cowpox is varying dramatically, differentiation from other skin diseases may be challenging. Since vaccination-related immunity in the world's population is waning, an increase of poxvirus zoonotic infections is to be expected. Hence, molecular diagnostics including differential diagnosis is required. Here we present a selection of unexpected clinical presentations of human poxvirus infections observed during our ten-year experience as German Consultant Lab for Poxviruses.
Bacteriophages against Francisella tularensis

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Naturally occurring tularemia is a zoonotic disease of animals and humans caused by the bacterium *Francisella tularensis*. The aim of this work was isolation and detection of *F. tularensis* bacteriophages. For isolation of bacteriophages, an enrichment method was performed in BHI broth supplemented with 0.1% cysteine, 1% glucose, and a mix of antibiotics. Eight tick and three soil samples, collected in the region of Kartli, Georgia were used as sources for phage isolation. One vaccine (Ft-LVS) and four virulent strains (Ft-4809; Ft-4812; Ft-6958; Ft-8932) were used for inoculation. Enriched samples were cultivated for 96 hours at 37°C. Bacteriophages were detected by spot test assay, liquid culture lysis, and transmission electron microscopy (TEM). According to spot test assay, several transparent zones appeared on bacterial lawn on CHAB-medium indicating lytic activity of five samples against corresponding bacterial strains; whereas the lytic activity in BHI was revealed by six samples. According to TEM results, bacteriophages belong to *Syphoviridae* and *Myoviridae* families. Several phages with lytic activity against vaccine and virulent bacterial strains of *F. tularensis* have been isolated in Georgia. The phages are not stable, although they reveal strong inhibitory activity against host bacteria in liquid conditions.
State-wide wildlife health surveillance based at a veterinary faculty.

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Wildlife health surveillance is an essential component of One Health, improving understanding of reservoirs of zoonotic and livestock diseases and ecosystem health. Veterinary faculties provide an efficient and productive base for wildlife health surveillance, as demonstrated by the Canadian Wildlife Health Cooperative since 1990. Wildlife Health Surveillance Victoria (WHSV) is based at the Faculty of Veterinary and Agricultural Sciences (FVAS) of The University of Melbourne. The project engages directly with a wide range of stakeholders, including the public, and community and governmental organisations. Stakeholders report wildlife mortality and morbidity events to WHSV. Dead wildlife are transported to FVAS for diagnostic investigations which involves input from faculty staff in pathology, microbiology, virology, parasitology, molecular epidemiology, and epidemiology. This project undertakes field inspections and engages in important collaborations with other institutions (Agribio, CSIRO AAHL, Zoos Victoria, Museum Victoria). Approximately 100 cases are investigated annually with key cases entered into Wildlife Health Australia's electronic Wildlife Health Information System, feeding into a national surveillance program. These investigations have improved our knowledge of baseline and changing health patterns in native free-ranging mammals, birds, reptiles and amphibians. Examples include chronic phalaris toxicity in kangaroos and spill-over infections from introduced domestic and feral animals.
Ausvetplan – Incorporating A One Health Approach Into The Australian Veterinary Emergency Plan

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Animal Health Australia

Consultation with public health authorities and wildlife health agencies is a routine part of the development process for relevant manuals to ensure AUSVETPLAN policies and guidelines are appropriate for safeguarding animal, human and wildlife health. For 25 years, AUSVETPLAN, the Australian Veterinary Emergency Plan, has provided the national contingency planning framework for the management of emergency animal diseases (EADs) in Australia. It is a comprehensive series of manuals that set out the various roles, responsibilities, policies and guidelines for agencies and organisations involved in an EAD response. AUSVETPLAN includes response policies for a number of diseases with both public health and/or wildlife health implications, including avian influenza, Hendra virus, Japanese encephalitis and rabies. The components of AUSVETPLAN are developed and agreed upon by governments and relevant industries in non-outbreak times using a collaborative process between Animal Health Australia, its government and industry members, and other stakeholders as required. This process includes an extensive consultation phase to ensure that any underpinning scientific and technical information is accurate, that it informs policy appropriately, and that any significant concerns with the proposed policies and guidelines have been addressed before endorsement.
Empowering people in surveillance systems: strategies to motivate and enable farmers, communities and veterinary service personnel

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Biosecurity risks are increasing as a consequence of agricultural intensification, global trade, climate change and other factors, and the need for surveillance for livestock diseases and zoonoses is growing. Within domains of expertise, much is known about surveillance methodologies, information and communication technologies, and sociocultural factors that influence disease reporting. However, few examples exist where cross-disciplinary collaboration has progressed beyond a pilot stage and delivered transformative change in surveillance capacity at a national level. This presentation explores the reasons why investments in surveillance systems that do not address technical, technological and social dimensions are unlikely to be effective or sustainable. Reasons include the tendency to focus on the technical and technological domains and ignore the central role that people play in surveillance systems, as contributors and users of surveillance information. Conversely, the implementation of strategies that motivate and enable people at every level of the surveillance system - from the farmer to the central policy-maker - can substantially enhance surveillance capability and health service delivery. We discuss recent experience in Indonesia which demonstrates how a multidisciplinary team put these theories into practice to establish a national animal health information system that currently receives more than 7 000 reports per day.
Extended Spectrum Cephalosporins destroys Beneficial Distal Gut Microflora of Neonatal Pigs

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The extended spectrum cephalosporins (ESC) are considered to be critically important used for treating multi-drug resistant bacteria in humans and animals. To date, little is known regarding the effect of ESC on gastrointestinal microflora of both humans and animals. In this study, we investigate the effect of treatment with an extended spectrum cephalosporin (ESC) on the distal gut microflora of neonatal piglets and their non-treated, in-contact littermates. Piglets were euthanased on day 12 post-treatment and rectal contents analysed by 16S rRNA analysis. The bacterial community profile defined by 16S rRNA amplicon analysis of the rectal contents of the treated animals showed significant reduction in beneficial bacteria such as Lactobacillales and Enterobacteriales and increased frequency of potentially pathogenic bacterial species such as Bacteroidales and Clostridiales (P<0.05). This result was also observed among the non-treated, in-contact littermates. This study demonstrates for the first time that ESC treatment will adversely affect the beneficial bacterial flora of treated animals as well as non-treated, in-contact littermates that shared a common environment. The pig alimentary tract is well regarded as a model for its human counterpart, and it is hypothesized that settings such as human hospitals where ESCs are widely used may experience a similar phenomenon.
Wildlife Disease Surveillance In Sri Lanka: First Results From The Sri Lanka Wildlife Health Centre

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Wild animals are the reservoir for many pathogens, some of which are zoonoses, emerging diseases of animals, humans and important causes of mortality in wild animal populations themselves. Recognizing the essence of wildlife disease surveillance, a general wildlife disease surveillance program was initiated by the Sri Lanka Wildlife Health Centre (SLWHC) based on post mortem examination of wild animals found dead. Accordingly, from January 2015 to January 2016, 32 autopsies were performed on carcasses received by the Veterinary Research Institute (a collaborative institute of SLWHC), which included 9 Felines (Fishing Cats, Jungle Cats, Rusty Spotted Cats, Leopard), 5 Civets, 5 Squirrels (Giant Squirrels, Flying Squirrel), 5 Deers, 2 Langurs, 2 Parrots, a Golden Jackal, Python, Cobra and a Star Tortoise. Histopathology and further testing was conducted as required in each case. In 13 cases (41%), the cause of death was trauma leading to spinal/ brain or vascular injury. Other significant causes were; pneumonia/ pulmonary haemorrhage and oedema (4), debility due to severe parasitism (3), septicaemia (3) and enteritis (2). A Ring Tailed Civet was diagnosed with Canine Distemper histopathologically, which was not previously reported in this species to our knowledge. None of the samples tested were positive for rabies.
Selection Of Different Serology Assays In Effective Diagnostics For Hendra Virus

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Hendra virus (HeV) has a natural reservoir in Australian Pteropid bats, however zoonotic spread has resulted in almost 100 equine deaths, four human deaths (from seven confirmed infections) and two asymptomatic canine infections. An equine Hendra vaccine was released in 2012, primarily as a countermeasure against the risks for human infection - all of which have resulted from direct exposure to virus shed by infected horses. A range of diagnostic and animal management situations can arise because of the zoonotic potential of the virus and related control measures such as post-incident surveillance and equine vaccination. Appropriate selection of different assays for serum antibody against Hendra virus can be used to infer the likely nature of exposure (recent or previous) and to differentiate equine infection from vaccination responses. At the Australian Animal Health Laboratory, the use of different HeV target proteins (G and N) in different formats of Hendra serology assays (e.g. iELISA, cELISA, MAC ELISA and microsphere) provides results to assist in HeV disease investigations and in associated animal management. We present examples of HeV serology test algorithms and outline the basis for interpretation of results.
Environmental Surveillance at Live Bird Market in Greater Jakarta as part of joint avian influenza surveillance between Ministry of Agriculture and Ministry of Health in Indonesia

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Over the years most human H5N1 influenza cases in Indonesia were reported in the greater Jakarta area and had a history of direct or indirect exposure to poultry, related to visits to live bird markets (LBM). As part of a Four Way Linking framework, involving animal health, human health, virology and epidemiology, the Ministry of Health and the Ministry of Agriculture initiated joint LBM surveillance covering serological surveillance in LBM vendors and environmental surveillance at 86 LBM in Jakarta to determine the risk of H5N1 virus infection among poultry vendors. Between February and November 2013, environmental swab samples were collected every month from markets. Samples were tested by RT-PCR for both matrix and H5 genes; virus isolation was also performed. A total of 878 samples were collected of which 54% showed positive on Matrix PCR and 34% positive on H5PCR. The results indicate that LBMs in greater Jakarta have a high contamination rate with H5 avian influenza viruses, increasing the transmission risk to humans. Vendors involved in slaughtering and selling poultry are at higher risk of infection. Interventions to reduce the risk of avian influenza both for vendors and consumers are proposed.
Rabies Transmission Within Wild Dog Populations In Northern Australia

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Australia is historically free from canine rabies but it is currently spreading through the Indonesian archipelago and is now 300 km away from northern Australia. Indigenous communities in northern Australia are situated within complex ecosystems and have a high risk of a rabies incursion. They contain large populations of free-roaming domestic dogs and are surrounded by wild dog populations. Therefore, the incursion of rabies into Australia, with spillover to wild dogs, is a genuine threat. The goal of this study is to determine strategies for controlling the spread of rabies in wild dog populations in northern Australia, should an incursion occur. The distribution and density of wild dogs across the study area – as well as the extent of interactions between wild and domestic dogs - is being evaluated using a range of field approaches, including motion-activated cameras placed at strategic locations and genetic analysis of fecal samples collected in the bush. A model of rabies spread in wild dogs will be developed and tested using different control scenarios and input parameters. The decision support system developed in this project will help in planning for a potential rabies incursion impacting indigenous communities, wildlife populations and the ecosystem in northern Australia.
The Detection of Beta-lactamase Genes in the wildlife of Papua New Guinea

Zachary Lederhose

Antimicrobial resistance in wildlife has been identified in a wide range of species and locations. This study used culture-independent gene identification to detect beta-lactamase resistance in wild birds and small mammals from Hogave Conservation Area, Eastern Highlands Province, Papua New Guinea. Polymerase chain reaction to identify beta-lactamase genes was performed on DNA extracted from samples stored on DNA capture matrices and in 100% ethanol. Beta-lactamase genes SHV-1 and CMY-2 were identified from faeces of a single rufous spiny bandicoot (Echymipera rufescens) specimen.

This study demonstrates the presence of antimicrobial resistance in wild animals in Papua New Guinea. Further molecular analysis and more extensive studies are required to evaluate the prevalence of antimicrobial resistance and the origins of resistance genes. The use of DNA capture matrices is a promising methodology for the collection of samples for culture-independent resistance detection in low-resource environments.
Brucellosis is a globally widespread and debilitating zoonotic disease that is endemic in Georgia. Some Brucella species are classified as potential biothreat agents. Biotyping of Brucella by classical microbiological methods or conventional PCR (e.g. AMOS and Bruce-Ladder) is time-consuming and insensitive. MGB-based Single Nucleotide Polymorphism (SNP) is used for Brucella species identification, but MGB probes have limited stability, resulting in sensitivity loss during long-term storage. Thus we developed and validated a more stable Locked Nucleotide Acid (LNA) SNP assay to identify Brucella species. Seventy Brucella isolates (45 human and 25 animal) collected from Georgia from 2009-2011 were confirmed by real-time PCR (Brucella T1, Idaho Technology/Biofire). Species identifications were determined using Bruce-Ladder PCR along with 15-marker Multi-Locus VNTR analysis subtyping, which together differentiated the 70 strains (43 B. abortus and 27 B. melitensis). SNP typing using this new LNA assay agreed with the Bruce-Ladder results, demonstrating its utility for genetic confirmation of Brucella species in strains actively circulating in humans and animals in Georgia. Since this real-time SNP LNA assay successfully confirmed the species of Georgian Brucella isolates without exception, and since LNA assay reagents are more stable, this approach can be incorporated for sustainable testing in future surveillance efforts.
Patterns Of Highly Pathogenic Avian Influenza H5 Virus Change And Circulation In Poultry Populations In Vietnam During 2003 - 2015

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Circulating highly pathogenic avian influenza A virus H5 in Viet Nam has changed and evolved since it caused a major outbreak in poultry and humans in 2004. To date there have been five predominant HA clades in poultry - 1 (2003-2013), 2.3.4 (2005-2010), 2.3.2.1a (2009-2012), 2.3.2.1c (2012-2015), and 2.3.4.4 (2014-2015) - with cases in humans the same clade as that circulating in poultry at the time. It is likely these viruses were introduced from neighboring countries, where circulation of similar viruses was reported shortly prior to their emergence in Viet Nam. Once introduced, there appears to be two patterns of virus circulation. One pattern involves spread of virus from the north to the far south where it then evolves and circulates locally, while in the north it eventually dies out (clade 1). The other is where the virus replaces the circulating clade in the country's north and center, but is rarely detected in the south (clades 2.3.4 and 2.3.2.1a). Currently, clade 2.3.2.1c is circulating mainly in the far south appearing to follow the first pattern, while clade 2.3.4.4 has been detected in the north and the central and may follow the second pattern. Mechanisms that drive these patterns are discussed.
An often familiar cry by sustainability opponents is *Not In My Back Yard (NIMBY)*, protesting that sustainability action threatens current lifestyles or landscapes. Between 2014-2016 the *Health Nature and Sustainability Research Group*, Deakin University, Melbourne, undertook a deliberative program to both profile and model sustainability action within the University's largest campus through two research programs focused on food. This action speaks directly to the social and cultural determinants of health as a means of simultaneously influencing these determinants for positive health and imbuing them with sustainability content. Firstly a feasibility study returned over 500 positive responses to the establishment of a campus based community garden. Critical mass lead to the formation of a student sustainable food society. Following two years of campaigning, the university approved a campus based community garden in early 2016. A second research investigated the "food culture" promulgated across the campus through a survey of staff, student and food outlets and an audit of facilities for food preparation, storage and disposal. Findings revealed hidden food insecurity, dissatisfaction with campus based food options and an ineffective recycling of food waste. *Yes In My Back Yard (YIMBY)* actions to positively address these concerns and influence the social and cultural determinants of health are being pursued.
Serological Evidence Of Henipavirus Exposure Among Apparently Healthy Occupational Risk Group In Bangladesh: A One Health Priority For Control

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Nipah virus (NiV) is an emerging bat-borne zoonotic henipavirus that causes severe encephalitis and respiratory illness in people, with case fatality of 77%. In Bangladesh Nipah encephalitis is caused by drinking raw date palm sap contaminated with saliva, faeces or urine of fruit bats (\emph{Pteropus spp.}). Nipah seropositive bats are distributed throughout Bangladesh along with evidence of henipavirus exposure in domestic animals, such as cattle, goats and pigs. However human cases of Nipah disease have occurred in local clusters. In conjunction with a case-control study of practices followed by date palm sap collectors/sellers (\emph{gacchis}) and consumers in the same villages, serum samples were collected from \emph{gacchis}. Case areas in which human cases of Nipah disease had occurred were Faridpur and Rajbari, and control areas which had never reported human cases were Jessore and Jhenaidah. Samples were initially tested for the presence of Nipah virus antibodies in indirect ELISA. Any suspected positives were further tested in virus neutralization test (VNT). All of the 326 \emph{gacchis} sampled tested negative for Nipah Virus antibody in either the ELISA or VNT. Possible explanations
for the findings, and the association between serological results and epidemiological evidence from the case-control study will be described.
Impact of Hazard and Exposure on tick-borne diseases risk

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Understanding spatial variation in tick-borne disease risk is essential for disease management and prevention. However, risk results from the combination of hazard, the strength of zoonotic transmission, and exposure, the intensity of contact between people and infected. While many environmental studies focus on hazard, land use and management can also affect the other main component of risk, exposure. We study the vector-host-pathogen system through various "keyholes" informing both hazard and exposure. The first keyhole, focused on the hazard, assesses ticks and their pathogens. The second keyhole, focused on exposure, assesses woodland attractiveness, by the popularity of woodland. Landscape factors of attractiveness for recreational forest users are investigated. The third keyhole, focused on both hazard and exposure, assesses the seroprevalence of pathogens transmitted by ticks in forest workers, which are regularly exposed to tick-borne disease pathogens and at a higher risk of infection. In a One Heath perspective, we propose to combine a geographic, spatially explicit perspective, assessing, land cover, land use and management, with a detailed epidemiological outlook. All data sets are statistically analyzed using a common environmental dataset, allowing a direct comparison of environmental factors affecting hazard and exposure.
Reported Zoonotic Diseases In The Sultanate Of Oman, 2005–2015: Calling For One Health Surveillance System Approach

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In this century the global healthcare system is facing many challenges, one notable example is zoonoses. The World Animal Health Database (WAHID) interface was reviewed for notification of zoonoses between 2005 and 2015 in the Sultanate of Oman. Only five zoonoses were reported: Brucellosis, Salmonellosis, Leptospirosis, Leishmeniasis and Crimean-Congo Hemorrhage Fever (CCHF). In general the number of human disease notifications for each were higher than in animals. Among these brucellosis was the most common disease notification in both humans and animals, whereas for CCHF (a cause of the highest mortality in humans) there were no confirmed notification in animals. Human brucellosis cases increased in number during the study period whereas reporting of animal cases fluctuated. Despite the reporting and prevalence of zoonoses apparently there is no integrated surveillance system for human and animal cases. The healthcare system in the Sultanate of Oman (i.e. Ministry of Health) includes a division for communicable diseases, however a similar division focusing on zoonoses is lacking. Development of such a surveillance system for animal health and the establishment of a One Health surveillance system for zoonotic diseases is recommended to address the impact of these diseases.
Wildlife as sentinels for ecosystem health – why Skippy’s lumpy bones may matter

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In the context of One Health, we most commonly think of infectious diseases; however, a range of non-infectious diseases including toxicities may reflect on ecosystem health, an essential component of the One Health concept. Wildlife toxicology is a relatively recent field, but toxicities in free-ranging wildlife often indicate broader issues within the ecosystem, including environmental pollution. Chronic exposure to elevated levels of fluoride have been demonstrated to cause significant pathology and disease in affected human populations. We investigated bone and dental pathology and clinical signs of lameness in a range of marsupial species resident near two fluoride-emitting industrial facilities in southern Victoria and found these to be consistent with chronic fluoride toxicity indicating elevated levels of fluoride in the environment immediately adjacent to the facilities. The monitoring of wildlife for evidence of toxicity may thus be used to flag pollution issues potentially impacting on human populations, especially where fluoride emitting industry is located in close proximity to residential areas.
Some 50 years ago, most people in industrialised countries still had natural contact with agriculture and farm animals. Nowadays this connection is less common, and knowledge about how to avoid infection risks is often limited. A project, funded by the Swedish Civil Contingencies Agency, aiming at improving ways of communicating biosecurity from a One Health perspective to public, has been initiated. Veterinarians and medical officers collaborate with pedagogic and psychologic experts to create a learning material covering the four areas biosecurity aspects of zoonotic diseases, food safety, animal welfare and One Health. The organisation 4H of Sweden is a project partner. This organisation is running petting farms, to which public and pre-booked groups are welcome. Classes for youths interested in animals and how to manage a farm are run on a regular basis. In this project we focus on children 7-12 years of age. A training package will be developed in collaboration with employees, leaders and young visitors at the farms. Follow-up studies will evaluate the outcome of different communication methods. An additional outcome of the project will be protocols for the biosecurity procedures at the farms, which include guidance for visitors on how to avoid zoonotic risks.
Vietnam is a "hot spot" for emerging infectious diseases (EIDs), including zoonotic diseases arising from the interaction of humans, animals and ecosystems.

The Government of Viet Nam (GVN) has shown a strong commitment to the One Health approach. The establishment of inter-ministerial committees such as those currently active in Vietnam dealing with avian influenza and pandemic diseases, One Health Partnership, and multiple training courses on One Health offered by universities as well as included One Health in the 2011-2015 Operational Plan for avian influenza and EIDs are key aspects of the adoption of this approach. However, there is a continuing need to build strong and functional linkages across different sectors and line ministries, to clarify overall assignment of One Health responsibilities across sectoral ministries, and to include a broad range of external stakeholders.

The request for a unified national steering committee on emerging diseases that would include One Health issues, the establishment of a working and sustainable partnership among Governmental ministries, local authorities, international partners, private sector and universities, and ensuring sufficient resources available for One Health responses are major steps forward of the GVN to effectively address EIDs and transnational public health threats.
One health approaches in dealing with Salmonella and Campylobacter in Queensland

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The food-pathogen combinations of Campylobacter-poultry meat, and Salmonella-eggs are frequently associated with foodborne illness. Poultry production facilities, poultry meat, eggs and egg products can easily become contaminated either during primary production, processing, or further along the supply chain. High consumption rates and growing demand for poultry products also increase the risk of exposure by Salmonella and Campylobacter to consumers. In Queensland, the reduction of foodborne illness is a priority and is achieved through a legislative framework which is administrated by three state government agencies - Queensland Health, Safe Food Production Queensland (SFPQ) and Department of Agriculture and Fisheries (DAF) to address food safety at different levels of the food supply chain. The three agencies have developed a strategy to facilitate engagement between Queensland food regulators and the food industry in order to ensure resources are focused on appropriate action along the food supply chain to control food safety risks. These objectives are achieved through the implementation of coordinated strategies, including the Queensland Foodborne Pathogen Risk Reduction Strategy and the formation of a Science Group for a co-ordinated one health, supply chain approach in controlling foodborne pathogens in Queensland.
Addressing Antimicrobial Resistance Globally At The Human-animal Interface Using A One Health Approach- World Health Organization (WHO) Initiatives

Awa Aidara-Kane

World Health Organization (WHO)

WHO's work on the public Health impact of the use of antimicrobials in food producing animals is undertaken through different initiatives. WHO provide support to WHO Member countries to effectively respond to the increasing threat of antimicrobial resistance, with due consideration given to the importance of the food chain as a driver for emerging resistance patterns that threaten human health. In May 2015 WHO member states have adopted the Global Action Plan (GAP) to combat antimicrobial resistance emphasizing the need for a "One health" approach. With the support of the WHO Advisory Group on Integrated Surveillance of Antimicrobial Resistance (AGISAR) WHO developed a 5-year strategic plan to support implementation of the GAP at the human-animal interface. WHO activities include: (1) supporting the development and implementation of "One Health" national action plans to combat AMR; (2) Capacity building through dissemination of a WHO guidance document on integrated surveillance of AMR, training workshops and AGISAR country pilot projects promoting a multisectoral approach to AMR surveillance; (3) developing a global "Tricycle" AGISAR curriculum on integrated surveillance of ESBL Ecoli in humans, the food chain and the environment; and (4) developing recommendations to preserve the efficacy of critically important antimicrobials for human health.
Zoonotic Tuberculosis In Cattle, Goats And Humans In Bangladesh, 2014-2015 Using A One Health Approach

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The objective of this study was to determine the prevalence of *Mycobacterium bovis* in animals and humans in Bangladesh. We collected blood and tissue samples from cachectic cattle and goats from August 2014 through September 2015 from two abattoirs and a veterinary hospital. We collected sputum from workers and traders at a cattle market and from patients at two government chest diseases hospitals who had history of animal exposure. Blood specimens were tested by ELISA for antibodies to *M. bovis*. Animal tissue and sputum specimens were screened for acid-fast bacilli (AFB) by Ziehl-Neelsen staining and cultured for *Mycobacterium spp.* Overall, 393 animals and 412 humans were sampled. No animal specimens were positive for *M. bovis* antibodies, AFB or *Mycobacterium spp.* Twenty-five (6%) human sputum specimens were positive for AFB, 43 (10%) for *M. tuberculosis* and none for other *Mycobacterium spp.* No evidence of current or past infection with *M. bovis* in animals or humans was found. No evidence of *M. bovis* may be due to sampling mostly indigenous/native animal which are less susceptible to *M bovis* infection than exotic. Further assessment of zoonotic TB in areas of Bangladesh with high levels of exotic animal-human interaction and human TB is important.
Prioritization of Human-Swine Reverse Zoonoses Relevant to the Pig Industry in Australia: A Weighted Multi-Criteria Approach

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In this study a multi-tiered approach was taken for the identification and ranking of human-swine reverse zoonoses relevant to pig production in Australia. Firstly, a systematic review was undertaken to determine agents with scientific basis to be considered as zooanthroponotic agents. Secondly, a small number of organisms which, while not appearing in the literature as confirmed zooanthroponotic agents, none the less were deemed by the research team as agents to be assessed. Finally, to determine the ranking of these agents, a semi-quantitative risk prioritization system was developed which was informed by evidence-based and expert opinions from stakeholders, in the form of an online survey.

The systematic review identified 22 agents with reverse zoonotic potential which could present some risk to the pig production industry. Following development and dissemination of a detailed questionnaire, 22 responses from industry representatives were used to finalise a scoring matrix, and this was then used to rank the pathogens. Methicillin resistant *S. aureus*, critical antimicrobial resistant *E. coli* and *Salmonella* sp. ranked highly amongst the agents. Influenza A is the highest ranking virus seen as a true threat. *Taenia solium* is the highest ranking parasitic agent. This study identifies the major reverse zoonotic agents of animal health and public health significance for the Australian pig industry.
The Social Lives of Birds: Ethnography of Behaviours and Their Rationales in Live Bird Markets and Transaction Chains in Chittagong, Bangladesh

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This ethnographic project, part of a large interdisciplinary epidemiological investigation, explores people's behaviours in the Bangladeshi poultry farming and trading system and in Chittagong City live bird markets. Through multi-site fieldwork using the concept of "the social life of things", it enhances understanding of rationales underlying bird handling and market transaction behaviours. First, it assesses how key actors influence the trajectories of birds as commodities in the Chittagong transaction chain. It attends to the consequences for disease surveillance, control and epidemiology of a constantly changing high number of relations between certain key actors. This part examines biosecurity standards, competing risk rationalities, and how the circulation of capital influences transaction practices. The second part assesses behaviours and their rationales among workers in Chittagong City live bird markets. The objective is to explain the rationales for practices exposing market workers to zoonotic viruses. Ethnographic methods are used to explore possible contradictions between the goals of standard biosecurity practices, Islamic food ethics and the reality of inherently contradicting internal rules governing the live bird markets.
Adding Value To One Health Interventions: Evaluating The Cost-effectiveness Of A Taenia Solium Control Intervention That Simultaneously Addressed Soil Transmitted Helminths And Classical Swine Fever In Northern Lao Pdr

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One Health interventions require robust economic analysis to establish cost-effectiveness for policy purposes, considering both the costs incurred undertaking the intervention and the subsequent benefits to both human and animal populations as a result of disease freedom. A recent *Taenia solium* intervention in Lao PDR achieved a significant (*p* < 0.0001) taeniasis reduction of 78.7% over twelve months. The intervention incorporated Soil Transmitted Helminth control through human mass drug administration, whilst pigs were vaccinated for Classical Swine Fever (CSF) alongside porcine cysticercosis control. Semi structured household questionnaires assessed the monetary and non-monetary costs and benefits to human and pig health, extrapolated to the broader northern Lao PDR region. Results estimated net cost-effectiveness as 14 USD per DALY averted, well below the current WHO standards for 'very cost effective' based on annual per capita GDP. Computation of various possible combinations of individual interventions determined that controlling *T. solium* in the human population alone was least cost effective, whilst the addition of STH control and/or porcine intervention(s) significantly increased the overall cost effectiveness. Whilst practical examples of economic evaluation of zoonoses control interventions remain limited, these findings encourage the consideration of various ways to include collateral benefits to the human and animal sectors under a true One Health approach.
Serological Responses And Duration Of Vaccinal Antibody Titres In Cattle Vaccinated With An Inactivated Trivalent Foot-and-mouth Disease (Fmd) Vaccine At The Wildlife/livestock Interface Of The Zambezi Region (Zr), Namibia.

Paidamwoyo Mutowembwa

AGRICULTURAL RESEARCH COUNCIL

Epidemiology of FMD in ZR is complicated by the role of African buffalo (*Syncerus caffer*) in maintenance and transmission of the South African Territories (SAT) virus serotypes. Control of FMD in ZR includes vaccination with a commercially available trivalent vaccine (SATs 1, 2 and 3). The objective of this study was to determine the effectiveness of the current FMD vaccination regimes in cattle at the wildlife/livestock interface in ZR. Cattle, n=602 were randomly selected from six crush pen areas (CPAs)- three CPAs from areas with high buffalo/cattle interactions and three from areas with low buffalo/cattle interactions. The cattle were sampled to determine the humoral immune response using a liquid-phase blocking ELISA. The proportion of adult cattle above 24 months with high levels of detectable antibodies (log₁₀ titre ≥2.0) was generally low (<80% seropositivity) suggesting that areas sampled were at risk for active spread of FMD virus. Antibody titres elicited by the vaccine under study significantly dropped at 4-months after vaccination, therefore the current 4-6 months inter-vaccination interval appears long with the current vaccine/vaccination regime. More research is necessary to determine reasons for the limited duration of vaccinal antibodies in order to limit number of outbreaks at wildlife/livestock interfaces of the ZR.
An Ecohealth Approach: Antibiotics Usage And Accessibility In Swine Farm In Central Java Province, Indonesia

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The overuses of antimicrobials in farms have contributed to accelerate the antimicrobials resistance. We conducted a cross-sectional questionnaire based survey on 40 pig farms in three regencies in Central Java to collect data on antibiotic use and accessibility and farmer knowledge, attitude and practices. Fourteen different antibiotics were used in farms. The majority were penicillin (50%), Sodium Sulfadimethypyrimidine (26.47%), and Oxytetracycline (26.47%). Antibiotics were used for treatment (92.8%), prevention (35.7%) or both (35.7%). Main sources of antibiotics were livestock / poultry shops (72.5%), livestock service officers (12.5%) and technical services of drug / feed companies (12.5%). The decision to use antibiotics was made by farmers (87.5%) based on experience (87.5%). About 72.5% farmers have poor knowledge and 67.5% have neutral attitude. In terms of practices, 67.5% of farmers administered antibiotics to all cases of illness, and 92.5% were ignorant of the information on antibiotic labels. Furthermore, 22.5% of farmers have used unlabeled / unlicensed antibiotics. These results indicated that farmers have a low level of knowledge and antibiotics are used without following the instructions in the label.
Global urban thinking for ecohealth

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The Lancet Commission asserts 'tackling climate change could be the greatest global health opportunity of the 21st century. This implies the relevance of an ecohealth approach to health that recognises the interconnectivity of ecological, social and economic dimensions of human and non-human wellbeing in an environmentally compromised world. It highlights that opportunities exist for strengthening ecohealth considerations within global agendas related to climate change and health including urban sustainable development. This project explored ideas for and principles of healthy and sustainability urban places that are being used by 'global urban thinkers'. The study used a qualitative approach involving 20+ semi-structured interviews with health, sustainability and/or urbanisation experts from diverse disciplines and regions of the world. The data was analysed thematically and compiled into a report that stimulated discussions at various ecohealth and sustainability forums in 2016. Findings indicated a set of core principles for healthy and sustainable urban places that transcend disciplinary perspectives that are broadly applicable across regions and cities. Numerous 'big ideas' relating to mobility, connectivity, density, equity, heritage and public space were identified. This presentation will showcase these ideas, providing recommendations for the role of ecohealth practitioners in creating healthy and sustainable places in the 21st century.
Community Attitudes And Knowledge About Bats In Nipah-affected And Non Nipah-affected Areas: Potential Threat To Biodiversity And Conservation In Bangladesh

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Fruit bats are the main reservoir of Nipah virus in Bangladesh where human cases have occurred annually since 2001. Consumption of raw date palm sap contaminated with bat urine or bat saliva is believed to be the major risk factor for human infection. From a wildlife conservation perspective there is concern that people’s negative perceptions about bats due to the potential threat to human health may threaten the bat species. We conducted a cross-sectional study in two areas where human Nipah cases have previously occurred (Rajbari & Faridpur) and two areas where human cases have never occurred (Jhinadoha & Jessore) to understand community knowledge, behaviors, attitudes and risk perceptions associated with bat conservation in terms of bat-borne diseases in Bangladesh. Most of the respondents in both Nipah-affected and non-affected districts showed negative attitudes towards bats. Illegal trapping for crop protection, consumption and traditional medicine directly threaten bats, while forest-fragmentation and habitat loss have an indirect effect on bat populations. A poor level of understanding about bat-borne diseases was found to be the main barrier to bat conservation in Bangladesh. A
multidisciplinary approach is required to maximize bat conservation as well as minimize the risk of Nipah outbreaks in Bangladesh.
Spatial mapping of Toxoplasmosis in Bali and Lombok Island based on One Health Approach

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Toxoplasmosis is a zoonotic disease caused by Toxoplasma gondii. This parasites distributed worldwide and infect around one third of the world population. Cats are the definitive hosts and all animal species as intermediate hosts. Toxoplasma infection in humans can occur vertically, or horizontal transmission.

One Health approach is an interface between environmental, animal, and human health. Rapid change of the land use and demographic caused increase the spread of toxoplasmosis. The purpose of this study to determine the seroprevalence of toxoplasmosis in Bali and Lombok Island, and the influence of geography, life style, work activities to toxoplasmosis. This research is analytic survey with cross-sectional study design. Blood samples were collected from 1100 respondents in Bali and 420 in Lombok. Spatial analysis using GIS and risk factors obtained through questionnaires.

The research results showed that seroprevalence of toxoplasmosis in Bali 57% and Lombok was 68,50%. The habit of consuming meat, work activities with raw meat, washing vegetables, drinking raw water, and livestock ownership belong to factors that have a significant interaction. In addition, elevation correlate to toxoplasmosis in lowland areas showed 70,80%. There is an evidence geographical conditions, life style, and water source contribute to toxoplasmosis in Bali and Lombok.
An ecosystem health approach was used to assess the capacity of health facilities and their medical staff in supporting antimicrobial resistance (AMR) control programs. Forty community health centers and 14 hospitals in Central Java, Indonesia were surveyed in 2014. Structured interviews were used to assess doctor knowledge, attitude and practices and the antibiotic provision system in the facility. Majority of doctors in community health centers (CHC) and hospitals had moderate (77.5%) and high (71.4%) levels of knowledge on antibiotics and drug resistance, respectively. All doctors expressed positive attitudes. In CHCs and hospitals, there was no patient education or surveillance program for AMR and doctors still prescribe antibiotics for non-specific diarrhea and acute respiratory infections. Antibiotic provision in CHCs is supervised by local Health Services. However, reporting of antibiotic use
in private health facilities is not mandatory. This study recommends increasing doctor knowledge on antibiotics and AMR, establishing public education and information services on AMR in health facilities, initiating an AMR surveillance programs in hospitals and CHCs, and implement mandatory reporting of antibiotic use in private health facilities to local Health Services.
Lay perceptions of risk factors for Rift Valley fever in a pastoral community in northeastern Kenya

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Consumption of contaminated livestock products is one of the risk factors for the transmission of Rift Valley fever (RVF) in humans. In pastoral communities, livestock is the main source of livelihood providing nutritional, economic and cultural services hence zoonotic diseases tend to be more prevalent in such communities. An understanding of the lay perceptions regarding the transmission of zoonoses can help institute effective interventions. A qualitative study was carried out in Ijara district in Kenya to investigate the lay perceptions of RVF transmission. Data was transcribed, coded and analysed according to emergent themes. Participants indicated that RVF infections in humans occurred as a result of mosquito bites and had little to do with consumption of livestock products from infected livestock. Despite having heard about the risks of acquiring RVF through consumption of livestock products, their experiences did not tally with this information hence to them, RVF was not transmissible through their dietary practices. The community in this region was aware of RVF, but did not have elaborate information regarding its transmission dynamics. It is necessary to develop appropriate interventions that include comprehensive explanations of the dynamics of RVF transmission and also takes into consideration communities' livelihood strategies.
Examining farm safety of the Australian farmers

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Farmers, being disadvantaged by living in remote locations, face the highest rate of workplace fatalities compared to other occupations in Australia. The cross-sectional study examined the safety of farming community members in Australia during 2009-16. Study participants were \textgreater{}18 years of age, spoke English and were involved/associated with farming. Among 1697 study participants, 62% were male and 58% were actively farming. Mean age was 53(±15.5) years. More than two-thirds (67\%) used chemicals on farm, but only 33\% used at least three protective items. A third of the participants (35\%) never used helmets when on a motorbike/quadbike and farmers were less likely to use those (31\% vs. 35\%, RR 0.63, 95\%CI 0.56-0.72). Use of seatbelts whilst driving on the farm was also less among farmers (34\% vs. 55\%, RR 0.62, 95\%CI 0.55-0.70). Almost half (42\%) of the participants had self-reported hearing problems, and only 13\% used hearing aids. Males (51\% vs. 31\%, RR 1.63, 95\%CIs 1.41-1.89) and farmers (45\% vs. 38\%, RR 1.18, 95\%CI 1.03-1.35) were more likely to have problems hearing compared to their counterparts. Farmers health promotion strategies should focus on identified farm safety issues and further research to understand reasons for non-compliance to address high work injuries.
Local Community Involvement Accelerate Control Of Emerging Rift Valley Fever Outbreaks.

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RVF is viral transboundary disease affecting both humans and animals. It is transmitted by direct contact with infected animals and mosquitoes bite. RVF outbreaks occur in settings with poor resources and then spread with devastating consequences within and outside Africa reached Arab Peninsula. RVF varies from influenza-like illness to hemorrhagic fever with no approved vaccine. In livestock, RVF causes massive miscarriage and deadly epidemics in young animals. Our aim was to investigate the factors affecting potential role of local communities to be a part of RVF One Health control measures at environment-animal-human interface. Across sectional study was conducted using special designed One Health questionnaire. We interviewed 240 household heads in an affected area in Sudan. Participants had poor knowledge about RVF. The knowledge of risk factors was insufficient. Although participants knew RVF could spread further with consequences of a ban on animal trade but they were hesitant to notify sick or dead animals to veterinary authority due to lack of compensation. For control of RVF outbreaks, participants focused more in human health authorities than in veterinary authorities. To conclude, many factors need to be targeted to involve local communities as a part of acceleration efforts to control emerging RVF outbreaks.
Cardiovascular, diabetes risk, bodily pain, health and wellbeing among Australian farmers/agricultural workers - future challenges for food producers

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Farmers, being disadvantaged by living in remote locations, face different physical and mental health challenges. The cross-sectional study aimed to explore health, wellbeing, behavioural, cardiovascular and diabetes risks among Australian farming communities. Study participants were >18 years of age, spoke English and were involved/associated with farming. Among 1697 study participants, 62% were male and 58% were actively farming. Although health was perceived as good to excellent by 88% of the participants, 39% reported moderate to very severe bodily pain and 45% indicated having moderate to very high stress in the last four weeks. More than two-thirds (73%) were overweight or obese. Farmers were more likely to eat vegetables/fruits everyday (86% vs. 79%, RR 1.08, 95%CI 1.03-1.14) and performed regular physical activities (90% vs. 79%, RR 1.15, 95%CI 1.09-1.21) compared to non-farmers. Current smoking rate was only 6%; 57% consumed alcohol at short term high risk levels at least monthly. Half of them were at risk of developing type 2 diabetes (AUSDRISK12) within 5 years; males (90% vs. 79%, RR1.14, 95%CI 1.09-1.20) and farmers (88% vs. 83%, RR1.06, 95%CI 1.01-1.11) were at increased risk compared to their counterparts. Interventions focusing on bodily pain, stress, weight, alcohol use and diabetes risk among farmers should be the primary focus for health promotion strategies.
Prediction of and preparedness against Rift Valley fever outbreaks

Magnus Evander

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Rift Valley fever (RVF), is a neglected, emerging, mosquito-borne disease with severe negative impact on human and animal health and economy. The RVF virus (RVFV) is transmitted through mosquito bites, exposure to blood, body fluids, or tissues of infected animals. More information based on epidemiological and demographic data and a better understanding of environmental factors, ecology of RVF virus, and the socio-economic environment is required.

We have targeted a research area in northeastern Kenya inhabited by nomadic pastoral communities who keep sheep, goats, camels and cattle. The high mobility of livestock and the temporary character of the nomadic settlements make it necessary to collect data from the tracks of the nomadic herds in order to create a high resolution prediction model. Geographic information systems, remote sensing and global positioning systems were used together with studies of cultural and equality factors and samples from mosquitoes, animals and humans. We characterized the pastoralist mobility in a spatio-temporal framework related to season, climatic factors, RVFV vectors and RVF seroprevalence. We identified factors that make specific geographic regions more prone to RVF outbreaks. We identified cultural and equality factors affecting appearance and consequences of RVF outbreaks and we developed a RVF risk-prediction model.
Advancing Planetary Health in Australia – focus on emerging infections and antimicrobial resistance

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With rising population numbers, anthropogenic changes to our environment and unprecedented global connectivity, the World Economic Forum ranks the spread of infectious diseases second only to water crises in terms of potential global impact. Addressing the diverse challenges to human health and well-being in the 21st century requires an overarching focus on "Planetary Health", with input from all sectors of government, non-governmental organisations, academic institutions and industry. In order to clarify and advance the Planetary Health agenda within Australia, specifically in relation to emerging and drug resistant infections, national experts and key stakeholders were invited to a facilitated workshop. Themes identified from emerging infectious diseases discussions included animal reservoirs, surveillance, mechanisms of emergence and the role of unrecognised human vectors (the "invisible man") in the spread of infection. Themes related to drug resistant infections included antibiotic use in production and companion animals, antimicrobial stewardship and education of professionals, politicians and the general public. Infection control was common to both topics. We provide an overview of key discussion points, as well as important barriers identified and solutions proposed. It is hoped that description of the Planetary Health consensus-building process in Australia will provide guidance to other countries and assist international initiatives.
Risk-based Surveillance For Swine Influenza Viruses With Pandemic Potential In Viet Nam

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Swine influenza, a highly infectious respiratory disease of pigs, is a zoonotic disease with pandemic potential. Viet Nam is considered at high risk for emergence of pandemic influenza viruses with efforts, until recently, focused on avian viruses. Cross-sectional studies on influenza viruses in swine were conducted from 2013-16 to better understand the risk factors associated with influenza virus evolution, transmission, and circulation across sectors, and to identify the gene pool of viruses in pig populations in Viet Nam. A risk-based approach was used to select localities, farms, animals sampled in order to maximize detection of viruses. Specifically, areas with high pig populations, large-scale breeding farms with low biosecurity, and 8-12 week old piglets. Five hundred farm visits were conducted over the period; approximately 70% of farms were serologically positive to at least one influenza virus, with evidence of recent infection in young animals in 50% of farms. Risk factors identified include farm type and purchase of boars. Viral subtypes isolated include two strains of H3N2, H1N2, and H1N1. These results show the wide prevalence of swine influenza viruses in large-scale breeding farms in Viet Nam.
Middle East Respiratory Syndrome Coronavirus (Mers-cov) Antibodies In Dromedary Camels (Camelus Dromedarius) In Bangladesh

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Middle East Respiratory Syndrome coronavirus (MERS-CoV) is a zoonotic virus causing respiratory illness in people and found in dromedary camels. In Bangladesh, camels are bred locally or imported from India. This study aimed to determine the seroprevalence of MERS-CoV in camels in Bangladesh. We collected nasal and rectal swabs and serum samples from camels (N=55) and corresponding demographic data. The swabs were tested by MERS-CoV qPCR. The serum samples were assayed with MERS-CoV ELISA and confirmed by a pseudoparticle neutralization test (PPNT). None of the swab samples tested positive. Seventeen (30%) camels were seropositive (95%CI:19-45) by PPNT where adult shows higher prevalence (n=44;36%; 95%CI:22-52) than juvenile (n=11;9%, 95%CI:0.2-41). Imported camels had a significantly higher seroprevalence (n=31;52%; 95%CI:33-70) than camels from Bangladesh (n=24;4%; 95%CI:0.1-21). Likewise, market camels had a significantly higher seroprevalence (63%; 95%CI:38-85; n=19) than farmed camels (14%; 95%CI:5-30; n=36). The majority of seropositive camels may have originated in India or further along the camel trade. Camel surveillance for MERS-CoV at markets, farms and entry point in Bangladesh and India will help characterize circulation in South Asia. Human surveillance among people in close contact with camels may help determine whether zoonotic transmission occurs.
Using an EcoHealth approach to understand the smallholder pig production system in San Simon, Pampanga, Philippines

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Smallholders are important contributors to pork production in the Philippines. A project aiming to improve the competitiveness of the smallholder pig system using an EcoHealth approach is underway in Pampanga, Philippines. A baseline survey of smallholder pig raisers was conducted, followed by farm visits, semi-structured interviews and focus groups with farmers and other stakeholders. Several management issues were identified. Water provision to sows was often restricted; some farmers believed that free access to water could drown piglets in utero/cause diarrhoea in piglets. The diet of sows during gestation was often inadequate in protein and energy. Other problems reported included diarrhoea, ill thrift and crushing in piglets. These findings were discussed with a focus group of farmers. Several interventions were proposed: seminars on water/nutrition and piglet management with input from successful farmers, a workshop to develop a sustainable record keeping system for smallholders and laboratory analyses of diarrhoea samples and drinking water. These steps will be the action component of the first of a series of cycles. Reflection will be used for knowledge generation.
in the next cycle. The strong participatory component of this research gives ownership to
farmers and should help to improve their pig production and thereby their livelihoods.
Health & Socio-Ecosystems: a pillar of the Research Platform “Production and Conservation in Partnership” (RP-PCP)

Alexandre Caron¹
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¹Cirad

The health of animals and people is a public good, which determines the amount of food, the labour force and well-being of the poorest rural communities. In socio-ecosystems where people coexist with pristine nature, development and conservation objectives need to be concurrently achieved. Health issues at the wildlife/livestock/human interface need to be addressed to mitigate the negative outcomes of these interactions. In parallel, the multi-sectorial dimension of the health issue can be used to trigger more interaction among stakeholders in these socio-ecosystems. Here, we present the Research Platform "Production and Conservation in Partnership", a collaboration between Zimbabwean and French Research institutions launched in 2007, implementing applied research to promote the coexistence between people and nature in Transfrontier Conservation Areas of southern Africa. The platform is currently expending regionally. The "health & environment" issue is one of the pillars of the platform. We present the community demand-driven, bottom-up applied research agenda that the platform is developing through a local and regional post-graduate training programme. After 10 years of existence, the platform has supported close to 100 postgraduate projects with extensive fieldwork in interface areas and has maintained its objective of scientific excellence through a strong publication policy supported by all partners.
Assessing Viral Diversity In Non-human Primates And Bats Of Peninsular And Bornean Malaysia.

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Land use change results in loss of wildlife habitat and increasing potential wildlife contact and emerging zoonoses. Our surveillance programs, USAID PREDICT and Deep Forest (DF), serve as an initial step towards understanding viral diversity in non-human primates (NHPs) and bats and the potential spillover to people. NHP swabs were collected from areas in Peninsula Malaysia and Sabah with human animal conflict. Bats were sampled across three human disturbance gradients (disturbed, intermediate, pristine) along the Kinabatangan River, Sabah. Samples were screened using PCR assays for up to 17 viral families and confirmed by sequencing. In both areas, NHP herpesviruses, including Macacine herpesvirus 1, foamy viruses, human adenovirus and human paramyxovirus were found in sampled NHPs. For DF bats, two coronaviruses including a strain related to the severe acute respiratory syndrome coronavirus were found in a pristine site. Lower number of bat viruses from pristine sites indicates healthier environment with low human disturbance. Our results indicate the potential for zoonotic and anthropozoonotic viral transmissions in wildlife-human contact areas. Certain NHP viruses can be hazardous to people. Land use change impacts on disease emergence needs to be considered when developing lands to minimize conflict and potential viral transmissions between wildlife and people.
Risk Assessment For Avian Influenza A (H5n1) In Indonesia

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The world has experienced influenza pandemics that caused huge economic, social disruptions and human tragedies that claimed millions of deaths. The dynamic evolution of influenza viruses is of very significant epidemiologic concern. Up to date, 850 Avian Influenza H5N1 human cases with 449 deaths have been reported to WHO. Recently, other human non-seasonal influenza A viruses such as H9N2, H6N1, H5N6, H7N2, H7N7, H10N7 and H10N8 have been reported to WHO. The world should keep vigilant as the dynamic viral epidemiology can change any time. Indonesia is endemic for H5N1 in poultry and a hot spot for H5N1 epicenter. Recent AI surveillance in poultry in Indonesia detected two clades of H5N1 circulating in poultry (2.3.2.1 and 2.1.3). Up to date, 199 human cases with 84% CFR have been reported from 15 provinces in Indonesia. Responding to the challenges, Indonesia has conducted efforts to control AI by implementing the national strategic plan for AI through strengthening surveillance, laboratory diagnosis, case management and referral system, risk communication, and pandemic preparedness. Comprehensive analysis and timely sharing information on epidemiology and virology among human and animal health sectors for risk assessment is crucial for early detection and prompt response to AI or other zoonosis EIDs.
One Health in Action: One Health at Work in Bangladesh

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A multi-disciplinary team including physicians, veterinarians, environmental scientists, civil society and development practitioners formed an organization, One Health (OH) Bangladesh, in 2008, that provided a forum for advocating the OH concept and its relevance for controlling zoonotic and emerging infectious diseases. As the advocacy continued, a phase emerged towards building effective partnership to practice the OH approach by undertaking joint outbreak investigations, surveillance, prevention, and control programmes for avian influenza, Nipah, rabies, and anthrax. Capacity building initiatives including OH training by FAO, the Field Epidemiology Training programmes by the Institute of Epidemiology and Disease Control Research, and OH Postgraduate training by Massey University in collaboration with local partners created a momentum for practicing One Health approach in Bangladesh. A National OH Strategic Framework and Action Plan was developed jointly by Government partners, UN agencies, and other stakeholders to benefit from a OH approach with some degree of institutionalization and targeted activities within the government systems. A process is now underway to establish a OH Secretariat by the Government for effective implementation of OH programmes with the support of Preparedness and Response project of the USAID-funded Emerging Pandemic Threat Programme-2.
Universities and other higher education institutions are mandated to train human resources who should appropriately respond to and solve real world challenges. Global health challenges are continuously changing. In the 21st century, biosecurity is one of the emerging worldwide health challenge. The cardinal question now is: How are universities and other higher education institution in sub-Saharan Africa responding to train the next generation of professionals to manage biosecurity issues? This paper presents findings of a gap analysis conducted in eight Schools of Public Health and 10 Veterinary Schools in sub-Saharan Africa. All the Schools surveyed participate in the One Health Central and East Africa project funded by USAID. Content analysis of curricula and development and investment plans of these Schools was undertaken. Only one Veterinary School had a graduate program specifically on biosecurity management. No school offered any undergraduate program on biosecurity. Some elements of biosecurity training were interspersed in various modules offered at graduate level. Even so, the focus was only on laboratory biosecurity and not a holistic approach to biosecurity management. The paper recommends accelerated efforts to develop academic programs for biosecurity management in sub-Saharan Africa.
Time to Disease Detection

Moe Ko OO

The most important component for effective disease surveillance is timely information regarding disease occurrence. Information of disease occurrence can come from sources other than the national routine surveillance system. Little is known about the relevance between the reported case from public reporting system and the reported case from national data and cross-border data in multi-country context. Understanding lag time of disease reporting between public reporting system and the routine national disease surveillance system would be helpful for rapid response and preparedness for an outbreak. Moreover, the validity of data from public reporting system, including magnitude of over- or under-estimate number of cases would be critical for effective and efficient planning to prevent and control outbreaks. The study covers 10-15 prioritized diseases, such as H1N1, AFP, Cholera/Severe Diarrhea, Encephalitis, Tetanus, Meningitis, Diphtheria, PHEIC, Leptospirosis, Chikungunya, Dengue, Typhoid, Measles, Pneumonia and Malaria. The five years data were collected from Cambodia, Laos, Myanmar and Vietnam. The lag time and validity of public reporting system calculated from this study provides valuable information for improving the national and cross-border disease surveillance.
Antimicrobial Resistance Profile Of Enterobacteriaceae Isolated From Children Under 2 Years Of Age In Peri-urban Lima, Peru

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Antimicrobial resistance is a major global health problem, mainly affects developing countries and pediatric population. There are no recent studies in Peru on antimicrobial resistance of enteric pathogens in the pediatric population in the community setting.

We analyzed 1059 strains of enteric pathogens isolated from children under 2 years in northern Lima, collected among 2008-2011. In addition, we analyzed 72 E. coli strains from environmental samples (water, cooked/raw foods and animal feces) from 100 families collected during the same period.

Diartheagenic E. coli (n=776) and Shigella spp. (n=96) strains showed high resistance to ampicillin (60-80%), trimethoprim/sulfamethoxazole (40-80%) and tetracycline (35-70%). However, ciprofloxacin and ceftriaxone resistance was less than 4%. For Campylobacter spp. (n=187), resistance to ciprofloxacin was 88%, tetracycline 90% and azithromycin 17%. The resistance was similar between samples from children with/without diarrhea. Resistance of E. coli environmental was lower to ampicillin (10-35%), trimethoprim/sulfamethoxazole (5-30%) and tetracycline (5-40%). Based on the registration of more than 90,000 children-day observation as part of an ongoing clinical study in the same communities, the antibiotics most commonly used were penicillin's (amoxicillin and ampicillin) (32%), macrolides (erythromycin and azithromycin) (17%), and trimethoprim/sulfamethoxazole (14%).

It is necessary to confirm these findings in other regions of Peru.
Reducing Horse Mortality to Improve Outcomes for Snakebite Victims in Myanmar

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In Myanmar, snakebite is a major cause of morbidity and mortality, particular among farmers in rural areas. At the request of the Ministries of Industry and Health in Myanmar, an Australian Government funded project was initiated with a number of objectives aimed at addressing this problem. In order to improve the quantity and quality of available antivenom, it was essential to reduce high levels of morbidity and mortality amongst horses in the production facility. Investigations led to identification of equine infectious anaemia as one factor contributing to both poor production and morbidity, along with other disease and management factors. In the last 12 months, in response to measures adopted, mortality has reduced from around 17-20% on a monthly basis, to an average of <5% over a 10 month period. The development of a database to record individual horse details has assisted both epidemiological investigations and herd management. This presentation will look at the investigations in the context of the entire project, which concurrently aims to improve the care of snakebite victims in health care facilities, to facilitate provision of sufficient antivenom to rural areas and to improve the health of snakes from which venom is collected.
One Health And Infectious Diseases In High Latitudes: Emerging Threats Or Old Problems?

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Northern latitudes are especially vulnerable to climate changes with several pathogens extending their distributions northerly and infecting naïve animal populations. At the same time, human driven activities change habitats, reduce resources or introduce additional stresses to several wild species, which leads to changes in infection patterns.

Tick borne encephalitis has been reported in several locations in Norway and there is evidence of its presence in cervids and bovines. Deer ked, a biting fly causing alopecia in moose but often also biting humans, continues to expand north and has been found to carry the zoonotic bacteria *Bartonella* spp. In 2015 European bat lyssavirus type 2 (EBLV-2) has detected for the first time in a Daubenton's bat (*Myotis daubentonii*) in Norway. In 2016 *Angiostrongylus vasorum*, also known as French heartworm was detected in 2 foxes in different geographic locations in Norway, and last April 2016 the prion disease Chronic wasting disease (CWD) was reported for the 1st time in Europe in Norwegian wild reindeer and moose (different locations).

Whether many of these agents are truly emerging due to climate, anthropogenic changes or are being identified as a result of increased surveillance remains a matter of intense discussion requiring further research.
Identifying Risk Factors for Nipah Virus Infection in the southern Philippines

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In 2014, the first known henipavirus outbreak occurred in the Philippines, in which there were multiple human and horse fatalities. Post-outbreak investigations revealed the most likely routes of transmission for people were from exposure to infected fluids during the slaughter of sick horses, the handling of raw horse meat and very close contact with infected people. A follow-up study has since identified a number of additional possible risk factors for transmission of the virus in this cultural setting. These include the almost ubiquitous consumption of fresh coconut sap, and the high prevalence of consumption of fermented coconut sap (tuba). With collection methods similar to date palm sap, which has been found to contribute to Nipah virus outbreaks in Bangladesh, these require further exploration as possible risk factors. Serological testing of pigs, horses and dogs was also conducted within the study area on the island of Mindanao. All sera tested negative for antibodies to Nipah virus, most likely indicating that the outbreak seen in 2014 was representative of rare spillover of the virus from the reservoir host to domestic animals and people. However, with inevitable encroachment on native ecosystems, these events may become more frequent.
Modelling The Problems Of Rabies Elimination In The Philippines Using One Health

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The Philippines has adopted a national, collaborative strategy, involving health experts and government agencies, seeking to eradicate rabies by 2020. Through the "Anti-Rabies Act of 2007", the National Rabies Prevention and Control Program was established. A central strategy for this was One Health. In support, an Administrative Order established the Philippine Interagency Committee on Zoonosis, enabling cross-sectoral and cross-disciplinary collaboration in various levels of government and society. The National Rabies Program has divided the Philippines into 18 regions with 81 provinces in order to pursue stepwise rabies elimination. Of these provinces, 35 have since been declared rabies free zones. Between 2007 and 2015, the number of suspected rabies cases declined by approximately 35%, from 3,379 submitted samples to 2,207. This presentation examines the system collaboration and mechanism which bridged the human and animal health professions to work with the various stakeholders and agencies at each levels of government. By exploring the various experiences of key stakeholders, we aim to investigate the nature of the collaboration, and to examine the potential and sustainability of One Health as a strategy to address other zoonotic disease issues in the Philippines such as ebola Reston, avian influenza and leptospirosis.
Q Fever Vaccine: A Call For Increased Vaccine Uptake Among Australia’s Veterinary Workforce

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Australia has a Q fever vaccine for humans, which is recommended for all veterinary workers. An online cross-sectional survey undertaken in 2014 explored Q fever vaccine uptake in Australia’s veterinary workforce. Responses from 890 veterinarians and 852 veterinary nurses identified poor vaccine uptake (29%) among veterinary nurses, who relied upon veterinarians for biosecurity information. Reluctance by veterinarians to recommend vaccination was a contributing factor, with only 35% willing to appropriately recommend vaccination to veterinarians, veterinary nurses and kennel hands across all veterinary practice types. Significant (p<0.05) factors for recommending vaccination were identified as being female (OR 1.5), disagreement that Q fever vaccine is harmful (OR 3.96), high level of concern for colleagues regarding exposure to C. burnetii (OR 3.5), and reporting high Q fever knowledge (OR 2.3). Veterinarians aged 39-48 years were least likely to recommend (OR 0.5). The study identified the need for veterinarians to take greater responsibility for workplace health and safety promotion, and understand that Q fever poses a threat to all veterinary workers regardless of practice type. Until improvements are made, individuals and clinics remain unnecessarily at risk of Q fever disease or litigation from colleagues affected by Q fever whilst under their employment or supervision.
Taenia solium from a Community Perspective: Baseline Costing Data in Katete/Sinda Districts in Eastern Zambia

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The zoonotic tapeworm Taenia solium is highly endemic in Zambia, however the societal cost of the parasite is unknown. Baseline economic costs related to T. solium cysticercosis in people and pigs were measured in fifty percent of randomly selected households in the study villages. One questionnaire (n=245) captured individual costs related to clinical signs commonly attributable to human T. solium infections. A pig questionnaire (n=271) captured herd demographic data, costs of pig-keeping, and economic losses from porcine cysticercosis. Human health data revealed 30 (12.2%) cases of seizure-like episodes, 90 (36.7%) of severe chronic headaches, and 54 (22.0%) of blurry vision or blindness, leading to 137 health care consultations and 16 hospitalisations in a five-year period. Hospitalisation costs ranged from $0-$570USD per visit. 489 working days were lost due to the surveyed conditions per year. Median monthly household income is $0USD (mean $9.20USD, range $0-$250USD). Twenty-five percent of surveyed households keep pigs, mostly free-ranging. Median pig-keeping costs are $0.50USD per pig per month. Over 95% of adult pigs are sold to local traders, who commonly perform tongue palpation before purchase. 94.5% (256/271) of survey respondents cannot sell tongue-positive pigs; infected pigs that are sold lose 45% of their value.
Village chickens in rural Timor-Leste make significant contributions to household income and food security. Current research on the impact of improving village chicken production on human diets and nutrition is being conducted in six villages in Timor-Leste. This research has found that livestock are the most economically important agricultural products for households. Of all livestock, chickens are most frequently sold to purchase essential household needs, such as food, cooking oil, and children’s school supplies. In resource-poor households with limited sources of income, chickens play an important role in maintaining economic status quo. When endemic Newcastle disease (ND) strikes, unvaccinated flocks suffer up to 100% mortality. With no chickens, households resort to only consuming limited varieties of self-produced staple foods, selling these same foods, sending family members away to major cities to look for work, or going into debt. Additionally, disease outbreaks lead to high levels of consumption of sick or dead chickens, a strategy used by farmers to prevent food waste. This can be a dangerous practice in the face of emerging or known zoonotic diseases such as highly pathogenic avian influenza. Maintaining village chicken flock health through ND vaccination can significantly contribute to household financial stability and food security.
Animal disease outbreaks represent a complex challenge for many countries. Contributing factors include limited human resources, inadequate health systems, uncontrolled migration, poor social cohesion, and certain traditional beliefs and practices.

This analysis jointly quantifies economic and epidemiological models, providing a balance between achieving a desired output and creating a feasible model. Output desirability was determined by stakeholders' questions relating to economic issues at various scales. Economic models can quantify impacts of animal health problems on producers, government costs, product prices, employment and international trade as well as on non-agricultural sectors and national welfare at scales range from individual herds to national and global economies.

Focusing on animal diseases, e.g., poultry, swine, and cattle, at the district and national levels a database of the Social Accounting Matrix (SAM) for Thailand was used with the SAM-based multiplier model to assess impacts. At the international level, the GTAP model was used.

Analysis shows that animal disease outbreaks would cause economic losses throughout the livestock sector in all regions of the country, with direct impacts on both the production sector and related sectors. Appropriate animal health policies can help protect the physical well-being of society while helping avoid economic losses at all levels.
SEACFMD Roadmap: A Framework to control FMD in South-East Asia, China and Mongolia (2016-2020)

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1OIE South-East Asia

The regional initiative to control foot and mouth disease (FMD) in South-East started in 1994 when countries in the region agreed to set-up an OIE Sub-Commission for FMD control. In 1997, the members formally launched the South East-Asia FMD (SEAFMD) Campaign to coordinate a sub-regional programme to control the disease. In 2010, China joined the Campaign, thus it was renamed as South-East and China Foot and Mouth Disease (SEACFMD). In 2016, Mongolia joined the Campaign. To provide long-term guidance to the Campaign, a SEAFMD Roadmap 2020 was launched in 2007. Then in 2011, the 2nd edition was launched to give more emphasis at reducing the overall FMD prevalence by targeting hotspots and critical nodes along movement pathways, and progressive zoning approach in areas with the most advance stage of FMD control. Maintenance of FMD free countries and zones was also highlighted in the 2nd edition. In 2015, a 3rd edition of the Roadmap was developed to provide a framework to guide the Campaign from 2016-2020. The current SEACFMD roadmap continue a risk-based approach which identify areas where possible sources of FMD viruses are circulating, and focus the intervention in those areas.
Health and the Key International Global Agreements – Opportunities to improve population health in the face of environmental change

Kathryn Bowen

The adoption of the Sustainable Development Goals (SDGs) in late 2015 capped off a tripartite of international agreements that year in areas of substantial significance for population health - i) the Sendai Framework for Disaster Risk Reduction; ii) the Paris Agreement to respond to climate change; and iii) the aforementioned SDGs agreed to in September. Each of these three agreements present, in theory, great hope for progressing global health outcomes, and reducing the inequitable distribution of the current burdens of disease. However, in order for these agreements to strengthen our responses to current and emerging health risks, we need to better understand and assess how health is framed in these agreements, and to what extent an integrative understanding of health is incorporated into these frameworks. If health is not considered as an interlinked, multi-sectoral and transdisciplinary element, then opportunities to progress efforts to improve population health across the globe will be hampered. This paper discusses each agreement and its health relevance, and proposes ways to strengthen the incorporation of a systemic approach to health and health responses in order to increase our resilience to contemporary global challenges.
Ecological Niche Modeling Of Bacillus Anthracis In Georgia

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Anthrax, caused by the bacterium Bacillus anthracis, is a zoonotic disease that causes significant mortality in animals and humans worldwide. Anthrax cases are reported annually in Georgia and requires improved surveillance and control efforts. To improve surveillance, we used the genetic algorithm for rule-set production (GARP) modelling system to model the ecological niche for B. anthracis using multiple environmental variables. Field data for anthrax positive cases from 2003-2015 were used as presence locations and a set of six BioClim data as predictor variables. To construct models we used: altitude, annual mean temperature, annual temperature range, annual precipitation, and precipitation of wettest and driest month. We completed three models based on different combinations of variables and chose the model with the highest area under the curve and lowest omission value. Our models accurately predicted testing data with 93.8% accuracy. Ecological niche model predictions of B. anthracis can be used to guide sampling efforts for ongoing field sampling in Azerbaijan bordering districts, where models showed the highest agreement of anthrax distribution. These maps also aid anthrax prevention and control efforts throughout Georgia by identifying priorities areas for surveillance, livestock vaccination, and public health education campaigns to reduce human transmission risk.
Infectious Disease Risk Assessment and Management The IDRAM Initiative: Bringing the Extractive Industry and One Health Together to Fight Infectious Disease

Francesca Viliani

Extractive industry operations bring about changes in local environmental, social and economic conditions that increase the potential for contact between wildlife, livestock and human populations. These changes act as major drivers of disease emergence. In effect, the extractive industry alters local ecosystems and this could facilitate the spread of emerging infectious diseases (EIDs). Concurrently, extractive industry projects are vulnerable to EID outbreaks, including the Ebola outbreak in West Africa, and therefore have a direct interest in supporting prevention strategies and strengthening the response capacity of national health systems.

For several years the IDRAM initiative has brought together multiple stakeholders to discuss these issues and develop joint solution. The presentation will briefly introduce IDRAM structure and its participants, show the main results obtained, and present the current activities.

IDARM is chaired by the Centre on Global Health Security at Chatham House in collaboration with International SOS. It has received financial support by the Emerging Pandemic Threat Program of USAID, the Skoll foundation, extractive companies and other private sector contributors.
Zoonotic Viruses Surveillance For The Confiscated Pangolin In Malaysia

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Emerging and re-emerging zoonotic virus outbreaks in the past two decades have raised major public health and economic concerns globally. These outbreaks are caused by factors including hunting, wildlife trade and land use change. Pangolins are critically endangered and the most illegally traded mammal in the world; 1.1 million pangolins were traded 2006 to 2015. Pangolins are smuggled from countries in Southeast Asia including Malaysia to China as a delicacy or for traditional Chinese medicine. Since 2010 the USAID PREDICT project in Malaysia has identified 60 novel (including a new SARS-CoV closely related virus) and 28 known viruses from wildlife. Through the USAID PREDICT and Infectious Disease Emergence and Economics of Altered Landscapes projects, 500 samples from confiscated pangolins in Malaysia will be screened for paramyxoviruses, filoviruses, influenza viruses, coronaviruses, henipaviruses, herpesviruses and others. As seen with the SARS outbreak in China forcing the government to close wildlife markets for the first time in history to control the outbreak, it is hoped that identifying viruses of potential public health concern in pangolins will serve as a powerful tool to lobby governmental agencies and the public to stop the pangolin trade and prevent disease transmission protecting regional economies and public health.
Study on prevalence of Cryptosporidium in livestock (cattle/water buffalo) in Western Nepal

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A cross sectional study was conducted from November, 2014 to June, 2015 in calves of cattle and buffalo of Bardiya, Kailali and Kanchanpur districts of western Nepal. Samples were examined for the presence of Cryptosporidium by Ziehl-Neelsen Staining technique. Out of 350 faecal samples tested, 170 were positive showing an overall prevalence of 48.6% for Cryptosporidium in calves. For age, the prevalence of infection was higher in 0-6 month's old age (50.3%) group calves as compared to 6-12 months age (36.4%) group ($\chi^2 = 3.003$, $P=0.083$) of the calves. Likewise, the prevalence was significantly higher ($\chi^2 =74.195$, $P=0.000$) in crossbred/exotic animals (50%) in comparison to the indigenous (46%). In the present study, highest prevalence is observed in Bardiya (57.7%) followed by Kanchanpur and Kailali ($\chi^2 = 8.401$ $P= 0.015$). Moreover, prevalence tended to differ ($\chi^2 = 5.844$ $P=0.054$) in farms who manage the manure in pits (45.8%) as compared to scattered (49.5%). Therefore, current study suggests that Cryptosporidiosis is evident in cattle and buffalo population of western Nepal. As the parasite having potential of zoonotic transmission, Cryptosporidiosis must be ruled out while diagnosing the enteric infections in livestock and human beings.
Maintaining Dog-mediated Rabies Elimination In Sikkim, India

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The Sikkim Anti-Rabies and Animal Health program (SARAH) is a state-wide rabies program successfully eliminating dog-mediated human rabies for over ten years. Maintaining freedom from dog-mediated rabies has been challenging with distemper outbreaks diminishing the vaccinated dog population and socioeconomic developments on the West Bengal borders of Sikkim. Two rabies incursions have been investigated using a One Health approach with Chief Medical Officers and Department of Forestry Officers in southern Sikkim notifying the SARAH Division of suspect rabies in people, dogs and cattle. The two outbreaks investigated occurred in early January 2015 and 2016, the first involving a jackal biting two people and a dog, and the second report involving an unvaccinated imported dog biting its owner who subsequently died five weeks later with symptoms of rabies. Laboratory confirmed diagnosis of human rabies is difficult due to community resistance and remote location. Rapid antigen test is used on suspect animal rabid cases but further laboratory diagnosis and molecular testing is needed. Rapid response teams were sent to the area to conduct tracing of in-contact animals and mass vaccination of dogs, cats and some livestock in a ten kilometre radius. An active surveillance program is being implemented and legislation strengthened for pre-border control.
Green Space Versus Wild Space: Are Some Types Of Nature Better For Wellbeing Than Others?

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Internationally there is growing investment in improving human wellbeing through interactive nature experiences. However, while there is a strong body of evidence showing positive linkages between spending time in urban green spaces or natural (wild) spaces and a person's wellbeing, some studies have also found limited connection. Concerns have also been raised that factors such as fear and lack of knowledge about being in nature may act to moderate the potential benefits of spending time in either green spaces or wild spaces. This paper examines evidence from the 2014 Regional Wellbeing Survey, in which 5,000 Australians were asked about the types of green spaces and natural spaces they spent time in, and whether they experienced any of a number of factors considered likely to moderate or mediate the wellbeing benefits of spending time in these places. It focuses in particular on identifying whether spending time in green spaces such as urban parks has different associations with wellbeing compared to spending time in wild spaces such as national parks and wilderness areas.
Flaviviruses Detected In Various Species Of Mosquitoes Across The Atlantic Forest Of Brazil

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In response to the recent Zika, Chikungunya and dengue virus epidemics, the Brazilian Public Health service has expanded arbovirus surveillance, including in arthropods that may be ecologically competent vectors. The goal of this study was to design and test a screening method for the rapid detection of flaviviruses in mosquito samples. This technique is based on a sensitive reverse transcriptase polymerase chain reaction (RT-PCR) that amplifies a fragment of the flavivirus NS5 gene from infected mosquitoes. Adult mosquitoes in the Southern Atlantic Forest in Bahia, Brazil were captured using CDC light traps, entomological net and an oral suction tube. Mosquitoes were pooled (1-150 individuals) by species, collection site, and date. Laboratory analyses were carried out at the Evandro Chagas Institute, Brazil. From the 233/304 pools that we have analyzed to date, 18 generated amplicons and thus confirming the presence of flaviviruses. Various mosquitos species observed in our study carry flavivirus, including: *Aedes fulvus, Coquillettidia venezuelensis, Haemagogus janthinomy*, *Limatus durhamii, Limatus pseudomethysticus, Trichoproson digitatum, Anopheles triannulatus, Phoniomyia sp., Sabethes sp., Runchomyia sp., Anopheles sp and Phlebotominae*. This study is improving the diagnostic technology necessary for quick arbovirus surveillance in mosquitoes, which in turn will help to inform public health policies in Brazil.
Situational Analysis of Antimicrobial Resistance Using the One Health Approach: A Case Study of Malawi

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Antimicrobial resistance (AMR) is a direct consequence of the selection pressure from necessary and indiscriminate antimicrobial use in humans, animals and the environment, requiring a One Health approach towards its understanding and containment. The WHO's National Action Plan (NAP) template and checklist were used to conduct a situational analysis of AMR in Malawi. The Ministries of Health, Environmental Affairs, and, Agriculture and Food Security established a core in-country team who facilitated data collection from key informants in their sectors ranging from government to civil society. This data was verified during a peer review process by an external panel of international peers who commended good practice and identified areas for intervention within a continuous quality improvement paradigm. Notwithstanding the minimal AMR-related activities in the country, the process engendered collaboration between and appreciation of the AMR challenges experienced within and between the human, animal and environmental sectors. The findings of the internal and external processes elucidated strengths, weaknesses, opportunities and threats (SWOT) to inform the development, implementation, monitoring and evaluation of the Malawian NAP, giving effect to Malawi's commitment to the World Health Assembly resolution on NAPs as well as the Ministry of Health's concept note and roadmap on One Health.
Are alternative agricultural systems good for wellbeing as well as for environmental sustainability? Evidence from Australian farmers

Jacki Schirmer
Kimberly Brown

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In Australia and internationally, growing numbers of farmers are managing their land using alternative agricultural methods intended to increase the sustainability of agriculture. Going under many labels, including biodynamic, organic, regenerative, holistic and natural sequence farming, these farming practices are argued to be better not only for the environment but also for the farmer. While the environmental benefits of these practices have been established to some extent, the claims made regarding the benefits of these farming practices for the wellbeing of agricultural households have not. This paper presents a quantitative analysis of the wellbeing of farmers engaging in these practices, based on a survey of 3,000 Australian farmers conducted as part of the annual Regional Wellbeing Survey. It examines whether alternative farming practices are associated with improved health and wellbeing for farmers compared to traditional farming practices, and in what circumstances. Based on this, the authors proposed a new approach to classifying alternative agricultural practices that focuses not only on their environmental outcomes but which uses a socio-ecological systems approach to classify them based on social, economic and environmental outcomes.
Can farming regeneratively support farmer wellbeing and achieve sustainable land management?

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The regenerative farming movement is growing in Australia, and focuses on achieving sustainable landscape-scale management with positive environmental, social and economic outcomes. Advocates claim there are wellbeing benefits associated with this practice, but there is limited evidence. In this paper, we examine the potential pathways by which regenerative farming may influence wellbeing of farmers, drawing on data from a series of semi-structured interviews held with regenerative farmers across southern New South Wales. Interview participants were asked their views on the costs and benefits regenerative farming has had on their household, farming business and personal wellbeing. Thematic analysis was undertaken and potential wellbeing and psychological health impacts of regenerative farming were identified. This paper examines when and in what ways farming in a regenerative manner may have benefits and costs for wellbeing, and what evidence is needed to better establish the potential for regenerative farming to address not only the major sustainability challenges facing many Australian landscapes, but also to improve health and wellbeing outcomes for the farmers involved.
Sink surveillance: joint Animal-Human Health environmental surveillance method to detect avian influenza viruses in live bird markets in Dhaka, Bangladesh

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Highly pathogenic avian influenza (HPAI) H5N1-infected countries have demonstrated that the HPAI H5N1 virus can be commonly found in live bird markets (LBMs). LBMs in major urban centers also act as accumulation areas of poultry pathogens as a result of a source-sink ecological dynamic along poultry value chains. Since no HPAI H5N1 outbreaks were detected by passive farm surveillance in Bangladesh since January 2015, a novel method for detection of influenza viruses using pooled environmental samples in LBMs in the pathogen sink area of Dhaka, Bangladesh was developed through joint collaboration of the animal and human health services of the Government of Bangladesh. Monthly sampling was initiated in January 2016 in 106 LBMs by a joint team of animal health and human health government officers. Of the 207 markets tested by real-time rtPCR from January to February 2016, 185 (89%) were positive for influenza A and 94 (45%) were positive for H5 subtype consistent with H5N1 virus. These high percentages indicate not only the high level of circulation of, and frequent human exposure to, avian influenza viruses in the LBMs of Dhaka, but also the high sensitivity of this new environmental surveillance method for detection of influenza viruses.
“It wouldn’t happen to me” – Horse owners’ suspecting and reporting of Hendra cases

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Hendra virus infection is a zoonotic disease which spreads from bats to horses and from horses to people. Transmission spillovers are rare events, but can be fatal to horses and people. When Hendra virus is confirmed on a property, owners may be reluctant to report because of potential disruption and stigma. As part of a national research program, the "Horse owners and Hendra virus: a longitudinal cohort study to evaluate risk" (HHALTER) project collected survey information from horse owners from 2012 to 2014. The fourth survey in a series of five included questions about the recognition and willingness to report a suspected Hendra virus case to authorities. The data are presented here using categorical analysis techniques to explore the relationships between attitudes towards reporting of a case and risk perception and demographic information. A total of 613 (42\%) participants responded to survey four. Although just under a third of these (31.1\%) thought that the possibility of Hendra virus in their horses was very or extremely likely, 13.7\% reported that they wouldn't think Hendra virus was a possibility when presented with clinical signs 'typical' of Hendra virus infection. The issues addressed have broader relevance to complex emerging disease scenarios.
Perpetuating Chemical Pollution through University Curricula

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Since World War II, industry has dramatically increased the production and dissemination of synthetic chemicals, which contaminate ecosystems and impact wildlife and humans alike. This paper takes a critical look upstream at a conspicuous yet underanalyzed source of this problem, one guaranteed to reproduce the status quo -- university chemistry departments that exclusively teach brown chemistry. Since the 1990s, green chemistry, the branch of chemistry dedicated to designing products and processes that minimize the generation of hazardous substances, has gained increasing traction, with substantial increases in research funding, conferences, and academic journals dedicated to the topic, as well as the development of teaching materials. Yet, as of 2015, there is a significant and consequential lag in the adoption of this paradigm, with fewer than 60 of the 1200 North American chemistry departments offering any training in the area. This paper focuses on the factors behind this lag and argues that the adoption of green chemistry is being stymied by a rearguard that continues to assert academic values that correspond with an industrial model of 'progress'.
Feasibility And Suitability Study To Establish And Promote Swine Production Zone In Nakhon Pathom Province Of Thailand

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Nakhon Pathom is one of the province in Thailand where swine are densely populated. Approximately 63 percent of the land in Nakhon Pathom is used for producing agricultural products. Pork and pork products are one of agricultural product that is the major source of farmer income. Even though pork and pork products from Nakhon Pathom demanding is increased, swine farms in the province is rarely expanded. Because swine farmer could not control the waste discharge from swine farm. This problem had led the Nakhon Pathom governor to initiate a project call "Swine Zoning" which enable multidisciplinary project that draw scientists, government officials, and private sectors to study the feasibility and suitability to establish pig production zone in order to help backyard and medium size pig farm to expand. The Thailand research fund granted the fund to study establishment and suitability of zoning where the objectives of the study is divided into 3 components which are 1) study the impact of zoning related to spatial, chain of production and disease control 2) study social impact in which which involved economics, social networks, wellbeing and willingness to participate in the zoning project and 3) policy content and context to drive zoning initiatives
One Health in Action: development of a multi-sectoral mass dog vaccination program for improved rabies control in Dhaka, Bangladesh

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A multi-sectoral human health, animal health, and animal welfare NGO initiative was taken in Bangladesh by the Communicable Disease Control (CDC) office of the Ministry of Health and Family Welfare, the Department of Livestock Services (DLS) of the Ministry of Fisheries and Livestock, and the Obhoyaronno Bangladesh Animal Welfare Foundation to improve rabies control in Bangladesh. The initiative's objective is to raise herd immunity through comprehensive mass dog vaccination of both owned and unowned dogs by trained dog catchers and vaccinators. To pilot the program, rabies vaccine was donated by the Agri-food and Veterinary Authority of Singapore and a rapid one-day training was conducted by FAO on dog catching and vaccination for 36 participants from CDC, DLS, and Obhoyaronno. The training was immediately followed by dog vaccination in selected areas of Dhaka with field mentoring by FAO. Six vaccination teams, each consisting of six members from the three Bangladesh partner agencies, vaccinated 4,177 dogs in nine days, the highest output rate achieved thus far by vaccination teams in Dhaka. The collaborative initiative taken by stakeholders in Bangladesh demonstrates that the One Health principle of coordinated action against zoonotic diseases is more efficient than independent stakeholder action.
Detecting Hidden disease in the UK cattle network; unexpected mortality as a tool for identifying and tracking unreported syndromes.

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The UK cattle industry is a rigorously tracked network of millions of individual cattle movements. However, whilst movement and animal information, including death, is stringently recorded, many of the UK’s cattle disease surveillance systems rely on voluntary recording. This can lead to under-reporting or delayed action, particularly when the disease is new or not easily diagnosed.

We have created a model which uses a "systems" approach and cattle mortality to better understand the UK bovine disease system and bypass the issue of under-reporting to help predict the spread of unknown/syndromic disease. The model firstly groups farms based on similar animal, environmental and landscape characteristics. Within these groups, farm-level mortality is predicted based on individual cattle parameters, and the model reports farms which significantly exceed this. The model then looks for relationships between these farms and disease cases, and the connectivity of these farms within the cattle network. Thus the model can help to identify potential hidden networks of disease spread and clustering of unreported infection. The results can be used as stand-alone information, or in conjunction with other outputs as a new tool to help target disease surveillance.
Practical One Health Implementation in Community: Lesson Learned from PODD project in Chiang Mai, Thailand

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PODD or Participatory One-health Disease Detection was a project which integrated One-health into disease surveillance activities in community level. It was implemented in 75 local governments in Chiang Mai, Thailand for 2 years. Ban Loung Sub-District Municipality, where is in Chom Thong, Chiang Mai, was a pilot local government that enrolled in PODD project. They have implemented PODD in their community. They recruited 4 volunteer reporters, who was using PODD mobile application to report human diseases, animal diseases and environmental problems, at the initial period and added more in the second year. They have established response team to control and solve those problems, which was reported through PODD application. They encouraged and financial supported backyard chicken farmers in community to set up chicken raiser group. The group members have been provided knowledge chicken disease prevention and control and trained to know how to vaccinate all their animals properly in a timely manner. This local government coordinated the participation among academic, authorities, farmers and people in community to work together in disease surveillance and control. Ban Loung Sub-District Municipality could be the role model that implemented One Health to pandemic control for better life community.
Adverse Events following Q fever vaccination in young Australian adults

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Australia has a licensed Q fever vaccine for humans (QVax®). The lower age limit for administering QVax® is 14 years. Adverse event following immunisation (AEFI) data for those aged 15-20 years, particularly females, is lacking. Such data are important to inform any recommendations for community-wide vaccination. Australian veterinary students are routinely administered QVax®. From 2013-2016, students were recruited at vaccination to complete an online post-vaccination AEFI survey. Data were analysed for frequency of local and systemic AEFIs. Chi-squared analysis was used to compare proportions. A total of 499 students participated, of which 375 (75%) were aged 17-20 years, and 424 (85%) were female. Injection site reactions (ISR) characterized by pain, erythema or swelling occurred in 489 students (98%). Significantly more females (32%) reported severe ISR as compared to males (14%) (p<0.005). Fever occurred with similar frequency (16% females, 14% males [NS, p=0.29]). There was no significant difference in local or systemic AEFIs when stratified by age (17-20 years vs ≥21 years). Q fever vaccination resulted in frequent ISR but few serious AEFIs. Females reported significantly greater ISR than males. AEFIs did not differ between younger and older vaccinated cohorts, suggesting a comparable safety profile in teenagers and adolescents.
What drives rural poultry farmers to implement Avian Influenza control in Bangladesh?

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We identify the factors that influence the adoption of effective interventions to control avian influenza (AI) outbreaks among poultry farmers. This involves the use of the Health Belief Model and the Snyder Hope Scale, exploring determinants of AI preventive measures among 108 backyard poultry farmers in Chittagong, Bangladesh. Almost all farmers (>94%) acknowledged the severity of AI in poultry, and the contagiousness of AI infection. Farmers were aware of interventions to minimise the risk of infection for their flock and themselves, but monetary constraints were reported to impede them from implementing the full range of AI preventive measures. About 72% of the farmers indicated that the investment cost building separate poultry houses remains a major barrier to AI prevention. We used the Hope Scale, a cognitive model describing the farmer's capacity to initiate actions and to generate routes to reach the goal of controlling AI spread. Statistically significant (P<0.05) relationships indicated more hopeful groups: 1) farmers who are aware of AI and 2) members of certain religious groups. They may therefore be more likely to explore multiple options for AI prevention. This
study suggests that social, structural and individual behavioural determinants should be considered in developing future AI control programs.
Antimicrobial resistance (AMR) has been identified as one of the world's most pressing issues. The spread of AMR is commonly attributed to overuse of antibiotics in both human health and animal production. The rapid emergence of AMR can, in part, be attributed to mobile genetic determinants such as the integron. Integrons capture genes by site-specific recombination, and those found in clinical settings have unique structures and carry genes that encode antibiotic resistance. These clinical class 1 integrons are embedded in other mobile elements (plasmids and transposons). The combination of this multi-level mobility facilitates spread of AMR within and between bacterial species. We have been investigating the carriage of AMR in bacteria from diverse wildlife species experiencing variable levels of human impacts. Hosts include flying foxes, marine mammals and marsupials in environments spanning captive breeding programs, the urban fringe and Antarctica. Using genetic and culture-based approaches we have isolated multidrug resistant *E. coli* from all wildlife hosts examined. The gene arrays within the class 1 integrons from wildlife hosts are commonly identified in clinical pathogens from humans. Our data demonstrates the far-reaching dispersal of AMR, including occurrence in some of the most extreme environments on Earth, Antarctica.
Understanding historical and environmental change for better coastal adaptation policies today

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Using a transdisciplinary framework leveraging natural sciences, social sciences, history and art-based approaches towards integrated policy recommendations, we are studying adaptation to climate change in the Cocagne River Watershed communities, New Brunswick, Canada. The inhabitants have demonstrated exceptional resilience through the creation of local non-governmental organizations and the building of rural development plans. By partnering with these groups, we are working together to develop adaptation strategies to tackle climate change and community health. One approach we use is to combine archival and geochemical analysis to reconstitute the evolving communities of the Cocagne River Watershed from the beginning of industrialization to the present day. Specifically, we have reconstituted the local population with the Canadian Censuses and sampled aquatic sediment cores in order to reconstruct ecosystem changes through indicators of aquatic productivity and the presence of metals. Thus, we use two types of data (archival and biogeochemical) towards the same goal of understanding how land use practices impact ecosystem health and community resilience. Our findings highlight the vulnerability and the resilience of small communities in constant change. Better understanding of past adaptations as well as local culture allow us to propose specific coastal adaptation policies to increase health and wellbeing of communities.
Adaptation Of The European Legislation On Epidemiological Surveillance In Ukraine

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As part of reforming health care systems, the development and implementation of national strategies for the prevention and control of infectious diseases should be in accordance with the international rules and European Union (EU) standards. The goal of this study was to identify gaps in national legislation for epidemiological surveillance in Ukraine, and to identify areas for adaptation of current legislation to the EU standards. The absence of a national strategy for the prevention and control of infectious diseases in Ukraine adversely affects the operation of the current system of epidemiological surveillance at both the Ministry of Health (MOH) and the regional levels. According to local regulation, each case of infectious diseases should be reported in Ukraine. However, in practice, only 67 diseases are reported, and there is no nosological classification system or priority for reporting. Hurdles to the adaptation of international rules and EU standards include the fact that there is no single electronic database of infectious morbidity; there are no developed Standard Operating Procedures; there is no national electronic notification system about public health threats; private sector laboratories remain largely outside of the reporting system; and there is no national strategy for combating antimicrobial resistance.
Beyond the virome: the occurrence of emerging non-viral zoonoses in flying foxes

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Spillover of zoonotic pathogens from wildlife to humans has been identified as a primary threat to global health. In contrast, the process of reverse pathogen transmission (zooanthroponosis), whereby pathogens move from humans into wildlife species is still largely unexplored. Increasing urbanisation and habitat loss are driving many wildlife species into urban and regional centres. In Australia, large numbers of flying foxes now live in close proximity to humans, increasing the risk of zooanthroponosis. We have been investigating the occurrence of diverse non-viral agents in flying foxes, specifically the waterborne parasitic protozoa Cryptosporidium and Giardia. Cryptosporidium is an emerging zoonotic parasite that infects a wide range of vertebrates. PCR screening of faecal samples from seven wild and two captive flying fox populations identified the presence of Cryptosporidium in both wild and captive individuals. Multilocus sequencing was used to identify Cryptosporidium in flying fox species and elucidate transmission pathways. Four novel Cryptosporidium genotypes were identified in captive and wild flying foxes and the human associated C. hominis was detected in captive individuals. Zoonotic Giardia genotypes were also indentified. Our data indicate the potential for flying foxes in transmission of non-viral zoonotic pathogens of public health risks.
Forest-based livelihoods, deforestation and malaria in Southeast Asia: the relevance of the chronotone for understanding malaria persistence at the forest fringe

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Deforestation in Southeast Asia has coincided with a substantial decline in malaria across the region, principally because local vectors require shaded forest environments. Malaria transmission is now limited to remote forested regions, especially border areas, where the forest is a focus of legal and illegal economic activities. Often these areas are inhabited by ethnic minorities, who are traditionally dependent on slash and burn agriculture, requiring overnight stays at their farms located in the forest. In these remaining malaria hotspots, 'forest-going' is recognized as the major risk factor for malaria infection, however how 'forest-going' manifests as a risk behavior in the context of deforestation becomes more complex. Using a case study approach, based on extensive mixed-methods field research in three settings in Vietnam and Cambodia, the concept of the chronotone will be employed to demonstrate that transitions in livelihoods as the forest recedes can contribute to local malaria hotspots persisting, even as malaria incidence in the region declines. It will be argued that persistent malaria transmission is driven by shifting access to forest resources, and that the exposure risks associated with 'forest-going' are best understood at a social network rather than individual level.
Spatial and temporal risk factors for sporadic Salmonella cases.

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Salmonella spp. is a leading cause of gastroenteritis worldwide, causing a large economic and social burden. Transmission via food is accepted as a common source of human infection and, in many countries, a successful reduction in case load has been achieved through targeted interventions in the food chain. However, sporadic cases continue to occur and are often associated with a contaminated environment or infected wildlife species. The drivers of these sporadic cases are poorly understood. This study used retrospective surveillance data to investigate the spatial and temporal risk factors for the main serotypes of Salmonella spp. in New South Wales, Australia. Regression models were constructed to predict the relative risk of salmonellosis at the Local Government Area level, based on human, animal and environmental characteristics. Furthermore, time series analysis was performed to assess the relationship between sporadically reported serotypes and climatic factors such as rainfall and temperature. Where possible, diagnostic data from humans and wildlife from the same region were compared. By using these methods it was found that spatial risk factors, such as the location being inland, were significant (p < 0.001) predictors for cases of sporadically reported Salmonella spp. serotypes.
Q Fever Surveillance in New South Wales 2005-2015

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Q fever is a worldwide zoonotic disease caused by infection with Coxiella burnetii. Notifications have been increasing in Australia, with 604 notifications in 2015. This is the highest number of notifications since the start of the National Q fever management program in 2002. While many cases have traditional exposures, an increasing proportion have non-traditional exposures, demonstrating the need for ongoing surveillance and identification of changing exposure risks. In New South Wales (NSW), notified cases are followed up by public health units for the purpose of monitoring the epidemiology to inform the development of better prevention strategies. We reviewed exposures recorded in surveillance data with a view to developing an enhanced approach to Q fever surveillance in NSW. Preliminary analysis has shown changes in questionnaire reporting trends and epidemiology of Q fever in NSW from 2005-2015. Cases fitted into five contact groups: direct contact with livestock (47%), indirect contact with livestock (7%), native animal contact (8%), companion animal contact (1%) and no known animal contact (37%). Capturing case exposure history has improved with time, however, the system may benefit from an enhanced surveillance approach with standardised tools to better quantify exposure risks and aid future preventative strategies.
Development of an autogenous vaccine to control Coxiella burnetii infection in a dairy goat herd

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Between 2012 and 2014, an outbreak of Q fever occurred on a dairy goat and sheep enterprise in Victoria, Australia. Further human infections with Coxiella burnetii have been controlled by vaccination plus environmental and biosecurity interventions, but infection of the goats remains a problem. Although a veterinary vaccine is available in Europe, it does not currently meet Australian registration standards. The aim of this project was to develop an autogenous vaccine for use on the affected farm. C. burnetii from the farm was isolated from an aborted foetus through inoculation into fertile chicken eggs. Studies were performed to determine growth and formaldehyde inactivation kinetics, the optimum method for purifying bacteria from the egg material and methods for testing antigen and formaldehyde concentrations in the purified material. In a safety and immunogenicity trial performed in goats, a prototype vaccine elicited an immune response in all vaccinated animals, with a swelling at the injection site the only adverse effect. The same vaccine protected guinea pigs against fever following exposure to C. burnetii in a small scale challenge study. Results are promising, but ultimately, vaccine efficacy will be determined through a series of field trials and use on the farm.
Using Problem Based Learning And Interactive Technology To Provide An Immersive Experiential Learning Environment In One Health For The Health Sciences Programs At Tufts University

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There is a critical need for students in veterinary, human and dental medicine to appreciate and develop expertise in One Health in order to promote and improve health for people, animals, and the environment. In this presentation, we describe an interdisciplinary web-based and manually available program developing and piloting One Health Problem Based Learning cases for use across the health sciences programs at Tufts University. In order to teach our students to practice effectively within the burgeoning field of One Health, we employ an approach that involves multidisciplinary collaborative efforts to combine the experience and knowledge base of practitioners across the Allied Health fields in order to develop intellectual resources within our students as well as teach valuable skills in teamwork and communication. Through funding from the Tufts Innovates Program a grant that supports multidisciplinary enquiry and collaboration, we assembled a cadre of faculty and students from across the schools to identify areas of thematic importance to create a One Health community of educators and learners. The outcome is six multi-disciplinary One Health PBL cases used across the health sciences schools. Facilitator and student OHPBL guides will be revised, completed and availed on line and manually.
Gender Equality In A One Health Zoonosis Program In Sikkim, India

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The role of women in rabies elimination programs has had minimal review therefore as a senior female veterinarian in the Sikkim Anti-Rabies and Animal Health (SARAH) program, for over ten years, this presentation will provide valuable examples and insights sharing the importance of women's participation in zoonosis programs. Sikkim has two main indigenous groups: Lepcha and Bhutia's comprising thirty percent of the population and the rest being heterogeneous Nepalese people with about twenty different languages spoken. This One Health rabies program incorporates education and awareness of rabies prevention involving Animal Birth Control and Anti-rabies mass vaccination campaigns. Using clear messages about birth control in dogs and animal welfare has increased the number of animals presented for sterilisation surgery and the welfare of animals. As the only female on the program team, my role has been pivotal in working with women. Lepcha and Bhutia women in Sikkim are relatively independent and empowered, but we are a minority. The education about rabies prevention within schools and communities incorporates the importance of treating all beings with respect and compassion. The SARAH program has a holistic approach with gender equality through compassion underpinning our health messages.
Increasing the One Health Impact in University Institutions by integrating One Health Core Competencies into University curricula in East and Central Africa: OHCEA's One Health Module development process.

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The Ebola outbreak in West Africa and the current Zika virus threat demonstrate how a geographically isolated outbreak of an infectious disease can cause global disruption and underscores the economic and humanitarian impacts of infectious diseases. What type of training will provide professionals with the skills and competencies needed to combat such threats? The One Health Central and Eastern African network (OHCEA) a network of 17 schools of public health and veterinary medicine has developed One Health core competencies and modules that are key to delivering knowledge and skills to a multidisciplinary workforce and building a framework on which One Health curricula can be designed and implemented. A total of 17 modules are being developed including One Health soft skills such as communication, culture, leadership, gender and core technical skills such as ecosystem health, infectious disease epidemiology, One Health concepts and outbreak response. These modules are being used at both preservice and in service levels as full courses, workshops or integrated into course materials for professionals who impact disease detection, prevention and response allowing them to successfully function as an integral part of a larger, multi-disciplinary, team of professionals. This is key to creating a stronger sustainable public Health workforce.
One Health as both a risk and an approach to eastern gorilla (Gorilla beringei) conservation

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Eastern gorillas (\textit{Gorilla beringei}) are the most endangered great ape species in the world. At just 880 individuals, the mountain gorilla (\textit{G.b.beringei}) in Rwanda, Uganda and Democratic Republic of Congo is the only great ape whose numbers in the wild are increasing. This is the result of "extreme conservation" measures centered on park protection, anti-poaching patrols and veterinary care. Human habituation of wild mountain gorillas facilitates ecotourism that provides essential revenue to the governments, but brings more than 29,000 people into close contact with mountain gorillas annually. This poses a potential risk for zoonotic pathogen transmission to this endangered species; human pathogens have been confirmed to cause mortality in wild great apes. Habituation also creates an opportunity for One Health interventions: with government partners, Gorilla Doctors provides clinical care to ill and injured gorillas, closely monitors the populations for disease events, cares for confiscated primates, and delivers a preventive health program to park workers. As the implementing partner for the USAID Emerging Pandemic Threats PREDICT project, Gorilla Doctors conducts zoonotic pathogen surveillance and research to better understand diseases in eastern gorillas and inform mitigation strategies for reducing the risk of pathogen transmission between people and gorillas. (word count: 196)
Japanese Encephalitis (JE) is a vector borne viral zoonotic diseases, transmitted by Culex mosquitoes. It is main public health problems in Asia including Nepal, engendering poverty and intellectual standard of nation hampering prosperity and misfortune of economy of life. People generally migrate from rural to urban areas for sustaining economy. To alleviate poverty, they rear pigs. Pigs are the reservoir hosts for JE virus. But, they have lack of knowledge about JE. Hence, the study was conducted with aim to study knowledge, attitude and risk factors associated with JE among pig farmers. Spatial distribution of JE and Acute Encephalitis Syndrome (AES) seemed to be similar and amount of irrigated land use density and degree of landscape mixing with irrigated areas were positively associated with JE and AES. The human and pig sero-positivity were found to be 11.17(41/367) and 28.93 (149/515) in Nepal. The individual, community and geographic scale using a mixed methods approach allowed us to reveal the social drivers of JE, and revealed the need to train health professionals to look to collaborative efforts to manage these social and geographic drivers rather than to consider more classical medical interventions as the primary strategy against JE and other vector-borne diseases.
Air pollution and respiratory health in West Africa: Knowledge and practices of populations

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In the aim to fight against air pollution, an intervention at community level termed "AIR-SAIN" is planned to be implemented in four West African cities. To assess the effectiveness of an intervention in human population, it is more adequate to perform a pre-intervention study to establish a baseline data, which will be used to evaluate the effect of the intervention.

The main objective of our study was to investigate the population (household) knowledge and behavior related to air pollution before the implementation of "AIR-SAIN" program.

The survey was conducted during the first semester of year 2016 based on a validated questionnaire, which were administrated to 959 households in eight districts from four cities (240 in Abidjan, 248 in Cotonou, 231 in Dakar and 240 in Ouagadougou).
The data collected during the survey were focused mainly on the characteristics of population's houses, their kitchens, their knowledge and practices related to air pollution in general, their beliefs about indoor pollution and their used of health services in the case of respiratory illnesses.

This study contributed to the planning of better activities to prevent air pollution in general and especially indoor air pollution based on real population's needs.
Epidemic And Endemic Mosquito-borne Flaviviruses Of The Asia-Pacific Region: Their Importance In Diseases Of Humans And Animals

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There are approximately 20 known species of mosquito-borne flaviviruses that circulate in the Asia-Pacific region, including a number of known pathogens. Normally most of these viruses exist in animal-mosquito transmission cycles. Over the past 20 years, a number of flaviviruses have emerged unexpectedly to cause outbreaks of human and/or animal disease. Japanese encephalitis emerged in northern Australia in 1995, causing human cases of disease; Zika virus emerged in the Western Pacific from SE Asia in 2007 as a significant human pathogen, and has since spread to several Pacific islands as well as to the Americas; and Murray Valley encephalitis re-emerged in south eastern Australia to cause human and equine disease, together with West Nile virus, which caused unprecedented numbers of equine disease. In each of these examples, a confluence of favourable vertebrate host reservoir and environmental factors occurred to allow these viruses to become established, including the presence of immunologically naïve human and/or animal populations and competent vectors. These examples of flavivirus diseases and the factors underlying their emergence or re-emergence will be presented in the context of One Health, and their potential for pandemic spread will be explored.
Development of an online course for future one health workforces in emerging and re-emerging zoonotic diseases

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Since 2014 the South East Asia One Health University Network (SEAOHUN) developed 14 One Health Short Course (OHSC) modules to effectively look for answers to public health challenges. These modules are suitable for undergraduate program but needed to be delivered face-to-face. An online course could appeal to a wider audience who want to learn about One Health at their own place anywhere in the world. It is suitable for young generation who grew up with mobile devices and want to gain knowledge without bordering from time and place. The Thailand One Health University Network (THOHUN) funded this project, aimed for future one health workforces. It was developed by the multidisciplinary team, included students and teaching staffs from health sciences, and media and technology. Pre-design questionnaire was collected. It reveals less understanding on one Health than zoonosis. They indicated to gain more knowledge in disease control and prevention. The contents are useful knowledge and implementation in zoonosis control with case-based approach. The flowchart and delivery methods were designed, based on their behaviour and society. The challenge and competition among learners are put in the course structure. This online course can help the learners to update fundamental knowledge and practice for response to emerging and re-emerging zoonotic diseases.
Comparative Pathology of Duck and Chicken Experimentally Infected with an
Indonesian H5N1 HPAI Virus Clade 2.3.2.1

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The outbreaks of H5N1 highly pathogenic avian influenza virus (HPAI) are still present in Indonesia. In 2012, a new clade of H5N1 HPAI virus, clade 2.3.2.1, was reported to be found in Indonesia causing mortality in ducks and chickens. The aim of this study is to compare the pathology changes observed in H5N1 HPAI infected ducks and chickens. Ten healthy chickens and eight ducks were experimentally infected with H5N1 HPAI virus clade 2.3.2.1 (A/duck/Sukoharjo/BBVW-1428-9/2012). Clinical signs and mortality were recorded. Several organs were collected from dead birds and tested with immunohistochemistry (IHC) and haematoxycilin and eosin (H&E). Results showed that both ducks and chickens were susceptible from H5N1 HPAI clade 2.3.2.1 infection indicating by severe clinical signs and mortality observed in these birds. Pathological changes which include necrosis and viral antigen were detected in several organs tested both in infected ducks and chickens, suggesting that Indonesian H5N1 HPAI clade 2.3.2.1 virus is pathogenic for both ducks and chickens.
Prevalence And Multidrug-resistant Foodborne Pathogens In Livestock & Poultry
Value Chain In Bangladesh

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Emergence of antimicrobial resistance foodborne bacteria due to easy access & indiscriminate
use of antibiotic has become a serious problem in Bangladesh. However, the prevalence of
foodborne pathogens and its potential risk to public health has not been well determined and
evaluated. A total of 63 (26%) salmonella along with 97(4%) E.coli O157 isolates were
recovered from 2420 samples taken in 6 categories representing 22 types during 2015-2016.
Among the Salmonella isolates, the predominant serotypes were S. Enteritidis (n=195),
followed by S. Typhimurium (n=136), S. Infantis (n=65), S. Dublin (n=45), S. Indiana (n=42),
S. Gueuletapee (n=36) and S. Derby (n =15). In disk diffusion assay, high rates of antimicrobial
resistance were observed for tetracycline (73.8%; 66.8%), gentamicin (72.4%; 69.2%),
ampicillin (70.3%; 68.9%), amoxicillin (54.5%; 67.9%) and ciprofloxacin (50.3%; 45.9%) in
salmonella & E. coli O157 respectively (CLSI standard). About 78.2% salmonella and 75.1%
E. coli O157 isolates showed a multidrug resistance (MDR) phenotype (resistance to ≥ 2
antibiotics). On-going study provided prevalence of foodborne pathogens in food, which may
be for poor hygiene and farming-to-slaughter practice. MDR highlights the need for immediate
action on regulation and monitoring antimicrobial use to reduce healthcare cost and risk to public health.
Mainstreaming Gender in One Health and Emerging Pandemic threats through a regional training of trainers program in East and Central Africa

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The diverse roles played by men and women create different exposure mechanisms to emerging pandemic threats and infectious diseases. Gender roles, the distribution of labor, access and control over resources play an important part in the biosecurity, control, prevention and response to infectious diseases. Therefore gender differences need to be addressed to respond effectively to public health threats. One Health Central and Eastern Africa (OHCEA), a network of 17 schools of Public health and veterinary medicine in Africa has identified Gender as a key One Health core competency. With this in mind, OHCEA set out to ensure that gender as a strategic concept is included as an analytical and planning tool across programs by creating a Gender and One health training program. The training applies gender analysis tools to disease surveillance, response, prevention and control mechanisms, engenders One Health skills and competencies, identifies gender gaps and develops gender sensitive indicators and policies to address those gaps. Trainings target in service personnel in multiple disciplines, the private sector and university faculty and students from OHCEA institutions. The end goal is to create a gender integration training curriculum that weaves the key principles of gender equality and gender analysis throughout OHCEA institutions.
Case Study On Qatar Experience On Mers-CoV One Health Surveillance And Response, 2012–2016

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The emergence of MERS-CoV in 2012 placed a great concern on public health institutions in the Arabian Peninsula. This is a case study that describes how the implementation of One-Health approach informed surveillance and response to MERS-CoV in Qatar during the period 2012 - 2016. A national, multidisciplinary outbreak control task force was formulated and was getting the technical support from the WHO, CDC and Erasmus.MC. While the leaders' commitment to the One-Health approach besides the early engagement of the community were central to ease the joint investigation of cases, the need for technical surveillance guidance from the veterinary sector was essential. The familiarity of the camel owners with the veterinarians within the joint investigation teams helped in building trust. Self-reporting of suspected cases among the people at risk increased. The investigation revealed that 12 cases were camel related workers. Control measures were also informed by the results obtained from the joint studies and investigation. Qatar was the first to report that camels can be a potential source for MERS-CoV virus. The One health Surveillance has been central to generating evidence to obtain a better understanding of MERS-CoV transmission.
Ecological Niche Modelling of Rift Valley Fever Virus Vectors In Baringo Kenya

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Rift Valley fever (RVF) is a vector-borne zoonotic disease that has an impact on human health and animal productivity. The episodic RVF outbreaks are closely linked to interannual climate variability. This study evaluated the effect of climate change on RVF vector distribution in Baringo County, Kenya with an aim of developing risk maps for spatial prediction of RVF outbreaks. The study used vector presence data and Maximum Entropy (MaxEnt) ecological niche modelling algorithm to predict the effect of climatic change on habitat suitability and the spatial distribution of RVF vectors. Data on species occurrence was obtained from longitudinal sampling of adult mosquitoes and larvae. We used current (2000) and future (2050) Bioclim climate data to model vector distribution. Model results predicted potential suitable areas with high success rates for Culex quinquefasciatus, Culex unvitattus, Mansonia africana and Mansonia uniformis. Under the present climatic conditions, the lowlands were found to be highly suitable for all vector species. Models based on future climatic conditions indicate an increase in the vectors’ spatial range, exposing new human and animal populations to RVF risk. Soil types, precipitation in the driest quarter, precipitation seasonality and isothermality showed the highest predictive power for the four species.
Ecology and impact of Beak and Feather Disease Virus in wild parrots

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Beak and Feather Disease Virus (BFDV) is a serious cause of conservation concern for parrots around the world. In Australia, it was listed as a "key threatening process" by the Commonwealth Government, as it can lead to decline and possibly extinction of already threatened parrot species. Due to the high genetic variability and mutation rates of BFDV, it may rapidly evolve and affect new hosts. Emerging evidence suggests that it can infect several non-parrot species. Studies on transmission dynamics and survival in relation to BFDV in wild parrot populations have so far been limited. The focus of this study, which started in March 2016, is to determine the prevalence and seasonal variation of BFDV in several wild parrot species, in particular the Crimson Rosella (Platycercus elegans). The second main goal of this project is to quantify the fitness costs of BFDV infection in wild *P. elegans* (breeding success and adult mortality), and to use genetic tools to understand the transmission dynamics and the effects of genetic diversity of both host and pathogen. A further aim is to identify the role of nest hollows for indirect virus transmission within and between species, as BFDV appears to be environmentally stable.
Framework and Core Competencies for Action-based Research for Wildlife Health

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Science often has a "catch up role" rather than being the "frontrunner" for tackling ecohealth problems. The timeframe for decision-making for preventing ecological changes is incompatible with the timeframe needed for science to fully understand those changes. Therefore, there is growing recognition from practitioners (wildlife health, conservation, public health and sustainable development), that a pragmatic problem solving approach is needed. In response, crisis disciplines and multidisciplinary approaches actively advocate for a socio-ecological approach. However, the social component of this approach has largely been neglected in fields such as Conservation Medicine and One Health. As a result, individuals (and institutions) seldom develop core competencies such as soft or non-technical skills (knowledge translation, effective communication and leadership) that are relevant for driving change in multidisciplinary fields. We propose an action framework that identifies the steps for balancing social and ecological information for action-based research in wildlife health context. This is drawn from literature on change behavior from public health, sustainability, climate change, conservation and outcome based medical education. This action framework will be tailored to wildlife health professionals and represents a set of steps and core competencies that researchers/practitioners must have to approach complex socio-ecological challenges that affect humans, animals and the environment.
The importance of total nematode counts in the development of diagnostic methods for 
*Trichuris trichiura* (whipworm), exploring the potential of saliva and serum antibodies.

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*Trichuris trichiura* infection is one of the most prevalent neglected soil transmitted helminths worldwide, affecting humans and non-human primates. Diagnosis, treatment efficacy and monitoring of anthelmintic resistance rely on detecting eggs in stool samples, however, commonly used diagnostic methods lack sensitivity. Furthermore, cases of low intensity infections, cultural sensitivities and challenges associated with providing stool samples, can contribute to underdiagnosis and underestimation of prevalence. In this pilot study, African green monkeys (*Chlorocebus sabaeus*) naturally infected with *T. trichiura* and a source of environmental egg contamination served as an animal model to study this zoonotic parasite.

We assessed stool egg counts and total adult worm counts, we observed salivary IgA and IgG alongside serum IgG antibody signals with Enzyme-linked Immunoelectrotransfer Blot. We found a lack of correlation between stool egg counts and adult worm counts, supporting the sensitivity concerns of current diagnostic methods that can overestimate treatment efficacy. We demonstrated the potential use of antibodies in saliva and serum in the pursuit of developing point-of-care options for the diagnosis of *T. trichiura*. This preliminary work demonstrates that African green monkeys can potentially be a source of exposure to humans and a model for studying this important neglected disease.
Landscapes And Livelihoods To Unpack The Complex Socio-ecological Dynamics Of Human Health: A Case Study From The Brazilian Amazon

Jordan Sky Oestreicher

There is a rich reservoir of knowledge on landscapes and livelihoods - both as research concepts and as frameworks for action - that has not yet been widely applied to human health; as such they represent an important contribution to the ecohealth toolkit. Landscapes and livelihoods are outcomes of complex human-ecosystem interactions. In the Brazilian Amazon, the landscape is a mosaic of rainforest, pasture, crops and growing urban areas. The diverse ways people make a living, known as livelihoods, often involves fishing, hunting, farming, and ranching. With on-going development in the region, however, livelihood options and the landscape are rapidly changing. In turn, this is altering the movement of toxins in the environment or the cycling of pathogens and disease vectors. Here, we demonstrate how landscapes and livelihoods can be used to integrate multiple health concerns into a common analysis that draws on interdisciplinarity and complexity thinking. We exemplify using two public health concerns in the Brazilian Amazon: one that is eco-toxicological (methylmercury exposure) and one that is vector-born (Chagas disease risk). Through an analysis of landscape patterns and livelihood activities, we highlight the complex, interrelated, and cross-scale social and ecological processes that drive the emergence of these two health concerns. We also identify pathways for public health interventions and ecosystem management.
Managing infectious cattle abortion at wildlife-livestock-human interfaces of the SE Lowveld of Zimbabwe: The need for a multidisciplinary approach

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Infectious causes of cattle abortions have significant impacts on livestock and people the health in developing countries. Adopting One Health principles for coordinated surveillance and simultaneous preventative actions in animal and human populations has proved to be efficient and cost-effective. However, wild ruminants can also be infected with the same abortive pathogens, which may considerably complicate the management strategies. We synthesise the results of several eco-epidemiology and ethno-veterinary studies carried out over the past decade in the Great Limpopo Transfrontier Conservation Area in Zimbabwe. Serological surveys indicated that Rift valley fever virus circulate in cattle and African buffalo populations, whereas brucellosis apparently infects only cattle. In areas where there was no physical barrier between cattle and wildlife, farmers interviewed perceived that the number of cattle abortions was higher, and the proportion of farmers perceiving wildlife as playing a role in livestock abortions was higher compared to other sites. Monitoring of movements of sympatric cattle and buffalo with GPS collars demonstrated seasonal home range overlap potentially resulting in interspecific transmission of brucellosis and RVF through aborted foetuses. Several management options are discussed including awareness campaigns, vaccination and other preventive actions to limit infective contacts between wildlife, livestock and people.>
Thailand's Emerging One Health University Network

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Formed in 2012, the Thailand One Health University Network (THOHUN) consists of 32 faculties in 7 Thai universities committed to enhance competencies in One Health (OH) and promote trans-disciplinary collaboration among Thai universities, government agencies, and relevant organizations. By the end of 2015, THOHUN has gathered a total of 935 participants under 28 activities supported by USAID's Emerging Pandemic Threats program. About 64% of the activities focused on developing programs for OH core competency development, curriculum mapping, course development, OH course integration, evaluation, and module development for OH workforce. These activities were attended by 665 students and educators from various disciplines (veterinary, medicine, public health, epidemiology, environment, education, sociology, etc.) from THOHUN's member universities along with the University of Minnesota and Tufts University. With the aid of its global partners and leadership from member universities, THOHUN has strengthened its position in the region by successfully building its internal capacity through a "Training of trainers" platform, publishing manuals for OH curriculum mapping and course evaluation, and improving network management. THOHUN will focus its future on the sustainable development of future and current OH workforces capable of effectively responding to emerging and re-emerging threats within Thailand and the region.
One Health ethics: The need for institutional policy to govern research and action

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One Health implies a strong emphasis on ethics, recognising the interdependent relationships of humans, animals and the environment. We argue that the universal ethical principles for human-subject research, presented in the Belmont report as Respect for Persons, Beneficence and Justice, should be applied to custodians of animals and the environment. Drawing on published and unpublished research, we highlight the challenges and opportunities of this approach in practice and policy.

Respect for Persons is demonstrated through informed consent. We describe the high rate of consent received in livestock research projects, raising questions around legitimacy, and outline a study to improve comprehension and engagement in the informed consent process for livestock keepers.

Beneficence dictates that benefits to research participants are maximized. We outline how a long-term impact assessment was designed with intrinsic value for farmers, using participatory photography. Additionally, we describe efforts towards non-maleficence through providing participants with research board contacts. We provide new data on low contact-rates and discuss possible causes.

Justice requires that research risks and benefits are distributed equally. We show how the requirement to sign written consent forms may preclude those working in informal livestock markets from participating in, and therefore sharing risks and benefits of research projects.
A One Health approach was used to investigate a report of crow mortalities (suspected highly pathogenic avian influenza) in northwestern Bangladesh. We present the results from the wildlife investigation. Samples were collected within 5 km of the outbreak and from live bird markets (LBM) and crow roosts in Rajshahi and Natore Districts. Swabs (cloacal and tracheal) were collected from 71 crows; 119 apparently healthy other bird species, seen to be roosting with the crows; and directly from poultry offal at the LBM on which crows were observed feeding. All swabs were tested by qPCR. Testing revealed that 27% of apparently healthy crows (n=33; 95% CI: 13-45) were positive, 44% for A/H5 and 56% for A/untypable; 85% of dead or sick crows (n=38; 95% CI: 69-94) were positive for A/H5; 13% of other species (n=119; 95% CI: 7-20) were positive, 20% for A/H5 and 80% for A/untypable. Of 72 LBM samples, 47% (95% CI: 35-59) were positive, 41% for A/H5, 26% for A/H9 and 33% for A/untypable. The crows likely become infected after feeding on poultry offal at the LBM on which crows were observed feeding. Improved LBM biosecurity measures are needed to reduce the risk of influenza virus spillover to bird or people in Bangladesh.
Global Climate Warming Causes Changes In Habitat And The Risks Of Some Viral Disease That Spread By Vectors

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Global climate warming in the world makes germs more active pattern and habitat move from animals to humans (zoonoses). It is supported by the vector spread due to climate change. The city of Manado in North Sulawesi, Indonesia changes in epidemiological patterns. Global warming itself causes the mosquito's have higher ability to develop into a vector itself. The spread of the viruses disease has spread in the towns around the area of the hills. The effects of global warming on the virulence of the virus changes, habitat changes and the spread of vector transmission pattern even viral infections from animals to humans become our interest to want to know more pangaruh global climate warming to habitat changes and the risks of some viral disease spread by vectors. Some of the research we have done on the density of Aedes in 2011 can be described that the density of Aedes spp high enough Manado and surrounding area it is also supported by transovarian transmission is high at above 30%. The conclusion that global warming is affecting the patterns of viral disease in manado area because the changed in habitat and the risks of some viral disease spread by vectors.
Working Better Together: One Health Approach For Understanding The Value And Challenges Of Inter-agencies Partnerships

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One of the One Health core competencies is Collaboration and Partnerships. Following 55th World Health Assembly declaration to accentuate that dengue prevention and control must be a priority; an inter-agencies intervention program was launched to document the effectiveness of a local-level inter-agencies approach and partnerships. Free Dengue Community Program which includes few ministries such as Ministry of Health, Ministry of Science, Technology and Innovation, a local industry player, Local Municipalities, Health District Offices and National University of Malaysia formed an alliance of partnerships that developed an inter-agencies collaboration for dengue prevention. The core objective was to design and implement activities for communication and social mobilization. Entomological indices were compared before and after the 12 weeks intervention period. The partnerships did achieve its aim of increasing the level of cooperation between the authorities to support social mobilization. The results give insight on how to tackle the challenges of inter-agencies partnerships and the approach for a better understanding on partnerships.
Training Of The New Health Workforce Generations Under One Medicine: A New Direction

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Recently, the world has witnessed emergence of novel diseases, the 'One Health' initiative has emerged to advocate for closer collaboration across the health disciplines and has provided a new agenda for health professionals education in the new area. Against this background, we addressed the directions of new public health training programs which have to be developed to generate a cadre of health professionals with a broad understanding of disease control and prevention.

Public health training programs around the world adopted a reductionistic approach - focusing exclusively either on the human or the animal component of the zoonotic paradigm. The reductionistic approach failed to produce trained cadre that is armed with knowledge and skills to address the factors that led to the spillover of these diseases. A one health interdisciplinary program that integrates training in human and animal public health at the intersection of the ecosystem will produce cadre that is competent and confident to meet the emerging challenges to the ecohealth.

Medical education intuitions need to take a pioneer step by supporting the One Health Education, aiming at sustaining the health of the communities by addressing zoonotic and emerging diseases in their education curriculums as well as integrated training programs.
Psittacosis in wild Australian parrots: investigating the threat to parrots, free-range poultry, and public health

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Chlamydia psittaci is a globally significant avian pathogen which commonly infects parrots, one of the most threatened bird groups in the world. Although parrots are thought to be the main natural hosts in Australia, C. psittaci may infect a wide variety of bird species. Free-range poultry may be especially at risk due to exposure to wild hosts. It is also transmissible to humans, when it may cause a severe, and potentially fatal, respiratory disease called 'psittacosis'. Despite being a notifiable disease in several countries, little is known about its prevalence, effects and transmission dynamics in wild birds. Here we review the occurrence and zoonotic potential of C. psittaci infection. We describe a new study aiming to investigate C. psittaci in wild Australian parrots, with primary focus on the crimson rosella (Platycercus elegans) a model species for which breeding sites are known. Other wild parrots will also be studied, in addition to local free-range poultry farms. Aims are to determine the survival effects and prevalence of C. psittaci in wild parrots, and to compare strains and genetic variants in wild reservoirs and poultry. The results should help to improve management of wildlife, public and domestic health risks posed by this pathogen.
Paratuberculosis in buffaloes in Northeast Brazil

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Mycobacterium avium subsp. paratuberculosis infection were investigated in the Northeast of Brazil. Samples were obtained from 17 farms, two slaughter houses and a quarantine area in the Northeast. About 15,000 buffaloes of the Murrah, Mediterranean and Jafarabadi breed as well as their crossbreeds were evaluated for meat, dairy and mixed farms with semi-intensive or extensive breeding practices. For diagnostic purposes, postmortem and histopathological examination, including Ziehl-Neelsen test of fecal smears and scraped intestinal mucosa were performed. PCR was applied for fecal samples, mesenteric lymph nodes and intestines. Six Johne's disease positive farms, which together with those previously identified, indicate that the disease is spread through the Brazilian Northeast, similar to what occurs in cattle herds in other regions of the country. The increase in prevalence of paratuberculosis is a consequence of introduction of animals from other regions without adequate veterinary assistance and due to the little official attention paid to this initially silent and chronic disease.
The Role Of Culicoides Midges As Potential Vectors For Zoonotic Arboviruses At The Wildlife/livestock/human Interface In The Mnisi Region Of Mpumalanga, South Africa

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Zoonotic arboviruses associated with neurological disease have caused large outbreaks in humans and animals. African flavivirus, alpha- and bunyaviruses cause severe neurological disease in horses, livestock and wildlife and have the capacity to infect humans. The reservoir host and vectors and the mechanism of transfer from wildlife to livestock and humans have not been clearly defined. To explore their contribution to disease, the purpose of this study is to identify neurological zoonotic arboviruses in specimens collected from humans, animals, and vectors in Mnisi region in the north-eastern corner of Bushbuckridge, Mpumalanga, South Africa. Culicoides midges collected in the area were pooled (n=500) and screened with genus specific nested-real-time polymerase chain reaction (PCRs). Preliminary results identified alphavirus, Middelburg (MIDV) in midges. Wildlife specimens from animals with neurological and/or febrile illness or acute death from surrounding game farms and Kruger National Park were also screened (n=17) and two single MIDV infections and a Sindbis/MIDV co-infection were identified in carnivores. Human adult cases of undiagnosed acute febrile disease in the same region collected in 2013 are currently being investigated for a range of pathogens including alphaviruses. Early results suggest that Culicoides may serve as transfer vectors for
Middelburgvirus; further work will be continued at the wildlife/livestock/human interface in South Africa.
Development Of One Health Core Competency Domains: Capacity-building Platform For Thai Current Workforce

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The One Health Collaboration Network is comprised of seven Thai ministries: Agriculture and Cooperatives, Education, Natural Resources and Environment, Public Health, Social Development and Human Security, Labor, Interior, and the Thai Red Cross Society; has been established as a multi-sectoral collaborative network at different levels in the Thai society. As a pioneering activity, the Thailand One Health University Network (THOHUN) brought 50 ministry representatives to identify the One Health Core Competency (OHCC) domains required for multi-sectoral collaboration between Thai governmental sectors to effectively respond to emerging infectious diseases (EIDs). By reviewing and mapping existing competencies, the ministry representatives gained a clearer picture of their roles and responsibilities in response to EIDs. One Health Professionalism, Communication and Informatics, Culture, Values, Ethics and Beliefs, Collaboration and Partnership, Leadership and Planning and Management emerged as OHCC domains deemed important by the participants. These OHCC domains will be circulated among member ministries and relevant stakeholders for comments and feedback. Once high level approval has been secured, these competency domains will be utilized by the ministries in partnership with THOHUN universities to develop One Health competencies to prepare current workforce to effectively prevent, detect, and respond to the disease outbreaks in Thailand.
Traditional Uses of Wild Edible Plants for Health and Nutrition: A Case Study of Aegean Region of Turkey

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Wild edible plants have been a good source of food for their nutritional value, providing trace elements, vitamins and minerals. Besides their nutritional properties they are valuable food products for people for carrying some medicinal properties. This study assesses the current ethnobotanical knowledge and traditional use of 5 popular food plants (Foeniculum vulgare Mill, Rumex acetosella L., Raphanus raphanistrum L., Symrinium olusatrum L., and Crithmum maritimum L.) in Aegean Region of Turkey. The data were collected from consumers and collectors by interviews, obtaining from 146 surveys. These surveys provided the information about why the people of Aegean region gathered local wild plants, for what purposes they use them and how they obtained their knowledge of such food. Food compositions of these plants were analyzed. Findings showed that wild plant collectors gathered for their own consumption for their health. These wild plants are also used as folk medicine for medicinal purposes. It was verified that wild edible plants play an important role in diet. All responders are believed that it is necessary to consume these wild plants at least once a year for body health.
Hantavirus risk in an ecosystem context

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Hantaviruses are emerging infectious pathogens that are spread worldwide and cause disease in humans. Typically, Hantaviruses have one small mammal reservoir; and pathogenic Hantaviruses are often carried by generalist rodents which tolerate human-induced disturbance and persist at low diversity. Detailed ecological knowledge is required to assess and predict disease risk by identify "unhealthy" ecosystems (habitat patches) where the density of infected animals is highest. Both the density of host species and proportion of infected animals are important in determining risk, but may be influenced by different and opposing factors. For example, intermediate levels of fragmentation may result in the local extinction of competitors and predators but enable persistence of high density populations of host species in suitable habitat patches; whereas extreme levels of fragmentations may result in local extinction of the host. We here discuss how habitat type and disturbance, host predators, and competitors interact to determine disease risk and we rank these factors by their importance. Our synthesis is based on the ongoing project in northern Sweden through which multiple studies on Puumala hantavirus and its host have been conducted, and we discuss our results in relation to public health and nature conservation.
Diversity Of Viruses In Bats From The Daintree Rainforest

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Viruses responsible for disease outbreaks in humans naturally emerge either from the human population itself or by spill-over events from animal hosts (zoonoses). Despite all differing possibilities of virus emergence, seventy-five per cent of emerging viruses have a zoonotic origin, thus highlighting spill-over events from animals to humans as a major threat to public health. Consequently, it has become evident that surveillance and long-term monitoring of viruses prevalent in wildlife is of particular importance. Hereby it is important to focus on apparently healthy animals in their natural habitat to maximize discovery potential and understand environmental disease factors, biology and ecology (heat, stress, nutrition deficiencies) that are further influencing the risk of virus spreading and shedding. In this collaborative pilot study the Tropical North Queensland (TNQ) rainforest has been chosen because it is the oldest rainforest in the world and comprises a unique diversity of bats. We investigate how the biodiversity of bats, the second largest order of mammals, influences the evolution of highly pathogenic viruses and vice-versa. To assess the viral diversity we are using metagenomic sequencing, serology and virus isolation. Results obtained so far from this collaborative project will be presented and discussed in comparison to similar work with European bats and the viruses they carry.
Investigation of Melioidosis in a Zoo in Thailand: using One Health Approach

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A series of melioidosis related deaths of animals occurred in a zoo in Thailand between 2009 and 2011. An investigation was initiated to describe the distribution and determine the contamination of pathogen in the environment. A cross-sectional study was conducted by review of animal melioidosis case records. Case finding in human was performed using a standardized questionnaire with ELISA results. Soil samples were also collected and sent for bacterial culture. The situation of wildlife melioidosis in the zoo between 2009 and 2011 showed that there were six wildlife melioidosis cases reported including 4 orangutans, a zebra and a black handed gibbon. The last confirmed melioidosis case was found in an orangutan which *B. pseudomallei* was isolated from abscess in lung, liver and spleen. Forty of 85 zoo staff were interviewed. Forty-five percent (18/40) were classified as suspected cases based on clinical signs and 1.9% (1/53) were found positive to melioidosis. Colonies of *B. pseudomallei* were found from soil samples near zoo's hospital area (50.0%; 2/4). Infected animals can shed the pathogen to the environment and pass on to humans, therefore investigation of melioidosis must use One Health approach and control measures must be implemented in both animals, humans and the environment.
Pets, purity and pollution: why conventional models of disease do not work for pet rat owners

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Following an outbreak of hantavirus in pet-rat owners in 2012, public health professionals tried to communicate risks without success. Individuals understand disease and risk differently and how they "construct" risk is complicated when the owner-pet bond is entangled within the transmission route.

Interviews with rat owners revealed they associate disease with dirt; the outside world is contaminated but their pets are isolated, therefore clean. Owners create a divide between wild and pet-rats, this boundary enables them to interact with their pets, knowing they are disease-free. Anything that crosses this boundary is a potential risk.

Owners have created a hierarchy of purity within rats; the purest are from specialist breeders. Moving down the hierarchy, risk of contamination increases and owners will take action to minimise potential disease transmission. It is this hierarchy, not public health advice, they base their behaviour on. Hantavirus is problematic because it has transcended this boundary and damaged their construction of "pure" rats.

Unravelling how rat-owners understand risk has led to the problematisation of conventional models of disease transmission, and has conceptualised a new model, specific to rat-owners. Their reaction to advice is now understandable, and highlights the importance of incorporating social research into public health interventions.
Coupled dynamics of water quality, childhood diarrhea, and wildlife dynamics in a dryland river system in Botswana

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Water connects humans, animals, and microbial communities across diverse landscapes. Our work on water quality-health in the Chobe River region of Northern Botswana identifies important linkages between human-wildlife health and landscape dynamics. We quantified seasonal variation of *Escherichia coli* and Total Suspended Solids (TSS) in the Chobe River using spatiotemporal and geostatistical modeling of water quality time series data collected along a transect spanning a mosaic of protected, urban, and developing urban land use. We found significant relationships in dry season *E. coli* concentrations and protected land use, floodplain habitat, and fecal counts from elephant and other wildlife. Dry season fecal loading by both elephant and other wildlife were important predictors of early wet season *E. coli* concentrations. Outbreaks of diarrheal disease in children under five years of age (2006-2015) living in this region covaried significantly with water quality declines and the magnitude and timing of hydrological and meteorological factors. Multidrug resistance among *E. coli* isolated from wildlife in the protected areas up river of the urban center are similar to patients from the local hospital. Couplings between the environment, animals, and human health are complex and dynamic involving multiple interdependent drivers and feedback processes.
Defining the epidemiology of zoonotic neurological arboviruses through a One Health approach in South Africa, 2008-2016.

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We investigate the epidemiology of neurological zoonotic arboviruses in South Africa, through passive surveillance between 2008-2016 for acute febrile and neurological disease in horses, livestock and wildlife. Blood or neurological tissue for fatal cases were screened for alpha-, flavi-, bunya and encephalosis virus (EEV) using polymerase chain reaction plus West Nile Virus (WNV) IgM ELISA and neutralization assays in horses. In total, 274/1654 (22%) cases tested positive: 249 (20%) horses, 6(4.3%) livestock and 19(7%) wildlife. Among horses, WNV was most frequently identified (n=96; 38.5%;34% fatal) followed by EEV(n=73;5.9%;13.7% fatal) Middelburg-(MIDV) (n=77;29.3%;33.8%fatal), Shuni-(SHUV)(n=23;23.9%;52.2% fatal), Sindbis-(n=23;23.9%;10%fatal) and Wesselsbronvirus (n=2;2%;50% fatal). Of 19 positive wildlife cases, 15(78.9%) were fatal. Wildlife tested positive for Middelburg (n=10; 52.6%, 80% fatal); SHUV (n=4;21%,100% fatal), Sindbis (n=5; 26.3%;100%fatal) and EEV (n=1;5.2%; 100% fatal). Positive species included buffalo, rhinoceros, sable, giraffe, warthogs, crocodiles, lion and genet. Of 141 livestock tested 5 Middelburg (80% fatal) and 2 WNV (100% fatal) cases were identified in cattle. Cases occurred primarily from February-June, peaking in March throughout the country following peak rainfall. Geographic location of veterinarians seropositive for WNV and SHUV identified in a serosurvey in 2010-2011 correlated with animal cases suggesting these arboviruses are widespread in the country and should be considered in animal and human neurological disease.
Envisioning the One Health Physician

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The developing concepts of One Health and Ecohealth have had limited penetration in the human medical community and do not figure significantly in current protocols for medical practice. Physicians as a group have been found to have limited knowledge or skills related to zoonotic diseases, environmental health, ecology, and other One Health issues. At the same time, the clinical recognition of disease events related to environmental change and emerging pathogens, utilization of the positive health aspects of the human animal bond and biophilia, the need to provide adequate occupational health services to animal workers, and the potential to partner with veterinarians, ecologists, public health and other professionals in One Health efforts will be vital skills for future medical practitioners. There is a need to translate these transdisciplinary approaches into actionable competencies and knowledge domains for physicians, and show how these concepts can be used in daily medical practice. Options for incorporating One Health, Ecohealth, and Planetary Health systems approaches into medical education and training as well as clinical practice protocols will be presented.
Since 2012 we have been working in the rural community of Sabana Grande, Nicaragua towards improving poultry health and management as a way of increasing meat and egg production and consumption. Veterinary Medicine students guided by a poultry medicine expert have trained small poultry holders in management, biosecurity and disease prevention. So far, this strategy has helped increasing poultry existences and egg production. In order to improve the penetration of our intervention we decided, for the first time, to target our training to primary school children ages. Veterinary Medicine students from the U.S. were trained by education experts at our school in strategies towards hosting poultry workshops to children between 6 and 12 years old. These students trained Nicaraguan veterinary students and a community youth group to facilitate three activities. These activities focused on concepts of disease transmission, poultry disease prevention, biosecurity and risk assessment. The effectiveness of the activities will be evaluated using a Social Network Analysis (SNA) assessing our importance in the community poultry network. In addition, the effects of our interventions in the community, the role of the language and the effects of disease prevention in village poultry in the community will be discussed.
"Lots of data, little information": Beyond environmental assessment and towards the next generation of integrative cumulative impact assessment

Chris Buse

UNBC

Resource development is a driver of local and international economies and has resulted in extraordinary advances for modern society. As the global thirst for lumber, minerals and energy grows, an increasing amount of stress is placed on the land and its ability to sustain life. With multiple industries now operating adjacent to one another, the cumulative impacts of diverse land-use has become a significant area of scientific inquiry, and it is increasingly recognized that project-based environmental assessment is limited in its ability to capture the impacts of multiple land-uses. This paper reports on the state of the art of cumulative impact assessment in relation to policy developments in British Columbia, Canada. The paper then discusses a new research tool developed by the Cumulative Impacts Research Consortium in collaboration with rural and remote communities with long and storied histories of resource development. The tool is explicitly designed to address shortcomings in the environmental assessment process; to bolster third-party monitoring initiatives at the regional level by integrating environmental, community and health data into a historical understanding of cumulative impacts. Implications for utilizing data across scales and improving an understanding of health and its determinants as related to resource development are discussed.
Field Studies On Aestivation In Umkhanyakude District Of South Africa

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Schistosomiasis transmitting intermediate host snails survive drought periods through aestivation. It is envisaged that with climate change dry/wet seasons may become shorter or longer, thereby reducing or increasing their chances of survival. This study investigated the ecology of the snails in four rivers in uMkhanyakude district to determine the influence of draught duration on snail survival and breeding. Aestivation patterns in *Biomphalaria pfeifferi* and *Bulinus globosus* were studied by first monitoring changes in snail population structure during the period when the habitats were flooded and then digging transects across the floor of their dried habitats at specified points for 12 months. A wide size range for both species was found to aestivate. Successfully aestivated snail numbers significantly declined for the first 3 months after the drying of the river beds. The longest period of aestivation for *B. globosus* snails was 8 months while that of *B. pfeifferi* was 6 months. More snails were found at the river banks compared to the centre of the riverbeds suggesting they preferred sheltering themselves among the vegetation and did not necessarily follow the receding waters. This study showed that aestivation ability declines with time and occurred in the first 5 cm from the surface.
Community of Practice Evaluation: A Case Study with CoPEH-Canada Exploring What Works

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This paper presents results from a qualitative case study of the Canadian Community of Practice (CoP) in Ecosystems Approaches to Health (CoPEH-Canada). The case study aimed to enrich understanding of CoPEHs, specifically to examine processes and outcomes related to CoP resilience and sustainability from the perspective of early-career members. The secondary purpose was to test an Evaluation Framework for Extra-Organizational CoPs (developed by the authors) in guiding a case study and informing theory. This framework sets out levels of analysis (e.g. individual, collective) and types of value (e.g. learning, professional connections). This case contributes detailed information regarding the mechanisms through which CoP work (e.g., socialization, individual and collective leaning outcomes as drivers for continued participation). The study also provides a deepened, more nuanced understanding of the resilience and sustainability of CoPEHs, particularly with respect to participation of early-career members. The discussion outlines the extent to which the framework can be applied to different CoPEHs and other forms of partnership in the ecohealth and one health fields (e.g. collaborations between CoPEHs, One Health networks) and the adaptations which could be helpful for evaluations guiding the development of CoP resilience.
Market and policy drivers of antibiotic use in smallholder periurban dairy farms: A scoping literature review using One Health Approaches

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Antibiotic use in the veterinary sector is a major contributor to the global antimicrobial resistance crisis. From a One Health perspective, policies and market are important components of the environment within which antibiotic usage in veterinary sector takes place. A scoping review was undertaken using the Arksey and O'Malley framework to identify the market and policy drivers of antibiotic use in smallholder periurban dairy farms. The process included: identifying the research question; identifying relevant studies; relevance screening; data charting; collating, summarizing, reporting the data; and expert consultation. Data was iteratively interpreted to develop a conceptual framework. Themes were grouped into three classes: market, farm and systems. Proximal drivers included adoption of intensive production norms, a preference for rearing high-yield exotic breeds in environments with poor hygiene and sanitation, with minimal infection control and biosecurity measures, causing high morbidity levels, necessitating higher antibiotic consumption. Distal drivers included market-level factors like urbanization, population growth, globalized markets, and changing food preferences. Systemic weaknesses, like the absence of antibiotic stewardship, monitoring frameworks, and surveillance and laboratory networks also drove higher antibiotic use. Farm-level antibiotic use is thus driven by a complex interplay of market, farm and systems-level factors needing One Health approach to address them.
Antimicrobial Use among Periurban Small Holder Dairy Farms in India: Need for a One Health approach

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Antimicrobial resistance (AMR) is recognized as major public health challenge. Misuse of antimicrobials is a substantial driver of AMR, and it is influenced by several factors. Animal production contributes to increasing antimicrobial use globally. In this study, data on demographics, knowledge and perception of antimicrobial usage was collected in Indian dairy farms. From five periurban sites in India, 170 villages were selected using systematic random sampling, followed by random selection of three farms per village, for a total of 510 farms. Around 49% of farmers showed knowledge of antimicrobial and 34.4% reported self-administration on the farm. Costlier drugs were perceived to be better (42.1%), and mild infection were expected to require shorter treatment (33.7%). Use of antimicrobials was influenced by drug price (37.8%), drug effectiveness (51.4%), ease of access (19.4%) and administration (12.2%). On performing univariate analysis, self-administration of antimicrobials was found to be significantly associated (p<0.01) with farmers belief that antibiotics cure all diseases, lead to more milk production, or make animals grow faster. Policies dealing with AMR require to be highly context-specific, because this hugely influence farmer's decision making. The study calls for a One health approach to intervention, recognizing the interlinked nature of human and animal health.
Veterinary antibiotic use in smallholder periurban dairy farms of India: A qualitative study

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Although food-producing animals account for a major proportion of antibiotics consumed annually, little is known about the local factors that drive this. This study looked at the knowledge-attitude-practices, influences, and drivers in the key actors in the dairy farming enterprise in peri urban India. In-depth interviews were conducted till attainment of saturation. Coding of core themes was followed by etiological enquiry and generation of a conceptual model. Convergence and divergence of perceptions were mapped across the major stakeholders (dairy farmers, veterinarians, para-veterinarians, traders, pharmacists, and civic officials or union representatives). Cost was a deterrent in seeking care for sick animals; quacks were the major service providers at the farm level. Veterinarians were approached as a final resort. Although civic officials emphasized the availability of laboratory services, farmers denied having ready access. Screening of animals was absent, and routine surveillance was weak. The risk of losing the razor thin profit margins to sickness fueled antibiotic overuse. Direct to farmer marketing, availability of antibiotics over the counter (without or by reusing prescriptions), and informal prescribers providing antibiotics for animal health issues further drove antibiotic. Understanding local dynamics assist in developing sustainable interventions to address the issue of irrational antibiotic consumption.
Addressing bovine tuberculosis in smallholder periurban dairy farms of India: A qualitative study

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Rapid urbanization has led to expansion of the periurban fringes, where intensive, industry-style livestock rearing has led to emerging vulnerabilities at the human-animal-environment interface. This study was undertaken to understand the health system and farm-level factors that influenced the risk of transmission of bovine Tuberculosis (bTB) in animals and humans in periurban smallholder dairy farms of India. In-depth interviews were conducted till attainment of saturation. Identification of core themes was followed by etiological enquiry and generation of a conceptual model. Convergence and divergence of responses were mapped to support the models. Veterinarians were consulted as a last resort after home-remedies and quacks had failed. Damage control measures - selling or abandoning sick animals - added to the risk of disease transmission. Although civic authorities believed in the adequacy of a functioning laboratory network, end users were aggrieved at the lack of services. Despite the presence of extension services, knowledge and awareness was limited, promoting risky behavior. The absence of cogent policies in dealing with bTB was a significant barrier. The stakeholders did not consider bTB to be a major concern. It is possible that they underestimate the problem. The current study helps to identify gaps which need to be addressed through collaborative research, and OneHealth interventions to build community awareness.
Developing a transdisciplinary database for operationalization of One Health surveillance of Japanese Encephalitis in India

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We developed and deployed a database to study Japanese Encephalitis (JE), which could also be used for collection of transdisciplinary data, obtained both through cross-sectional and longitudinal approaches, across various biotopes, which can function as an affordable surveillance database. A multidisciplinary group of experts, representing epidemiology, human health, veterinary public health, microbiology, GIS, social sciences, and entomology, was assembled to develop a conceptual framework through collaborative iterations. A unique identifier was developed to construct a relational database to organize data from multiple sources, collected in multiple rounds: animal testing, human testing, questionnaire-based surveys, demographic data, GPS data, environmental and metereological data, vector collection and entomological data. The database was developed using Microsoft Access. The unique ID based system spanned multiple strata; data points could be identified from a macro (state or district) level to a micro (individual) level. The relational database allowed comparisons across and within strate, allowing us to tease out the determinants that had interactions at various levels. Developing an affordable, simple, and efficient database that could collate transdisciplinary data, allowed us to not only identify unique insights in JE epidemiology, but also provided us with a template to develop One Health surveillance database for vector borne diseases.
Stakeholder Mapping and Analysis in Periurban Smallholder Dairy Farms in India: A One Health Perspective

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Policies addressing vulnerabilities at the human-animal-environment interface in periurban dairy farms are influenced by multiple stakeholders. From a One Health perspective, it is vital to identify, map, and analyze the likely impact stakeholders at various levels and from different sectors may have on policy environment and implementation. We adapted the WHO multistep method for identification of stakeholders from human health, animal health and environment sectors at micro, meso and macro levels. Expert interviews, brainstorming, and evidence synthesis were conducted. Weights were applied based on stakeholder and expert opinion to compute likely impact each stakeholder was perceived to have. Thirty-six stakeholders from were recruited from five cities. A grid-classification showed no stakeholders at the macro-level had high power/leadership combination, whilst most micro-level stakeholders had low power-leadership position. Similar results were obtained for knowledge/power, resource/power and interest/power matrices. Results indicate a lack of resources and power to impact periurban smallholder dairy farms in India, possibly a key reason behind the critical gap in policy formulation and implementation. Thus, despite reporting interest and knowledge, stakeholders cannot successfully mitigate issues at the human-animal-environment interface. This calls for the leadership to recognize the complexity of stakeholder influences and the need for collaborative One Health approach.
Resilience Of Populations To Malaria And Schistosomiasis In The Context Of Climate Change In West African Sahel (Côte D’ivoire, Mauritania)

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Malaria and schistosomiasis are still important public health concerns in sub-Saharan Africa, such as Côte d’Ivoire and Mauritania, in spite of tremendous efforts from researchers and policymakers for their control. Those figures are aggravated by the process of climate change that contributes to change relationships between human beings and their environment. This study aims to analyze proactive and reactive mechanisms of populations to overcome the burden of malaria and schistosomiasis. Ecohealth methodology was implemented. This consisted of two cross-sectional household surveys in rainy and dry seasons in each site. Quantitative data, questionnaire (n=728 in Korhogo and 721 in Kaedi) per season. Qualitative data: techniques of photovoice (n=80) and focus group (n=64) with communities members. From the preliminary results, it appears that populations rely on various strategies of resilience ranging from individual to institutional strategies. The use of self-medication and natural plants in both locations shows that people rely basically on individual resources. Social resources are also mobilized through family and neighborhood networks. However they are not clearly oriented to health problems. Support from structures do not appear to be a major asset for resilience. Conclusively, people in both sites have not yet developed cost-effective resilience mechanisms to malaria and schistosomiasis.
Setting research priorities to control zoonoses in smallholder dairy farms of periurban India

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In order to address the problems of the emerging periurban ecosystem and inform policies, we aimed to identify the critical gaps in knowledge and develop a strategic research agenda. We used the modified CHNRI method, previously used for identifying priorities in zoonoses control in India. A wide range of experts were interviewed to generate research options, followed by their prioritization by another group of expert independent scorers. Brucellosis emerged as a major priority; primary consumers of farm produce and farmers themselves were identified to be high risk groups; solid waste management was the major farm-related commodity of concern. Out of the identified 316 research options, most were related to basic epidemiologic research (38%), and research to develop new interventions (30%). Research leading to deliverable, affordable and sustainable interventions were the most highly valued. The overt stress on developing newer interventions, added to the ignorance of the current epidemiological situation, reflects the uncertainty in policy approaches dealing with issues of periurban India. This reflects the need to undertake advocacy to sensitize the major stakeholders - funding agencies, researchers, policy makers and program managers - so that the research-policy disconnect can be addressed.
Oral Combination Vaccine Against Hepatitis B & Anthrax

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Infections are still leading cause of morbidity and mortality and most of which can be prevented by vaccination. However, there are too many vaccines to be administered, increasing cost of immunization. Combination vaccines can answer these problems by development of single vaccine containing all possible antigens.

Goal of present study was to see effect of 2 antigens when given in combination. Bilosomes can provide needle free, painless approach for immunization. Recombinant hepatitis-B surface antigen(HBsAg) and recombinant protective antigen(rPA) were candidate antigens.

Bilosomes containing rPA and HBsAg were prepared by lipid cast film method. Antigen loaded bilosomes were characterized in-vitro for shape, size, and stability in various body fluids. The in-vivo study comprised of immunization of Balb/c mice and estimation of IgG response in serum and sIgA in various body secretions using specific ELISA.

Bilosomes formed were multilamellar and stable. Fluorescence microscopy suggested that bilosomes were taken up by gut associated lymphoid tissues. In-vivo data demonstrates that combination produced both systemic as well as mucosal antibody responses but fail to produce any synergistic effect.
When rPA and HBsAg given in combination, HBsAg potentiates production of anti-rPA antibody. The combination produced both systemic as well as mucosal antibody responses upon oral administration.
Crimean Congo Haemorrhagic Fever, 2014 Sudan

Claudia Kohl

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In 2014 an outbreak of hemorrhagic fever in humans was reported from different states of Sudan. The NPHL, Khartoum investigated the cases and forwarded 28 sera samples from patients suffering from hemorrhagic fever to the RKI. The sample-set included a panel of 10 sera collected during former hemorrhagic fever outbreaks in the same region in 2013. All sera were tested with qPCR assays for Filoviruses and CCHFV. Additionally, all samples were subjected to metagenomic deep sequencing on an Illumina MiSeq sequencer.

CCHF was identified by two independent qPCR assays in a sample from November 2013 and November 2014, respectively. Deep sequencing confirmed these results. Based on the available sequences the novel CCHFV strain 'Sudan 2014' shares 96% identity (na) with its closest relative CCHFV SPU 187/90 from South Africa.

CCHFV is reported to be transmitted by ticks in Europe, Asia and Africa and known as etiological agent of severe hemorrhagic fever in humans and livestock. Beside insect-repellent no preventive measures are available. The pathogenicity and characteristics of this novel strain have yet to be determined by cell-culture isolation and serology. Further molecular analysis will contribute to clarify the divergence of the CCHFV strains detected in 2013 and 2014. First results including novel viruses identified by metagenomics will be presented.
Analyzing the Health Value of a Tropical Forest – New Strategies to Mitigate Pandemic Emergence

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Land use change is a key threat to conservation and public health, through the loss of tropical forest biodiversity and the emergence of known and novel diseases. Efforts to reduce deforestation have focused on estimating the value of ecosystem services, including carbon sequestration, pollination and other services from biodiversity, and incorporating these into land use planning. However, the economic drivers of deforestation and agricultural development often override conservation priorities. Here we describe a new economic modeling approach that explicitly accounts for the cost of disease outbreaks resulting from deforestation. First we show that accounting for the cost of malaria cases associated with land use change in Brazil halves the economic returns from land use change - more than double the impact of loss of ecosystem services. Secondly, we use detailed data on the costs of malaria and other infectious disease cases in Sabah, Malaysia, and ecosystem services valuations to demonstrate that forest conversion represents a net economic loss for the state. Spatial analysis provides potential for land use planning that can provide economic returns on logging and land conversion, reduce public health risk, and optimize conservation benefits. This approach holds the promise of harnessing government, community, and industry commitments to achieve reduced impact land use planning.
Deciphering Transmission Of An Environmental Mycobacterial Infection: Is An Ecohealth Approach Plausible?

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The exact mode of transmission of environmental mycobacteria remains challenging and has negatively affected the implementation of control and preventive strategies. Buruli ulcer (BU) is an example of such a non-tuberculous mycobacterium infection which also lacks adequate information on the survival and transmission of the causative organism, \textit{Mycobacterium ulcerans}. With an Ecohealth approach, four BU endemic communities in Ghana were mapped and all water contact areas identified. Using structured questionnaires, activities around the water bodies in relation to water contact areas were determined. Viable number tandem repeats (VNTR) profile types of human disease and environmental samples were then compared for infection overlaps. VNTR profiles of fourteen confirmed human BU disease samples and 140 environmental samples were compared. Four assigned human profiles identified \(W, X, Y\) and \(Z\) were also detected in water contact sites associated with human activities and a higher risk of infection for swimming and bathing (OR=3.2840, \(p=0.045, n=224\)) was identified. No type was detected in human disease that was not detected in a community associated waterbody.
suggesting direct human infection from community associated environments through activities that may cause skin abrasions. The multidisciplinary Ecohealth approach is recommended as an effective tool for ecological studies of mycobacterial infections.
What is the model of resilience of household to malaria in Korhogo town, Côte d'Ivoire?

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In the current study, we tested the hypothesis that the most of household who are affected by malaria concern (e.g., indice). A cross-sectional study was conducted among 1,456 households in korhogo in Northen of Cote D'Ivoire respectively 728 in rainy season 2014 and 728 in dry season 2015. We employed both explanatory and predictive modeling strategy by using multivariate linear regression models. In the explanatory models, we assessed the association between households infected by malaria and type or item of resilience (individual, social and institutional). From identified item of resilience that significantly contributed to higher household protected, we employed predictive modeling to explore predictors for the specific type of vulnerability.

To fight against malaria, people mainly use individual resources and social resources are also mobilized for health assistance. However, support from institutional level does not present for the strategy of resilience.

Therefore, to fight malaria, it’s necessary for to include the communities and government.
Small Ruminant Meat Quality And Nutrition Risk In Senegal

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For the first time between 2011-2013, cross-sectional survey on small ruminant value chain was carried in Dakar and Tambacounda, two main cities of Senegal. The aim was to assess the socio-economic and health risk as well as intervention cost-benefit. All serum (n=384) tested are free of Brucella antibody but 72% [IC (95%): 67.51-76.49] are positive for Peste des Petits Ruminants. Raw meat and small ruminant roasted meat from 40 restaurant called "dibiterie" are identified as risk factor for toxoplasmosis and neosporosis with a prevalence of 35.6% [IC (95%): 27.1-44.1] and 19.3% [IC (95%): 26.6-41.2] respectively showing high exposure for women attending antenatal care. Half of the 118 roasted meat samples are unsatisfactory for microbiology standards. The risk assessment identifies high - very high level [50.52%, IC (95%): 43.45-57.59]. Focus group discussion shows that women use traditional and modern methods for risk management. The risk mitigation options include stakeholders’ organisation and legal and investment incentives.
Setting research priorities for zoonoses control: A seven-country study

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The recent outbreaks of zoonoses and emerging infectious diseases (ZEID), and the resulting global panic, emphasizes that they have become a global concern. Africa and South Asia are hotspots for ZEID risks. In order to understand the knowledge gaps, identify cross-country trends, and develop a global research agenda for zoonoses prevention and control, we deployed the modified CHNRI method in three African (Ghana, Ethiopia, South Africa) and three South Asian (Indonesia, Sri Lanka, Nepal) nations and a developed European country (Belgium), to serve as a comparator. At all sites, a wide range of experts are contributing to identification of priority ZEID issues and developing a strategic agenda in three steps: defining the contexts and identifying critical gaps; generating research options to address these gaps; and weighted scoring to establish a prioritized research agenda. Results from a study carried out on such a global scale is likely to produce insights that streamline the approach to ZEID risks. Emerging results show interesting patterns: for example, while there are some overlapping priorities, Indonesia has more concerns about outbreak prone diseases, while those in South Africa are centered around endemic zoonoses. By understanding the convergence and divergence of priorities, this study can help address the ZEID issues in a strategic, evidence-based manner.
Exploring Human Behaviors And Practices At High-risk Interfaces For Disease Spillover In Sulawesi, Indonesia

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High levels of undiagnosed disease occur in Sulawesi, Indonesia, along with potential behaviors (wildlife consumption) that may be high risk for zoonotic disease spillover. Little is known about the disease experiences and wildlife exposures among people involved in the wildlife trade. We conducted 47 targeted ethnographic interviews with people involved in the wildlife trade in Northern Sulawesi between February and July 2016. Participants included 26 women and 21 men, between 30 to 65 years old, and included hunters, collectors, transporters, vendors and consumers of wildlife. Half of the participants raised domestic animals and had free access to wildlife meat. No one reported using any protective gear when working with wildlife, (e.g., hunters used leaves and plants to carry captured wildlife). Hunters and vendors considered that they had no alternative livelihood options. The majority of participants were unaware of disease risks posed by wildlife, although 80% had experienced high fevers and other unusual illnesses. Local doctors attributed the illness to viruses of unknown origin. Herbs and traditional practices are used to cure such fevers. The lack of knowledge of disease risks posed by wildlife may facilitate zoonotic disease spillover.
Drivers for MERS-CoV emergence at Human Camel Interface in Qatar

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The recent discovery of MERS CoV as a zoonotic disease endemic in dromedary camels raised questions about the possible origin of this infection. Therefore, we set out to review the literature, history and statistics of camel farming, camel Human interface in Qatar, interviews and brainstorming with the stakeholders were conducted, in order to generate hypotheses about the drivers for MERS CoV emergence. The rapid increase in GDP in the past two decades has been paralleled with rapid growth of the production, camel trade and racing industry. As a precious animal, camels are being kissed, hugged, and greeted. Consistent with the disease seasonality, contact with animals intensifies during winter time where camel-related activities flourish through race and beauty competitions, trade, camel reproduction and breeding. These activities imply extensive camel movement and mixing along with their owners and workers from all over the Gulf region. Moreover, camel products are used for a variety of domestic purposes. Camel workers live inside camel barns while owners pay regular visits to their barns. Nevertheless, they all strongly deny that MERS-CoV can be transmitted from camels to humans. More in-depth studies were needed to understand the role of social practices in the virus transmission.
Tourist Attitudes and Practices Regarding Contact with Primates in the Caribbean

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Contact with wild primates places those species, as well as ourselves, at risk of anthroponotic and zoonotic pathogen exchange. Primate-based entertainment involving animal exhibitions is popular in many different regions, yet the potential for pathogen exchange remains equivocal. To investigate the willingness of tourists to engage in risky animal contact, 1399 surveys were collected from visitors on the beaches of Cockleshell Bay and South Friars on the Southeast peninsula of the island of Saint Kitts, Federation of Saint Kitts and Nevis, West Indies. This island is home to approximately 30,000 African green monkeys, and touching and feeding these animals are encouraged by locals that solicit tourists for money. Almost all respondents were cruise ship passengers visiting the island for only a few hours. Despite the fact that 87.5 percent and 77.7 percent of respondents reported belief that humans can get/give diseases from/to wild monkeys and apes, 56.1 percent would still touch or feed one. 666 people touched a wild primate (mostly on the island itself), and 53 people were bitten or scratched. Despite acknowledged health risks, the drive to bond with animals and explore our physical world through direct contact will continue to place ourselves and other species at risk.
Risk factors and micro-geographical heterogeneity of Schistosoma haematobium in Ndumo area, uMkhanyakude district, KwaZulu-Natal, South Africa

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This study determined the spatial distribution of Schistosoma haematobium and related risk factors in Ndumo area, uMkhanyakude District, KwaZulu-Natal province in South Africa. A sample of 435 schoolchildren between 10 to 15 years old from 10 primary schools was screened for S. haematobium using the filtration method. The GPS for their homesteads were recorded. Getis-Ord Gi* and Bernoulli model were used to determine the hotspots of S. haematobium. Semiparametric-Geographically Weighted Regression (s-GWR) model was used to predict the spatial distribution of S. haematobium in relation to environmental and socio-economic factors. Significant S. haematobium cases and infection intensity clusters (p<0.05) were observed. The s-GWR model performance was low (R² = 0.45) and its residuals did not show autocorrelation (Moran's I = -0.001; z-score = 0.003 and p-value = 0.997) indicating that the model was correctly spelled. The coefficients for distances of homesteads from operational piped water collection points, distance from open water sources, religion, toilet use, household head and places of bath and laundry varied at local scale and were significant (t-values +/-1.96) in some areas. This evidence may be used for control and management of the disease and further research is required to improve the performance of the s-GWR model.
Biodiversity for Food and Nutrition: Edible Wild Species, Wild Mushrooms and underutilized species of Turkey

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In Turkey wild edible plants and wild mushrooms have been used as a food source since ancient times. Although wild species are known to have played an important role in regional economies they have different uses in different areas of the country. The nutritional properties of wild plant and mushroom species are known from various studies and are utilized in rural and urban areas. Gathering is one of the oldest traditions in Anatolia. Wild foods are common in Turkish cuisine and are either eaten raw, boiled, fried or baked to be served in dishes such as stew, stuffed and rolled vegetables or as cold or hot drinks for certain occasions and seasons. The underutilized land races are also use locally in for traditional and local dishes together with economic benefits. This study was developed on 43 the edible wild plants, mushrooms and underutilized species of Turkey, in 3 regions as a multi-disciplinary approach to gather data on their traditional uses as well as to improve the conservation and use of agricultural biodiversity for food and nutrition by providing evidence and raising awareness of the nutritional value of this diversity and its importance in food-based approaches to tackle unhealthy diets
A Global One Health approach to identify drivers of Emerging Zoonoses

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Global One Health is the combined effort of multiple disciplines to improve the health of humans, animals, and plants within sustainable ecosystems at a global level by using an integrated systems approach to come to transnational and global policy, research and practices (Fresco et al., 2015). Aspects under study include the emergence and control of zoonoses, that are influenced by social, economic, environmental, and ecological factors.

In a multidisciplinary research approach driving forces of the emergence of zoonoses are identified using a systems approach. Schematic diagrams are developed to depict and help explain cause-effect relationships. In addition a mechanistic model is developed to evaluate the effectiveness of intervention measures for the reduction of emerging zoonoses risks. Adoption of measures will be evaluated using a behavioural economics framework. Results of the project will be used to scrutinize potential intervention and policy measures for their effectiveness. Research outcomes contribute to integrated insights in public health protection, health promotion, and policy making in the field of public health. A first overview of the driving factors of emerging zoonoses will be presented based on a retrospective analysis of the increase of Lyme disease incidence in The Netherlands and the emergence of rabies in South-America.
Zooprophylaxis Contributes to the Interruption of Onchocerca Volvulus Transmission in an Endemic Focus with Intense Cattle Husbandry in North Cameroon

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Due to onchocerciasis control efforts with mass treatment of the local population with the microfilaricide ivermectin, interruption of the filarial parasite transmission has been confirmed in many American and some African countries. Because in North Cameroon onchocerciasis incidence and transmission has been lower on a highland focus with intense cattle farming compared to an adjacent endemic lowland focus, it has been hypothesized transmission to man is reduced by the presence of animal-borne Onchocerca spp. transmitted by the same vector, a phenomenon called zooprophylaxis. Here we investigated the impact of zooprophylaxis in the very same two foci where vector transmission rates have been surveyed since decades. Microscopic species discrimination of the Onchocerca species was complemented with single-stranded conformation polymorphisms of amplified 16S rRNA sequences to assign unambiguously the species, final host and phylogenetic relationship of nearly all isolated L3’s. O. volvulus transmission still prevails in the lowland focus after 29 years of ivermectin treatment, albeit drastically reduced to 3.5% of baseline. The proportion of animal-borne Onchocerca spp. was 95%. The endemic focus on the highland focus had only bovine Onchocerca spp. in the vector population as soon as 12 years after mass treatment introduction. This clearly demonstrates zooprophylaxis supplements disease control efforts up to the regional interruption of O. volvulus transmission.
Converting lawns to gardens: Improving health and food security for new refugees in the U.S.

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Refugees and new immigrants in a country often struggle with learning a new language, laws and systems while trying to find jobs, housing and also coping with past traumas. Community gardens offer physical and mental health benefits to alleviate some of these stressors for immigrants. In this project, refugee settlement agencies partnered with urban and suburban churches to convert their lawns to gardens and create new community garden space to immigrants in the Twin Cities of Minnesota, USA. This study reports on the evaluation of this project using pre and post surveys and focus groups with gardeners. The surveys had a 44% response rate. There was a statistically significant increase in vegetable intake throughout the day between the pre and post surveys. Only 3% of gardeners indicated food insecurity issues but 84% participated in one or more food subsidy program. Qualitatively, gardeners indicated the value of the gardens to improve their mental and physical health, and the social connections. The results illustrate the value of gardening for improved physical and mental health of refugees and strengthened social connections. In addition, the model of converting lawns into gardens has implications for creating a more sustainable use of the environment.
Targeting Surveillance for Zoonotic Viruses Based on Risk of Disease Spillover and Spread

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Emerging zoonotic diseases continue to present a significant burden to global health, particularly where dense human populations and pressures on environmental and economic resources are greatest. To establish a risk-based surveillance strategy to detect emerging diseases that threaten human health for the Emerging Pandemic Threats PREDICT project, we examined past trends in animal hosts and transmission mechanisms involved in spillover of zoonotic viruses and amplification by human-to-human spread. We find that viruses with high host plasticity (i.e. taxonomically diverse host range) were more likely to amplify viral spillover by secondary human-to-human transmission and have broader geographic spread. Viruses transmitted to humans during circumstances that facilitated mixing of diverse animal species had significantly higher host plasticity. We also identified a strong linear relationship between species abundance and viral spillover, with the more common species, especially those increasing in abundance, having transmitted more viruses to humans. Our findings suggest that surveillance should be focused at high-risk interfaces that facilitate mixing of animal species in areas with high biodiversity, dense human populations, and land use change that facilitates
frequent contact between people and wildlife, particularly highly adaptable species increasing in abundance.
One Health Ecohealth science approaches underpinning human health and security in New Zealand: one organisation’s journey

Virginia Hope
Graeme Benny, Libby Harrison, Rob Lake, Phil Carter

ESR - The Institute of Environmental Science and Research

The Institute of Environmental Science and Research in New Zealand (ESR) provides human health, environmental and forensic science support for government agencies in New Zealand. Across the three areas, the human-animal-environment interface is an increasingly relevant aspect of our operational and research work. ESR also shares the location for its outbreak and pandemic related services with animal health experts working for the Ministry for Primary Industries at the National Centre for Biosecurity and Infectious Disease which has led to a range of joint operational activities and research projects. The development of genomic approaches to the management of communicable disease in humans and animals and in water and food quality monitoring has further enhanced our ability to work across this interface in the interests of human health. Investigation and attribution of the burden of zoonotic diseases by ESR is relevant to a number of government agencies, and benefits from taking an integrated health perspective. This presentation will track the growth in importance of One Health Ecohealth aligned activities both across ESR and with external collaborators, and describe support for translation into policy and action.
Rhodococcus Equi infection in cats presented to the University Veterinary Hospital, Universiti Putra Malaysia from 2009 to 2014

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*Rhodococcus equi* is a facultative, intracellular, gram positive coccobacilli with zoonotic potential. The objectives of this study were to determine the prevalence, disease characteristics and antimicrobial sensitivity profiles of cats diagnosed with *R.equi* infection at the Universiti Veterinary Hospital (UVH), Malaysia. Record from the bacteriology laboratory and UVH from the year 2009 to 2014 were reviewed retrospectively. A total of 39 cats were diagnosed over a six-year period with overrepresentation of less than one-year old (55%), Domestic Shorthair breed (77%), male (69%), intact (87%) and outdoor managed (57%) cats. Pulmonary disease (pyothorax) (64%) was the predominant form of disease while cutaneous form includes superficial wounds and ruptured abscesses. Common findings from blood profiles include thrombocytopenia (53.8%), neutrophilia (46.2%) and monocytosis (38.7%). Antibiotic sensitivity profiles for thirteen *Rhodococcus* isolates from cats revealed a 100% resistance to cephalexin and a high susceptibility to marbofloxacin (100%) and enrofloxacin (91%). A total of 23 cats (59%) died despite exhaustive medical intervention. Malaysian *R. equi* isolates from cats appear to have variable multidrug resistance properties and exclusively resistant to cephalaxin. Future studies should focus on molecular approaches for further understanding of antimicrobial resistance in these organisms.
Redefining the Australian anthrax belt under current and future climate conditions

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The ecology and distribution of *B. anthracis* in Australia is poorly understood, despite
continued occurrence of anthrax outbreaks in eastern states. The spatial extent of disease risk
has been limited to a qualitative definition of an anthrax belt extending from southeast
Queensland through the centre of New South Wales and into northern Victoria. This definition
does not consider the role of environmental conditions in the distribution of *B. anthracis*. Here,
we used the genetic algorithm for rule-set prediction model system (GARP), historical anthrax
outbreaks and environmental data to model the ecological niche of *B. anthracis* and predict its
potential geographic distribution in Australia. The niche of *B. anthracis* in Australia is
caracterized by a narrow range of ecological conditions concentrated in two disjunct corridors.
The largest corridor, redefining the belt, parallels the Eastern Highlands running from north
Victoria to central east Queensland through the centre of New South Wales. We also modelled
changes due to future climate change. Under multiple scenarios, the future distribution will
likely contract and shift southeastward, changing surveillance priorities into areas without
historically confirmed cases. The geographic distributions identified can help inform anthrax surveillance strategies by public and veterinary health agencies now in the future.
Barriers for capacity building of environmental health management

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Our aim was to identify barriers that may hinder the process of capacities development or strengthening for environmental health management (EHM).

The process of institutional capacity development has been standardized by UNDP in a cyclic 5-step process:

- Involve actors,
- Diagnose capabilities,
- Develop a program,
- Implement an answer
- Assess. However, its application in the context of each region or country involves some adjustments to achieve the ultimate goal of adaptability, stability and performance of institutions. In the particular case of EHM capacity development it is strongly dependent on aspects such as intersectoral work and governance.

In 37 territories of Colombia we applied these steps for capacity building in the area of EH at the Health Territorial Entities. The capabilities needed for EHM were established, an assessment of the capacities for EHM was performed and a plan for capacity building was designed.

Our conclusion was that development of capacity for EHM depends heavily on other development goals: decent jobs so that people can be committed to the objectives of their institution, cross-sector work that allows interaction between sectors that generate results for the improvement of the quality of life of people and corruption defeat to build trust.
“SOS: Summer of Smoke. A mixed-methods, community-based study investigating the health effects of a prolonged, severe wildfire season on a subarctic population.”

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Between June 15-Aug 31 2014, wildfires burned 3.4 million hectares of forest in Canada's Northwest Territories (NWT), yielding Canada's most severe urban smoke exposure for Yellowknife, the subarctic capital, and surrounding aboriginal communities. We analyzed PM2.5 levels, salbutamol dispensations, clinic and hospital cardiorespiratory variables, and analyzed in-depth video interviews with community members. 49% of days June15-Aug31 in 2014 had a PM2.5 over 30 mcg/m3, as compared to 3% in 2012 and 9% in 2013 and 2015. Max daily PM 2.5 in 2014 was 320.4 mcg/m3. There was a 22% increase in outpatient salbutamol dispensations in 2014 compared to the average of 2012, 2013 and 2015. More cough, pneumonia and asthma were seen in clinics compared to 2012-2015 (P<0.001). There was a 42% increase in respiratory ER visits in 2014 compared to 2012-13, but no change in cardiac variables. The respiratory effect was most pronounced in children 0-4 (114% increase in ER visits). Qualitative information shows a reduction in traditional activities, and that severely-affected people left. Respiratory and cardiac findings are consistent with previous studies. Further mixed-methods studies are required to detail whole-picture health effects of wildfires in order to best target public health interventions. Funding: Health Canada--Aboriginal Health Branch.
A network approach to the study of participation, transdisciplinarity and sustainability in ecohealth research

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In ecohealth research, participatory and transdisciplinary approaches have been proposed in order to allow researchers, communities and policy makers to share and collaborate on complex ecosystem-related health issues, according to their perspectives, concerns and priorities. Social relations, such as information exchanges, collaboration, resource sharing and trust, are central to these collective processes of knowledge generation. We present a synthesis on the use of social network analysis (i) to map the relations among actors involved in participatory and transdisciplinary ecohealth research, and (ii) to characterize the structural characteristics of networks that emerge from these multi-stakeholders collaboration, and (iii) to understand how patterns of relation affect the capacity of the research process to promote health improvements and environmental sustainability. We also propose indicators, based on individual-level and whole network measures, to characterize several key aspects of ecohealth research, such as gender issues, equity in participation, sustainability of the research results, levels of pluridisciplinarity, adaptive capacity to social and environmental changes, robustness and resilience of the knowledge generation processes. Indicators are illustrated and discussed using several ecohealth case studies, including community development projects, health promotion initiatives and international governance programs.
Scaling-up Intermittent Rice Irrigation for Malaria Control in Peru: The role of farmers’ perception and social networks

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Since the 1970s, large-scale irrigation systems in Peru's North coast have enabled a huge expansion of rice cultivation. Irrigation also brought malaria to the region. A pilot ecohealth research showed that Intermittent Rice Irrigation (IRI) could achieve a 90% mosquitoes decrease in rice paddies, but also higher rice yields and a 30-60% reduction in water use. The research aimed at characterizing farmers' perception on the social, health, environmental, and economic advantages and trade-offs associated with the adoption of IRI and to understand the role of information exchange networks in the scaling-up of the irrigation technique at the watershed level. Semi-structured interviews were conducted in April 2016, with 368 farmers, 311 men and 57 women, distributed throughout the Jequetepeque watershed. Data included farmers' characteristics, interpersonal communication on agriculture and health, and perceptions of advantages and trade-offs of adopting IRI. Preliminary analyses showed that men value the economic advantages of IRI, while women establish linkages between the new practices and their health benefits. Information on IRI circulates through two distinct gender-specific diffusion pathways. Furthermore adoption for men is associated with participation in communication networks on agriculture, while discussing health is linked to women's adoption. Implications for scaling-up ecohealth interventions are discussed.
Taenia solium Cysticercosis in Central America and the Caribbean Basin

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Cysticercosis caused by the zoonotic pork tapeworm, Taenia solium, is emerging as a serious agricultural and public health problem in many areas of the world including sub-Saharan Africa, South and Southeast Asia and Latin America where pork is consumed, pigs are left roaming and where there is poor sanitation. Cysticercosis has been ranked by multiple expert groups as the most important foodborne parasitic disease globally. The disease can lead to epilepsy and death in humans, reduction of the market value of pigs and make pork unsafe to eat. Neuro-cysticercosis is the most common parasitic infection of the human nervous system and the most frequent preventable cause of epilepsy in the developing world possibly causing more than 30% of the acquired epilepsy cases in endemic countries. The scope and content of an eventual control program for cysticercosis needs to be decided in relation to the specific situation. A One Health, transdisciplinary approach is in the process of being utilized to undertake an analysis of the cysticercosis situation in Central America and the Caribbean Basin to determine areas of transmission and build capacity to combat T. solium infections.
American Cutaneous Leishmaniasis (ACL): Perception by Health Professionals in Bandeirantes-Pr-Brazil

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The Leishmaniasis is a infectious disease of chronic evolution. Its etiology is attributed to several species of the genus Leishmania protozoan, is transmitted to humans through the bite of the female sandfly. To evaluate the knowledge of health professionals on the ACL, at Bandeirantes-PR. We interviewed 62 health professionals in the health strategies of the family. Of all respondents 82% were female, the predominant age group was between 30 to 39 years (31%), 56% had completed high school, 44% had two to five minimum wages, 71% received training, but none of ACL, 87% reported knowing about the disease and 77% know that is reportable, 40% recognize that cases in the city increased. Most respondents have knowledge about the etiologic agent (48%), responsible vector (59%), transmission (55%), as the realization of diagnosis (90%) and drug use (58%). As the demonstration, only 14 people know about the mucosal form and 33% do not know what happen with the infected animals. There are deficiencies in the knowledge of the disease and the lack of professional training, so developed a continuing education plan in partnership with the University and municipality health program along with teams of family health programs to stimulate learning interest.
Introduction: Leishmaniasis etiology is attributed to the Leishmania protozoan transmitted by the bite of the sandfly females. It is manifested clinically in the visceral, cutaneous and mucocutaneous forms. Objectives: To describe the personal characteristics of the population affected. Material and Methods: A retrospective, descriptive epidemiological study based on a secondary database that were obtained from the epidemiological investigation forms the Municipality Health program. The project was approved by the Municipality Health and the Ethics Committee of the Public Health School of the University of São Paulo (COEP-216/2012). Results and Discussion: There was an outbreak in 2007, when the incidence rate reached 1.06 cases / 1,000 inhabitants per year. The spatial distribution of the cases presented its highest concentration in urban areas (72.50%). Of the 200 notifications of LTA, 126 (63%) occurred in females. There was a predominance of the age> 60 years (35.50%), domestic activity (44%), incomplete primary education (53.5%) followed by illiteracy (26%). The cutaneous form was predominant in 97.50% of cases, the most widely used drug was the pentavalent antimony (99%). Of patients reported in the study period 15 (7.5%) died. Conclusion: socio-economic data presented show that predominantly affects women LTA suggesting that the transmission of Leishmania sp. is taking place in the intra and peridomicile.
Integrative approaches to environment, community & health: Learning from local, Indigenous and geospatial knowledge in northern BC, Canada

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Integrative approaches to environment, community and health issues are demanding new tools and processes. Within our expanding digital toolscape is a growing suite of integrative approaches and geospatial tools that are being used to value and profile diverse knowledges in new ways, and create conversations across local, Indigenous, scientific and organisational knowledge, among others. This presentation will present findings from two interrelated projects underway in northern British Columbia, Canada that are developing, refining and applying integrative and geospatial tools to better understand and respond to the health implications of resource extraction and development in northern British Columbia: the "Nechako Watershed Portal", and the "Cumulative Impacts Research Consortium". Discussion will focus on how these complementary approaches are seeking to value local and indigenous knowledge, to foster diverse stakeholder engagement, and to inform intersectoral decision-making in relation to the cumulative environmental, community and health impacts of resource development. Attention will also be given to how efforts in BC compare to related efforts that are developing in other jurisdictions, including Canada, the US (Alaska and Hawaii), and Aotearoa/New Zealand.
Modelling the risk of Japanese encephalitis human infection in a urban area of Cambodia

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Japanese Encephalitis (JE) is the first cause of infectious encephalitis in humans in Southeast Asia, and considered a rural disease. However, the growing pig farming sector and the presence of JE mosquito vectors in peri-urban settings may lead to urban cases. We assessed the risk of JE peri-urban transmission through 2 complementary surveys performed in a Phnom Penh peri-urban area (Cambodia). We first estimated the force of infection (FOI) of JE in 2 cohorts of sentinel pigs settled in this area and using a generalized linear model. Then, we estimated the risk of JE transmission to humans associated with a pig slaughterhouse. The epidemiological system was modeled using a Susceptible Infectious Removed (SIR) model for pigs combined with a SEI model for mosquitoes, and SR for humans. The infection rate was estimated from a published pig serological dataset (Vaesna et al, 2011).
The estimated FOI were 0.03192 $d^{-1}$ and 0.04637 $d^{-1}$. Considering a totally susceptible exposed human population, the cumulative number of new human clinical infections induced by this single slaughterhouse within 1 year would be around one. This number drastically increases with an increase of the mosquito population size and the proportion of viremic pigs transiting through the slaughterhouse.
Using the Global Green and Healthy Hospital Network to create a healthier world

Carol Behne

The health sector is a significant contributor to greenhouse gas emissions and ecological harm. Both of these are risk factors for human health, despite the health sector's mission to protect and promote health. As one of the biggest industries in the world, the health sector can play a leading role in responding to climate change and reducing its ecological impact. The Global Green and Healthy Hospitals Network is a worldwide community working together to reduce their environmental footprint, and move to healthier, more sustainable low carbon operations. Launched in 2012, the network is driving transformative changes in the health care sector with over 20,000 members worldwide. The network is a virtual global community, supported by innovative technology, with members working together to chart their progress, share best practices and find solutions to common challenges. Nurses, facilities managers, executives, and sustainability professionals are all part of spearheading initiatives across ten goal areas - leadership, energy, waste, water, buildings, chemicals, food, transport, pharmaceuticals and purchasing. With members in every continent, Global Green and Healthy Hospitals is demonstrating the health care sector can lead a transformation in sustainable operations through collaboration, and a commitment to finding shared solutions to global and local challenges.
Rapid diagnosis of Hendra virus using Reverse Transcriptase Recombinase Polymerase Amplification and Lateral Flow detection

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Hendra Virus (HeV) is a highly pathogenic zoonotic disease causing severe illness and mortality in humans and horses. Early detection of this Henipavirus is critical for containing outbreaks, however, confirmatory diagnosis currently requires shipment to a centralized facility that delays diagnosis for several hours or even days. Here we describe the development and testing of a rapid assay for the detection of HeV RNA. A reverse-transcriptase recombinase polymerase assay combined with lateral flow assay (RT-RPA-LFD) was developed that targeted the M gene of the HeV genome. RNA extracted from a wide range of samples from infected and non-infected horses, including nasal, oral, rectal and urogenital swabs, as well as bloods were tested by RT-RPA-LFD and compared to Hendra virus real-time reverse transcriptase PCR where it demonstrated 100% analytical sensitivity and 100% clinical specificity. The HeV RT-RPA LFD was optimized to amplify results in 6 minutes, isothermally at 39 °C, and provides a sensitive, and rapid detection method, amenable for field adaptation. The assay has the potential to dramatically reduce HeV diagnosis times, improve biosecurity surveillance, support a One Health approach, protect attending personnel and reduce prolonged suffering of animals.>
Insights from Australia’s experience in facilitating collaborative approaches to rabbit management

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The European rabbit (*Oryctolagus cuniculus*) is one of Australia's most destructive pest species, undermining our ecosystems, the productivity of our landscapes, and is often a point of contention within regional communities. With the evolution of government policies and frameworks on biosecurity issues, there is a renewed call for more collective approaches for managing established species, such as rabbits. This shift requires a movement away from the more orthodox institutional-led approaches towards more collaborative approaches. Within these, communities and landholders are not seen as passive recipients of technical knowledge and programs, but as being actively engaged in developing collective approaches that work for them in their particular locale. Inherent to this approach are different assumptions and metrics in terms of how we understand and measure success, which are more conducive of landscape scale change. Through the work of the Victorian Rabbit Action Network, we have sought to reframe rabbit management towards a collective response through facilitating a systems strengthening, democratic participatory approach. Drawing on the findings from a formative evaluation of the program, we will present on what we see as the implications for institutional change to facilitate more collective approaches to invasive species management.
Biosecurity relies on strong collaborative partnerships between the government, industry and the community. Natural resource managers in remote regions have a particularly important role to play in the detection of pests to protect against emerging infectious diseases. In this paper we outline a 'total system health approach' to translating and integrating local and scientific information to inform surveillance efforts. Using Indigenous communities in Australia and the Asia Pacific region as a case study, we reflect the importance of understanding how different stakeholder groups source and evaluate information, how they manage and use different kinds of information to make decisions, and if and how the partnerships they use can be improved to build total system health approach to biosecurity surveillance.
Global Impact of Food Borne Diseases – a Case Study of a One Health Approach for Control of Taenia solium in Lao PDR

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WHO publications characterise 31 food borne diseases comprising: 11 diarrhoeal agents; 7 invasive infectious agents; 10 helminths; and 3 chemical toxins. While the burden of foodborne disease is a global concern, WHO highlights African and South East Asia Regions with the highest incidence and death rates. *Taenia solium* taeniasis/cysticercosis is a Neglected Tropical Disease ranked first on the global scale of foodborne parasites and is of significant public health importance across Africa, Asia and Latin America. Humans are both the definitive and accidental dead-end host of the parasite, with consumption of undercooked pork, open defecation and free ranging pig production systems important risk factors for disease transmission. A coordinated approach by the human and animal health sectors in endemic countries is recommended for the effective control of taeniasis/cysticercosis. Yet to date, there has been little published on the outcomes of such coordinated approaches. Results of a coordinated intervention in a *T. solium* hyper-endemic village in Lao PDR are presented. Together with economic assessment of the cost effectiveness (abstract presented separately), this work provides evidence for policy makers to devise appropriate government intervention programs.
Antimicrobial Resistant Escherichia coli in Rural Well Water

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Antimicrobial resistant (AMR) bacteria are a leading public health issue, and aquatic ecosystems are a significant reservoir of resistance. Consumption of well water contaminated with AMR E.coli has been linked to human carriage of AMR bacteria, however the prevalence of AMR E.coli within rural well water remains unknown. The objective of this study is to determine the prevalence (or positivity) of resistance in E.coli in rural well water samples submitted for routine testing in the province of Alberta, Canada. For antimicrobial susceptibility testing, an agar screen was performed on up to 20 E.coli isolates from each sample. Presumptively resistant isolates were confirmed as E.coli based on API\textsuperscript{®} 20E biochemical tests and minimum inhibitory concentrations were measured using NARMS panels. Of 801 E.coli positive water samples tested, 173 samples (21.6\%) contained AMR E.coli. The highest levels of resistance were to tetracycline (72\% AMR E.coli isolates), streptomycin (40\%) and ampicillin (35\%). Multidrug resistance (>3 antibiotics) was observed in 40\% of isolates, and 10\% of isolates were possible extended-spectrum beta-lactamase producing E.coli, which will be confirmed via disk diffusion assays. Contaminated wells will be spatially mapped to identify temporal and spatial clusters, and risk factors associated with specific resistance phenotypes will be evaluated.
POLYMORPHISM & Sequence analysis of Prion Protein Gene of Pakistani Goat Breeds

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The association between Caprine PrP gene polymorphisms and susceptibility or resistance to scrapie has been keenly investigated in current years. As the ORF of the PrP gene is extremely erratic in different breeds of goats, we studied the PrP gene polymorphisms in different Pakistani goat breeds. Six distinct polymorphic sites (one novel) with amino acid substitutions were identified in the PrP gene that includes 126 (A -> G), 304 (G -> T), 379 (A -> G), 414 (C -> T), 428 (A -> G) and 718 (C -> T). The locus c.428 was found highly polymorphic in all breeds as compare to other loci. On the basis of these PrP variants NJ phylogenetic tree was constructed which showed that goat breeds along with domestic sheep appeared in one clade and sharing its most recent common ancestors with deer species while Protein analysis has shown that these polymorphisms can lead to varied primary, secondary and tertiary structure of protein. Based on these polymorphic variants, genetic distance, multidimensional scaling plot and principal component analyses reveals the clear picture regarding greater number of substitutions in cattle PrP regions as compared to the small ruminant species. In particular these findings may pinpoint the fundamental control over the scrapie in *Capra hircus* on genetic basis.
Texas A&M University One Health Initiative: Five Easy Steps to an Interdisciplinary Approach

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Audra Richburg, Heather Moberly

1Texas A&M University One Health Initiative

Established in 2012, Texas A&M University One Health Initiative has positioned itself as a global leader in research, education and outreach programs; it serves 80,000 students, faculty and staff. This Initiative is advised by a Campus Council represented from 16 colleges, schools and entities. Three examples of these programs are illustrated using performance metrics and case studies. 1) A call for research proposals required submissions to be transformative and interdisciplinary with an applied One Health approach. Seed grants were awarded competitively to five principle investigators who utilized the funding to attract additional major funding, produce peer reviewed scientific publications, and involve numerous students and interdisciplinary faculty. 2) Local, national and international educational programs involve our undergraduate, graduate and professional students. Students are mentored to present their results of these experiences at national and international conferences and, submit publications to peer review journals. 3) Outreach modalities include a website, list serve, social media and extensive dissemination of "success stories" of this Initiative globally. The impact and success of the Texas A&M University One Health Initiative program is attributed to the interdisciplinary approach of productive researchers, educationists and stakeholders who collaborate across the university, locally, regionally, nationally and internationally.
Study on seroprevalence and associated risk factors of Porcine Reproductive and Respiratory Syndrome (P.R.R.S.) in pigs of Bhaktapur district, Nepal

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A cross-sectional study on PRRS was done in pigs of Bhaktapur district of Nepal to find out the sero-prevalence and associated potential risk factors from February to July 2015. A total of 354 serum samples were collected from 40 farms of 5 municipalities of Bhaktapur district randomly by two-stage sampling along with a questionnaire survey. Antibody ELISA was carried out to detect antibodies against PRRS virus. The individual level seroprevalence was found to be 13.2% and farm level prevalence was 50%. High prevalence was seen at the slums of the Manohara belt (91.489% animals and 80% of farms). This could be due to the improper and unorganized farming practiced in the community. Two step analysis was performed with Chi-square test and then obtained significant risk factors analyzed through GEE population average model i.e. the multiple logistic regression. Source of pig and surrounding were obtained as high significant risk factors. Farms importing pigs from other farms were more likely to test positive than non importing farms (Odds Ratio of 6.53 95% CI 1.59 - 26.79) and odds of pigs in farms surrounded by urban areas were 9.15 times (95% CI 1.54 - 54.35) greater than pigs in farms surrounded by rural agricultural land.
Knowledge and practices towards rabies: questionnaire survey in school children of Kathmandu District, Nepal

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1National Zoonoses and Food Hygiene Research Centre

A cross-sectional survey was conducted among 351 schools students of grade 8, 9 and 10 of Kathmandu district. With school education being the major source of information (54.2%), majority (91.5%) replied that they have heard about rabies, but when specific questions relating to the disease were asked the correct/closest answers kept declining. 80.7% knew dog bite as transmitting factor and 11.8% only knew about all the signs of rabies. Dog being the commonest pet (90.4%), only 75.9% vaccinated their pets against rabies. 55.4% pet dogs had access to community/stray dogs. Bite cases were high with 56.7% children knowing someone who has been bitten and 28.5% were themselves bitten. 55% replied of not having provoked the dog and in majority of the instances (69%) the dog ran away after biting. Hospital based treatments (72%) and PEP/vaccination (64%) were common. A significant association was seen between knowledge/practice towards rabies and type of school, pet ownership and grade of students. These findings demonstrate that although majority of the children knew about Rabies, still there seems to be a knowledge gap. Therefore effective awareness must be conducted starting from the school level as one of the important means of battling rabies in Nepal.
Exploring mental health services among climate victims in a cyclone affected area of coastal Bangladesh

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In 2014 German Watch declared Bangladesh as the 5th ranked country in climate risk. Every year it is attacked by cyclone creates huge impact on mental well being but this issue is still a neglected topic. We conducted this exploratory study with a view to explore the situation of mental health services in a cyclone affected village. A social mapping, KII with different stakeholders (10) & IDI with affected people (10) were done for identification of location of health care service centers, activities of government institution, NGOs, local volunteers, informal health care providers, resources & possible future steps related to mental health care. It was revealed that natural disasters like cyclone had many psychological impacts on population. People have suffered by post traumatic stress disorders, anxiety, panic, acute stress reaction, sad feelings, suicidal thoughts & children and female were more vulnerable. The government/NGOs had no specific plan of action/initiative to address these issues. There was a visible gap in thinking about finding of an effective way to give the people proper psycho social services. To make resilient & responsive health systems for this vulnerable group of population, implementation of effective mental health program with a strong mental health policy is needed.
Attention to the ‘bottom billion’, their animals and shared environment

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The 'bottom billion' refers to the poorest and most marginalized people in the world today. These populations experience social and economic inequality, structural violence, harsh environmental conditions with often inadequate water supply and sanitation and close proximity to their animals. They lack access to basic preventative health measures, and experience higher incidences of diseases eliminated elsewhere. Preventable, endemic diseases are rarely prioritised for surveillance as they do not pose a risk of epidemic or pandemic outbreak. This is a failing on two levels: (1) the presence of preventable diseases acts as an indicator of the overall state of the health system; and (2) knowledge of 'usual' allows detection of the unusual. Strengthening surveillance and other systems for endemic diseases, infectious or otherwise, provides necessary infrastructure to both combat the existing and target the emerging.

This symposium aims at an interactive discussion on operationalising One Health in the context of neglected endemic diseases and strategies to work across sectors and platforms to maximise reach and impact. Our international panel will discuss perspectives on community engagement, disease surveillance, zoonotic risks, devastating animal bites, biodiversity loss, water and sanitation, with field examples on the control of specific issues as rabies, snake bites, cystic echinococcosis, among others.
Using Problem-Based Learning Case Studies to Integrate One Health Concepts into the Health Sciences Curriculum in Malaysian Institutions

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Emerging, reemerging and transboundary diseases affecting humans and animals are global issues and graduating veterinarians and medical students must be equipped with holistic and critical thinking on OH concepts. It is imperative that health science professionals be they medical doctors, public health specialists, veterinarians environmentalists, policy makers and social scientists get involved in OH research and discoveries to ensure authoritative contribution and leadership to OH issues. Problem-based learning (PBL), since the introduction into the veterinary curricula 13 years ago, has been well-received by teachers of the veterinary program. This presentation describes the development of the One Health PBL case studies and the integration of the OH concepts in the medical and veterinary curriculum through PBL sessions. Eleven diseases prevalent to the region such as nipah virus, foodborne zoonoses, tuberculosis, and leptospirosis were developed as OH PBL cases. The cases were developed as the result of collaboration among 44 academicians from member universities of Malaysian Universities One Health Network (MyoHUN), and were piloted to veterinary and medical students. Feedback from students, case-writers, and facilitators were used to improve the cases. The PBL activity on OH enabled students to understand transdisciplinary collaboration in prevention and control of diseases, and the interdependency between all disciplines.
Addressing food security within a One Health approach: Integration of health and agriculture issues in the socio-ecosystem’s dynamics

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In a global context of increasing urbanization and high population densities, growing intensification of trade and farming systems, drastic land use changes and biodiversity erosion, food security is directly related to complex health issues emerging at the Animal-Human-Environmental interface. Indeed, global changes affecting biodiversity, water management and agricultural production may unexpectedly increase the risk of zoonotic and environmental diseases transmission, threatening food security, with devastating socioeconomic and wellbeing impacts for the poorest communities. Assessing and managing these risks implies taking into account socioecological dynamics, in link with epidemiological patterns and public-health policies. For instance, epidemiological surveillance of animal diseases has to involve economic costs and social impacts associated to disease reporting for the farmers. As zoonotic diseases' spreading can be largely induced by important ecological modifications, it implies to deeply understand eco-epidemiological systems involving pathogens and their reservoir, vectors and hosts. It requests a holistic approach to understand the relationship between "Health" and "Agriculture" within the socio-ecosystem's dynamics. It implies to underline the institutional constraints and potential coordination gaps across sectors and institutions and across action levels. Such integrative approach at the interface between ecosystems and societies cannot be achieved spontaneously, and implies methodological guidelines for cross-sectorial and interdisciplinary collaborations.
The Application of One Health Concepts to an Outdoor Problem Based Learning (PBL) Activity for Veterinary Students

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Tengku Rinalfi Putra Tengku Azizan¹, Noor Farhana Bachek¹, Hasliza Abu Hassim¹, Intan Shameha Abdul Razak¹, Lokman Hakim Idris¹, Yusof Hamali Ahmad¹, Mohd Shahrom Salisi¹, Hafandi Ahmad¹, Mohd Qayyum Ab Latip¹, Ahmad Afifi Abdul Ghani¹, Mohd Syafiq Shahudin¹, Stanley Gordon Fenwick², Richard Speare³

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The One Health (OH) approach seeks to bring human and animal health closer together and is particularly suited to the effective management of zoonotic diseases across both sectors. To overcome professional silos OH will be most effective if it is taught at the undergraduate level, and we recently implemented a pilot PBL activity on leptospirosis using the OH approach for third year veterinary students in Malaysia. Two groups of 59 students completed the 2-day activity at a deer park adjacent to a wilderness area. Students were asked to evaluate the activity using an online survey with quantitative and qualitative components. Response rate was 69.5% and the activity was rated excellent (69.5%) and good (30.4%). Levels of satisfaction were high on a range of criteria. 97.5% of students said that the activity had contributed greatly to their understanding of the disease. Delivery of an outdoor PBL activity using the OH approach was very successful in terms of participation, knowledge delivery and understanding of the issues and willingness of students to integrate OH into their future practice. Involvement of other disciplines in future PBL programs (medicine, biotechnology, biomedical sciences and public health) will be discussed by the relevant faculties at the university.
**Pandemic predictions: Can influenza pandemics ever be anticipated?**

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Influenza pandemics emerge from animal influenza viruses. The example of the 2009 pandemic highlighted the rapidity with which a newly emerged pandemic virus spreads globally, making it unlikely that conventional vaccines will be ready in time to mitigate the first wave of the pandemic. There are efforts to enhance surveillance and risk assessment of influenza viruses at the animal-human interface so as to identify viruses of highest potential risk, so that pre-emptive steps to initiate development of candidate vaccine strains can be implemented allowing a head-start in the vaccine development process. Such risk assessments may also help identify animal viruses of the greatest concern, so that interventions may be instituted to minimize risk of pandemic emergence. Recently, influenza virus risk assessment strategies have been developed to make this process more systematized and transparent. These include the Influenza Risk Assessment Tool (IRAT) developed by the US CDC, the Tool for Influenza Pandemic Risk Assessment (TIPRA) being developed by WHO with "One-Health" partners and FluRisk being developed with the European Food Safety Authority. Application of such approaches to risk assessing animal influenza viruses provides an understanding of knowledge gaps and will potentially lead to enhancing the process in an iterative manner.
Tackling rabies in Indonesia with a One Health Approach

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Rabies has been recorded in Indonesia since 1884, gradually spreading from West Java to 25 provinces, although it was eradicated from a further four provinces in the 1990s. Lessons from attempts to eradicate the incursions into Flores since 1997 and Bali since 2008 have been used to frame a Masterplan for rabies eradication from Indonesia, which, although expensive, will be cost-beneficial in the long term. It relies heavily on strong structural coordination at senior government levels between the Agriculture, Health and Home Affairs Ministries, as well as an integrated dog bite case management system in the field between local health officers and animal health officers, for early detection and prompt treatment to prevent human deaths. Systematic dog mass vaccination campaigns will progressively eradicate rabies from endemic islands or provinces while risk-based surveillance and dog movement controls will prevent further spread to uninfected areas.
Tackling the crisis of antimicrobial resistance – lessons learned from undertaking a One Health approach project

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We describe our experiences – positive and negative – of undertaking a multidisciplinary, multi-stakeholder project aimed at investigating perceptions of critical stakeholders (e.g., doctors, veterinarians and dentists) to the antimicrobial resistance crisis. This project led by a geographer with expertise in risk and policy brought together experts from microbiology, human medicine, veterinary science, dentistry, pharmacy, law, ethics and policy (amongst others) from 11 institutes and centres across two universities and senior federal government policy makers. We describe the challenges of bringing diverse experts together, the process of finding 'common ground', learning and overcoming siloed disciplines and languages in order to bring new 'One Health' insights to the issue of antimicrobial resistance. We find that despite the movement towards the concept of doing integrative One Health' projects, the reality is such projects are really hard to do. We offer suggestions for interdisciplinary teams to help guide future researchers anticipate and circumvent the challenges of undertaking One Health oriented projects.
Developing local disease identification and surveillance capacities through ZCAs

Javed Khan

Relief International

Relief International one health program aimed at working with communities, relevant government agencies, research institutions and academia to improve community-based pathogen and infectious disease surveillance and response. In order to Networking public health, veterinary health, wildlife & education departments & communities to address the larger agenda of zoonoses & other communicable diseases in Pakistan, we established Zoonoses Control committees, independent bodies for prevention and control of zoonotic diseases. ZCAs are responsible for the monitoring & reporting of zoonotic diseases to district level government departments, & are supported by government departments, research organizations, & academic institutions. ZCAs have tried to answer the following important coordination questions of:

- Linking the public and animal health, policy and public communities to help address societal needs.
- Bring communities together to build a disease surveillance system that works.
- How the system is build on existing capacity (infrastructure and workforce) is backed up by policy makers at the district level
- How these systems answer several societal needs from health to environmental and to national and regional security

ZCA encourages collaboration to address the larger agenda of zoonoses and other communicable diseases and helping in increasing accessibility and acceptability of different disease eradication program.
Implications of Afghan conflict on Trans-boundary Kuchi nomads’ mobility, disease transfer and livelihood

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There are about 1.4 million Kuchi (nomads) rearing more than 50% livestock of Afghanistan. A sizable portion of these nomads used to move with their herds from the central Afghanistan summer highlands to the Pakistani Indus valley plains wintering lowlands. The past 35 years of conflict in Afghanistan has negatively impacted this trans-boundary mobility and Kuchi’s livelihood. This paper reflects for the first time on the demographic make-up of the trans-boundary Kuchis and their livestock, including their migratory patterns and implications of the conflict for their livelihood and zoonoses. Methodology included transect walk across areas occupied by Kuchi during winter, group discussions and semi-structured interviews in Naran an Zhob. Our study shows that toward the North some 350 Kuchi families have shifted their mobility during summer from the central Afghan highlands to the Himalayan uplands of Naran in Northern Pakistan. Toward the south near Zhob, many Kuchi's still cross into Pakistan with their livestock herds. The traditional mobility across the border is hindered and access to summer highlands curtailed due to competing claims of the settled communities. The study reflects on the livestock dynamics, livestock disease pattern and access to services and recommends measures to improve access to services.
International Partnerships for Building a One-Healthier Community in Baja California Sur, Mexico

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The Colorado State University Todos Santos Center (CSU-TS) in Baja California Sur (BCS), Mexico is a community hub for education and research where CSU and BCS communities benefit from cultural exchange and co-created discovery. CSU-TS and the One Health Institute (OHI) at CSU share the common vision of framing challenges about complex systems into aspirational futures by engaging directly with communities. These relationships have catalyzed a One Health movement in BCS, Mexico. We facilitated a workshop to build a co-creative dialogue and reflection among members from diverse nationalities, backgrounds, and affiliations within academia, public health, and environmental agencies to collectively identify regional challenges and opportunities relevant to One Health in BCS. Water-related issues, nutritional health, and conservation of natural resources were identified as major, priority challenges to address. Social awareness and governance were also recognized as essential components to consider. The findings derived from this co-creative process revealed strong synergies that will enable future collaborative actions among the regional and international stakeholders in BCS so that we may engage in sustained and focused research, education, and outreach projects. Together we aim to improve the health and well-being of humans, animals, and their environments in BCS, Mexico.
The National Institute of Tropical Medicine of Argentina: a One Health EcoHealth project

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The National Institute of Tropical Medicine of Argentina- INMeT- was created in 2011, it belongs to the Ministry of Health, and half of the staff are researchers from the Ministry of Science and Technology. The location of INMeT is in the border with Brazil and Paraguay, in an area of mixed landscapes of preserved forest (Iguazu Waterfall National Park), rural and urban environments. Rangers, farmers, aboriginal people, urban services-related people, researchers, tourists (> 1200000/year), domestic (pets and livestock), synanthropic and wild animals are living or circulating in this patched subtropical environments, ecotones and international borders. The missions and objectives of INMeT were developed by a collective construction with a multidisciplinary group of experts, followed with an extended Internet-consultation. Therefore, the theoretical frame of the INMeT was defined to be the One Health - EcoHealth multidisciplinary eco-epidemiological approach. The research lines that are currently in progress, are related to zoonotic vector-borne diseases as leishmaniases, yellow fever, dengue virus, tick-related diseases; zoonotic parasites and virus in humans, wild and domestic animals; venoms and envenomation by snakes, caterpillars, accident management and other risks in nature reserves, and social cartography and perception of risk in Mbya Guaran and peasant communities.
Managing the health risks of a changing climate

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Climate change is one of several global environmental changes that will have far-reaching consequences for animal, plant, and human health across the 21st century. At the same time, development choices will alter underlying vulnerability to these risks, thereby affecting the magnitude and pattern of impacts. The current and projected human health risks of climate change are diverse and wide-ranging, potentially altering the burden of any health outcome sensitive to weather or climate. Climate variability and change can affect morbidity and mortality from extreme weather and climate events, and from changes in air quality arising from changing concentrations of ozone, particulate matter, or aeroallergens. Altering weather patterns and sea level rise also may facilitate changes in the geographic range, seasonality, and incidence of selected infectious diseases in some regions, such as malaria moving into highland areas in parts of sub-Saharan Africa. Changes in water availability and agricultural productivity could affect undernutrition, particularly in parts of Asia and Africa. These risks are not independent, but will interact in complex ways with risks in other sectors. Policies and programs need to explicitly take climate change into account to facilitate sustainable and resilient societies that effectively prepare for, manage, and recover from climate-related hazards.
Expanding Constituencies for One Health

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In remarkable ways, the embracing of the One Health concept over the last decade has resulted in a dramatic shift in the discussions, practices, polices and partnerships that link the health of people, animals and our shared environments. In part, One Health has benefited from many innovative, collaborative efforts well underway and years in the making. Institutions large and small have found ways to utilize the theme of One Health, though the uptake has been strongest by the animal health and zoonotic disease community. While in itself this evolution has had positive effects, a question remains as to the value of expanding stakeholder engagement in One Health and where opportunities may lie. The principles of One Health are aligned with goals of developing global initiatives with different missions or visions but provide opportunities for high-level political support. These include the Global Health Security Agenda, the Sustainable Development Goals, Future Earth, the Convention on Biodiversity's partnership with the World Health Organization, and World Bank Group's development initiatives. Thematically, these initiatives recognize that health underpins security and development, and in turn, are dependent on broader approaches to challenges such as climate change, improving resource and land-use decision making, food security, and biodiversity loss.
Water, Sanitation and Hygiene for health and development: A focus on joint action to tackle Neglected Tropical Diseases (NTDs)

Alison Macintyre
Yael Velleman

Water, sanitation and hygiene (WASH) interventions have broad public health benefits that reduce multiple diseases and contribute to multiple health outcomes such as maternal and newborn health and nutrition. WASH also contributes to non-disease outcomes such as school attendance, income and overall wellbeing and empowerment. WASH is critical in the prevention and care for all of the neglected tropical diseases (NTDs). Linking WASH and NTDs therefore has potential to impact on multiple NTDs through a single area of intervention. Further, linking WASH and NTD interventions as part of a One Health approach that takes into consideration environmental, economic and social factors has potential to impact on multiple NTDs and can help secure sustainable and equitable progress towards universal access to WASH. This presentation will present the overall links between WASH and health, and provide particular focus on the WHO Global Strategy: 'Water, Sanitation and Hygiene for accelerating and sustaining progress on Neglected Tropical Diseases'. The Strategy focuses on cross-cutting actions that benefit disease control and care efforts, and strengthen health systems. Implementation of the strategy and the accompanying action plan can help ensure that the health and development agenda leaves no one behind.
The influence of nighttime light pollution on the landscape epidemiology of Hendra virus spillover in eastern Australia

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Hendra virus is an emerging pathogen of concern in Australia given its history of zoonotic transmission from the natural reservoir hosts, pteripid bats, to domestic animals and humans. Moreover, the landscape epidemiology and infection ecology of Hendra virus spillover is poorly understood. Specific human pressures, such as artificial light pollution and forest fragmentation, may play important roles in modulating spillover risk by influencing bat ecology and increasing the potential contact between bats and domestic animals and humans. This study explored the association between Hendra virus spillover and nighttime artificial light, vegetation cover, and the ecologic niche of Pteropus bats using an inhomogeneous Poisson model to identify the spatial dependence of this zoonosis. The spatial model identified nighttime radiance from artificial light (Relative Risk (RR) = 1.12; 95% C.I. 1.09 - 1.16), vegetation cover (RR = 1.08; 95% C.I. 1.04 - 1.12), and predicted Pteropus bat occurrence (RR = 6.54; 95% C.I. 2.09 - 20.48) as significant predictors of Hendra virus spillover. These findings further contribute to the landscape epidemiology of Hendra virus spillover and suggest that nighttime light pollution may be associated with increased risk. However, more detailed field studies will be required to validate these results.
Specific programs targeting human cysticercosis caused by *Taenia solium* and echinococcosis caused by *Echinococcus granulosus* have, in most cases, had limited outcomes or effects that were not sustained. Changes in endemic areas such as economic advancement, improvements in sanitation and education could be expected to reduce the prevalence of these diseases, however in many endemic areas these seem unlikely except in the distant future. Characteristics of the transmission cycles for cysticercosis and echinococcosis limit the opportunities that are available for combining interventions for these diseases together with other infections, including other NTDs. Vaccination of livestock animals to prevent transmission of *T. solium* and *E. granulosus* through their natural animal intermediate hosts is now a viable option for controlling both cysticercosis and cystic echinococcosis. Field trials of the TSOL18 and EG95 vaccines have demonstrated their effectiveness against field-derived infections in pigs and sheep, respectively. Critical to the further validation of these as control measures will be demonstration of the practicality and sustainability of their use in poor resource settings.
Expanding disease control in South Africa through the rabies One Health Model

Kevin Le Roux

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An international collaborative project to demonstrate the feasibility of eliminating human rabies in KwaZulu-Natal South Africa, has inadvertently left behind it a model for One Health in Developing countries. Historically rabies is probably the "original one health story", and the close multi-sectoral collaboration needed for control, combined with the need to understand the complex symbiotic relationship between humans and animals, has allowed for the formation of a One Health network in terms of research, advocacy and control, that can be generically applied to many zoonotic diseases.

This foundation is now being applied to Brucellosis and has effortlessly created a platform, for research and control that has been absent in South Africa for many years. The tendency to decentralize major disease control to local level, often results in reduced political backing, and collective disease control efforts. In addition fragmentation of effort can erode the advantages of specialisation, and champion driven programs. This One Health model brings individual diseases under specialist management, and ensures purposeful attainment of goals, while allowing existing networks to overlap, expand and complement each other.
Is a national One Health disease surveillance system possible?

Peng Bi

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The risk of emerging and re-emerging disease outbreaks in Australia and the Asia Pacific region will be amplified in coming decades due to drivers such as demographic changes, increased travel, globalisation of food production, intensive animal husbandry, increased antibiotic resistance and a changing climate. With the likelihood that serious epidemics of emerging zoonotic diseases could arise in coming years, a One Health approach is increasingly being considered the most appropriate way to manage these threats. Australian communicable disease notification systems have to date focused primarily on human diseases. This presentation will discuss the benefits and barriers to integrated veterinary and public health surveillance linking animal and human data. Whilst this has been successful in managing zoonoses to some extent at state level, a national system is yet to be realised. Issues such as information sharing, security issues, the challenges of data linkage; and the potential need for a national coordination authority will be discussed.
Beyond and Between Ecohealth and One health

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Human's relationship with Earth is broken, dismembered by the political economic view that exploitation of natural systems is the only way to relate to our planet. The consequences for human and non-human health are adverse and will worsen. To contribute to the global effort to turn this around, the public health movement needs to promote a compelling narrative that promotes a vision of an alternative relationship to Earth. Drawing on Indigenous and human ecology perspectives, the Planetary Health concept puts human's relationship with other species and the ecosystem central to the story of humanity's wellbeing. This enables several outcomes: a strong, coherent narrative for communicating the importance of human respect for Nature to multiple audiences; a vision for a healthy relationship between humans and our planet; a set of principles and practices to guide planning and implementing action for achieving that vision; and a transdisciplinary framework to connect research, policy and projects within the disciplines of Ecohealth, One Health, human ecology, political ecology and other elements of public health. It includes and complements, not replace, these disciplines. Using the Planetary Health concept will help the public health movement to better promote action to ensure human and Earth System wellbeing.
The development of a One Health curriculum for universities in Vietnam

Phuc Pham-Duc
Thao Nguyen-Thi-Bich, Trang Le-Thi-Huyen, Stanley Gordon Fenwick

A One Health (OH) curriculum for students from the health-related disciplines is one of the most important initiatives for building a future generation of practitioners with the knowledge, skills and attitudes to respond to outbreaks of emerging and re-emerging diseases. To achieve this, in Vietnam OH has been incorporated into the curriculum in many different disciplines. One issue however is that the training programs have concentrated on technical subjects and have not addressed the core competencies required for OH professionals. In 2016, a series of workshops were implemented to review the OH curricula of the 17 member universities of the Vietnam One Health University Network (VOHUN), to identify opportunities for inclusion of material related to the seven OH core competencies and eight OH technical competencies proposed by the network in 2012. Utilizing this competency-based framework, VOHUN subsequently created a portfolio of educational OH modules to more effectively teach these competencies to undergraduate and postgraduate students and the modules were made freely available to all institutions. This presentation will focus on the key outcomes and achievements of VOHUN in transforming the curricula of veterinary, medical, nursing, environmental and public health institutions across Vietnam using the competency framework and review process.
Emerging Viruses Related Etiology in Diseases Of Central Nervous System Prevalent In Uttar Pradesh, India

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Although, the diligent execution of immunization program has resulted in reduction of the most common viral cause of central nervous system (CNS) related illnesses such as poliomyelitis, and encephalitis in the state of Uttar Pradesh (UP), but still non-polio acute flaccid paralysis (NP-AFP) and non-Japanese encephalitis cases increasingly detected in the region, are of serious concern. Thus, we employed sequence independent single primer amplification method on stool and cerebrospinal fluid (CSF) specimens from NP-AFP and encephalitis patients, tested negative for the known viral etiology. Randomly amplified PCR fragments generated were cloned, sequenced and analyzed for sequence similarity to identify the virus type. Viral RNA fragments related to human cosaviruses (HCoSV’s), Scaffold viruses (SAFV), human parechovirus (HPEV), Enterovirus (EV) and human parvovirus (HPV) were identified in 3/40 stools of NP-AFP and 4/70 CSF specimens. Frequency of infections was analyzed by real time PCR, HCoSV (25%), PEV (8.3%) and SAFV (4.6%) detected from 107 stools of NP-AFP patients, while, one each HCoSV, HPEV, EV and HPV were detected in 4 CSF samples. A few isolates were genotyped as HCoSV-D4, A11; PEV-1; EV-83 and HPV-4. These findings have implication for understanding the role of these emerging viruses in CNS diseases of unknown etiology.
Stopping anthrax outbreaks in Indonesia – policy is not enough

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Severe anthrax outbreaks can occur after unvaccinated animals graze land formerly contaminated with anthrax spores, and human infections can follow when uneducated people handle or eat meat from sick or dead animals. Indonesia has had a long-standing policy of annually vaccinating all ruminants in anthrax-affected areas. Nevertheless in the Eastern Islands, outbreaks of anthrax, with livestock and often human deaths, occurred yearly, especially on the islands of Sumbawa, Flores and Sumba. The policy was poorly implemented due to many practical, funding and logistical problems. A project that increased the knowledge levels of junior and senior officials, mapped in detail the sites of historical outbreaks, and determined local risk factors for incidence, has now reduced anthrax outbreaks in the target area to negligible levels. Junior veterinary staff carried out local applied technical and socio-economic research and their results and historical data were captured in a book that was widely distributed in the target area. The impacts of multi-disciplinary capacity building to enable cost-effective, risk-based, location-specific and sustainable anthrax control programs will be discussed.
Antimicrobial Resistance – A Food Safety Issue of Global Concern

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The concept of producing foods and foodstuffs that are wholesome and safe to consume was presented decades ago. As the scientific community addressed these issues in earnest, it became evident that bacterial evolution introduced unexpected challenges. Mitigation of known zoonotic and other food related pathogens continues to remain a challenge. Resistance among bacterial populations to many different compounds, including antimicrobials, has been reported in bacteria isolated from closed environments indicating that resistance genes are part of ancient bacterial architecture. However, the routine introduction of antimicrobials in both human and veterinary medicine in the early 1900's confounded and exacerbated the development of resistance to new antimicrobials. In less than seven decades, antimicrobial resistance has emerged to drugs of last resort. Attribution of emerging resistance both locally and globally is ill-defined and complex. Few other topics elicit the same level of passionate debate as those regarding 'appropriate, prudent, judicious' antimicrobial use in food animal production. A doubling of the food supply needs to occur by 2050. This presentation addresses the impact of known antimicrobial use practices on food production including an assessment of the global environmental impact. The need to develop new approaches to controlling antimicrobial resistance is real and immediate.
Human Health Consequences of Artisanal and Small-scale Gold mining in Ghana

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This is one of three synthesis documents emanating from an Integrated Assessment (IA) that aims to increase understanding of artisanal and small-scale gold mining (ASGM) in Ghana. Given the complexities surrounding ASGM, an IA framework was utilized to analyze economic, social, health, and environmental data, and co-develop evidence-based responses with pertinent stakeholders. This current analysis focuses on the health of ASGM miners and community members, and synthesizes extant data from the literature as well as co-authors’ recent findings regarding the causes, status, trends, and consequences of ASGM in Ghana. The results provide evidence from across multiple Ghanaian ASGM sites that document relatively high exposures to mercury and other heavy metals, occupational injuries and noise exposure. The work also reviews limited data on psychosocial health, nutrition, cardiovascular and respiratory health, sexual health, and water and sanitation. Taken together, the findings provide a thorough overview of human health issues in Ghanaian ASGM communities. Though more research is needed to further elucidate the relationships between ASGM and health outcomes, the existing research on plausible health consequences of ASGM should guide policies and actions to better address the unique challenges of ASGM in Ghana and potentially elsewhere.
Wildlife diseases and public health security in Albania

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Albania is situated in the Western Balkans and is soon to be part of the EU. As surveillance did not exist 25 years ago, Albania was classified as a European hot spot for the presence of wildlife diseases. Albania is aligned to countries that have a wide range of zoonotic diseases originating from wildlife, such as rabies in wild carnivores, tularemia in wild rabbits, avian influenza (H5N1) in wild birds, Hantaviruses in wild rodents and echinococcosis in fox. Surveillance and monitoring of wildlife diseases is not only a prerequisite for public veterinary health but also an obligation of European institutions for the integration of Albania into the EU. A sector for monitoring and implementing a system for the surveillance of wildlife diseases has been established and operates in Albania since 2004. This consists of lecturers and scientific researchers from the Faculty of Veterinarian Medicine at the Agricultural University, researchers from the Food Safety and Veterinary Institute, experts from Albania Wildlife Disease Association.
Addressing the Emergence and Dispersion of Leishmaniasis in the Border of Argentina, Brazil and Paraguay and Uruguay

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Cutaneous leishmaniasis (CL) and visceral leishmaniasis (VL) are vector-borne zoonotic parasitic diseases, with more than 2 000 000 new cases/year worldwide. The current control measures have relatively low effectiveness or there are culturally or ecologically unsound. This project look for the social and biological drivers of risk on the Argentina, Brazil and Paraguay border, and Uruguay (IDRC- PAHO). The locations and domestic units visited were around 500 to perform sampling of vectors, dogs, rodent activity, ecological surveys and social interviews. The main outcomes were: 1) The characterization of VL spread and CL risk, with parasite genotypification from humans, vectors, and animal reservoirs (dogs). 2) The spatial segregation of the vectors of each leishmaniasis, associated with variables that could allow the modelling of its distribution in time and space. 3) The evidence-based delimitation of an area for environmental interventions of 400 x 400 m. 4) The social modulators of risk, mainly of VL and canine VL, due to the human-dog inter-specific relationship and consequent ways of management. Currently we are integrating the multidisciplinary results an to promote an intersectoral discussion in order to develop alternative and feasible strategies of surveillance, prevention and control of leishmaniases in a healthy environment.
An overview of ongoing PREDICT-2 activities in Lao PDR: surveillance on emerging infectious diseases in wildlife and human behavior study

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The PREDICT program has been actively working in Lao PDR since 2010, and in the past has focused mainly on bush meat sampling from markets. With PREDICT-2, activities in Lao PDR have been expanded to include live animal sampling, of both wildlife and livestock, and human biological and behavioral surveillance work. The remote village of Na Pa Kieb in southern Lao PDR has been selected as the first surveillance site. Residents of this village live in close contact with livestock, including poultry, swine, and ungulates, and regularly cross the border into neighboring Cambodia to hunt wild animals. In addition to this village, PREDICT-2 is working closely with a district-level hospital, to which village residents present when they are ill, to perform syndromic surveillance of patients with symptoms of unknown origin. With this paradigm to be replicated in several other sites across Lao PDR, the PREDICT program aims to shed new light on diseases that are shared between animals and humans, and which behaviors might best be targeted to reduce the risk of transmission.
Bat viral diversity linked to anthropogenic drivers

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In the Atlantic Forest of Brazil, we investigated the effects of anthropogenic drivers on the prevalence of 9 viral families: Astroviridae, Coronavirusidae, Adenoviridae, Herpesviridae, Paramyxoviridae, Alphaviridae, Arenaviridae, Filoviridae, Flaviviridae and Hantavirus and Henipavirus in bat communities. From April to November of 2013, we sampled bats across 8 sites in forested (n=163) and non-forested (n=172) areas in Pontal do Paranapanema region, São Paulo state. Blood, saliva and rectal samples were collected from 335 bats and analyzed at University of São Paulo. PCR and NESTED reaction was performed for each viral family following protocol. In non-forested sites (n=172 bats, 10 species) sixteen viruses from 5 families and one genera (Coronaviridae, Paramyxoviridae, Herpesviridae, Adenoviridae, Astroviridae and Hantavirus) were detected in 9.3% of sampled bats. In forested sites (n=163 bats, 11 species), we found six viruses from one family (Coronaviridae) in 3.68% of sampled bats. Chi-square test showed that non-forested sites had significantly greater viral prevalence than forested sites ($X^2 = 4.31$, df=2, p<0.05). This strongly suggests that human disturbances could increase risk of viral transmission given contact with bats. Emphasis on avoidance of resettling human communities directly adjacent to forested areas could thus mitigate risks of viral emergence.
A series of ecological, economic and demographic changes are impacting on the distribution and endemicity of zoonotic diseases in resource-poor settings. The first is changes in climate, including in ambient temperature and precipitation, with impact on animal habitat, distribution and density. This has resulted in changes to host-feeding choices, human-vector contact rates and parasite transmission. These changes combine with changed vector habitat and behaviour in response to the use of insecticides, and changes in the density and residence patterns of humans and domesticated animals. In elaborating this, I consider three zoonotic diseases of poverty. In the case of Chagas disease, in South America, I illustrate how triatomin bugs vary their feeding patterns and so the transmission of T. cruzi depending on the location of domesticated animals. While improved human living conditions will reduce the potential for the bugs to infest human dwellings, this will also reduce the probability of human/animal co-residence, so reducing alternative blood meals for the bugs. I then consider African trypanosomiasis (sleeping sickness), which is recurring as human populations lose prior immunity, with a risk too of concentration in domesticated animal hosts as wild host populations decline. My third example, zoonotic schistosomiasis, highlights the complexities of ecosystems where humans and animals coexist, both in Asia and in Africa. In these examples, there is clear evidence of links between shifts in the density and regional settlement of human and animal populations, maximising opportunities for the vector and parasite. Although the direct relationship between biodiversity and disease transmission is uncertain, human settlement and behaviour clearly influence parallel changes in biodiversity and the epidemiology of zoonotic disease.
Herbs as Alternatives to Antibiotic Growth Promoters in Broilers Chicken

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The effect of supplementation of whole bulb garlic, whole leaf aloe vera (@ 1.0, 1.5 and 1.5%), cinnamon and black pepper (@ 0.5, 1.0 and 1.5%) powder was studied as an alternative to antibiotic growth promoters in broilers chicken reared on starter and finisher phase feeding pattern for five weeks. In vitro studies on theses herbs revealed that black pepper and cinnamon possess antibacterial properties against E.Coli and Salmonella spp. Supplementation of garlic at 1.5% level improved (P<0.05) productive, economic and sensory parameters of meat along with duodenal morphology. Change in biochemical parameters was also observed. Inclusion of black pepper and cinnamon at 0.5% level resulted significant (P<0.05) better productive performance, improved sensory attributes of meat, duodenum morphology and economic parameters of chicks up to five weeks age. Black pepper and Cinnamon powder supplementation significantly (P<0.05) influenced nutrient utilization and biochemical parameters. Supplementation of aloe vera powder at 1.0% level significantly (P<0.05) improved the feed conversion ratio, sensory attributes of meat, duodenal morphology of chicks. It can be concluded that theses herbs where available can be used in broiler feed as an alternative to controversial antibiotic growth promoters as well as for producing healthy chicken for the consumers.
AMRRIC's work to improve remote Indigenous community health through veterinary and education programs

Bonny Cumming
Simon Costello

AMRRIC - Animal Management in Rural and Remote Indigenous Communities

AMRRIC - Animal Management in Rural and Remote Indigenous Communities - is a national charity that coordinates veterinary and education programs in Australian Aboriginal and Torres Strait Islander communities. Our work is delivered in some of the most remote regions of Australia, where geographic and socioeconomic barriers preclude permanent veterinary services. In these communities, un-controlled dog and cat populations result in animal health and welfare concerns, biodiversity impacts and impaired human health and safety. By collaborating with remote Aboriginal and Torres Strait Islander communities to improve the health and management of their pets, AMRRIC’s work is improving the health and wellbeing of communities, from the individual to the whole. Our work recognises the inextricable links between human, animal and environmental health and aims to deliver integrated veterinary and education programs that cater to the unique socioeconomic and cultural context of remote communities. The immediate objectives of our programs are stable and healthy companion animal populations, however in the long term, our One Health model builds capacity and sustainability so that communities can confidently and effectively manage their own companion animal populations. Through the sharing of skills and knowledge, AMRRIC's OneHealth approach is helping to create happier, safer and healthier Aboriginal and Torres Strait Islander communities.
'Camp dogs': their role in the culture and health of Australian Indigenous communities

Bonny Cumming
Simon Costello

AMRRIC - Animal Management in Rural and Remote Indigenous Communities

Geographic and socioeconomic factors that contribute to the disproportionate life expectancy between Aboriginal and Torres Strait Islanders and non-Indigenous Australians are well documented. Disparity is particularly prominent in remote communities, where access to services is extremely limited. Despite this, Aboriginal and Torres Strait Islander peoples living in remote communities experience an intimate connection to culture and country that many consider essential to their own wellbeing. In remote Aboriginal and Torres Strait Islander communities the social and cultural determinants that underpin the health and wellbeing of both humans and their companion animals must be respected when delivering health services, including veterinary and education programs. This presentation explores dogs as integral to the fabric of Aboriginal and Torres Strait community and culture and the significance of collaborating with communities to develop culturally appropriate programs that meet the needs of the community. Additionally AMRRIC - Animal Management in Rural and Remote Indigenous Communities - shares the key attributes for empowering Aboriginal and Torres Strait Islander communities and creating happier, safer and healthier communities.
Malaria continues to be a major public health problem in Sub Saharan Africa despite efforts that have been made to prevent and control the disease. The knowledge on prediction of occurrence of the disease that communities acquired over the years has not been seriously considered in control programmes. This paper reports on studies that aimed to integrate indigenous knowledge systems (IKS) on malaria into the malaria control programme in Gwanda District, Zimbabwe. Data was collected using participatory rural appraisals, key informant interviews and workshops in 3 wards (11, 15 and 18) with the highest malaria incidence in Gwanda district. Disease livelihoods calendars produced by the community showed their knowledge on the relationship between malaria and rainfall. Indigenous environmental indicators for the occurrence of malaria were classified as insects, plant phenology, animals, weather and cosmological indicators. Plant phenology was mentioned as the most important indicator. A community based malaria early warning system model was developed using the identified IKS indicators. In the model data on indicators was collected at village level by IKS experts, analysed at ward level by IKS experts and health workers and relayed to the District Health Team.
A One Health Database for Tracking Antibiotic Resistance

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Antibiotic resistance in bacteria poses a global health threat to humans, animals, and environments, and is therefore a classic One Health challenge. There is a need for improved stewardship of antibiotics in human medicine, animal medicine, as well as agriculture and aquaculture. Despite this, our traditional methods of tracking the emergence of antibiotic resistant strains of bacteria have been fragmented between human and animal sectors, and generally non-existent in the environmental realm. Efforts such as the US National Antibiotic Resistance Monitoring System (NARMS) track certain pathogens in humans and animals, but tend to include only a small number of pathogens, and not routinely produce data reports on a local level. We report on the efforts of a Statewide One Health steering committee to assemble an ongoing database of antibiotic resistance in humans, animals and the environment in order to detect emerging trends and monitor the impact of antibiotic stewardship activities. The database currently includes data from state human and animal health labs, the NARMS system, private veterinary clinics and laboratories, and human hospitals. Data from our pilot efforts to assemble and analyze this database, will be presented, with implications for One Health antibiotic resistance tracking efforts in other regions.
Developing a One Health Institute in academia

Claire Tucker
Bruno Sobral

1One Health Institute at Colorado State University

Traditional university settings, while in support of many of the disciplinary components and objectives of the global One Health movement, are not always well-equipped to support the that movement. The One Health Institute at Colorado State University (CSU) was founded with the goal to make innovation in health real and sustainable though the institutionalization of community-engaged transdisciplinary action research in a networked academic setting. As a centralized priority within the CSU system, the One Health Institute has leveraged the strengths of academia, while fostering a collaborative community across the university and into the communities where CSU is an anchor institution and beyond.

This presentation will highlight unique aspects of the organization and vision of the One Health Institute and how they have interfaced with financial and operational structures at a land-grant university within the United States. A central element of the Institute are the three Principles around which the Institute is shaped: Communities Creating Health, Systems Thinking, and Co-Creation and Inclusive Design Thinking. These have been intentionally applied to programmatic and research design, including the funding and review of seven initial catalyst research projects. We will share our indicators of transdisciplinary team success, and highlight key moments of pivot and remaining challenges within the Institute.

With data and insight generated from our inaugural year, the One Health Institute provides valuable information on how to develop One Health within an academic setting, and how to set reasonable expectations for "Return on Investment" on transdisciplinary research.
Zoonotic diseases transmitted by arthropods and rodents can be a serious public health issue in China. We sought experts' opinions on China's capacity to meet the environmental and social challenges of emerging and re-emerging zoonotic diseases in a changing climate. Face-to-face interviews were conducted with 30 infectious diseases experts in four cities in China. Two vector-borne diseases (dengue fever and malaria) and a rodent-borne disease (haemorrhagic fever with renal syndrome) were discussed. A thematic analysis identified strengths and shortcomings of the current system. Participants expressed optimism in China's future capacity to manage these diseases. However, health literacy in the population is lacking, research capacity could be strengthened, and improved training and conditions for staff involved in surveillance and response would aid capacity building. Early warnings of disease outbreaks would be useful, and prompt and coordinated responses are required when outbreaks occur. It was also considered important that health professionals remain skilled in the identification of diseases such as malaria for which incidence is declining in China, so that re-emerging or emerging disease trends can be rapidly identified and interventions activated. The study's recommendations may be useful to policymakers in China and the Asia Pacific region.
Improving household dietary quality and reducing food loss through village poultry in Timor Leste

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Food loss and waste in a developing country like Timor Leste has been identified as a critical factor contributing to human undernutrition. Our project enhances natural scavenging systems by improved poultry production, with improved management, vaccination against Newcastle disease (ND) and logistical support. We are working to implement the sustainable use of heat tolerant ND vaccine, administered as eye drops triennially by trained paraveterinarians. We are simultaneously improving cold chain management, vaccine potency verification, biosecurity practices applicable in village poultry situations and locally-made shelter to protect birds from predation. Increased poultry production with these improved systems leads to improved scavenging systems - more hens equals more effective searching for scraps, insects and other invertebrates as they fend for themselves with minimal carbohydrate input provided by their owners. In return more hens are available to produce eggs for sale or chickens for consumption. Each of these activities results in better availability of balanced protein and bioavailable micronutrients for growing and lactating humans. Once households observe that their flock dynamics are no longer subject to dramatic decreases, the option of consuming eggs becomes an option rather than prioritising them for hatching to obtain replacement birds.

WENDE MAULAGA

Elpidius Rukambile, Robyn Alders, Julia de Bruyn, Ezekiel Muyengi, Elizabeth Lyimo, Grace Moshi, Brigitte Bagnol, Furaha Mramba, Robyn McConchie

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Despite increases in agricultural production over the past two decades, undernutrition rates in children have not diminished significantly in many developing countries. In Tanzania stunting in children under five, a major determinant of individual development, was estimated to be 34% in 2014. There has been an ongoing disconnect between agricultural policies and contemporary nutritional challenges, the persistent problem of micronutrient undernutrition and child stunting. Furthermore, the emerging challenges of other nutritional disorders coupled with food imbalances at household level and adverse environmental disturbances contribute to widening the gap in implementing proposed interventions. Our research is exploring how a multidisciplinary and multisectoral working team covering human and livestock health, food and nutrition security and related policy-making agencies, can create a cohesive team focused on delivering long term solutions. The composition of the Tanzanian Country Coordinating
Committee (CCC) of the 'Strengthening food and nutrition security through family poultry and crop production in Tanzania and Zambia' has made acknowledged contributions to nutrition-sensitive policy interventions at District and National levels. Linkages between the CCC and participating households have enabled community members to raise issues across a broad range of nutrition-sensitive interventions.
Evaluating a decade of Australia's investments in pandemics and emerging infectious disease preparedness and response in Asia Pacific: are health systems stronger?

Irene Wettenhall

Gill Schierhout, Adam Craig, Laurence Gleeson

1Department of Foreign Affairs and Trade
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Title:
Evaluating a decade of Australia's investments in pandemics and emerging infectious disease preparedness and response in Asia Pacific: are human and animal health systems stronger?

Abstract:
There is more to be learned about how aid programs focused on pandemics and emerging infectious diseases (PEID) influence country health systems, both animal and human and the interface between them. This paper presents emergent findings from an evaluation conducted by the Department of Foreign Affairs and Trade (DFAT) of Australia's efforts to reduce the risk of PEIDs across Asia and the Pacific between 2006 and 2015. Led by DFAT's Office of Development Effectiveness, the evaluation covered 30 initiatives, worth over $190 million and included data collected from fieldwork in Indonesia, Cambodia, Thailand, Fiji, Solomon Islands and Australia. Drawing on current understandings of health systems strengthening and on the WHO's International Health Regulations and OIE Performance of Veterinary Services, we assess the impact of these investments on country health systems. By exploring implementation characteristics and outcomes achieved in different contexts, we identify 'what works for whom and in what circumstances' in building stronger health systems, and linkages between animal and human health systems. Implications of the findings for future investments in this area will be discussed.

Proposed Theme (selected from choice on conference website): Responding to Emerging Diseases and Invasive Species

Sub theme: Disease Control and Eradication Programmes

Key words: One health; international development; evaluation; multi-country; health systems;

Presentation type: Oral presentation preferred
Creating Sustainable Futures for Animals, People, and Prairie – A One Health Approach to Bison Reintroduction

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There is widespread interest in restoring the iconic plains bison across the American West, but only if bison pose minimal risk to livestock and human communities. Our research addressed this challenge by advancing the science of bison genetics and disease management, and evaluating bison effects on grassland ecology and human well-being. Specifically, our objectives were to: 1) establish a genetically diverse, brucellosis-free herd of bison with Yellowstone genetics; 2) understand the ecological consequences for grassland birds and mammals; 3) document effects on visitors and agricultural stakeholders. We used state-of-the-art assisted reproductive technology, bird and plant surveys, wildlife cameras, and interviews with visitors and ranchers to achieve these objectives. Our efforts and those of our city, county and federal agency partners have resulted in an established herd of 15 brucellosis free bison of Yellowstone genetics in Colorado, U.S.A. Less than a year after reintroduction, we find no change in bird communities, but altered vegetation structure and habitat use by mammals. Visitor surveys are underway; we predict greater visitor activity, and a shift in demographics and perceptions post-reintroduction. Our collaborative research epitomizes One Health by building on social, ecological and animal science to facilitate the return of bison to northern Colorado.
Hospital sentinel surveillance for MERS-CoV, Zika virus, and yet-to-be-detected pathogens through a One-Health lens

Supaporn Wacharapluesadee¹
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Developing countries are at risk for outbreaks of emerging infectious diseases due to limited preparedness given economic resources and diagnostic capacity. Targeting certain hospitals for sentinel surveillance allows for earlier detection of diseases. In Thailand, detection of novel and known viruses has been implemented in Chulalongkorn Hospital laboratory (CHL), the country's reference PREDICT laboratory. The experienced well-qualified staffs at CHL have been trained to handle and characterize novel viruses including coronaviruses, flaviviruses and filoviruses in both wildlife and human samples using PREDICT protocol. Recently, two imported MERS cases in Thailand were first diagnosed and confirmed here, within 24 hours. No secondary infection followed these cases, and more than 100 close-contacts from each case were tested. In 2016, Zika virus was detected in 9 provinces through active surveillance carried out by the Thai government, tested at CHL. Human transmission was controlled within 1-2 months in all provinces, as a result of early laboratory detection and rapid reporting. The high-quality diagnostic data, as well as the One-Health collaborative approach between hospitals, CHL, Ministry of Public Health, Department of National Parks, and Department of Livestock Development has been key for the success of controlling disease transmission in the country.
Development of Pseudovirus-Based Assay to Investigate the Mechanism for Interspecies Transmission of Bat Coronavirus

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Bats have been proven to be the natural host of severe acute respiratory syndrome coronavirus (SARS-CoV) so infection studies of bat CoV on cells of different animal species are required to understand the zoonotic risk of bat CoVs. However, bat CoVs are difficult to isolate and grow in cell culture system. This study aimed to produce bat CoV pseudovirus by using lentivirus-based pseudovirus system. The full length of S gene amplified from Scotophilus bat CoV 512 strain isolated in Taiwan (CYCU-S1/2013) has been cloned as pEGFP-N3-Sco-S. Pseudovirus expressing S protein of Scotophilus bat CoV 512 and green fluorescent protein (GFP) were produce after co-transfection of pEGFP-N3-Sco-S, packaging plasmid and transfer plasmid containing red fluorescent protein (RFP) gene. The production of Scotophilus bat CoV pseudovirus was confirmed by virus infection test on 293T cells, immunofluorescent antibody (IFA) assay against GFP and p24 protein of lentivirus, and electron microscopy. The Scotophilus bat CoV pseudovirus-infected 293T cells expressed red fluorescence and were tested positive for p24 capsid protein of lentivirus. The results showed that lentivirus-based pseudovirus system can produce Scotophilus bat CoV pseudovirus for further infection studies on cells of different animal species to understand the cross-species transmission of bat CoV.
Since discovery of Australian bat lyssavirus (ABLV) in 1996 and human deaths now totalling three, Australia has aggressively managed potential lyssavirus exposures. This has led to significantly greater use of Human Rabies Immunoglobulin (HRIG) in post exposure treatment as defined by current guidelines, and usage has not been curtailed despite a well-documented chronic global shortage of HRIG and scarcity of the product in countries with endemic canine rabies and high rates of human deaths.

Disproportionate HRIG use by risk-averse wealthy countries with low rates of human lyssavirus infection is an issue of global distributive justice. There has been no appetite in Australia to re-assess the tolerance of risk to potential lyssavirus exposures. With Australia's worsening obesity epidemic and increased travel to rabies-endemic areas, the volume of HRIG use will only increase.

This presentation argues that current guidelines for management of potential lyssavirus exposures both in Australia and other industrialised nations raise ethical dilemmas that must be addressed. This presentation argues for a unified approach to rigorous risk stratification of potential exposures, according to factors such as mode of exposure (bite vs. scratch), species of animal (non-human primates and rodents), geographic location of exposure and site of injury.
Global Health True Leaders: Internalizing The Core Life Values of True Leader in The Curriculum

Wiku Adisasmito1,2
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In the era of globalization with the borderless world, people and animal mobilization enables the countless threat of disease pathogen to spread across the world. As a threat faced by multisector, leading collaboration across sector is challenging. A true leader is needed to lead multisector collaboration to tackle disease threats. It motivated Universitas Indonesia and the Indonesia One Health University Network to start a program called Global Health True Leaders (GHTL) to nurture prospective one health workforce with core values of true leader in supporting multisector collaboration. The program is a combination of in-class training, field work, and leadership training which developed and integrated 10 core values on all activities. INDOHUN formed the values through leadership value mapping from national and international references. The values then summarized into 10 core values consist of 5 true leader characters (smart, responsible, brave, integrity, wise), and 5 true leader abilities (to think, to decide, to act, to communicate, and endurance). GHTL trainers will nurture these values through each module activities. This approach is expected to improve leadership skill among the participants to collaborate in combating one health problems.
Counting on health: the search for evidence of health benefits as a consideration in national climate change mitigation policy

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The implementation of robust domestic policies to reduce carbon and other emissions (mitigation) can result in short-term, positive health outcomes for local populations. Quantifying and incorporating these health co-benefits into the development of national climate change and other mitigation policies may facilitate the development of more ambitious policies. For over a decade, some academics, non-governmental organisations and even some governments have quantified and monetized health co-benefits. Yet, there is minimal research analysing the influence of health co-benefits on the development of such policies. As a starting point, analysis of National Communications (NCs), which are reports on domestic climate change policies and initiatives by Parties to the United Nations Framework Convention on Climate Change (UNFCCC), may provide some insight into how health co-benefits are considered. This research uses content analysis to explore references to 'health' and 'benefits' in four NCs: China (2012), Australia (2013), the European Union (2014) and the United States (2014). Results reveal that explicit references to health co-benefits represent a minimal proportion of total references to 'health' and 'benefits' in the four NCs analysed, suggesting further research involving policy-makers is warranted to determine the role of health co-benefits in the development of national mitigation policies.
One Health Field Epidemiology Education and Training Program: FETP Revitalization in Indonesia

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Threats from infectious diseases need to be addressed at the human-animal-environmental interface and require strong surveillance system that can support early detection and response. The application of field epidemiology skill is extremely relevant considering the risk of disease outbreaks in Indonesia. Indonesia needs 1250 field epidemiologists by 2020, while it is estimated that current FETP will only able to prepare 420 field epidemiologists. FETP revitalization using multisector approach may needed to fulfill national demand and improve surveillance system. Two working groups that gather members from government, academia, and practitioners are established to address education and regulation issues. Working group for education focuses on curriculum standardization as well as the academic process. Working group for regulation advocates policy maker to protect the profession as well as approach them to utilize the workforce in central and local level. The members support FETP revitalization and promote the process among national stakeholders.
Loss of connection between people and their food systems affects physical, mental, and emotional wellbeing. The rising rate of chronic disease and mental illness requires public health interventions that differ from the traditional approach of directly delivering programs and services. Saskatchewan, Canada, is a major producer of the globe's wheat and pulse supply, yet this farming rich province only produces 7% of the local demand for fruits and vegetables. The purpose of this study was to reconnect people with a community food system through discussions on developing an urban agriculture action plan for the Saskatoon Food Council. We used concept mapping and participatory diagramming along with individual interviews to map a strategy for supporting urban agriculture within the province's largest city. Reconnecting people with food production provides a means to increase fruit and vegetable intake, promote physical activity, and improve social relationships. We also examined the economic aspects of home and community gardening to explore the feasibility of promoting urban agriculture as a means to supplement income or reduce home food costs. Urban agriculture was found to be a means of creating sustainable livelihoods. The next steps will be implementation and evaluation of this action plan.
Improving natural environments and human health by enhancing the delivery of environmental volunteering programs

Matthew Ebden
Rebecca Patrick, Claire Henderson-Wilson, Mardie Townsend

Deakin University

In Australia environmental volunteers are fundamental to supporting governments, organisations and communities improve and maintain healthy natural environments. Equally, engaging people within natural environments is important to promoting human health and wellbeing through the benefits of contact with nature.

Hence, recruiting more people into environmental volunteer roles is fundamental to support environmental organisations to achieve their targets and in supporting public health efforts.

This presentation will report on the findings of three mixed method studies (n = combined total participants, in UK and Aust) of environmental volunteering. The results, combined with an extensive literature review highlight people experiencing social isolation and mental health issues may be in a position to become volunteers and stand to gain health and wellbeing benefits. Collaboration across health, environmental and government sectors is paramount to enabling people experiencing social isolation and mental health issues to participate in environmental groups and programs. The presentation will highlight that to enhance cross sector collaboration, policy and practice, transdisciplinary research investigating the methods and benefits is required.
Do yearlong health and management interventions for village chickens in Myanmar influence farmers’ knowledge and perceptions on the prevention of poultry diseases?

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Scavenging indigenous chickens are the dominant livestock species in Myanmar. High chick mortality and deaths from Newcastle disease (ND) are the major constraints to village chicken production. We conducted a 12-month intervention study in two townships in Central Myanmar that included ND vaccinations and improved chick management. In November 2014 before the start of the intervention and again in December 2015 after interventions were completed, a total of 53 and 26 village chicken farmers were surveyed in each township, respectively. We used the Health Belief Framework to determine the level of change in farmers' knowledge, beliefs, barriers and actions to prevent ND in their flocks. In general, farmers ranked the susceptibility of their birds to ND and the severity of ND lower after the interventions (p<0.05). Interestingly, there was also a larger uncertainty amongst farmers in regards to birds' ND susceptibility after the interventions. Farmers acknowledged more the need to overcome barriers for ND vaccination following the interventions (p<0.05), but tend to be less proactive in other biosecurity measures. This indicates that farmers consider vaccinated birds at lower risk for ND infection, but also that after ND vaccinations fewer self-initiated actions might be conducted by farmers to prevent poultry diseases.
What does the future hold for wildlife health?

Lisa B Adams
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Wildlife Health Australia (WHA) is a peak body for wildlife health in Australia and coordinates a national network of over 600 members. Our mission is to provide a robust national wildlife health surveillance framework to better manage the adverse effects of wildlife diseases. Creating real social impact requires more than a mission. WHA is developing its business model using the concept of the endgame. Endgame refers to the specific role an organization intends to play to confront an overarching challenge in a certain issue area. We asked ourselves the following questions. What social problem is WHA needed for? What is the total addressable challenge and desired sector-wide change? What is the endgame and WHA’s role? We present the results and implications of this enquiry. One result is the production of a short story, "Healthy Wildlife Healthy Australia and the role of Wildlife Health Australia". Presented as a three-minute video, the story uses the creative processes of illustration, collage, stop motion and motion graphics. Stories allow us to understand issues and problems, the actors and stakeholders, and how they link. Embracing complexity and uncertainty in this way expands our understanding of a problematic situation and possibilities for action. Organisation leaders can usefully clarify for their organization its endgame or endgames for achieving social impact.
A collaborative framework for advancing pathogen detection at the livestock - wildlife interface.

Peter Black\textsuperscript{1}
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\textsuperscript{1}FAO

A collaborative framework for pathogen detection at the livestock - wildlife interface is being implemented in a number of countries in Asia and Africa as a key component of the USAID funded Emerging Pandemic Threats Phase 2 (EPT-2) Programme. This framework contributes to the broader goal of determining the risk of pathogen spillover at human, livestock and wildlife interfaces. The framework aims to collect a common core set of samples from livestock species (e.g. poultry, pigs and cattle) - at the same times and at the same locations - that wildlife samples are collected. Staff from PREDICT arrange and perform the wildlife sampling while the United Nations Food and Agriculture Organization (FAO) arranges the livestock sampling. FAO has close relationships in country with the counterpart Departments of Agriculture and it is this relationship which underpins the capacity for livestock sampling within this collaborative framework. This synchronized surveillance requires good collaboration and coordination between officers from FAO, Departments of Agriculture and PREDICT. Site selection, data collection, animal sampling, testing and information management system issues will be described using the experience of implementing the framework in Lao PDR during 2016 as an example.
Economic evaluation of One Health policies for controlling anthrax in Bangladesh

Kamrul Islam

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Anthrax, an acute highly infectious bacterial zoonotic disease, poses an eminent public
health threat and causes huge socio-economic loss in the livestock industry in Bangladesh.
A major challenge is preventing people from slaughtering anthrax-affected animals and
selling the meat cheaply, causing localised outbreaks of cutaneous anthrax in people. Hence
integrated control of anthrax in animals is likely to have a major impact on anthrax in
humans. We are using an excel-based economic analysis tool to compare a range of policy
options for controlling anthrax in humans and animals to identify the most cost-effective
approach that could be applied under Bangladesh circumstances. The options include
different combinations of integrated surveillance and outbreak reporting in people and
animals, community education programs, animal vaccination and management of anthrax-
affected carcasses under the challenging conditions faced in Bangladesh where area for
burying carcasses is constrained by extensive flooding in the monsoon season. The generic
economic analysis tool is designed to facilitate economic evaluation of control policies for
a range of diseases, supporting epidemiologists and policy advisors who do not have an
in-depth knowledge of economic analysis to evaluate different disease control policy options.
Outcomes of the anthrax control policy evaluation will be presented.
After more than 28,000 cases and 11,000 deaths, the largest Ebola virus epidemic ever recorded has been nearly brought under control in West Africa. Despite the tremendous progress in controlling the outbreak, the fact that Ebola emerged to affect West Africa in 2013 suggests Ebola virus may have become endemic in the region, potentially by circulation among animal populations. Without the identification of these possible animal "reservoirs and hosts" and development of prevention programs to block transmission from animals to humans, it is likely that future "spillover" of viruses will continue to occur because of continued animal-human contact. The concept of One Health is a collaborative effort to promote and improve the health of humans, animals and our environment through multidisciplinary activities. To avert another Ebola outbreak, a comprehensive, long-term, simultaneous, multi-country coordinated investigation into the potential host range is necessary, including sampling a wide taxonomic range of domestic and wild species. This project, currently underway in Guinea, Liberia and Sierra Leone with assistance from USAID EPT2, may determine how widely distributed the virus may be among animal populations, and how animal host distribution will impact the response and prevention of Ebola in Sierra Leone and other West African countries.
Aiming to sustainably improve human and animal health of mobile pastoralists in the Sahel this project was initiated by the pastoralists’ report on economic losses due to fascioliasis in cattle. *Fasciola gigantica* and *Schistosoma bovis* are water transmitted trematodes affecting livestock, similar to *Schistosoma haematobium* and *Schistosoma mansoni* that cause human disease. By applying One Health research, we investigated these human and animal infections in parallel aiming at elucidating a predictive potential of one to the other and providing the evidence base for One Health intervention strategy development. At Lake Chad, mobile pastoralists of four different ethnic groups participated. In humans (N=401), *Schistosoma haematobium* showed a prevalence of 8%. *Schistosoma mansoni* prevalence was 0.4%. In cattle (N=534), prevalence of *Fasciola gigantica* was 31% and *Schistosoma bovis* 20%. Equally in humans and cattle, prevalence correlated within ethnic groups, but varied significantly between ethnic groups. Our results reveal that the mutual predictive value of human schistosomiasis and livestock fascioliasis is defined by transhumance patterns and husbandry system. With a systems understanding of health this shows that taking the ecological and ethnical dimension into consideration is crucial to develop tailor-made locally adapted and accepted interventions, applying the One Health approach.
One Health and Eco-Health Research and Capacity Strengthening: Perspectives from the Special Programme for Research and Training in Tropical Diseases (TDR)

Johannes Sommerfeld

Special Programme for Research and Training in Tropical Diseases (TDR), World Health Organization (WHO)

For more than a decade, in collaboration with the International Development Research Centre (IDRC) of Canada, TDR, the Special Programme for Research and Training in Tropical Diseases at the World Health Organisation (WHO) has been supporting, fostering and funding several international research initiatives that applied eco-health or One Health research perspectives. We have worked with research groups throughout Asia and Latin America on "eco-bio-social" approaches to community-based vector control for dengue prevention and are completing a major programme on community-based adaptation to environmental and climate change in five African countries addressing One Health public health conditions such as African Trypanosomiasis, malaria, Rift Valley Fever and schistosomiasis. Such research typically combines research on the vector biology and epidemiology with social research on community dimensions, including community engagement and anthropogenic change to biodiversity, livelihood strategies and land use patterns. This presentation will provide an overview of the conceptual, methodological and practical issues of international research and research capacity strengthening in these emerging fields of inquiry.
Capacity Building for Research on Vector-Borne Diseases and Climate Change: Policy Objectives and Research Uptake

Bernadette Ramirez¹
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The African continent is challenged by environmental changes, including climate change. Environmental change is of particular significance for drylands where vector-borne diseases (VBDs) affect populations that are poor, food insecure, ecologically fragile and socially vulnerable. Lack of knowledge on the possible impacts of climate change on VBDs remains an obstacle to evidence-based health policy. The WHO/TDR-IDRC research programme focuses on VBDs, in the broader context of human vulnerability to climate change. The goal is to generate evidence to enable development of innovative strategies to reduce human vulnerability and to increase resilience to VBD-related health threats. Socioeconomic status, access to health services and local capacity to cope with climate-related hazards, all determine the level of health vulnerability to climate change and must be taken into account when assessing risks/planning adaptation measures. Knowledge, research capacity-building, and policy advice products are expected outcomes from the research programme. Research uptake for improved understanding of health risks resulting from climate change is relevant to two important policy objectives: for better informed decision-making about the need for adaptation response to climate change; and as information base for choosing and developing adaptive strategies to lessen already unavoidable VBD-related consequences of climate change.
A Thai case study: One Health approach for participatory research design to strengthen community responsibility in waste and waste water management and collaboration at Animal/Human/Environment interface.

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In the framework of ComAcross EuropeAid project, a case study is implemented in Ayutthaya province, Thailand in order to address Health impacts of waste and water resources management at provincial and municipality levels in Thailand, according to the community needs as it has been revealed through bottom-up participatory approach. The study involves local authorities, communities and provincial authorities as well as academic staff. Capacities are built in participatory epidemiology, health risk mapping and participatory modelling in order to identify Environmental Health issues in link with livelihoods (notably agriculture and livestock farming) and to map the institutional local context and coordination gaps. We aim at improving the coordination between actors and sectors (Agriculture/Health/Environment) and to provide scientific evidences regarding health risk linked to waste and water management. Agricultural waste water and landfill contamination to the natural water bodies will be studied as well as social responsibility of each stakeholder and coordination gaps between activity sectors to overcome waste and waste water management problems for communities and at provincial level. One Health approach can lead to communities’ empowerment to find solutions to their own development challenges.
Prevalence and Antimicrobial Susceptibility of Salmonella and Escherichia coli in retail chicken from small scale shops in Kandy district, Sri Lanka

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Issues concerning the wide spread use of antibiotics within the livestock industry are increasing in prominence, with many common bacterial pathogens being capable of the rapid development of anti-microbial resistance (AMR). Herein we report on the prevalence of AMR within bacteria isolated from the merchandise sold within 72 small scale meat retail shops in the Kandy District of Sri Lanka. Following standardized protocols (ISO 6579 and modified SLS 516: part 3: 1982), Escherichia coli and Salmonella were cultured and identified, isolates were assessed for sensitivity to 10 antimicrobials using a disc diffusion assay - performed according to CLSI (2008) guidelines. The prevalence of Salmonella and E. coli in the samples was 42% (n=34) and 100% (n=72) respectively. Isolates exhibited substantial levels of AMR for antibiotics that have been widely used in poultry production (ampicillin, amoxicillin, cephalothin, neomycin, streptomycin and tetracycline). Multidrug resistance (criterion; AMR ≥5 antimicrobials) among E. coli was as high as 78%. The results highlight the need for immediate attention to be focused towards more effective intervention strategies to minimize contamination of meat with AMR foodborne bacteria and to minimize the continued evolution of these bacteria towards further drug resistance.
Intersectoral Municipal Leadership for EcoHealth based interventions for prevention of Obesity and Diabetes in the Municipality of Soraca, Boyaca, Colombia

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The municipality of Soraca is located in the department of Boyaca, Colombia; it has a high prevalence of non-communicable diseases (NCDs), such as diabetes (>5%) and obesity (>50%) in adults, added to poverty, low educational level, low income, high alcohol consumption and 24% of population older than 60 years of age. We aim to formulate and implement a policy for the improvement of the current local food and nutrition situation to reduce the prevalence of NCDs. An integral model of intervention for the prevention of NCDs within the framework of Food Security is appropriate. This framework provides a holistic approach that allows us to address a health problem in an inter-sectoral and transdisciplinary way. In order to formulate this policy we surveyed a representative sample of 305 families. We collected information about their food consumption, basic food basket, and anthropometric measurements. To screen for diabetes we randomly selected 80 adults out of the surveyed families. From an Ecohealth framework the results of the survey will be used to discuss and construct an intervention with active participation of community and local authorities. Challenges include cultural barriers, socioeconomic vulnerability, and degraded ecosystems. Strengths include transdisciplinary work, strong political, will and inter-sectoral commitment.
The Role of Veterinarians in Integrating Zoonotic Disease Management in Ghana

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Field veterinarians are the first actors on the ground to detect, prevent and control zoonotic diseases, which makes them important actors of One Health. During a seven-month ethnographic study of Ghanaian vets of different positions, I carried out participant observations, interviews and a network survey to explore how veterinary policy, practice, culture and networks shape the role of vets for zoonosis integration in Ghana. The study first found that there is limited potential for animal health policies to be coordinated at the top. Second, vets constitute a very heterogeneous group of actors approaching their practice in various ways, from playing roles in the field which differ from their official attributions to dealing with informal practitioners. Third, veterinary professional culture is based on multiple interests, sometimes competing ones which are influenced by the international context of securitisation of health linked to emerging zoonoses. Fourth, veterinary networks show how this heterogeneity of practices and individual interests can be linked to social interaction dynamics and therefore collaboration challenges for zoonosis management. The complexity of zoonosis integration disentangled in this study through an ethnographic lens raises questions around the role of a profession such as veterinarian for implementing One Health in resource-limited settings like Ghana.
Seasonal variation of climate and tsetse fly species abundance in the Maasai Steppe, Tanzania

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Tsetse fly, the vector of trypanosomiasis presents a threat to public health. Limited information to support informed intervention render ineffective the diseases control strategy in Maasai Steppe. This study therefore assessed relative abundance of tsetse fly species in the Maasai Steppe of Tanzania in relation to seasonal variation in climatic conditions in 2014-2015. Tsetse flies were captured using odor baited Epsilon traps deployed in ten sites selected through stratified random subsampling of the major vegetation types in the area and climate data were acquired from the satellite. Three species of tsetse flies were identified, *G. swynnertoni* (70.8%), *G. m.morsitans* (23.4%) and *G.pallidipes* (5.8%). All species showed seasonal and monthly changes in abundance with most of the flies collected in July, coinciding with the long dry season; *G.pallidipes* was also common in November, during the short rain season. The abundance of all three *Glossina* species was negatively related to minimum temperature at the time of sampling. Analysis of effect of maximum temperature on relative abundance of tsetse fly species however indicated positive but not significant relationship with *G.swynnertoni*, and negative relationship with *G.pallidipes* and *G.m.morsitans*. Rainfall effect on relative abundance yielded positive relationships with *G.pallidipes* and *G.m.morsitans* and significant negative association with *G.swynnertoni*. This study established seasons of highest risk of tsetse fly burden; an important contribution to informed vector control strategies. Established seasonal patterns together with climate relationship shown can be combined into models that are skilled to predict temporal dynamics of tsetse fly abundance; useful for informed vector control strategies.
Urbanisation and disease emergence: dynamics at the wildlife-livestock-human interface

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Urbanisation in developing countries is characterised by rapid intensification of agriculture, socioeconomic change, and ecological fragmentation, which can have profound impacts on the epidemiology of infectious disease. Here, we review current scientific evidence for the drivers and epidemiology of emerging wildlife-borne zoonoses in urban landscapes, where anthropogenic pressures can create diverse wildlife-livestock-human interfaces. We present a conceptual framework to categorise these interfaces, and consider how dynamics of infection at an interface are determined by changes in diversity and abundance of, and contact rates between, reservoir and target hosts, thus influencing risk of cross-species disease transmission. We argue that these interfaces represent a critical point for cross-species transmission (and emergence of pathogens into new host populations), and thus understanding their form and function is necessary to identify suitable interventions to mitigate the risk of disease emergence. To achieve this, interfaces must be studied as complex, multi-host communities whose structure and form are dictated by both ecological and anthropological factors. Molecular epidemiology and phylogenetics could provide a platform for investigating epidemiological connectivity at interfaces, by mapping transmission between host species and detecting adaptation across multiple scales of biological organisation, and in doing so adding 'real world' complexity to studies of disease emergence.
A model for Integrating One Health into health care delivery training: The University of Global Health Equity in Rwanda

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The University of Global Health Equity (UGHE), operated by Partners In Health, is a groundbreaking health sciences university in Rwanda training the next generation of global leaders in health care delivery. Leveraging expertise from the Government of Rwanda and academic partners including Harvard University, Tufts University and the University of Rwanda, UGHE is an accredited, private institution aiming to utilize innovative pedagogy and multidisciplinary curricula to produce graduates uniquely literate in both global health delivery and equity. UGHE's flagship program, the Master of Science in Global Health Delivery (MGHD), is designed to provide students a robust foundation in global health, One Health management, research methods, and biosocial approaches. The MGHD targets mid-career professionals in medical, nursing, dental, and veterinary science fields, among others, and will also be integrated into the curriculum for future UGHE health professional training programs. By mainstreaming One Health in MGHD's global health delivery training - via curriculum, real world case studies, and strategic planning - UGHE ensures students learn to critically examine the complex roles that humans, animals, and the environment play in health outcomes. This model ensures that graduates emerge with a unique ability to address, solve, and plan for the most complex emerging global health challenges.
Breathing Easier: Maximizing the Use of Clean Cooking Technology to Achieve the Sustainable Development Goals

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Of the 7 million early deaths per year caused globally by air pollution, approximately 4 million are the result of household air pollution, primarily from combustion of solid fuels for cooking in homes in Low and Middle Income Countries. The Global Alliance for Clean Cookstoves has set a goal of introducing clean cooking technology into 100 million homes around the world by 2020, as part of a massive global effort to modernize household energy use. This generally well-conceived effort dovetails with at least five of the Sustainable Development Goals, including health, environment, and social empowerment objectives. However, most clean cooking programs around the world are still driven by climate change mitigation objectives and financed, at least in part, by carbon credits. The result is that the overwhelming majority of the nearly 49 million households that have participated since the goal was established in 2010 are using relatively low-tech improved cookstoves that burn solid fuels more efficiently, but yield minimal health benefits. A strategic focus on clean fuels, such as liquefied petroleum gas, biogas or ethanol, rather than improved biomass stoves will provide significantly greater benefits to all five relevant Sustainable Development Goals.
EPIDEMIA: An Online Platform for Data Acquisition, Integration, and Analysis to Support Ecological Forecasting of Malaria Outbreaks

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Malaria early detection and early warning systems are important tools for public health decision makers, especially in regions where malaria transmission is unstable and dependent on environmental conditions such as rainfall and temperature. We designed and implemented the EPIDEMIA online platform, an automated tool for forecasting malaria outbreaks in the Amhara Region of Ethiopia. The components of the system handle epidemiological data acquisition whereby public health collaborators upload malaria surveillance data, environmental data acquisition whereby our previously-developed EASTWeb software continuously downloads and summarizes environmental monitoring data derived from satellite remote-sensing products, data integration which harmonizes the various datasets, modeling and forecasting of outbreaks using state-space models, and reporting via PDF, HTML, and Shiny app visualizations. Our modeling and forecasting subsystem uses a new data-driven dynamic linear model based on the Kalman filter with time-varying coefficients that are used to identify malaria outbreaks as they occur (early detection) and predict the location and timing of future outbreaks (early warning). The ecohealth informatics tools implemented in EPIDEMIA can be modified to incorporate new modeling techniques, applied to other geographic areas, or extended to other diseases linked to environmental conditions.
Evaluating indigenous and commercial Ethiopian chicken flocks as sentinels for West Nile surveillance in Africa

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West Nile virus is endemic in Africa and re-emerging to cause epidemics. Virus transmission occurs between ornithophilic mosquito species and passeriform avian hosts. Human disease surveillance in Africa is hindered by limited resources and competing healthcare priorities. Captive and wild birds are used in sentinel surveillance for West Nile in Europe, Australia, and the Americas. However, this is expensive, labour-intensive, and limits surveillance to predetermined areas. Ethiopian chickens were sampled from 3 sites, Horro, Debre Zeit and Awassa, during the most likely time for virus transmission and a commercial competitive enzyme-linked immunosorbent assay was used to screen samples (serum and eggs). None of the 285 samples tested were positive suggesting that the prevalence of WNV, if present, was low at the time of sampling. The use of commercial and indigenous chickens was socially acceptable and not limited to a predetermined area allowing rapid surveillance where human febrile illness was reported. This is the first report of sentinel surveillance for West Nile in Africa using commercial and indigenous chicken flocks. This low-cost surveillance strategy could be applied throughout Africa, Asia, and South America, where chickens are commonplace.
Zoonotic arbovirus monitoring in Victoria, Australia: Past, present and future

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Vector monitoring, arbovirus detection and vertebrate sentinel surveillance form the foundations of an integrated surveillance program for zoonotic arboviruses. The Flaviviruses Murray Valley encephalitis virus (MVEV) and West Nile virus (subtype Kunjin) (KUNV) are members of the Japanese encephalitis virus serogroup. Both are endemic to Australia and are maintained in an enzootic cycle by wild birds and mosquitoes, with Culex annulirostris the principal bridge vector. Vector and arbovirus surveillance is conducted annually as part of an integrated arbovirus surveillance and control program. MVEV was last detected in Victoria in 2011, following a La Niña climatic event which led to extensive flooding throughout the state. Although there were no confirmed human cases in 2011, MVEV and KUNV (as well as Ross River virus) contributed to one of the largest equine arbovirus outbreaks in Australia. The magnitude of vector abundance and the co-circulation of arboviruses highlighted limitations with the methodologies currently employed within the surveillance program. Recently, advanced molecular methods, such as massive parallel sequencing, have the potential to improve the identification of mosquito species and virus isolates detected by surveillance programs. Such innovations will contribute to smarter surveillance programs, which are responsive to emerging endemic and exotic vector-borne risks.
The social, economic and environmental drivers of disease emergence are complex and dynamic. They operate against a backdrop of a potentially large diversity of unknown pathogens with an unknown capacity to infect people and become pandemic. All of this is added to a clear lack of capacity or governance to deal with known threats to global health. Given these challenges - what solutions can we envisage to future disease emergence? In this talk I will lay out a growing body of work that allows us to understand, and even predict aspects of disease emergence - from where, from what species, and with what propensity to spread. I will then discuss three types of programs that may help us pre-empt future pandemics at source, or even before they emerge: 1) Pathogen discovery programs; 2) Capacity building programs targeted to the likely origins of future EIDs; and 3) Efforts to identify and reduce the underlying drivers of disease emergence (e.g. land use change, wildlife trade). All of these have significant challenges, significant gaps in our knowledge, and will incur significant cost. However, given the exponentially increasing drivers of disease emergence and the similarly increasing frequency of new EID events, I will demonstrate how these new programs are likely to provide significant return-on-investment.
Building an African Leptospirosis Network

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Although leptospirosis is a disease of global importance, local context is crucial to formulating effective intervention strategies. Factors including reservoir host species, pathogen type, environmental, and social settings generate context-specific epidemiologies. Diverse climatic zones, agricultural systems, urbanization patterns, and cultural practices in Africa are likely to drive considerable variation in leptospirosis epidemiology. There is growing evidence of a substantial burden of human leptospirosis in Africa that is difficult to quantify in part due to
lack of surveillance and clinical awareness of leptospirosis. Leptospirosis is therefore rarely considered as a differential diagnosis for acute febrile illness, and there is little access to diagnostic services for leptospirosis on the continent. In 2016, a virtual network was founded focusing on improving awareness and understanding leptospirosis in Africa. We currently have 40 members from academia, clinical practice, government and non-governmental agencies and others. Current members are based predominantly in institutions outside the continent but increasingly colleagues based in public health, laboratories, veterinary, and academic institutions within Africa are joining. We will share our experiences of developing this network, and our plans for capacity building through identifying and addressing knowledge gaps in our understanding of leptospirosis in Africa.
Social and cultural determinants of health

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The social and cultural determinants of health are distinct and ideally complementary frameworks which help to articulate the myriad ways in which social and cultural factors impact health and wellbeing and produce differing health outcomes across and between populations, nations and global regions. The social determinants refer to the conditions in which people 'are born, grow, work, live and age' and are particularly focused on the forces and systems which shape these conditions including 'economic policies and systems, development agendas, social norms, social politics and political systems' (WHO 2016). According to the National Collaborating Centre on Aboriginal Health cultural determinants refer to the systems of meaning that are 'learned, shared, and transmitted from one generation to the next and is reflected in the values, norms practices, systems, ways of life and other social interactions of given culture' (2010, p. 1). Contemplations of health in the nexus between social and cultural factors are necessarily diverse and the voices and wisdom of Indigenous people are integral to this work. In this session a range of theoretical, ontological and epistemological considerations will be given to the subject and a critical and emancipatory ethic will be invited to inform the discussions.

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Climate and health co-benefits from changes in diet. A case study from Austria

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Diets are crucial for the environment and for health. We examine co-benefits from changes in diet using Austria as case study. As a novel aspect, our analysis covers the entire causal chain from feasibility of implementing a policy via the effectiveness of the measures, their impacts on diets, up to the resulting climate and health benefits. Leverage points for achieving co-benefits are examined with two scenarios and benchmarked against the baseline year. The scenarios focus on reducing meat intake, known to yield strongest effects. The happier animal scenario (HA) introduces recommended animal welfare standards. Additionally, the healthier people scenario (HP) implements a meat tax used to subsidize fruits and vegetables. The results reveal that meat intake can be reduced by 20% (HA) and 50% (HP) leading to a 25% and 60% reduction of greenhouse gas emissions respectively (rd. 3 and 7 million tons/year, calculated as 50 years average). The health benefits show strongest effects in overall mortality in the HP-scenario, where more than 120.000 life years are saved annually. The incidences of colon cancer and diabetes decline by 15% and 20% respectively. The study stresses the importance of integrated policies that strive for both protecting the climate and promoting health.
Bats and Bushmeat: Targeting high risk taxa and behaviours for prevention of viral spillover

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Climate change and human population growth have the potential to influence the distribution and population dynamics of bats and other wild animals leading to increased human-wildlife interactions. The launch of the PREDICT project in 2009 in Tanzania improved awareness of the presence of high-risk human-animal interfaces, resulted in targeted wildlife sampling of key taxa at prioritized sites representative of Tanzania's biological and geographical diversity and has helped to improve the infrastructure and human resource base for the detection of emerging viruses of pandemic potential. More than 64 viruses were detected in 268 animals (bats, rodents and non-human primates), and 75% of these viruses were from bat hosts. In addition to investigating connections between people and key taxa like bats that harbor diverse viruses, we also focused on the viral transmission risks associated with common routes of contact with diverse wildlife taxa, like hunting and examined practices associated with bushmeat hunting, targeting villages bordering the Ruaha ecosystem. Ethnographic data collected from community members revealed risky practices associated with hunting and meat preparation and consumption. Results also indicated that the communities had a limited awareness of the potential risk for zoonotic disease transmission associated with wildlife hunting and consumption.
Living with Ebola virus: decades of outbreaks and education lead to rapid action and response in the Democratic Republic of Congo

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Between 1976 and 2014, Ebola Virus, a biosafety level four pathogen, has caused 7 outbreaks in the Democratic Republic of Congo (DRC) with an average case-fatality rate of 76% (range: 47%–88%). The last outbreak of Ebola Virus Disease in DRC began on 11th August, 2014 with the death of the presumed index case. The country response allowed a rapid control of the outbreak in a period of 40 days, with no cases exported out of the affected area. This successful result was made possible due to lessons learned during 4 decades of combatting Ebola. Political commitment of the government; implementation of a One Health Approach with a well coordinated multi-sectorial partnership; the constitution of coordination committees at national, provincial, territory and local levels; rapid diagnostic made possible by the PREDICT project; the involvement of rural communities; and psycho-social care of both infected and affected persons were among reasons for this rapid result. Here we present this experience, with a focus on 3 main approaches: 1) a community-based approach, village to village sensitization and zero tolerance of household without disinfectant and corpse manipulation; 2) a medical approach through free health care in the affected area; and 3) secured burials.
One Health and controlling foodborne infections

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In 2015 the World Health Organisation estimated the global burden of foodborne illness to be approximately 600 million illnesses and 420,000 deaths per annum, with a disproportionally high burden experienced in developing countries. Many foodborne pathogens, such as non-typhoidal Salmonella and Campylobacter spp., are maintained in animal reservoirs that transmit infection to humans via food, water and other environmental pathways. Reducing the burden of foodborne infections therefore requires a concerted One Health collaborative effort involving experts from a wide range of disciplines including: medical, veterinary and environmental health; ecology, microbiology; molecular biology; epidemiology; social anthropology; and health economics - working alongside local and national government agencies and the food industry. Understanding the source of foodborne infections is essential for their control and prevention, and this requires identifying the relative contribution of animal reservoirs, transmission pathways and risk factors for infection. Recent advances have led to the development of new tools for 'source attribution', embracing recent developments in pathogen genome sequencing, and evolutionary modelling. This presentation will include examples of the application of source attribution tools in both developing and developed countries, and how they have informed effective policy, leading to a reduction in foodborne disease burden.
One Health Aspects of Response to Health Emergencies

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Increasingly, health emergencies are being viewed as One Health opportunities for collaboration and communication between human, animal, and environmental sectors. In practice, however, it can be difficult to overcome operational silos and create a truly coordinated response. The use of emerging communication technologies in these instances may help to resolve some of these barriers. We present an overview of the literature describing recent public health emergencies and the utility of technology in addressing these situations. In addition, we will discuss the cultural and organizational barriers to truly transdisciplinary collaboration that can arise. We will also present an anthropological approach to understanding and overcoming such barriers that incorporates the use of cutting edge communication technology.
Development, validation, transfer and monitoring of a rabies immunoperoxidase antigen detection test for improved diagnosis of rabies in Indonesia

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Rabies is endemic across Asia and continues to pose a threat to human health in Indonesia. While the eight Indonesian national veterinary laboratories are equipped to undertake rabies testing using the OIE gold standard Fluorescent Antibody Test (FAT), limited resources exclude provincial laboratories to conduct the FAT. This study describes the development, validation and transfer of a novel rabies immunoperoxidase antigen detection (RIAD) test to Indonesian provincial laboratories to replace their reliance on the less sensitive Seller's stain test, which results in many false negative results. The RIAD test was designed with the triple objective of accuracy, sustainability and cost and was validated against other rabies tests using panels of dog brain samples from high and low rabies prevalence areas. The RIAD performance matched that of the FAT and demonstrated point estimates for sensitivity (Se) and specificity (Sp) of 100% (96-100%, 95% CI) and (97-100%, 95% CI), respectively. Repeatability and reproducibility of the RIAD was assessed with a proficiency panel in 16 provincial laboratories and results showed high levels of agreement. The RIAD vastly outperformed the Seller's stain test and represents a promising and sustainable alternative for the diagnosis of rabies in Indonesia.
Malnutrition in Zambia remains a public health problem. For example, more than a third of children age 0 - 59 months are stunted and more than 5% are wasted. This situation is partly explained by poor food consumption and dietary diversity scores due to high poverty levels. A shift from consumption of whole grains and cereals to refined products has been witnessed and is attributable to a rise in both under- and overnutrition in the country. Key sectors implement nutrition interventions in a fragmented way.

To address undernutrition, 12 of the priority interventions advocated by the Lancet series 2008 are being implemented. Some of these are specific in nature and their implementation pathways are clear, whereas, some are sensitive and their implementation pathways are not clearly demonstrated by fragmented nutrition-sensitive activities such as orange maize with limited coverage and acceptance.

Sensitive agriculture activities require a clear understanding of integration within existing agricultural activities. Worthy of consideration are nutrition education for enhanced dietary diversity, water resources management for sustained agricultural production, and adequate water, sanitation and hygiene. This study aims at identifying areas for integration of sensitive agriculture activities, packaged accordingly for sharing with relevant stakeholders.
Local and global environmental change is profoundly affecting our health and environment, and threatens global health progress achieved in recent decades. In many parts of the world, the burden of non-communicable diseases (NCDs) are growing, in addition to the catastrophic impact of disease emergence events as well as unresolved persistent endemic diseases- creating a so-called "double burden" of infectious and non-communicable disease. While the Sustainable Development Goals have a dedicated set of targets to address existing disease threats, preventive systems must be in place to anticipate and more fully address health impacts will result from widescale land conversion and resource extraction, changing food production systems, rapid trade and travel, and climate change. The sustainability research platform Future Earth, launched in 2015, provides a new opportunity for the One Health/EcoHealth/Planetary Health community to engage in research, policy and practice toward a healthier and more sustainable society. Priorities identified in the Future Earth Strategic Research Agenda "Vision 2025" will be examined.
Ecology and Health: What Drives Disease

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Through a synthesis of current knowledge on disease ecology, the dynamics of pathogens, species diversity and habitat fragmentation will be explored. Given the high variability in different disease systems (e.g. Hantavirus, Lyme disease), long-term monitoring programs have the potential to improve understanding of disease trends at the human-animal-environment interface. Using examples from research in Latin America, surveillance approaches that could be upscaled for greater understanding will be highlighted, as well as potential policy applications of findings for the conservation, agriculture, land use planning and public health communities.
Diversifying Food and Diets: Using Biodiversity to Improve Global Nutrition

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One of our greatest challenges is ensuring everyone has access to a healthy and affordable diet that is produced in a sustainable manner. Despite advances our global food system still fails to feed a significant part of humanity adequately. While transformations in global agrifood value chains have made a greater variety of food commodities available to consumers in many countries around the globe, they have also led to greater homogeneity in the global food system, compromising dietary diversity and environmental sustainability. The enhanced use of biodiversity is a cornerstone of an integrated approach to address the ‘triple burden of malnutrition’. Countries such as Brazil have shown by strategic actions and interventions that it is possible to create better environments to mainstream biodiversity for healthier diets and improved nutrition into government programs and public policies. The 2030 Agenda for Sustainable Development presents an opportunity to reshape food systems and move beyond business-as-usual towards sustainability and the provision of healthy diets, however, at present the importance of biodiversity for healthy agriculture, food systems and diets is not adequately reflected in the SDGs.
Strategic foresight for Sustainable Agriculture for People, Animals and Environment

Peter Black

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Strategic foresight - the process of organizational planning to anticipate future uncertainties - can guide more future-oriented planning around risks as well as opportunities. Between now and 2050, it is estimated that agricultural production will need to increase by 70% to meet projected demand. In this context, it is vital to reconcile and form synergies around often seemingly siloed priorities including food and nutrition security, animal and human health, biosecurity, and economic development - all while under increasing pressure from climate and other environmental change. Strategic foresight approaches lead to the conclusion that sustainability is about maintaining the complex systems that support our longer-term survival and health. When this is realised, the most fundamental drivers that underpin sustainable agriculture for people, animals and environment can be more readily recognized and reconciled. However, this process is extremely challenging as it does require a fundamental shift in our thinking and a close examination of what it is that societies value. Key research questions and challenges from the food and agriculture sector will be raised to stimulate thinking and discussion on areas of collaboration in animal, human and environmental health.
Using Climate and Weather Data to Predict and Mitigate Disease

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While not typically directly integrated into health resource allocation planning, climate and weather forecasting can provide important inputs for risk assessment and response for global and local health. Advances in satellite remote sensing enhance precision in risk prediction. In addition to increasingly-recognized utility for vector-borne disease (e.g. Rift Valley Fever virus) and extreme weather effects, this technology can also support action to reduce burden of non-communicable diseases (such as expected respiratory illness attributable to forest fires during periods of drought, or reduced food provision or supply due to flood events). Examples from 2015-2016 Global Climate Anomaly and Potential Disease Risks forecasting report will be presented, with consideration of additional data and systems that can support further improvement in risk prediction, as well as potential preventive measures that can be mobilized in partnership with other sectors for a more integrated understanding of the environmental determinants of health. Emerging technologies and data applications can enable us to anticipate and better mitigate and prepare for health threats.
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How One Health Can Help Promote Future Health

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While additional research is needed to more precisely elucidate human-animal-environment links, there are ripe opportunities for the One Health community to reach beyond the health, environment and animal sectors it has thus far focused on and shift from reactive to proactive measures that address the drivers of disease and ecosystem degradation. Lessons to date from One Health research indicate areas of action for implementation, including: integrated health, environment and social impact assessment, frameworks for optimizing land use for health, environment and economic development, and improved disease risk monitoring (e.g. antimicrobial use in agriculture, aquaculture and human clinical settings). Valuation of health-benefitting ecosystem services in terms of their present and their continued provisioning (e.g. clean water, pollution remediation, pollination, carbon sequestration, and flood protection/resilience) can help more fully assess the costs and benefits of land development. While implementation of such policies may require trade-offs, such as greater planning-phase assessment and mitigation measures by development funders, doing so will help us attain preventive systems that promote the health of planet and people.
The demand for livestock food products has lead to annual livestock production net growth globally since 1961, and it is expected to further grow to meet demands projected for 2030-2050. Concerns over a growing global demand for meat have emphasized livestock agriculture's role as a leading contributor to greenhouse gas emissions, as well as the anticipated land conversion to support both cattle raising and cattle feed. But could future demand actually be met with current production levels? Disease remains a major contributor to reduced efficiency in livestock production systems, with an estimated one-fifth of production loss. Livestock management solutions for improving disease prevention and control will be discussed in the context of sustainable development.
Brucellosis is a chronic disease accompanied by abortions, retained placenta, endometritis and other disorders in animal reproduction. We analyzed the incidence of brucellosis in cattle and sheep in Armenia from 2010-2015 and the effectiveness of control measures. Analysis of blood was via Rose-Bengal Test (RBT) with confirmation using the serum agglutination test (SAT) and enzyme-linked immunosorbent assay (ELISA). The overall brucellosis incidence was 0.21% for cattle and 0.2% for sheep. The prevalence of brucellosis in cattle was high in Kotayk marz (0.38%) and Gegharqunik marz (0.35%), but low in Syunik marz (0.18%) and Yerevan (0.15%). For sheep, the highest incidences were seen in Gegharqunik marz (0.56%) and Kotayk marz (0.4%) while the lowest were in Syunik marz (0.04%) and Yerevan (0.23%). Higher incidences were associated with general poor animal health, overcrowded conditions, and insufficient or irregular disinfection practices. The presence of placentas, aborted fetuses and manure were also associated with greater disease prevalence. Some farms with a high prevalence do not practice basic tenets of livestock quarantine as healthy and sick animals share grazing and watering areas. The low rates may be the result of a trial vaccination program in Syunik marz and the low density of animals in Yerevan.
Designing a One Health surveillance strategy for emerging diseases: big data, dynamic challenges, and encouraging step-wise successes

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In an effort to move from the current reactive disease response paradigm to one of prevention and preparedness, the USAID’s PREDICT Consortium has designed and implemented a targeted, risk-based strategy, based not on syndromic sentinels of disease but on detecting viruses early, at their source, where intervention strategies can be implemented before there is opportunity for spread. As a result, the team has advanced One Health capacity in more than 30 countries in emerging infectious disease hotspot regions. Environmental, host, and behavioral data are collected, and samples assayed for the presence of potential zoonoses. In addition to detecting approximately 200 known viruses, we have identified more than 800 previously undetected viruses. By combining these discoveries with data on human-wildlife contact and potential pathogenicity, we are assessing risk to inform mitigation strategies. Focusing our work where environments, human behaviors, and market systems are changing in ways that are conducive to the spillover of viruses among hosts, we locate areas posing the highest risk for exposure; detect and better characterize pathogens of epidemic and pandemic
potential; identify significant animal reservoirs and amplification hosts of viruses; and provide information needed to efficiently design intervention strategies that target disease emergence, amplification, and spread.
Plasmid Mediated Colistin Resistance Has Become Wild: Whole Genome Sequencing of Multidrug Resistant E. coli Strain Revealed Putative Zoonotic Connection

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In response to the first report of transmissible colistin resistance mediated by the mcr-1 gene in E. coli, we focused on detection of plasmid mediated colistin resistance E. coli from wildlife. Fecal swabs of wintering migratory waterfowls in Pakistan were screened for phenotypic resistance to colistin using VITEK-2 system. RealTime PCR used to confirmed mcr-1 gene. Plasmid conjugation experiment was performed to show colistin gene is transferrable. For genetic characterization, whole genome sequencing (WGS) was carried out on an Illumina MiSeq instrument (Illumina, USA). In-silico analysis WGS data were performed on web service of the Center for Genomic Epidemiology. We found one colistin resistant ESBL- E. coli (MIC > 8 mg/L) from migratory Eurasian coot which carried mcr-1 gene on IncI2 plasmid. WGS data showed strain carried plasmid resistance genes for beta-lactam (blaTEM-1B, blaCTX-M-15), aminoglycosides (strB, strA, aadA1, aadA2), sulphonamide (sul3, sul2), tetracycline (tetB), trimethoprim (dfrA14). The strains belonged to MLST type ST354. Recently, mcr-1-harbouring E. coli of ST354 have also been identified in China from companion dogs and a human with a possible transmission link from dogs to human. The long-range migration of these birds can lead to intercontinental dissemination of mcr-1-carrying bacteria.
Achieving EcoHealth Principles through Community Engagement

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Community Engagement (CE) in health research ensures fulfilment of the EcoHealth principle of stakeholder involvement. The challenge for researchers is to attain the necessary skills and resources to implement CE. We describe CE in an EcoHealth community based research project in two rural, vulnerable, research naive communities in Southern Africa. A qualitative, multiple case study approach was used. Data was collected through Participatory Rural Appraisals, FGDs, KII, and observations.

The engagement process included:

- extensive formative research activities such as PRAs
- Introductions to the political, traditional and administrative leaders,
- Establishing a community advisory mechanism through Community Advisory Boards,
- Community empowerment through education of ordinary community members at biannual meetings, training of community research assistants (CRA) and utilizing indigenous knowledge citizen science groups.

Empowerment of CRAs and citizen science groups enabled the study to initiate sustainable community initiated research activities. High stakeholder and community involvement also ensured high research uptake even at policy level.

It is possible to achieve the EcoHealth pillars through enhanced, deliberate CE. EcoHealth implementation should be consistent with community values and attitudes. Achieving EcoHealth and CE is constrained by community research literacy levels, time, human and financial resources but creates a conducive research environment.
Risk Factors and Determinants of the Geospatial Distribution of Giardiasis in New South Wales, Australia

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1South Western Sydney Local Health District/ NSW Ministry of Health

Giardiasis is a common cause of parasitic infection but little is known about the distribution of risk factors, including zoonotic transmission, for giardiasis in Australia. This study seeks to identify the risk factors and the determinants of the geospatial distribution of giardiasis in New South Wales. A spatial cluster analyses will be implemented on confirmed giardiasis cases notified to the NSW disease surveillance system from January 2011 to December 2016, in order to delineate areas with high rates of giardiasis. A nested case control study will assess cases notified from January-December 2016, to identify risk factors for giardiasis including zoonotic, water-borne, foodborne and person-person transmission. Preliminary results reveal significant clusters in semi-rural and rural areas as well as urban clusters associated with lifestyle practices. Further analysis will investigate the distribution of giardiasis cases by Local Health District; the association with certain environmental risk factors including proximity to wild-life, use of recycled water, onsite farming, access to municipal water supply, and onsite septic systems and demographic variables. The application of advanced geospatial analysis to the investigation of giardiasis in New South Wales will improve understanding of the epidemiology and geo-spatial distribution of this disease and inform development of appropriate control measures.
Recurrent Q fever in Occupational Settings: a Case for a Strengthened OneHealth Approach

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Despite the availability of an effective vaccine against Q fever and legislation to support mandatory reporting of cases in high risk occupational settings, large outbreaks continue to occur in Australia. A cluster of Q fever cases linked to an abattoir was identified in September 2015 by the South Western Sydney Local Health District Public Health Unit. An outbreak investigation employing an OneHealth approach and incorporating active case using a standard case definition, microbiological, environmental and epidemiological assessments was conducted. A confirmed case included detection of *Coxiella burnetti* by laboratory methods. Eight cases (seven confirmed and one suspected), all males and currently or having a history of being employed at the same abattoir during their incubation period, reported symptom onset between November 2014 and September 2015. Field investigation identified multiple potential hazards and risk factors at the abattoir and the majority (75%) of employees were not vaccinated against Q fever. Widespread lack of risk avoidance and compliance with vaccination requirements were noted. This investigation confirmed the significance of this zoonotic disease as an occupational hazard and identified major gaps in multi-sectoral coordination. An OneHealth approach is needed to strengthen Q fever control and enforcement of vaccination requirements in high-risk occupational settings.
HDR has developed a prototype laboratory 'kit of parts' design approach consisting of a series of laboratory and supporting space 'Modules' capable of supporting the majority of scientific activities typically present in public and animal health testing laboratories. HDR has used this approach on projects globally including Kenya and Iraq. The modules were designed with consistent dimensions to easily fit together, akin to LEGO blocks. The modules incorporate current international best practices and are designed to ensure the potential for a sustainable approach utilizing local trades, methods and materials. Three dimensional drawings and plans, annotated with equipment requirements, are used for each module. The intent is that the modules can be used in early stage design meetings to allow users to make well informed selections of spaces to quickly realize a schematic design with sufficient information to develop accurate space, service and budget requirements. The primary advantage of this unique approach is to shorten the time and reduce overhead costs related to the design phase. The goal has been to develop a system that allows flexibility to address unique risks in unique situations, while taking advantage of the quality and consistency inherent in a well-developed, repeatable, and sustainable design.
Three Reasons why One Health and EcoHealth need Population Dynamics

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The last ten years have seen a rapid expansion in One Health and EcoHealth; they have achieved this momentum on the thinnest of scientific ice often characterized by weak correlations and over confident specious mapping exercises. If OneHEalth is to truly emerge as a respectable scientific discipline it needs to more warmly embrace a deeper mechanistic understanding of how pathogens are naturally embedded in ecological communities and how disturbance to these systems leads to pathogen emergence. In this talk I'll make some quantitative estimates of levels of pathogen diversity in natural communities; essentially illustrating how trivial it should be to 'discover' new viruses. I'll provide an example of the factors that determine successful emergence and subsequent evolution in a well-studied avian pathogen, before concluding with an analysis of the current and future dynamics of Zika virus and its response to potential control methods.
What Interest of Microscopy in Diagnosis of Plasmodium Falciparum for Better Management of Malaria in Current Context?

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Microscopy remains WHO gold standard. It is performed in hospitals as a standard method. Through the external quality assessment programs (EQA) in microbiology conducted. One third of the regional health centers are still performing it. The purpose being to control the microscopy diagnosis quality and technicians performance. Thick blood smears, thin blood film, stained slides were performed by the National Reference Center (NRC) for malaria chemoresistance housed in IPCI. A questionnaire was submitted to participants. Including slide code, clinical information about the patient, the result of thick blood smear with parasite density, the result of thin blood film with identification of species and sexual forms and results interpretation. On a total of twenty-four (24) smears stained slides and notwithstanding the parasitemia, only 30% of correct answers were recorded for *P. falciparum* identification and none for other species. Parasitemia was approximate. Microscopy identification of parasite being WHO standard method entails a major problem. It requires a high qualified staff which is not available in areas where malaria is endemic. Unfortunately rapid tests are not satisfactory as well. New tools like PCR strip should be evaluated to replace microscopy for a strategic fight against malaria.
The Ongoing Spreading of AIV-H5 Through Ducks (Anas javanicus) Traded at Sepanjang’s Live Bird Market, Sidoarjo, East Java, Indonesia

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¹Airlangga University

Ducks and other water fowl have been described as carrier of Avian Influenza Virus (AIV) in the world. AIV-H5 has become endemic in Indonesia since it has been evolved in 2003. Surveillance must be implemented to evaluate and monitor the distribution of AIV and the potential public health problems it may cause in Indonesia, includes ducks meat trading which is one of the most favourites food in East Java Indonesia. To know the role of water fowl as carrier of AIV-H5, the previous study was done to isolate AIV-H5 virus in ducks (Anas javanicus) traded at Sepanjang market, Sidoarjo, East Java, Indonesia.

Of totally 156 in three-pooled duck cloacal-swab samples was collected. After isolated in Specific Anibody Negative (SAN) embronyated chicken eggs Hemagglutination-Inhibition test (HI-test) was done to identify the AIV-H5.

The results showed 43 (27.6%) of the samples were positive AIV-H5, and 33 (21.2 %) were unidentified. Further identification is needed to identify the untypeable samples. This means that ongoing spreading of AIV-H5 and other subtype of AIV in those area were detected which might be lead to reassortment of AIV. Surveillance is needed as an early warning to detect the emerging of a novel AIV.
Antimicrobial Resistant Staphylococcus sp. in Dogs in Remote Australian Aboriginal Communities

Gemma Ma
Jacqueline Norris, Michael Ward

Community acquired methicillin-resistant *Staphylococcus aureus* (MRSA) is a serious public health concern in Australian Aboriginal communities. Currently little is known about the epidemiology of these infections, however significant differences exist to hospital acquired MRSA infections for which risk factors have been well established. Dogs have been documented as asymptomatic carriers of MRSA in a number of studies despite this bacteria not being considered part of their normal flora. Dogs play an important role in Aboriginal communities with close inter-species contact. In addition dogs in remote communities are frequently overpopulated and have poor skin health. These factors make it likely that rates of MRSA carriage will be higher in dogs in Aboriginal communities than in other populations. A cross-sectional study is proposed for September 2016 to estimate the prevalence of asymptomatic MRSA carriage by dogs in 5 remote Aboriginal communities in NSW. Two hundred dogs will be recruited from a community dog health program. Swabs will be taken from the nares, buccal mucosa, perineum and skin lesions or wounds (if present) for bacterial culture. Antibiotic resistant isolates will undergo whole genome sequencing to determine their significance to human health. Full results will be available and ready for presentation by December 2016.> (Arial, Font 11)
Analysis of lineage dynamics of human influenza B viruses towards the prediction of epidemic dynamics

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Influenza is one of most common zoonoses and the control of its epidemic is required urgently. Vaccination is known to be an effective intervention, the prediction of the evolutionary dynamics of influenza for the next season is one of the biggest obstacles for constructing an appropriate influenza vaccine. In this study we focus on the evolution of human influenza B at lineage level. We construct a parsimonious model describing the lineage dynamics while taking into account seasonal fluctuation of transmissibility and epidemiological interference. Using this model we estimated the epidemiological and evolutilonal parameters with the time-series data of the lineage specific isolates in Japan from the 2010-2011 season to the 2014-2015 season. Estimated basic reproduction number is similar between Victoria lineage and Yamagata lineage. The estimation results regarding the duration for the immunity suggests that this immunity may persist temporarily and wane rapidly, which is consistent with the results of phylogenetic analysis, Victoria lineage is under stronger selection pressure due to host immunity, and the antigenicity of Victoria changes faster than that of Yamagata.
Knowledge Dissemination of One Health-Ecohealth Research through Scholarly Publishing

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Understanding the outbreaks of zoonoses, emerging infectious diseases in humans and animals, antimicrobial resistance, including ecological, biological and societal drivers associated with these phenomena are crucial for the development of timely intervention tools and strategies for prevention and control of the diseases. This requires interdisciplinary approaches involving multidisciplinary expertise, sharing of knowledge, and implementing knowledge into practices. In the past few years, there have been considerable initiatives based on One Health-Ecohealth approach established in Asia and Southeast Asia, including a number of global organizations endorsing the One Health-Ecohealth concept and the establishment of a few scholarly publishing journals, mainly open access, devoting directly to One Health-Ecohealth-related work. Nevertheless, there remains a huge gap in knowledge dissemination and an urgent need to devote more efforts to ensure sharing of One Health-Ecohealth knowledge in the communities. This presentation will discuss on how One Health-Ecohealth scholarly publishing journals could play a role in knowledge dissemination. Emphasis will be given on the development of "One Health and Ecosystems", an open-access journal, under the Field Building Leadership Initiative: Advancing Ecohealth in Southeast Asia (IDRC/FBLI) and its linkage with the Council of Asian Science Editors (CASE) and the Ecohealth Network Asia (EHNA).
Serological Detection of Bat Coronavirus Specific Antibodies in Three Bat Species of Taiwan

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Rhinolophus severe acute respiratory syndrome (SARS)-related CoV, Scotophilus bat CoV 512, and Miniopterus bat CoV 1A were detected in the faeces of 9 bat species in Taiwan by reverse transcriptase polymerase chain reaction (RT-PCR) targeting RNA-dependent RNA polymerase (RdRp) gene. Short infection period of CoV, instable viral RNA, and PCR inhibitor can cause low sensitivity of RT-PCR. To better access CoV epidemiology in the bat populations under surveillance, western blot (WB) and indirect enzyme-linked immunosorbent assay (ELISA) were developed for detecting CoV-specific antibodies. The carboxyl terminal fragment of nucleocapsid protein (N3) without a highly conserved motif among all known CoVs from SARS-CoV and Scotophilus bat CoV 512 were used. Within 52 serum samples from chestnut bats (Scotophilus kuhlii), 26% was positive by WB and 71% were positive by ELISA. Within 63 serum samples from Formosan lesser horseshoe bats (Rhinolophus monoceros), 37% was positive to SARS-CoV, 40% was positive to Scotophilus bat CoV 512, and 26% was positive to both CoVs. Only 1 out of 18 Miniopterus bat serum was positive for Scotophilus bat CoV 512 by ELISA. Lactating females had higher detection rate of CoV-specific antibodies. Serological assays were sensitive to assess the infection history of CoV in bats.
Extension of rubber plantations and impacts on movement and health of rubber workers

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Rubber is an important commercial crop. Thailand is the biggest rubber producer with 30% of the total world production in 2012. High demands of the rubber products lead to an extension of rubber plantations in many parts of the country. Chachoengsao, eastern Thailand, has been experienced this extension resulting in more employment and increased movement of both national and international workers. In this study, 248 workers were interviewed (66% Thai and 34% migrants). Sixty-one percents of them worked in the medium-size rubber plantations (average 41 rai or 6.56 hectares). For Thai workers, 49% came from northeastern provinces and 38% was local residents. Migrant workers mostly came from Cambodia (43%) and Myanmar (34%). Fifty percents of them visited their homelands once a year; and at the same time 29% of them worked in different places, therefore, enhancing disease spread. Rubber plantation is considered as a hot spot of diseases and 46% of workers lived inside the rubber plantations making them more vulnerable. Besides, chemical products were intensively applied and hence increased more health risks. Regular health check-up, frequent vector control, and effective self-protection measures should be promoted and implemented in the rubber plantation areas to reduce disease risk among rubber workers.
Risk behavior, prevention and control of vector-borne diseases among workers associated with rubber plantations

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Rubber plantations are the hot spots for risk of vector-borne diseases. This study aimed to assess risk behaviors including the prevention and control of vector-borne diseases among difference working groups associated with rubber plantations in Chachoengsao, eastern Thailand. A total of 503 individuals were interviewed, including 213 rubber owners (42.35%), 42 managers (8.35%), 164 Thai workers (32.60%) and 84 migrants (16.70%). Most of Thai workers (45%) and migrants (48.81%) worked and lived in rubber plantations. They did tapping during the night in the rainy season to obtain high yield of latex, which made them more exposed to *Anopheles dirus*, the malaria vector. Our results showed that owners, managers, and Thai workers had experienced dengue, chikungunya and malaria, with the high incidences of chikungunya reported (6%-12%). For migrants, since they have no knowledge on these diseases, their infections could not be confirmed. All groups protected themselves by sleeping under bednets (70.30%), wearing long sleeves (76.92%) and using mosquito repellent lotions (52.40%). However, most of them sleep outside mosquito nets during 12.00-18.00 hours. Even though all groups never eliminate larval breeding sources in rubber plantations, the rubber workers usually turned down latex collecting cups which could breed mosquitoes during un-tapping season.
A comparative study of the socio-economic impacts on health care among different groups involved in rubber cultivation industries in Thailand

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Rubber cultivation industries are expanding in Asia. The environment and life style of workers associated with rubber plantations enhance disease risk. This study examined the household income and its impact on health care of individuals involved in rubber cultivation industries in Chachoengsao, eastern Thailand. Our sample size comprised 503 respondents from nine rubber cooperative groups. Results indicated different socio-economic conditions and practices toward health care and treatment. Rubber plantation was the main source of income and an average monthly household income was 10,001-20,000 THB (300-600 USD). However, 40% of foreign workers had less income. Thai and foreign workers earned all year round while owners and managers earned during the tapping season (Jun-Oct. and Nov.-Jan.). Forty-five percents of respondents spent less than their incomes but 47% of Thai workers spent as much as they earned. Universal health coverage service provided by the Thai Government was beneficial to 53% of the respondents, covering only Thai citizen and registered foreign workers. 76% of foreign workers did not see doctors for minor illness; in serious cases, they bought medicine at a drugstore or returned to their homeland for treatment. In conclusion, medical treatment for rubber workers in Thailand should be improved and openly accessible.
Reducing risk of mosquito-borne diseases among workers associated with rubber plantations using DEET-impregnated screen jackets

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Rubber plantations are rapidly expanded in Asia. The environment in rubber plantations and the behavior of workers enhance productivity of mosquito vectors. So far, self-protection strategies from mosquito bites among workers have been very limited. We developed DEET-impregnated screen jackets and then conducted the experiments to test their efficiency in a real situation. A total number of 30 rubber plantations in Chachoengsao, eastern Thailand were selected. Trials of these jackets among workers indicated significant reduction in the mean numbers of mosquitoes attracted within five minutes when compared between treatment and control (before work: 8.33 vs 4.63, F=25.842, P=0.000; after work: 8.48 vs 5.03, F=34.037, P=0.000). However, there was no significant difference (F=0.227, P=0.634) in the mean numbers of mosquitoes collected before and after work respectively (treatment: 4.63 vs 5.03, control: 8.33 vs 8.48). This result demonstrates the prolong efficiency up to at least 4-hour working period. Identification of mosquitoes collected by workers showed that all medical important genera of mosquito vectors were present and the species with highest numbers (68%, n=7,010) was Aedes albopictus. In conclusion, our jackets could be an alternative approach for workers to protect themselves from mosquito bites and hence reduceing risk of mosquito-borne diseases.
Vector-borne Co-infections in an Intensive Human-livestock-wildlife Interface Ecosystem in Northern Tanzania

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The Maasai steppe ecosystem at the wildlife/livestock/human interface is known to support occurrence of vectors that transmit pathogens to livestock and vulnerable communities in northern Tanzania. The transmission of these pathogens result in increased incidence of vector-borne diseases causing serious livestock and economic losses to the Maasai people. This study aimed at establishing the extent to which human activities affect the abundance of three protozoal pathogens in the Maasai steppe. Polymerase Chain Reaction was performed to detect 3 vector-borne parasites of importance in blood collected from 200 cattle of known East Coast fever (ECF) vaccination status in 2 villages of Simanjiro district. The overall prevalence of blood parasites was 29.5%, of which 16.5% were infected with trypanosomes, 12.5% with *Theileria parva* and 4% with *Ehrlichia ruminantium*. The study also revealed that ECF vaccinated cattle were 43% less likely to carry trypanosomes. 11.9% of infected cattle carried concurrent infections with 2 parasites and only calf carried all three parasites. This study provides evidence to the risk associated with vector-borne diseases in the Maasai steppe ecosystem and suggests importance of comprehensive control measures directed at ecology and transmission of pathogens to livestock and humans in wildlife interface areas of northern Tanzania.
An early warning system derived from the spatial analysis of Aedes vector populations, dengue cases and rubber plantation areas: A case study in northeastern Thailand.

Chitti Chansang

Uruyakorn Chansang, Somchai Sangkitporn, Pattamaporn Kittayapong

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Dengue, a mosquito-borne disease, remains a major public health problem in all parts of Thailand. Survey and control of Aedes mosquito vectors is still a significant disease control measure. Environmental factors affect mosquito abundance and outbreaks of dengue. In recent years, there has been an increase in rubber plantations especially in northeastern Thailand. In this study, an environmental factor analysis with GIS as an early warning system, using Aedes vector populations, dengue cases and rubber plantation areas, was conducted in northeastern Thailand. Aedes mosquitoes were surveyed by using ovitraps in 1,920 households. Dengue cases and rubber plantation areas during 2012-2015 in 12 provinces were used in the analysis. Results showed that there was a relationship between Aedes vector populations collected from ovitraps (4.35±0.29) and dengue cases (128.03±15.37). In six provinces with high rubber plantation areas, there was a trend in increasing Aedes vector populations (4.35±0.39) and also dengue cases (107.35±24.72). Therefore, rubber plantation was one of the environment factors that enhanced dengue risk. In conclusion, a spatial analysis of Aedes vector populations from ovitraps, dengue cases and rubber plantation areas could be used as an early warning system to plan and implement effective vector control interventions.
One Health Program Formulation to Control Trans-Boundary Animal Diseases

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The Ebolavirus and Highly pathogenic avian influenza (HPAI) virus are salient reminders of how human and nonhuman health are inextricably linked globally. "One Health" approach is a call for the interdisciplinary and cross-sectoral researchers and practitioners to mitigate the risks of diseases in sustainable way. Trans-boundary animal diseases (TADs) are highly contagious diseases of livestock in the world and are a major public health threat concerning globally. Foot and mouth disease, Peste des petits ruminants, HPAI etc. are priority TADs in many countries especially in Asia. Global problems require global solutions. "One Health" concept can play crucial role to formulate control strategies based on current knowledge of HPAI both in birds and in humans. Reported articles on HPAI in birds and humans in Asia were identified with the reported test based prevalence, were admitted into the database, and reviewed for pooled analysis. Summary of these findings indicate a burden of this disease and require an integrative efficient approach to control disease. Henceforth, "One Health" will strengthen human-vet health services, collaboration for epidemiological training, surveillance, and disease management, sound regional communication strategy, and clear chain of command in terms of common TADs.
Brucellosis in a pastoralist/agro-pastoralist community in Kenya: Diagnosis, prevalence, and risk factors, 2014

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Brucellosis, an important zoonosis caused by the select agents of the genus *Brucella*, is endemic in Africa but data on the disease is limited. This study was carried out in Baringo County, Kenya in 2014. Informed consent was obtained. Serum samples showed *Brucella* seropositivity of 10.8% in goats, 10.0% in cattle, and 7.7% in sheep. From respective blood clots, using PCR, *Brucella abortus* was detected in cattle, goats and sheep while *B. melitensis* was detected in one goat sample. The seropositivity in cow's milk was 10.7%. For humans, suspected of suffering from brucellosis, using rapid diagnostic tests (RDTs) and competitive ELISA (cELISA), seropositivity was 26.5% by RDTs and 10.2% by cELISA. The RDTs had a relative sensitivity of 37.5% and specificity of 74.7% when compared to cELISA. Using pre-tested questionnaires, factors associated with the disease transmission in livestock were mixed farming, communal grazing and watering and calving in pasture while in humans the factors were handling of sick animals and drinking unboiled milk. We recommend education of the community on brucellosis prevention and control. Since the RDTs used for diagnosis in humans overestimate seropositivity, we recommend the development of more effective kits for use in a *Brucella*-endemic areas.
Expansion of rubber plantations as an environment factor to increase malaria risk at the Thai borders

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Rubber plantations, originally cultivated in southern Thailand, have been expanded to the Thai-Cambodian and Thai-Myanmar borders. The malaria incidence rates transmitted by Anopheles were still high and most reported cases were found at the borders where there are movement of migrant workers. As there is no existing evidence on the impact of rubber plantations along the borders on malaria incidence rates, our study was initiated to determine this relationship by focusing on the distribution and density of Anopheles mosquitoes in relation to malaria case reports. Mosquitoes were sampled by entomological tools with the cooperation of local people in rubber plantations along the Thai-Cambodia and Thai-Myanmar borders. All collected locations were measured by GPS units for further GIS mapping. A variety of Anopheles spp. was found in the rubber plantations where owners and migrant workers lived in. The density of mosquitoes varied from 10-35 mosquitoes per night captured. The incidence rates of malaria at the Thai-Cambodian border were 79.92-81.24/100,000 while those at the Thai-Myanmar border were 56.77-1,027.16/100,000. This study showed that an expansion of rubber plantations enhanced high occurrence of Anopheles and could be one of the drivers to increase malaria risk at the borders of Thailand.
Abundance of domestic and wild animals in rubber plantations and risk of vector-borne and zoonotic diseases among rubber workers in Thailand

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Dengue, chikungunya, filariasis, Japanese encephalitis (JE) and malaria have been reported as health problems of workers associated with rubber plantations. In addition, antibodies against dengue and JE have been reported in domestic dogs in Thailand. Our study aimed to investigate the presence of domestic and wild animals in rubber plantations and the risk of vector-borne and zoonotic diseases among rubber workers. We visited 255 rubber plantations and interviewed 213 owners, 42 managers and 248 workers related to an exposure to domestic animals and other possible reservoirs. Our results showed that out of 503 respondents interviewed, 48% lived inside rubber plantations and 79% had at least one species of domestic animals, mainly dogs (91%), poultry (35%) and cats (34%). Sixty-nine percent reported that the dogs lived or stayed with the owners in the rubber plantations. Most of respondents (96%) had mosquito bites while working in rubber plantations. Wild animals, i.e., rats (51%), ticks (26%), bats (16%) and monkeys (2%) were also present in the rubber plantation areas. Since these animals have been reported as the reservoirs of zoonotic diseases, rubber workers are prone to be at high risk of vector-borne and zoonotic diseases and efficient preventive measures are urgently needed.
Rethinking livestock vaccination: modeling the environmental risk of anthrax in Ukraine to aid in policy and estimate potential cost-savings of switching to targeted vaccination.

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Livestock vaccination is the most effective method for controlling anthrax. In Ukraine, there is a long history of anthrax. Recently, the burden of anthrax has been reduced significantly in Ukraine through sustained vaccination; \textless;1 outbreak per year on average during the last 5 years. However, there are now questions concerning the need for a national livestock vaccination campaign. To address this question, we obtained data on the number of livestock anthrax outbreaks per district in Ukraine during 1979-2015 as well as the number of doses of livestock vaccine administered. We developed environmental risk models using a zero-inflated negative binomial model to estimate the cost of switching to a campaign targeting high risk areas. We used anthrax sero-surveys from wild boar (\textit{Sus scrofa}) to estimate the range of sentinel exposure. From 1979-2015 there were 475 anthrax outbreaks. Results from the zero-inflated model indicated high risk areas in south-central Ukraine. The cost of vaccinating one animal was estimated at $1.60 USD. During 2010-2015 (34.5 million doses) the cost of vaccination was estimated at \textasciitilde$55 million dollars compared to \textasciitilde$30 million targeting high and medium risk areas (19.3 million doses). Our findings suggest possible cost-savings of switching to targeted vaccination, however, broad geographic anthrax exposure in boar suggest persistence of active anthrax foci across Ukraine. The risk of changing vaccination policy must carefully weighed with the cost-benefits.
Farmers in developing countries like the Philippines have been relying on pesticide use to meet quantity and quality demands for food. Previous studies in Benguet, the largest vegetable producing province in the Philippines, showed farmers' dependence as soil, water and vegetable samples contain pesticide residues. Agricultural crops serve as major revenue source, likewise, tons of wastes from vegetable rejects and trimmings contributing an estimate of 60 tons daily in 2011. The local government treat wastes as a problem, while some natives view them valuable by utilizing them as feed to backyard pigs. Pork products sourced from this type of practice creates public health risks from exposures to carcinogenic chemicals, chronic disease and antimicrobial resistance. The objective of this study is to provide an assessment of farmers' knowledge, attitudes and practices on pesticide use and residue build up (in meat). Mixed methods will be utilized in performing the study, consisting of constructive grounded theory and quantitative methods. The results will serve as basis creating evidenced base policies for regulatory and surveillance purposes of drug residue in food and agricultural products.
The seroprevalence of Toxoplasma gondii in Victorian ewe flocks, and the associated risk factors

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Toxoplasma gondii is a protozoan parasite capable of infecting any mammal. It is an important zoonosis, with severe consequences for immunocompromised individuals and pregnant women. One confirmed route of human infection is the consumption of undercooked sheep meat containing toxoplasma cysts. Consumption of rare lamb is popular in Australia, posing an exposure risk for susceptible individuals. Toxoplasma is also an important agent of abortion and perinatal loss in sheep flocks. Its' role in reproductive wastage may be underestimated due to difficulties detecting insidious abortions in large flocks at pasture. The current prevalence of toxoplasmosis in Victorian sheep flocks is not known. The risk factors for infection of Australian flocks are also unclear, and are often inferred from overseas studies. The importance of T.gondii, and lack of specific information about infection in Victorian sheep, stimulated the current study. Our aim is to assess the within- and between flock seroprevalence of T.gondii by using a commercially available ELISA (Toxotest, IDEXX) to determine the serostatus of 50 mature ewes on 50 farms across Victoria. A questionnaire will also be completed by each farmer, to define the risk factors for infection of Victorian flocks. We present preliminary results from ten surveyed farms.
Molecular Characterization of MRSA in Pigs, Farm Employees and the Farm Environment in Selected Areas of Sri Lanka

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Methicillin-resistant Staphylococcus aureus (MRSA) is traditionally known as a nosocomial pathogen. More recently, MRSA emerged in livestock, denoted as livestock-associated MRSA (LA-MRSA). Two major Sequence Types have been identified: ST398 in Europe, US, and Canada, and ST9 in Asian countries. Its zoonotic potential has been identified, particularly in association with pig farms. MRSA is a common nosocomial pathogen in Sri Lanka but there is no data available on occurrence of MRSA in livestock. In this study, samples from 100 pig farms from Sri Lanka were analysed for the presence of MRSA in pigs, farm employees and dust. Isolates were confirmed as Staphylococcus aureus. The methicillin resistance gene (mecA) was detected using PCR. Sequence types were determined by multi-locus sequence typing. MRSA prevalence at farm level was 10%. MRSA-positive samples in pigs, humans, and dust was 1.2% (6/493), 2.1% (5/228), and 0.8% (1/119) respectively. Results indicated lower prevalence compared to published studies outside Sri Lanka, in intensively raised animals. Sequence types identified were 1, 5, 6 and 3841. Sequence types 1 and 5 were found both in pigs and humans suggesting transmission. This is the first report of MRSA in pig farms in Sri Lanka.
Knowledge of Q fever in Thailand is limited. We reported a preliminary analyses of baseline data from a prospective cohort study among dairy cattle farms and farmers in Chiang Mai to describe the magnitude and factors associated with *C. burnetii* infection among farmers. Two stage random samplings of farms and farmers were performed in five dairy cooperatives. Face to face interview with farmers, and blood samples were collected for baseline assessment. Bulk tank milk (BTM) samples were collected from each farm and additional specimens were collected including cows' sera, swab from other animals, and farm environment from the farms with positive BTM. Farmers' sera were tested by Indirect Immunofluorescence Assay. BTM and cow sera were tested by Enzyme-Linked Immunosorbent Assay. Other specimens were tested by polymerase chain reaction. Information of farms and farmers were analyzed using descriptive statistics and Generalized Estimating Equation. Among 637 randomly selected farmers, 532 participated (83.5%). The overall *C. burnetii* seroprevalence was 16.9% (90/532). Working in the farms with BTM positive (OR 2.61, 95%CI 1.40-4.85), age (OR 1.25, 95%CI 1.01-1.5), and having contact with cow's birth products (OR 1.95, 95%CI 0.98-3.90) were positively associated with the *C. burnetii* seropositivity. Health education regarding Q fever prevention to farmers was performed.
Border Health Indicator Development in New Zealand

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Pressures are mounting on international borders with the spread of emergent infectious diseases and vectors. New Zealand's Environmental Health Indicator (EHI) programme, sponsored by the Ministry of Health, set out to further develop national border health indicators, with the aims of: identifying priority border health issues and populations vulnerable to these, in a widely-accessible format, and supporting decision-makers to target border health protection strategies. Indicator scoping and selection phases were completed. Literature review identified a dearth of EHIs for border health, internationally. Key informant interviews and disease risk assessment informed border health priorities, the development of a conceptual framework, and identified ten potential indicators. Indicator data were sourced and evaluated. Numerous data limitations were found. Four indicators were selected: Border health priority disease notifications in New Zealand; Overseas distribution of border health priority disease outbreaks, with focus on the Asia-Pacific region; Exotic mosquito species established in New Zealand; and High-risk pests intercepted at New Zealand's border. Data analyses were undertaken, and indicator implementation (www.ehinz.ac.nz) is scheduled for September 2016. Recommendations for data and indicator improvements, including strengthening of One Health collaborations, have been made.
Environmental Conditions and Biological Profile of Patients with Major Depressive Disorder With or Without Suicidal Behavior

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This study characterized the environmental conditions and biological profile of patients with major depressive disorder (MDD) and suicidal behavior (SB) who are admitted in the psychiatric emergency room. The study is based on the Signature Bank, a biopsychosocial bank collected and stored from people with mental health problems. The bank is located in Canada and it is accessible to researchers around the world. The first 50 patients with MDD with or without SB were selected (28 men and 22 women). Their mean age was 43-year (SD, 13-year). Their education level and annual earnings were lower, while they reported more adverse childhood experiences in comparison with a matching control group of 50 non-hospitalized individuals from the 2012 Canadian Community Health Survey on Mental Health. Plasma levels of the inflammatory cytokine tumor necrosis factor-alpha (TNF-a) were positively and significantly correlated with suicidal ideations. These findings contribute to better characterize the poor socioeconomic conditions of life of MDD patients admitted in the psychiatric emergency room. Additionally, the data suggest that plasma TNF-a may serve as a susceptibility marker of suicidal risk in patients with MDD. Novel strategies are likely to emerge in order to predict and prevent suicidal risk in MDD patients.
Rapid analysis of environmental samples for Campylobacter using MBiT

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Campylobacter is the leading cause of bacterial gastroenteritis in New Zealand with 150.3 cases per 100,000 people. Campylobacter has many environmental reservoirs such as birds, rivers, livestock and domestic animals as well as being readily passaged through humans. For the past two years we have conducted a study in the Southland region of New Zealand. Environmental samples were collected from rivers in the region and tested for the presence of Campylobacter. Human clinical samples from the region positive for Campylobacter were also collected. DNA was extracted from these samples and multiplex ligation-dependent probe amplification-binary typing (MBiT) analysis carried out. The MBiT environmental types were compared with the library of characterised sources to determine the most probable source of the Campylobacter. Similarly the human cases were compared to each other for similarity to determine if undetected outbreaks occurred and what was the probable source of the Campylobacter. By linking the sources of Campylobacter present in the environmental as well as humans the impact of Campylobacter in the environment on public health could be established. This research has found that MBiT is a suitable tool to screen a large number of samples from a variety of environments quickly for source attribution.
A Modified Time-Series Regression Approach to Examine Non-Linear Associations of Climate Variability with Infectious Cryptosporidiosis Across Three Climate Zones in Australia

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Associations of health outcomes with global indices of environmental change can provide important insights into the pathways through which such change may impact health, but previous illnesses can modify this time-varying relationship between environmental exposures and disease. To examine the influence of past illnesses, the non-linear and time varying association of cryptosporidiosis with an index of global climate variability, the Dipole Mode Index (DMI), was assessed using models modified to include past cryptosporidiosis counts. As exposure-disease relationships vary geographically, we focused on weekly reports of cryptosporidiosis from 2001 to 2012 in Australia from the tropical, subtropical and temperate regions (92% of all reported cryptosporidiosis). In the subtropical region, disease risk was strongly positively associated with an immediate increase in DMI, although this general relationship was observed across all climate zones. These findings provide some support for the previously established role of rainfall with cryptosporidiosis as the expected increases in the frequency of positive DMI events may result in regional decreases in rainfall, increasing turbidity and pathogen concentration in water sources, leading to more waterborne cryptosporidiosis. Future models for environmentally sensitive infectious diseases that account for previous illness may better represent the time dependant environmental exposure-disease relationship.
Detection of antibodies specific to bat coronavirus in the bat biologists of Taiwan

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Bats have been proved natural reservoirs of severe acute respiratory syndrome-coronavirus (SARS-CoV). Scotophilus bat CoV 512 and SARS-related CoV have been detected in 9 bat species in Taiwan. Potential zoonotic risk of bat CoV urged a survey of antibodies to bat CoV amongst bat biologists, who are at the highest risk of exposure to bat CoV due to the bites and scratches by bats and frequent contacts of bat faeces and blood. In 2014, 63 bat biologists have answered the questionnaires and 37 of them have given informed consent for blood samples subjected to the antibody testing against nucleocapsid protein fragment (N3) of Scotophilus bat CoV 512 and SARS-CoV Western blot (WB) and enzyme-linked immunosorbent assay (ELISA). About 86% of them have exposed to faeces or urine of bats and 75% have experienced bites or scratches by bats. Within 37 bat biologists, 10 had antibodies to the N3 of Scotophilus CoV 512 and 8 had antibodies to the N3 of SARS-CoV. Significantly higher detection rates of bat-CoV specific antibodies were found in the bat biologist experienced bat bites and scratches. Therefore, the contact history of bats may correlate with the risk of bat CoV infection.
Development of the Degree Programmes on One Health and Ecosystem Management under the Field Building Leadership Initiative in Southeast Asia

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In response to global environmental health challenges, multi-disciplinary research and training are becoming popular among several countries in the world. However, systemic degree training programmes emphasizing integration of multi-disciplines are still not existed in the Asian Region. With approval from the University Council of Mahidol University, the Degree Programmes in "One Health and Ecosystem Management" are currently under development in collaboration with the University of Indonesia, Kunming Medical University and Hanoi School of Public Health. This will be one big step in integrating One Health/Ecohealth concept and system thinking into university curricula. The main objective is to produce high quality and competent graduates, who have background in multi-disciplinary research aiming at healthy environment and healthy living, to work in either government or private sectors. The research-based topics will be emphasized on an application of One Health/Ecohealth approach to human and animal health, environmental health, emerging and re-emerging infectious diseases, and social science, economics and policy in One Health/Ecohealth. It is expected that the students resulting from these programmes should help bringing One Health/Ecohealth practice into their professional work which hopefully will improve disease management and, hence, improve well-being in the long-term.
The Effect of Abiotic and Biotic Factors on the Establishment of Ixodes Scapularis Populations in Ontario, Canada

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In eastern North America, the hard tick *Ixodes scapularis*, is the vector for the causative agent of Lyme disease, *Borrelia burgdorferi*. Within the last two decades the spread of *I. scapularis* has accelerated northward and this spread is hypothesized to continue, in part due to climate change. Other ecological factors also influence *I. scapularis* and may play a role in population establishment. The objective of this study was to understand what abiotic and biotic factors are significant in the establishment of *I. scapularis* in Ontario. Tick dragging was conducted at 154 sites in Ontario during the months of May to October 2014 and 2015. Ecological and georeferenced data was collected for each site. Multi-variable mixed logistic regression models were created to assess the impact of the ecological factors on the presence of *I. scapularis*. Cumulative annual degree days was positively associated with the presence of *I. scapularis*, as well as the density of the understory, the presence of shrubs and the interaction of these two ecological factors. Elevation was negatively associated. These findings enhance our understanding of the factors contributing to *I. scapularis* population establishment, and can be used to enhance current predictive models and risks maps for *I. scapularis*. 
Village chickens are an important livestock species in Malawi for household food security and livelihoods. Most are raised in a free range scavenging system, confined at night with little inputs. In a survey of 297 chicken owning households in Nchisi District, central Malawi, respondents were asked about losses from and vaccination for Newcastle disease and other diseases, losses from predation (including theft), and night time housing for chickens. Vaccinating households (vaccinated within the previous six months) owned an average of 14.7 chickens, almost twice the number owned by non-vaccinating households. Production of eggs was in the same proportion to the household chicken population for both groups. Newcastle disease was the largest source of loss, with deaths over the past three months averaging 25% of the current flock. The percentage of chickens reported dead from Newcastle disease was over five times higher in non-vaccinating households compared to vaccinating households, 61% vs 12% of the current flock. Over 70% of households confined their chickens in the owner's house at night rather than in an outside khola to mitigate petty theft. However those that used a khola had an average household chicken population of 16.8 vs 9.4 for households without.
Chasing a Shifting Baseline: Reflecting on Surveillance During Disease Emergence
Using Lyme Disease in Canada as a Case Study

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Surveillance for emerging and re-emerging zoonotic and vector-borne disease is critical to assess disease risk and initiate management and prevention measures. However, given the continuous change that accompanies disease emergence, surveillance can be plagued with challenges. In Europe and North America, there has been a notable geographic spread of the vector for Lyme disease, and a subsequent increase in the incidence of disease. We conducted a Realist Review of the literature, using the emergence of Lyme disease in Canada as a case study. Our objectives were to: (1) illustrate the evolution of surveillance approaches across space and time; (2) demonstrate the challenges with past and present surveillance programs; (3) reinforce the value of surveillance; (4) determine the requirements for effective surveillance programs for the future. Based on our review, there appears to be little consistency in surveillance approaches, although many countries have been conducting surveillance for Lyme disease for decades. As a result, limited standardized data are available that can be used to gain a greater understanding into disease emergence and risk. Lyme disease, like other zoonotic and vector-borne diseases, does not respect political boundaries, and we need to move towards a collaborative, integrated and multidisciplinary approach to surveillance.
A Luminex-based multiplex assay for the simultaneous detection of glycoprotein specific antibodies to ebolaviruses, marburgviruses, and henipaviruses

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Biosurveillance is critical for the identification of emerging zoonotic infectious diseases (EIDs), and programs such as USAID-PREDICT and the Global Health Security Agenda have begun to focus on efforts to improve EID detection. We have developed a Luminex-based multiplex assay that is able to simultaneously detect antibodies with specificity to viruses from the *Ebolavirus, Marburgvirus,* and *Henipavirus* genera. Virus species in this multiplex assay include all five species of ebolaviruses: Ebola virus (EBOV), Bundibugyo virus, Tai forest virus, Sudan virus, and Reston virus; two related marburgviruses: Marburg virus (MARV) and Ravn virus; and three henipaviruses: Nipah virus (NiV), Hendra virus, and Cedar virus. A mammalian cell culture system was used to produce soluble viral envelope glycoproteins (sGp) that retain their native oligomeric conformations. Following purification, the sGps were coupled to color-coded Bio-Plex microspheres. Monoclonal antibodies (mAbs) and polyclonal sera from EBOV, MARV, and NiV infected non-human primates (NHP) were used to investigate specificity and cross-reactivity with the panel of sGps. The assay is able to differentiate antibody reactivity between ebolaviruses, marburgviruses, and henipaviruses. This assay has the potential to be integrated into One-Health surveillance programs to screen domestic animals, wildlife, and humans for evidence of exposure to these EIDs.
Microbial Source Tracking of Fecal Contaminants in Drinking Water Using 16S rRNA Gene Sequencing and Phylogenetic Analysis

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The present study was designed for microbial source tracking of fecal contaminants using 16s rRNA gene sequencing and phylogenetic analysis. The targeted population in this experimental trial was that community of humans who lived in close proximity with animals with poor sanitary management system at ten different districts of Punjab Pakistan. The fecal, stool and droppings samples were collected from human and almost all types of animals and birds (either a pet or domesticated). Similarly drinking water samples and sewage samples were also collected from the same localities from where fecal samples were collected. The indicator organism in this study was E. coli. Phylogenetic analysis of 16S rRNA gene of the E. coli isolates recovered from feces of animals, poultry, human, sewage water and drinking water was performed. Comparison of 16S rRNA gene sequences of all the isolates by using Neighbor joining method with 1000 bootstrap value revealed that the E. coli isolate recovered from drinking water was sharing the same clade with the E. coli isolate from dog stool sample and sewage water sample. Similarly another sequence of E. coli isolate recovered from drinking water was found in the same clade with E. coli from horse dung. These results gave an indication of the possible contamination of drinking water with sewage water with more emphasis on the involvement of dog and horse fecal material. The results of this study revealed that the use of 16s rRNA gene sequencing and phylogenetic analysis can be a useful tool for source tracking the fecal contaminants of drinking water.
Combining Experts, Government and NGO’s to sustainably Eliminate Disease

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A major problem in disease eradication programs is ensuring that the interests and objectives of all potential partners are combined and harnessed to efficiently achieve the desired outcomes. Following on from its successful participation in the global eradication of polio, Rotary in Australia is participating in the WHO Global Elimination of Trachoma by 2020 project. Despite substantial Government funding for this cause to date, Australia remains the only developed country where trachoma is still endemic. Rotary has established partnerships with subject experts, institutions, health authorities and NGO's, to enhance their expertise and delivery approaches with an objective overview. While subject experts and research institutions deliver the medical interventions required to eliminate blinding trachoma, Rotary enhances the practical action and activities related to hygiene, environment and education that are essential to targeting the root cause of disease and preventing the spread of infection. Through Rotary's extensive network of community leaders, professionals, businesses and with organisations such as Plan International and Soapaid, we are targeting the public health interventions that will end trachoma completely, significantly reduce the incidence of concurrent diseases, and lead to the alleviation of poverty among our least advantaged Australians.
Banded mongoose, Mycobacterium mungi, and the changing face of tuberculosis in Africa - an old disease finds a new pathway

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An emerging *Mycobacterium tuberculosis* complex (Mtbc) pathogen, *M. mungi*, infects wild banded mongooses (*Mungos mungo*) in Botswana causing significant mortality. This Mtbc pathogen is closely related to the human tuberculosis pathogen, *M. africanum* but is not transmitted through primary aerosol or oral route. We utilized histopathology, spoligotyping, MIRU-VNTR, qPCR, and molecular markers, including the mongoose-specific deletion in RD1 (RD1<sup>mon</sup>) to investigate pathogen invasion and exposure mechanisms in the mongoose host. *M. mungi* DNA was identified in 29% of nasal planum samples (n=52), 56% of nasal rinses and swabs (n=9), 53% of oral swabs (n=19), 22% of urine samples (n=23), 33% of anal gland tissue (n=18), and 39% of anal gland secretions (n=44). Histological data were consistent with these results, suggesting pathogen invasion occurs through breaks in the nasal planum and skin of the mongoose host in frequent contact with these olfactory secretions. Lesions in the lung, when present, occurred only with disseminated disease. The presence of *M. mungi* in environmentally deposited olfactory secretions effectively circumvents natural social barriers (e.g., territoriality) to pathogen transmission facilitating between-group transmission. These results have important implications to our understanding of pathogen evolution and transmission potential in spatially and socially structured wildlife populations.
The future for sustainable diets, the health of people and the environment is inseparable from responsible production of foods and consumption. It is challenging to provide sustainable diets with low environmental impacts so that people today and in future can lead healthy lives. Although increased agricultural productivity through the introduction of novel crops and innovations in precision agriculture will be essential for production of the food supply, the food processing industry will need to play its part to transform food from the land to maximise the amount of safe food and preserve the nutritional value to food delivered to consumers. In addition as 1/3 of the food produced is wasted, there is an opportunity, through efficient collection and food processing, to use edible food loss that would otherwise be lost in the food supply chain as the new raw ingredients for nutritious food products. Healthy diets which meet consumer expectations produced from environmentally sustainable agrifood systems need to be delivered in a changing world with diminishing natural resources, changing demographics and increasing urbanisation in a digital age. It will be important for the food industry to work with nutritionists, consumers, governments and other stakeholders along the whole agrifood supply chain.
Resource Capacity, Gaps and Lessons learnt in applying the One Health approach: A case study of the 2016 Rift Valley fever (RVF) Outbreak in Kabale, Uganda

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Management of RVF outbreak is a good illustration of a One Health Eco-health approach to prevent and respond to disease outbreaks. RVF is a mosquito vector-borne zoonosis caused by the RVF virus. Both eco-climatic and eco-epidemiological factors are important for RVF outbreak. First ever RVF outbreak in Uganda was confirmed in March 2016 in Kabale district which has until recently been known not to harbour mosquitoes. In response, a National Task Force (NTF) developed an inter-sectoral and inter-disciplinary tactical approach by constituting teams of different players. This paper highlights resource hiccups including inadequate staffing, lack of vehicles for response, people fatigue and stigma and lack of diagnostic kits. Gaps include lack of an RVF policy embracing One Health principles, no inter-sectoral preparedness and contingency plan, intermittent information flow from the NTF to the district, no common resource envelop and bureaucracies in sharing survey results. In conclusion, using continuous standardised messages to the public; emergency fund; technical capacity; harmonized surveillance approaches and timely feedback to clients are key. Despite the gaps, the One Health approach has so far proved efficient and could also be used, with appropriate amendments, for other emerging/re-emerging zoonoses
Climate change poses large risks due to multiple exposure pathways through which increases in climatic extremes can threaten human and animal health. Case studies will be presented on both anthroponoses and zoonoses, including recent findings on El Niño and Zika virus in South America. Public health preparedness for the range of climate-sensitive diseases will be outlined, as well as priority interventions that offer health "co-benefits" from greenhouse gas mitigation options. Examples of the latter include: air quality benefits from use of clean energy technology, opportunities to enhance physical fitness through "active" transportation (via walking and biking), and sustainable food systems via alternative protein sources and cropping methods. Climate change represents one of our greatest health threats, but at the same time, policies to confront fossil fuel combustion at the root of the global climate crisis, offer some of the greatest health opportunities of our times.
Climate Change Vulnerability to Dengue at a Colombian Watershed

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Climate change will impact the people’s health worldwide. Among other effects, climate change will increase extreme weather events that have the potential to impact the occurrence of vector borne diseases like dengue with a differential pattern of disease distribution according to local contexts. In this regard, vulnerability assessment is needed to analyze different aspects of complex ecological and social systems to intervene and reduce impacts on health. With this purpose, a fuzzy inference system was built including exposure, sensitivity, non-climatic factors and adaptive capacity in a comprehensive model. Data was obtained from primary and secondary sources from multiple sectors and vulnerability was estimated in 42 municipalities in the Cauca river geographical valley at South Western Colombia finding mostly high (69%) and medium (31%) levels of vulnerability. In particular this result is consequence of high exposure to extreme weather events (87%), medium level of sensitivity (59%), and average levels of adaptation capacity (89%) and non-climatic factors (78%). The processing system allowed to handle the imprecision and uncertainty associated with climate change in the case of dengue. However, given that vulnerability is changing over time, constant evaluation is required for building sound adaptation strategies that take into account local and global influences and consider conditions of local development.
Epidemiology and Laboratory Collaboration and Information Sharing: One Health Approach

Oanh Kim

Epidemiology and laboratory collaboration between the human health and animal health sectors is a fundamental requirement and basis for an effective One Health response to the challenge of emerging infectious diseases in Viet Nam.

During the past decade, there has been significant investment in laboratory equipment and training as well as support for quality assurance and improved networking, covering both the human and animal health laboratory systems with a focus on both diagnostic and research capacity related to human, livestock and wildlife samples. There has also been extensive investment in enhanced active and passive surveillance systems as well as epidemiological capacity in both the human and animal health sectors over the same period. However, internal and external assessments and evaluations within both sectors indicate the persistence of specific gaps in the implementation of Joint Circular 16 on coordinated prevention and control of zoonotic diseases, information sharing and inter-sectoral collaboration. It is needed for clear, structured and practical guidance as well as strong commitments from Human Health-Animal Health sectors in strengthening epidemiology and laboratory collaboration and information sharing, based on relevant policies and regulations as well as actual practices.
Geo-Surveillance of Viral Hemorrhagic Fevers in Cameroon: Case study of Filoviruses in Bats

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Viral hemorrhagic fevers (VHFs) refer to diseases caused by several groups of viruses which include zoonotic potentials like Ebola and Marburg. Routes of their transmission are variable, and migratory fruit bats are known to be carrier reservoirs. We induced a geo-monitoring system of these bats and evaluated biorisk factors in Cameroon and across international borders. Blood and swap samples were also collected for molecular screening of filoviruses. Our findings indicate that bats in Cameroon are illegally hunted for human consumption with high biorisk of viral spread to human. Age estimate was based on wing measurements. Global Positioning System (GPS) chips were fixed on the neck of some colony-distribution-based bats for geo-monitoring at the national and international transboundary levels using computer software system. This geo-surveillance allowed monitoring of bats movement in the countries with some colonies crossing international borders to Nigeria and Chad. Laboratory screening of 298 sampled bats using 'RealStar Filovirus Screen RT-PCR Kit' indicate total absence of Ebola and Marburg viruses in Cameroon. This eating habit should be corrected to reduce the biorisk. Such study should be conducted yearly in many countries worldwide, taking into account all VHF that can be transmitted by through bats.
Status of One Health Concept in Veterinary Diagnostic and Investigation Laboratories in Ethiopia

Solomon Gebre

The National Animal Health Diagnostic and Investigation Center (NAHDIC) of the Ministry of Livestock and Fisheries of Ethiopia is the referral and reference veterinary laboratory in Ethiopia. It is the center of excellence for animal disease surveillance, investigation, diagnosis and research which contributes substantial role in promoting export of animal and animal products, improvement of the livelihood of the smallholder farmers and pastoralists, provision of professional support for investors involved in animal farming and transfer technology for stakeholders. The implementation of the Quality Management System (QMS) in NAHDIC has brought an important milestone for the centre in the face of regional and international community's being as the Regional Referral Diagnostic Laboratory for avian flu and Newcastle diseases. This will have its own impact on international trade of animals and animal products from Ethiopia. Currently, NAHDIC has implemented ISO/IEC17025:2005 in three laboratories selecting 10 tests as its scope of accreditation from SANAS South Africa, since 2009. There are also 14 other regional veterinary laboratories in the country besides many districts, zonal and regional veterinary service clinics providing animal health services for millions of livestock in the country. Emergency response management for zoonotic disease outbreaks of many livestock diseases often involves several different priorities, including protecting animal and human health, food safety and food availability. Disease control measures including livestock and poultry quarantines and commodity movement restrictions may disrupt local and international market continuity and food security. Although NAHDIC has started working on surveillance of some zoonotic diseases such as Rift Valley Fever (RVF), Highly Pathogenic Avian Influenza (HPAI), tuberculosis, brucellosis etc. as such it has not been working with concept of one health with other relevant human health and environmental protection Institutions. However thanks to Cambridge university of UK for ETCOBOT project on tuberculosis (bovine and human), DTRA/ ECEB for biosafety and biosecurity and CDC for Brucellosis (human and animal) projects the centre has started working in collaboration with stakeholders dealing human health and environmental protection activities. One health concept has already started in the country some years back by some Universities nevertheless it has not rooted yet in veterinary research and diagnostic laboratories. So the coordinated One Health approach by the human and animal health sectors in Ethiopia will improve the management of zoonoses of public health significance, and ensures the different interests of each sector.
Sero-Prevalence of Bovine and Human Brucellosis on Selected Farms in South-western Uganda

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Brucellosis is among the zoonotic diseases that continue to afflict man and animals in Uganda. The increase in the number of Brucellosis outbreaks in animals from 1990 to 2013 and the numbers of human patients diagnosed with brucellosis in private clinics and hospitals has placed Brucellosis to be among the top re-emerging diseases in the country.

Brucellosis infection in humans is non-specific and caused by direct or indirect contact with infected animals or their products. Brucellosis manifests as intermittent fever, headache, weakness, profuse sweating, chills, weight loss, generalized aching that may involve multiple organ systems in the body. In animals, Brucella organisms localize in the reproductive organs, causing abortions, decreased milk yields and temporary sterility. Its effects impact negatively to the sale value of the affected animals causing financial losses to the animal owners.

Brucellosis was investigated in three districts of south Western Uganda by the staff of the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) in May and June, 2015 under the sponsorship of the United States Department of State Biosecurity Engagement Programme (BEP).

Brucellosis test results from a total of 1503 cattle showed a sero-prevalence of 14% in Kiruhura, 18% Bushenyi and 23% Mbarara districts respectively. ELISA-positive Brucella cases from farm attendants on the sampled farms in the same districts had a prevalence of 4% in Kiruhura, 9% in Bushenyi and 12% in Mbarara.

This underscores Brucella exposure as one of the major re-emerging diseases that should be treated with great concern by both Ministry of Health and MAAIF. Based on our results, we believe that the Ministry of Health and Agriculture should increase on community sensitization on the risk of Brucella infections in humans from cattle, and promote measures that can protect high risk families from getting infected.

This survey indicates that Brucellosis infections are still prevalent in Uganda and continue to occur in the local communities. The public health and animal health service providers need to work together in compiling the disease epidemiological data for a concerted disease intervention measures.
Converting One Health Principles into Practical Action

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An integrated education into action program based on One Health principles is building capacity to manage emerging diseases in nine Asian countries: Afghanistan, Bangladesh, Bhutan, China, India, Mongolia, Nepal, Pakistan, Sri Lanka, funded by the European Union. Massey University provides One Health Master's degree education in epidemiological investigation, disease control and health risk management for public health professionals, veterinarians and wildlife specialists through blended distance and in-person teaching. The Master's is integrated within a One Health Fellowship jointly managed by national epidemiology centres and Massey University; Fellows work with national institutions to conduct epidemiological investigations and evaluate control policies for priority zoonotic diseases in their country. Collaboration with senior decision makers and technical advisors in government institutions integrates the program with government priorities and strengthens capacity for formulating evidence-based zoonotic disease control policies. Software tools facilitate policy evaluation using a One Health approach, providing a user-friendly framework for comparing multiple control policies for humans and animals including structured economic analyses (HandEcon), and supporting spatial modelling of surveillance and/or control policy options for selected diseases (HandiSpread). Fellows also develop scenario-based One Health training programs and materials for investigating emerging diseases customised for university students and field personnel in their countries.
Achieving Effective National and Regional Involvement in the Application of a One Health Strategy for Zoonotic Diseases

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Participatory engagement with key government, non-government and research institutions working on detection and management of emerging and endemic zoonotic diseases, and with universities educating future public health, animal and wildlife health professionals, is a critical success factor for One Health epidemiology capacity-building programs implemented by Massey University in South Asia, funded by European Union. Central to this is establishment of a collaborative framework and engagement of host organisations from both the human health and the animal health sectors in each country to partner with Massey University in the design and implementation of in-country and regional activities structured into a 2-year One Health Epidemiology Fellowship Program. This arrangement provides a strong and supportive in-country base for program participants, creates opportunities to strengthen host and collaborating organisations' capacity through involvement in program design and delivery, and strengthens collaborative One Health relationships within and between countries. Collaboration on applied epidemiology, policy evaluation and train-the-trainer components of the program between the host organisations, government institutions and universities stimulates multidisciplinary and inter-sectoral engagement. Agile design allows programs to be customised to suit institutional arrangements and capacity-building needs in each country, with coordination managed nationally by the host organisations and regionally by a Regional Program Coordinator.
A Template for Development of One Health National Control Policies for High Priority Zoonotic Diseases in Bhutan

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A structured approach using detailed information gathering, evaluation and reporting templates has been developed for providing advice to government on policies for controlling zoonotic diseases, using scrub typhus and rabies in Bhutan as examples, funded by European Union. A situation assessment was used to populate a preliminary policy options paper, and an initial economic analysis comparing the options chosen conducted. This process identified issues which required further field epidemiological investigation. Scrub typhus is an emerging disease in Bhutan, so a case-control study was conducted in 18 health centres to identify risk factors for incident cases, and determine their spatial distribution. A study of rodents was also conducted to gather evidence about possible reservoir hosts. In contrast, rabies has only been reported adjacent to the border with India, but post-exposure prophylaxis (PEP) is used far more widely. Knowledge, attitudes and practices related to PEP use in high and low risk areas of the country were compared to assess targeting accuracy and compliance with the national policy on its use. Situation assessment and field investigation evidence was then incorporated into a standardised economic analysis procedure (HandEcon) and outputs were incorporated into a policy options paper for the government following a systematic process.
Experience of Incorporating Collaborative Field Epidemiological Studies into a One Health Policy Development Process for Zoonotic Diseases in Bangladesh

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Situation assessment and economic evaluation of policy options for controlling Nipah encephalitis and potential introduction of a new highly pathogenic avian influenza virus (AIV) in Bangladesh using a One Health approach identified key gaps in available epidemiological information. Given drinking raw date-palm sap contaminated by bats is a risk factor for Nipah encephalitis, 326 date-palm sap collectors and 50 consumers were interviewed and sap collection, processing, marketing and consumption practices were compared between areas where Nipah cases had and had not occurred. Results provided insights into significant factors influencing risk of disease, enabling subsequent refinement of policy. A second study interviewed >900 poultry producers, product suppliers and agents to characterise contact networks between poultry holdings and biosecurity practices in two areas in which proportions of commercial and backyard poultry holdings differed substantially. Potential transmission pathways and biosecurity-associated risk factors for spread of AIV were identified and used to refine economic evaluation of policy options for AIV control. In addition to providing useful epidemiological information for policy design and evaluation, studies provided participants with valuable experience in designing and implementing epidemiologically valid studies, including practical aspects of budgeting, questionnaire design, data collection and analysis, and problem solving under challenging rural conditions.
A One Health Approach to Developing National Workforce Capability and Capacity for Responding to Emerging Infectious Diseases, and Its Application in South Asia

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In order to increase national capability for responding to emerging infectious diseases, a One Health scenario-based teaching strategy and resources have been developed and tested with participants from the human, animal and wildlife health sectors in four South Asian countries, funded by the European Union. The core of the strategy is a staged description of a novel zoonotic disease outbreak, named Mysteria. Over at least two days, participants are progressively given information about the epidemiology of the disease and associated implications for disease control and management of social and economic impacts. They are taught to use the information to develop an integrated understanding of why the various manifestations in different countries and situations have occurred, and provide guidance to policy makers on actions they should take from local to international levels. Part of the simulation exercise involves a field trip to gather information from livestock owners. Review sessions throughout the simulation help participants develop an integrated understanding of key epidemiological principles and their application. Mysteria has been used in both South and South East Asia, and variant scenarios have now been developed for Afghanistan, Bangladesh, Bhutan and Nepal, to be used for training both field personnel and university students.
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Massey University and partner institutions in South Asia have developed collaborative One Health capacity-building programs training cohorts of medical doctors and veterinarians together in-country, funded by the European Union. Programs combine Master's degree education with strengthening of multi-sectoral collaborative frameworks and practical application of acquired knowledge and skills to epidemiological research, zoonotic disease control policy evaluation, and train-the-trainer activities in a 2-year One Health Fellowship Program. Best outcomes are achieved when components are fully integrated and participants in each country are co-located full-time in a collaborating institution which actively co-creates and coordinates the program, supported by an expert regional coordinator and overarching academic and program directors. The degree program builds in-depth knowledge, strong cross-sectoral relationships and powerful motivation amongst cohorts, which in turn serve as key resources within the collaborative frameworks which expand capacity-building to a wider network of individuals and institutions through applied program components. Regional workshops further expand relationships and knowledge-sharing. Cohorts trained in this way perform very effectively on return to service. This integrated approach builds both individual and institutional capacity, fosters collaboration, develops epidemiological skill, and drives research to generate information about priority diseases nationally and regionally, used to inform policy and government decision making.
Transdisciplinary research

Jonathan Kingsley

Both a strength and challenge of ecosystem approaches to health is its core principle of transdisciplinary research and action. This presentation will briefly explore a community driven qualitative research project with 71 participants to understand the health and wellbeing benefits of Gathering Place models, cultural identity and connection to Country (traditional lands) for Aboriginal Victorian peoples. The presentation will explore the mechanisms employed to ensure this project worked successful across academic disciplines (such as epidemiology, social science and Indigenous health), different communities and government bodies. The second half of the presentation will review a current research undertaken since 2013 to explore the opportunities and challenges to upscale local transdisciplinary research to regional and global action through groups like the Oceania EcoHealth Chapter. These examples provide a platform to explore successful transdisciplinary research from across the globe in this session.
One Health – A Hong Kong Perspective

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1Permanent Secretary for Food and Health

Hong Kong is no stranger to new and emerging infectious diseases, with the first case of humans infected with H5N1 avian influenza (AI) and severe acute respiratory syndrome (SARS) reported respectively in 1997 and 2003. As our awareness of the vulnerability of human health to practices affecting animal and environmental wholesomeness grows, so must we revisit our approach to managing risks. Discrete risk management must give way to an integrated approach. The "One Health" concept has at its core the recognition of the symbiotic relationships among humans, animals and the world in which we dwell. Like other places, Hong Kong embraces a "One Health" approach to tackling zoonotic diseases and safeguarding public health. The last two decades have seen the increasing integration of veterinary with public health expertise in policy making and in tackling food incidents and threats of infectious diseases.

Hong Kong is one of the few jurisdictions where the oversight for both animal and human health is put under one policy roof. Over the years, there have been occasional AI and food safety incidents. We follow up each with a rigorous review of our strategy and operational procedures. No review is complete without the involvement of both veterinary and public health expertise.

Looking back, we have come a long way. Still, our system is far from perfect. Safeguarding humans and animals from zoonotic diseases and reaching the lofty food safety target of "from farm to table" is an uphill task. The real world comprises more than just veterinary and public health personnel. Nor is the veterinary and public health sector an island - its proper functioning relies on many other players. As we globalize exchanges of all sorts, threats to
human and animal health also transcend jurisdictional boundary. International collaboration is not only desirable, it is essential. These put the "One Health" concept in an even broader perspective. The concomitant diversity of perceptions, interests, values and cultures is what we must grapple with. With illustrations drawn from our experience in handling a number of food safety and infectious disease incidents, Hong Kong would like to share our reflections on the practice of "One Health" that must encompass, but also go well beyond, our local veterinary and public health sector.
Challenges and Opportunities in Developing One Health Approaches to Studying Zoonotic Diseases – Experiences in South Africa

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Old and new zoonotic pathogens continue to emerge, many of which pose significant challenges to animal and human health communities. In the last few decades majority of emerging and remerging pathogens of epidemic prone potential originated from a zoonotic source. Development of sustained and effective prevention, detection and control strategies for these pathogens requires a One Health approach. This presentation will share the knowledge and results obtained after implementation of a One Health programme focusing on zoonotic viruses in bats in South Africa. Bats host a suite of viruses with severe public health consequences including SARS-like and MERS coronaviruses, Marburg, Ebola, Hendra, Nipah as well as rabies and rabies related lyssaviruses. Factors such as the availability of food resources, co-infecting parasites, age, reproductive status, migration and population density have all been demonstrated to increase or decrease the risk of viral infections within bat populations. Longitudinal surveillance on cave dwelling bats, measuring the presence of rabies related and filovirus antibodies over time, indicated cyclic fluctuation with marked increases shortly after the parturition period. We identified several viruses that are being shed into the environment, potentially infecting other species. This information together with our understanding of bat-human interactions is used to formulate feasible public health recommendations to prevent spill-over infections to humans and other animals.
National Incursion Management Standard: The potential to adapt the HACCP model to manage incursions in Australia

Michelle Christy

Invasive Animals CRC National Incursion Response Facilitator

Incursion prevention is considered the cornerstone of invasive species management, but design and delivery of integrated approaches to managing invasion vectors are typically difficult. This is because pathways for introductions are not always obvious or easy to control. Pathways can be diverse and dynamic, and have enormous taxonomic and/or geographic variability. Understanding incursion pathways is critical to improve policy actions, guide integrated management strategies, and enhance educational campaigns aimed at reducing the threat of future invasions.

To reduce the risks posed by new and emerging vertebrate pests, Australia's government agencies are progressively improving the national approach to incursion prevention and response. As part of that approach, a national planning process that uses self-assessment and initial response with government oversight to evaluate and manage risks associated with vertebrate incursions, is being investigated.

A conceptual framework for an innovative, adaptable, and systematic approach to national incursion management based on the Hazard Analysis and Critical Control Point (HACCP) planning process is presented. The HACCP model for invasive species management has successfully been applied overseas and there is potential for adoption in Australia for both new incursions, and movement into new areas of species already established in the country. Examples are used to illustrate how the process fosters partnerships and cost sharing between industry and government and can be applied at any level, from national to site-specific.
Will countries fighting Antimicrobial Resistant (AMR) bacteria in food nationally continue to allow import of food with AMR problems?

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AMR bacteria in animals represent a significant problem for human health. Although some AMR bacteria reach humans through contact the overwhelming majority reach humans through food, thus this is a significant One Health food safety problem. A recent US Presidential report states that AMR is developing at an alarming rate and UK Government estimates that, if left unchecked, AMR will kill 10 million people annually from 2050. The recent UN General Assembly agreed a resolution about AMR in September 2016.

Certain specific policies to reduce the use of antimicrobials in animals, and thereby reduce the level of AMR bacteria have been put in place both nationally and internationally. EU (still 28) has banned all use of antimicrobial growth promotors in animals (which constitutes 60% of all antimicrobial use). To remove economic incentives some governments have legislated to reduce veterinarian profit from antimicrobial sales, and other have reduced animal use of antimicrobials through mandatory reduction.

It is likely that a national reduction in AMR prevalence will lead to trade limitations, as enabled by existing WTO/SPS rules. Such types of limitations are already in use to limit Salmonella in food import.

The paper will describe the experience in this area and discuss such potential trade action relative to future AMR One Health policies.
Roles and responsibilities of different stakeholders in combatting Antimicrobial Resistance

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From 2008 on, the Dutch policy for a substantial reduction and a more responsible use of antibiotics in the livestock industry was drafted as a reaction to the persistent high level of antibiotic use in the livestock sector and public concerns about the risk of antimicrobial resistance.

The policy was set up as a public-private partnership. Stakeholders in the major livestock production sectors - pigs, broilers, veal and cattle - together with the Royal Netherlands Veterinary Association (KNMvD) took responsibility for effective measures, facilitated and supervised herein by the national government. Key elements in the approach, which was strongly linked to the production chain quality systems, were:

- Transparency of antibiotic use per herd and per veterinarian.
- Improvement of herd health with clear responsibilities for farmer and veterinarian
- Reduction targets for livestock production as a whole: -20% in 2011 and -50% in 2013 and -70% in 2015 with reference to the amount of effective substance sold in 2009.

The recommendations of the Health Council of the Netherlands on "Antibiotics in food animal production and resistant bacteria in humans"\(^[1]\) became the cornerstone of the Dutch policy. With this, human healthcare risks became pivotal for Dutch antibiotics policy in livestock production.

The farmers stakeholders took their responsibilities in their private quality systems whereas the KNMvD developed professional guidelines and veterinary medication guidelines with first, second and third choice antibiotics. This public-private policy has been a success. The sales of
veterinary antimicrobials in the Netherlands dropped by more than 58% in 2015 compared to 2009. Hardly any critically important antimicrobials are used in the main livestock sectors. As a result of the reduction antibiotic resistance levels diminished[2].

The policy for the period 2016 - 2020 is based on the principle of prevention is better than cure. Each major livestock sector will analyse the elements which may contribute to low or high use and measures will be more sector specific. Furthermore sector specific benchmarks will be established, reflecting prudent use of antimicrobials. Dutch government maintains the goal of 70% reduction of antimicrobial use with reference to the year 2009.


EcoHealth: Actionism, enterprise, social, cultural economies for sustainable life!

Anne Poelina

Madjulla Incorporated

Today's economy is built on the foundation of global industrial and financial systems with immense productive capacity, but the extractive nature of this has created extreme income disparity and social injustice and wrought devastation on people, communities and nature.

EcoHealth must be grounded in Climate Reality and the need to transition from Fossil Fuels to maintain the wellbeing and sovereignty of our Australian nations' peoples, land, water, food security. My actionism is based on protecting human and environmental rights as complementary rights. We need regional approaches to development (collective wisdom) traditional ecological knowledge, western science and industry partnerships to build "forever" industries and sustainable life.
Transport networks and the spread of pests and pathogens

Dean Paini

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The spread of invasive species continues to provide significant challenges to researchers and those government biosecurity agencies charged with protecting a country's borders. In an increasingly connected world, these invasive species are potentially able to spread further and more rapidly. Transport networks such as the global shipping network or tourist movement networks represent just two examples of networks that can facilitate the human mediated spread of invasive species and pathogens. I will discuss some of the work I am or have been involved in, which examines and models transport networks. Examples of this work includes modelling the spread of invasive species via shipping containers, development of a real time tool for analysing ships arriving into Australia for their risk of carrying Asian gypsy moth eggs, informal trade networks in SE Asia, and tourist movement networks in New Zealand, as well as a global analysis of the threat from crop pests and pathogens.
Predicting risks to a healthy world - What can we learn from Ebola, MERS and the other emerging disease?

Ab Osterhaus

Artemis One Health, Utrecht, The Netherlands, RIZ

Complex relationships between humans and animals have created an interface that allowed cross-species transmission, emergence and eventual evolution of a plethora of human pathogens. Until 1900, infectious diseases were the major cause of mortality of humankind, causing an estimated fifty percent of all deaths. In the western world, this decreased to only a few percent, due to the implementation of public health measures and the introduction of vaccines and antimicrobial compounds. This prompted policymakers and scientists to speculate that soon human infectious diseases would be brought under control. Paradoxically, soon thereafter the world was confronted with an ever-increasing number of (re-)emerging infectious diseases, like AIDS, Avian flu, SARS, MERS, Ebola, and Zika spilling over from animal reservoirs. A complex mix of predisposing factors in our globalizing world, linked to major changes in our societal environment and global ecology, collectively created opportunities for viruses and other pathogens to infect and adapt to new animal and/or human hosts. This paved the way for the unprecedented spread of infections in humans and animals with dramatic consequences for public and animal health, animal welfare, food supply, economies, and biodiversity. It is important to realize that due to the complex and largely interactive nature of the predisposing factors, it is virtually impossible to predict what the next pathogen threat will be, from where it will come and when it will strike. However better understanding of the underlying processes may eventually lead to predictions that would improve our preparedness for outbreaks in humans and animals. Investment in a better understanding the human-animal interface will therefore offer a future head start in the never-ending battle against infectious diseases of humans. Importantly, the increased emergence of viral infections is largely paralleled by medical, veterinary, technological, and scientific progress, continuously spurred by our never-ending combat against pathogens. Especially the establishment of vaccine
development platforms, widely applicable to both known and unknown viruses will further contribute to an R&D based response preparedness.
Health emergencies and other disasters: integrated approach to saving lives and livelihoods

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Recent infectious disease epidemics, such Ebola virus in West Africa, Highly-Pathogenic Avian Influenzas, and Zika, demonstrate the major health and economic and social impacts of disease disasters. Other types of disasters such as natural and human-induced may similarly increase vulnerability to health emergencies resulting in negative health impact (e.g. cholera, famine, and chemical exposures). These disasters often disproportionately affect socio-economically-disadvantaged populations and vulnerable groups.

With the frequency and severity of natural and biological disasters increasing, the Sendai Framework for Disaster Risk Reduction 2015-2030 was agreed by Member States and centers on four priority actions: 1) Understanding disaster risk, 2) Strengthening disaster risk governance to manage risk, 3) Investing in disaster risk reduction for resilience, and 4) Enhancing disaster preparedness and building back better.

A One Health lens is a critical component for achieving disaster risk reduction goals and targets, with key applications including risk-based assessment and planning, managing hazard exposures, early warning systems, and cooperation among sectors and stakeholders. By taking a multi-hazards, cross-sectoral approach and working toward risk reduction and prevention through upstream and integrated methods, the Sendai Framework for Disaster Risk Reduction is bridging Sustainable Development Goals for systems that promote health through resilient health sector, resilient cities, and sustainable natural resources, among others.

National and local Disaster Risk Management Platforms provide a model for collective leadership, informed decision making, and coordination of efforts. They also foster exchange of experiences and expertise and enhance collaboration.
Open data platforms such as the DesInventar database could be used to more fully capture the trends, impact and costs of health emergencies in relation to other disasters and show their impact on livelihoods, agriculture and food security, healthcare and other critical infrastructure to identify solutions for preventing and mitigating disaster risks toward a safer world.
The detection of mcr-1 gene and antimicrobial resistance of E. coli isolated from pigs in Thailand

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MCR-1 is a plasmid-mediated polymyxin resistance mechanism. It was recently reported that the E. coli carried mcr-1 gene caused dramatic increase of colistin resistance in pigs. Since polymyxin is the last group of antibiotic used to treat pan-drug-resistance gram-negative bacteria, urgent study on mcr-1 gene in E. coli is needed. During 2013 to 2015, ninety two isolates of E.coli from pig samples from 18 provinces in Thailand were retrospectively studied for antimicrobial resistance profiles and detection of mcr-1 gene, while colistin was generally used for pig medication. Origins of the isolates were variation, most of the E. coli were collected from respiratory organs (43.47%). Eleven antimicrobial agents including colistin were tested for their minimum inhibitory concentration using broth micro-dilution assay. The resistance rates were relatively high in all antimicrobial groups. The percentage of resistance to ampicillin and tetracycline were 100. For cephalosporin group, the isolates were resistant to ceftazidime at 92.39% and 72.83% for cefotaxime. For quinolone group, those isolates were resistant to nalidixic acid, enrofloxacin and ciprofloxacin at 70.65%, 67.39% and 52.17%, respectively. The isolates were resistant to sulfamethoxazole/trimethoprim, chloramphenicol, gentamicin and colistin at 85.87%, 85.87%, 76.09%, and 92.39%, respectively. Furthermore, investigation of mcr-1 gene that located in plasmid and could encode colistin resistance was performed by PCR. Twenty seven isolates of E. coli (29.35%) gave positive result and all of them were both resistant to colistin and were multiple drug resistant (MDR). It was concluded that E. coli isolated from pig farms in Thailand that carried mcr-1 gene were highly resistant to colistin. This information supports the Department of Livestock Development policy to reduce the use of colistin in livestock.
The Ocean, People and Ecosystem Health: Challenges and solutions in a changing world.

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One of the most distinguishing feature of our planet is the fact that 71% of its surface is covered by warm liquid ocean. This ocean has nurtured life's origins and is critical to its future. For humans, the ocean is essential, with the annual economic value of the Ocean to humanity being recently valued at $2.4 true dollars per annum, a vastly minimum value given this does not include important intangibles such as the environmental contributions such as to health, culture, climate stability and many other aspects. Even without these, the ocean would be the seventh largest economy if it were a nation. Unfortunately, major challenges face the ocean's health. Pollution and overexploitation of degraded coastlines and the destruction of fisheries, 90% of which are either fully exploited or are in serious decline. At the same time, ocean warming and acidification are occurring at rates that are unrivalled by anything seen in tens millions of years. The good news is, however, that there is still time to turn these global problems around. I will finish by discussing how we can meet these challenges through mechanisms such as the recently activated Paris Climate Agreement and the global agenda being set by the UN Sustainable Development Goals.
Predicting the next pandemic of infectious disease in humans has become a major topic in biomedical science, generating huge amounts of research income particularly in the United States. But how accurate are such predictions? Can we ever successfully predict what pathogens will emerge? I will address this key issue in three ways. First, I will first show how genomics has provided new information on the origin, emergence and spread of recent viral epidemics in humans and how this may aid predictability. To achieve this I will focus most on the 2013-2016 outbreak of Ebola in West Africa, arguably the most densely sampled virus epidemic in human history, and one that provides powerful insights into the patterns and processes of disease emergence. Second, I show how new comparative techniques allow inferences on some of the key generalities of virus emergence, particularly why some types of virus are intrinsically more likely to emerge in humans than others. Finally, I will show how ongoing surveys of virus biodiversity are providing a radically different view of the virosphere and the types of viruses that might be able to jump species boundaries and cause disease.
High prevalence of avian influenza virus in an isolated island population: Evidence for widespread viral reassortment in Australian wild birds?

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Historical surveillance of Australian wild birds suggests that the prevalence of Influenza A virus may be substantially lower than other regions of the globe. Moreover, although broadly part of Eurasian clade, Australian lineages of avian influenza viruses (AIV) are thought to be phylogenetically distinct, suggesting that endemic viruses circulate within the continent, with occasional introductions of viruses from other regions. Ruddy turnstones are known hosts for AIV, and several populations overwinter in SE Australia before returning to their breeding grounds in the Russian Arctic. The majority of these populations show very low levels of AIV prevalence; however, we found prevalence levels in line with estimates from the AIV 'hot-spot' of Delaware Bay, USA, in a low-density population of birds overwintering on a small, isolated island in the middle of Bass Straight. This epizootic was comprised of three distinct strains of AIV, each of which comprised a unique assortment of Australian, recently introduced Eurasian, and recently introduced American lineage gene segments. Strikingly, the Australian-lineage gene segments were all derived from strains isolated in 2010 and 2012, during outbreaks of H10N7 AIV in poultry that occurred 1000-1600km to the north. These results indicate the potential for rapid reassortment of gene segments within Australian wild birds, involving serial transmission over vast distances, and potentially suggest a higher incidence of AIV than has been detected by historical surveillance programs.
Many people now spend very little time making meals. The fast food industry is changing our food culture, and it is having an alarming impact on our health. Rates of obesity, heart disease, and diabetes are growing. The slow food movement is a reaction to a fast food lifestyle predominant in many modern cultures. In essence the slow food movement is about telling food's story and connecting the consumer to that person, place and process of how their food was produced. Slow Food is a global, grassroots organization, founded in 1989 to prevent disappearance of local food cultures and traditions, counteract the rise of fast life and combat people's dwindling interest in the food they eat, where it comes from and how our food choices affect the world around us. Since its beginnings, Slow Food has grown into a global movement involving millions of people, in over 160 countries. Each of Slow Food's 100,000 members around the world are part of a convivium - a local chapter - that brings the Slow Food philosophy to life through the events and activities they organize in their communities: From simple shared meals and tastings, to visits to local producers and farms, conferences and discussions, film screenings/festivals, taste education courses for children and adults, promoting farmers' markets or supporting local and international campaigns. Today there are more than 1,300 convivia around the world. Although a potential market for slow food products in the world, little is known about slow food movements. The purpose of this paper is to provide information about the Earth Markets in Turkey as a part of the Slow Food Movement.
Connecting Science and Policy in a drifting societal context

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One of the core tasks of governments is to protect society against risks. Policymakers and politicians have to deal continuously with voluntary and involuntary risks and incidents that threaten society. Science has a crucial role in risk analysis, risk management and balanced decision making. However, there is an increasing divergence in the results of scientific research and the public willingness to accept these results in policy making. Society may reject scientific results that politicians use as input and policymakers need to take societal opinions into account.

One of the reasons of this divergence may be the fact that the general public is mostly indirectly exposed to science through online and mass media. These mediated realities have a great influence on the public debate and therewith the policy making or implementation of policies. Disseminating scientific evidence into policy is getting increasingly complicated.

An example is the low vaccination coverage in the first human papilloma virus vaccination campaign in the Netherlands in 2011. The vaccination debate in society was very much focussed on ethical, moral and political issues instead of on scientific issues whereas the communication campaign relied mostly the latter. Social and other online media, which have the power to reach millions within a matter of hours, also influenced the public opinion enormously. The results of this campaign showed that the slower traditional communication of scientific information was not sufficiently effective in current society and that policymakers were not sufficiently prepared for a differentiated communication strategy for the different groups (parents, girls, medical doctors etc.).
Science as well as policy and politicians should communicate to different groups in an accessible way that opens dialogues and establishes connections. Next to the traditional communication methods the usage of new communication methods is essential but the right framing of the message may even be more important. Framing a message is presenting the message in such a way that it significantly impacts the targeted audience and it also helps the audience understanding the message. Framing is therefore an integral part of good communication. It is a challenge for science and policy to find the right frames for different messages and different target audiences regardless of their backgrounds in science or policy. This will lead to a better agenda building taking science and societal context into account.
Field response to Ebola outbreaks influenced the development of vaccines and therapeutics

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Research Centre in Infectious Diseases, University Laval

Infections caused by viral hemorrhagic fever viruses (VHFs) such as Ebola virus are of relative low impact on global public health. However, these outbreaks can be devastating for the socio-economical environment of affected communities. The World Health Organization is coordinating outbreak responses from international partners to optimize infection control and minimise the overall impact on affected populations. Substantial challenges have to be addressed when responding to highly virulent infectious agents such as Ebola virus including safe and efficient management of field laboratories when performing real-time diagnostic. Interestingly, these activities generate practical knowledge and hypotheses important to better understand the normal ecology of Ebola and what pathways are used for natural zoonotic transmission. In return, this knowledge and hypotheses offer a solid basis onto which preventive and therapeutic measures can be developed. This presentation will review and discuss related aspects and expectations on the way forward.
The Ecology of MERS-CoV: From Host Reservoir to Disease

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In 2012 a novel coronavirus associated with severe respiratory disease in humans emerged in the Middle East. To date, over 1800 cases of MERS-CoV have been reported, with an approximate case fatality rate of 35%. Circulation of MERS-CoV-like viruses has been identified in various bat species. However, epidemiological investigations identified dromedary camels as the likely source of MERS-CoV zoonotic transmission. Neutralizing antibodies, viral RNA and infectious virus have been detected in dromedary camels throughout the Middle East and Africa. Zoonotic and human-to-human transmission occurs relatively frequently. Human-to-human transmission occurs predominantly in hospital settings. No prophylactic and therapeutic countermeasures against MERS-CoV in humans are currently available. Several vaccine development programs for MERS-CoV are currently underway, including vectored and classical subunit approaches. A potentially promising way to minimize the public health impact of MERS-CoV is to prevent transmission from dromedary camels to humans. Here we present data on the ecology of MERS-CoV in relationship to the ancestral and current host reservoir, transmission, disease in humans and the development of countermeasures.
Nutritional ecology and human health

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¹The Charles Perkins Centre and School of Life and Environmental Sciences, University of Sydney

Despite a huge amount of research effort, many important nutrition-related problems remain unsolved. No country, for example, has reversed the rise of obesity, and globally diabetes and cardiovascular disease are on the rise. This suggests that new approaches are needed in the way we think about nutrition and structure nutrition research, dietary advice and nutrition policy. In this talk I will present a framework from nutritional ecology, called nutritional geometry, which provides a systems approach for unravelling the complex web of causes in human nutrition systems. I will show, using obesity as an example, how nutritional geometry can provide new insights and point the way towards better solutions.
Taking care in the garden: risk factors for Legionnaires' disease caused by Legionella longbeachae

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Background. New Zealand has the highest incidence of reported Legionnaires' disease worldwide. About two thirds of these cases are caused by Legionella longbeachae, a globally underdiagnosed cause of Legionnaires' disease. Unlike other Legionella species, which are associated with water, L. longbeachae is found in soil and compost-derived products.

Methods. We conducted a case-control study in Canterbury, New Zealand to assess risk factors for L. longbeachae disease. Cases were people hospitalized with L. longbeachae pneumonia and controls were randomly sampled from the electoral roll. The questionnaire asked about exposure to soil, compost and potting mix in the three weeks prior to onset of symptoms or interview. Multilevel mixed-effects logistic regression was undertaken to estimate the effect of health and gardening-related risk factors.

Results. Among 31 cases and 172 controls, important risk factors for L. longbeachae disease were chronic obstructive pulmonary disease (COPD) (OR 4.2; 95%CI 1.2, 14.7), having smoked for ≥10 years (2.8; 1.2, 6.3), and exposure to compost or potting mix (OR 6.2; 2.2, 17.3). Gardening behaviours associated with L. longbeachae disease included having unwashed hands near the face after using compost or potting mix (4.8; 2.1, 11.1), and tipping or trowelling compost or potting mix (8.3; 3.2, 21.5). Mask- or glove-use were not protective among people exposed to compost-derived products in this study.
**Conclusions.** This study suggests that general precautions against inhaling compost and attention to hand hygiene may be effective actions to prevent *L. longbeachae* disease. Long-term smokers and those with COPD should be particularly careful.
How does infection alter animal migration? A meta-analysis across experimental and observational studies

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Migratory animals are widely assumed to play an important role in the long-distance dispersal of pathogens, and are frequently implicated in the global spread of high-profile zoonotic pathogens such as avian influenza, West Nile and Ebola viruses. However, pathogen infection imposes physiological constraints on hosts that, when combined with the energetic demands of migration, may lead to the isolation of infected hosts ('migratory separation') or their mortality ('migratory culling'), thereby curtailing transmission. The extent to which pathogen infection impacts body stores and refuelling rates of migratory hosts, and how these carry over to changes in movements, migratory timing and survival remain decidedly unclear, but is critical to determining the capacity of migrants to act as long-distance vectors for pathogens. In this study we compile effect sizes from the available literature in order to quantify infection-induced changes to body stores, refuelling rates, movement capacity, migratory timing, and survival in migratory hosts. Overall, our results signify a trend for infected migrants to restrict large movements and maintain body stores until infection has subsided, moderating the long term effects of infection on phenology and survival, and potentially limiting the capacity of migrants to transmit pathogens over long distances.
The case for a One Health approach to managing Australia’s most common mosquito-borne disease

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In the 50 years since the zoonotic Ross River virus (RRV) was first isolated from Australian Aedes mosquitoes a substantial body of work has accumulated, defining virus-, vector-, host-, environmental- and human-related predictors of RRV activity and risk of human disease. The versatility and complex ecology of RRV is a key theme arising from this research, and in turn poses new questions and challenges about how to (and even whether to) manage human and domestic animal (horses in particular) exposure to this virus. The major vertebrate hosts of RRV are marsupials, especially macropods, and the virus is vectored by a number of major rural pest mosquito species and most likely several less common species in specific habitats. Prospects for managing such a ubiquitous and diverse mosquito fauna to an extent that would prevent virus transmission are low. Instead, to achieve outbreak management and long-term reductions in the risk of RRV disease, we need an integrated One Health approach. This should involve: (i) surveillance and management of vectors; (ii) use of risk communication based on the breeding conditions of vertebrate hosts; and the impact of introduction of new non-immune amplifying hosts into the ecology; (iii) impacts of extreme and changing weather conditions, land-use and urban planning; and (iv) the influence of other human activities such as water management practices on vector, host and human interactions. Thus integration of public health, environmental health, and wildlife ecology are essential components in achieving this.
Pierre Horwitz

Centre for Ecosystem Management, Edith Cowan University

Water, its quality and quantity, where and when it occurs, and how we access it, determines much about our place. To emphasize its importance our languages are replete with watery metaphors. The ecological character of wetlands has both direct and indirect, positive and negative consequences for the health of local populations. The way we organize and manage our ecosystems, in this case wetlands, is a central consideration for sustainability and health. Even though Water (and sanitation) has its own Sustainable Development Goal, it is embedded in most if not all of the other SDGs, including a profound link to Climate Change. This short presentation argues that these connections demand a fresh approach to cross-sectoral governance, and a clear-minded review of the way we address attitudes and behaviours to water.
Applying economics to a One Health approach

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The paper will explore the need for economic considerations within a One Health approach to include issues that extend beyond costs and benefits of infectious disease, encompassing non-communicable disease and wider environmental impacts. It will present an overview of the burdens of disease and health problems across species groups, questioning whether the current use of the DALY as a measure of burden is adequate, and discussing the need to update this with information from the wider species affected and the need for net rather gross measures of impact. Costs of surveillance, prevention and control will also be explored with a need to identify critical capital costs that require public and private coordination in order to optimize societal benefits. Finally the paper will reflect on whether current systems used to value human life, domesticated animals, wildlife and environmental goods are adequate in presenting a case for One Health.
Our group is examining the potential use of inherited bacterial symbionts of insects known as *Wolbachia* as a novel method to interfere with *Aedes aegypti* associated viruses. This work has now progressed from basic bench studies into open field trials in five countries. I will give an overview of *Wolbachia*-mosquitio-pathogen interactions as well as the current status of the global Eliminate Dengue Program that aims to deploy *Wolbachia* infections as a cost effective and sustainable approach to control *Aedes aegypti* associated viruses.
Integrating epidemiological and human behavioural research for the development of effective animal health interventions

Dirk Pfeiffer¹
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The complexity of eco-social systems needs to be recognised when designing animal health interventions, with the social aspects being given more recognition than has been the case in the past. Ultimately, with most infectious diseases in animals and humans it is the behaviour of humans that needs to be modified to reduce the risk of pathogen spread within animal and human populations. For animal populations, trade in live animals plays a key role in infectious disease spread, and even more importantly in eco-social systems with important live poultry trade linking producers with consumers through various other actors along the value chain. Research targeting such complex systems involving an important social dimension requires a combination of qualitative and quantitative approaches to be able to come up with meaningful inferences about the key mechanisms influencing system dynamics. This approach will be presented using examples from studying live poultry trade systems in Bangladesh and their role in avian influenza spread. The inferences from research will inform policy development in the country, and can be used to inform research efforts in other countries in South, South-East and East Asia will similar poultry production systems.
The Gap in Closing the Gap: Aboriginal and Torres Strait Islander food and nutrition – the consequences of invasion

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In this presentation the social ecological context of Aboriginal and Torres Strait Islander health will be described and discussed, with a specific focus on food and nutrition. Dietary intake is the leading preventable risk factor for poor health in Australia. Prior to invasion Aboriginal and Torres Strait Islander communities were culturally rich, and possessed good health and strong social cohesion. This was disrupted within a generation and the social and health consequences of the colonisation process are still being played out. The destructive impact on the landscape of introduced animals such as cattle and British farming methods was immediate. People's exposure to previously unknown diseases, removal from traditional lands, life and culture, dependence on the British for every aspect of life including food was devastating. The 'nutrition transition' which occurred will be described, and the health consequences (including a heavy burden of non-communicable diseases) explored. Food and nutrition challenges for Aboriginal and Torres Strait Islander communities will be identified within the context of Australia's current 'obesegenic' and policy environment. Suggestions to address manage these challenges will be presented. This key risk factor for poor health among Aboriginal and Torres Strait Islander peoples has fallen off the policy agenda, and a targeted national response is well overdue.
Evidence based practice for Ecohealth: what might this look like?

Ruth Garside

University of Exeter

We urgently need to make the right decisions about how to direct effort and resources towards activities that benefit the environment and human wellbeing. Ensuring that new interventions are based on what is known to work, and are robustly evaluated is no mean task. There is also an increasing awareness that top-down interventions are ineffective and may be harmful, and that community involvement and co-production strategies may be vital. Conversely, a wealth of data is being generated and analysed which is not necessarily brought together to share learning across different projects. This presentation will suggest approaches for evidence based Ecohealth - that brings together best available evidence with community experience and preferences and the input of organisations and practitioners in the field. It considers the role of systemic review and evidence synthesis, evidence mapping and the Collaboration for Environmental Evidence.
How can we achieve successful One Health outcomes through One Health education, training and capacity building?

Joanna McKenzie
Peter Jolly

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Investing in people through One Health (OH) education, training and capacity building is fundamental to growing a workforce and communities with the relationships, knowledge and skills to collaborate using interdisciplinary and transdisciplinary approaches to manage complex health problems involving people, animals and their environments. OH education provides an effective foundation for collaborations between people from different disciplines and community sectors, which further training and capacity building can then build on. Integrative curriculum design and learning activities, delivery mode and mix of trainers and participants are key factors that contribute to successful OH outcomes of education, training and capacity building programs. Key OH competencies identified through Southeast Asia OH University Network (management, communication, culture and beliefs, leadership, collaboration and partnership, values and ethics and systems thinking) and customised technical modules provide a useful guide for OH curriculum development. Mobile and web-based technologies can link educators, trainers and participants from different locations around the globe. Participatory learning methods, problem-based learning, scenario-based training and collaborative group work contribute to building relationships and effective learning, both within and between disciplines and sectors. The presentations in these two sessions provide valuable insights into factors that influence the effectiveness of OH education, training and capacity building.
The Global Virome Project

Dennis Carroll

U.S. Agency for International Development’s (USAID)

The frequency of pandemics is increasing, driven by rapid demographic and environmental change and globalized trade and travel. Viruses of animal origin are a particular threat and have caused a series of significant recent outbreaks (e.g. SARS, pandemic influenza, MERS, Ebola and Zika). Recent work suggests only an estimated 1% of viral threats have been identified and fewer have had vaccines or counter measures developed. In the future, we will witness spillover from a pool of more than 500,000 currently unknown viruses into human populations. We need to be better informed about these threats to improve preparedness and reduce response times and associated costs. Here, we discuss the scientific and economic rationale, governance and technical framework for a global initiative to identify and characterize every significant viral threat available for spillover from animal reservoirs. We propose that such a step toward ending the pandemic era is achievable over the next ten years at a cost of less than $3.5 billion, and can be scaled up from current projects in a way that will provide rapid benefits to global health.
The challenges of antimicrobial resistance: A global problem needing a One Health approach

Peter Collignon

The Canberra Hospital, Australian National University

Antibiotic resistance is a continuing and growing problem. Antibiotic resistance causes increased deaths, complications, expenses and prolonged hospital stays. There are not likely to be many new classes of antibiotics becoming available in the next few decades. Resistant bacteria and the DNA encoding resistance spread from and into the environment to food animals, to people and into hospitals and back again.

We need to take a "One Health" perspective to this problem. We need to preserve the usefulness of those antibiotics we currently have by decreasing their overall use in all sectors, and especially the use of broad spectrum agents. We also need to improve our ability to prevent infections and the spread of resistant bacteria wherever they arise or are found. This means improving our practices with infection control, hygiene, animal husbandry. We need safe water supplies and to improve the development and delivery of effective and safe vaccines. Failure to do this will result in huge numbers of people entering a "post-antibiotic era" for too many common infections.

We need the One Health approach to be adopted globally if we want to control and prevent the development and spread of antibiotic resistance. The environment, agriculture, the community and hospitals are all interconnected. We need to have much better controls in all these areas.
Challenges and opportunities for food security and health in rural Africa

Hettie Schönfeldt¹
Beulah Pretorius¹

¹University of Pretoria

About 780 million people, or the vast majority of the hungry, live in the developing regions of the world. Sub-Saharan Africa has the highest prevalence of undernourishment for any region. In 2016, an estimated 23.2% of the population is undernourished and about 220 million people are hungry. Factors such as rising food prices, droughts and political instability in several countries delayed the progress in fighting hunger. Major challenges remained unaddressed, especially in terms of addressing rural region's inadequate hygiene conditions, access to food and quality of diets. These challenges not only illustrate the multifaceted nature of food security, but also suggest that different dimensions require different approaches to successfully improve food security. For instance, making even more energy-dense foods available is unlikely to further improve overall food security. Rather, new measures should focus on the ability of poor people to access balanced and diverse diets and on overall living conditions, to prevent negative health outcomes such as protein-energy malnutrition, micronutrient deficiencies, underweight, wasting and stunting in children often coexisting with obesity and other non-communicable diseases in adults.
Increasing the Impact of One Health and EcoHealth

Simon Reid¹

¹University of Queensland

One Health and EcoHealth are rapidly developing fields of scientific endeavour that are gaining acceptance in many fields of "health" practice. The recent rapid increase in the number of research publications and the emergence of new One Health networks would suggest that the field is beginning to have an impact on the health of humans, animals and ecosystems globally. However, it is concerning to note that a recent review of One Health publications identified significant siloes of activity that suggests a need for greater cross-sectoral collaboration and awareness of the need to approach problems from a systems perspective. This session includes a series of papers that provide case studies that extend existing methodologies into more integrated, collaborative and effective activities. They adoption of integrated assessments for environmental impacts and the use of participatory systems dynamic modelling to better demonstrate the convergence of issues associated with zoonoses. The mid-session presentations provide examples of the use of mobile technologies to address information gaps and surveillance needs in resource poor settings. The final presentations encourage us to consider examples and issues associated with the implementation of One Health approaches within an institutional context.
Wellcome: what does influence mean for a global funder?

Katherine Littler¹

¹Wellcome Trust

Wellcome is an independent, global charitable foundation, dedicated to improving health. This talk will begin by outlining the reasons why Wellcome wants to influence policy development at national and international level, in order to extend the impact of research from publications and into societies. A series of case studies will be presented, which illustrate different approaches used by Wellcome to increase the influence of science in developing policy for current global health priorities (such as public health emergencies, antimicrobial resistance, gene drive technologies, mitochondrial donation and the links between environment and health). Finally, opportunities for the One Health community to foster greater dialogue between researchers and policymakers will be highlighted.
Antimicrobial Resistance: The need for a Global “One Health” Response

Awa Aidara-Kane

World Health Organization (WHO)

Antimicrobial resistance is a growing public health concern that is accelerated by the overuse and misuse of antimicrobial agents in all sectors. The One Health approach, i.e. the collaborative multidisciplinary effort of multiple sectors locally, nationally and globally is therefore the best way to address antimicrobial resistance. Leadership for international collective action is also required to successfully contain AMR. WHO has lead the development and publication in 2015 of the Global Action Plan on Antimicrobial Resistance that provides a much needed blueprint that sets out five key objectives and actions that various actors stakeholders need to undertake over the 5-10 years to combat Antimicrobial Resistance. In 2015 Member countries of the FAO, OIE and WHO adopted resolutions that recognize the importance of developing multisectoral national action plans on antimicrobial resistance using the one health approach. More recently, on 21 September 2016, the United Nations General Assembly adopted a political declaration aimed at combating the global threat posed by AMR and confirmed the need for a "One Health" approach in line with the Global Action Plan. If antimicrobial resistance is not contained in all countries, it will spread to harm public health, healthcare, animal health, livestock production, food safety, poverty, and economies everywhere.
Zoonotic diseases response and research: the cradle of One Health

Linfa Wang

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One health is a concept that was officially adopted by international organizations and scholarly bodies in 1984. Broadly speaking, it combines human, animal, and environmental components to address global health challenges that have an ecological interconnectedness. On the other hand, the concept of zoonosis has been around for a much longer time and it refers to any disease or infection that is naturally transmissible from animals to humans. Animals thus play an essential role in maintaining zoonotic infections in nature. In this opening remark for the session on the "Role of One Health in Zoonotic Diseases", it is appropriate to claim that research of and response to zoonotic diseases is the earliest form of One Health and that the modern One Health research platforms and tools will have a huge impact on future management and prevention of zoonotic diseases.
Henipavirus outbreak in the southern Philippines

Debbie Eagles¹

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This presentation describes the investigation of an outbreak of neurological disease in the southern Philippines in 2014, in which there was high case fatality amongst people and horses. Clinical case presentation, epidemiologic findings and laboratory results indicated that the causative virus was a henipavirus, most likely Nipah virus or a virus closely related to Nipah antigenically and genetically. The outbreak occurred in an area where consumption of horsemeat is customary, and there appeared to be a strong epidemiological link between involvement in the slaughter of horses and human illness. In a small number of cases, clinical and epidemiologic evidence suggested direct human-to-human virus transmission. The presentation will outline the methods and results of the outbreak investigation, including challenges faced.
Multiple antibiotic resistant Escherichia coli ST10 from swine

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Escherichia coli resident in the commensal flora of intensively-farmed, food production animals represent a reservoir for mobile genetic elements that harbor multiple antimicrobial resistance and virulence genes. The composition of these elements however, is not well described. An analysis of the MLST database indicates that E. coli ST10 is a sequence type that is adept at colonizing a wide range of animal species as well as a common extra-intestinal pathogen in humans. As part of the AUSGEM (Australian Centre for Genomic Epidemiological Microbiology) program, we employed a genomic epidemiology approach utilizing next-generation whole genome sequencing technology and in silico bioinformatic analyses to characterise multiple drug resistant (MDR) E. coli from humans and commercial pigs. Our analysis suggests that MDR ST10 carrying diverse antimicrobial resistance and virulence gene content are common in the faecal flora of healthy pigs. Furthermore, MDR ST10 E. coli is increasingly associated with extra-intestinal disease in humans. These observations suggest that E. coli ST10 may be an emerging pathogen with a diverse animal reservoir.
Estimating the burden of food-borne disease

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Human and animal populations share infections, either through direct contact or indirectly through food or environment. Recently, many countries have seen an increase in number of foodborne disease outbreaks as well as number of endemic foodborne disease cases. However, a thorough and scientific estimation of foodborne disease burden has until lately been missing, at national as well as international level. One of the reasons for this has been the lack of efficient collaboration and data-sharing between relevant sectors (primarily agriculture and health). However, methodology for estimating foodborne disease burden has now been developed. Disease burden can be assessed in a standardized manner through the use of 'Disability Adjusted Life Years' (DALYs) enabling objective comparison of different disease complexes. In the area of food borne diseases WHO efforts have over the latest eight years focused on providing the first-ever global estimates of foodborne disease burden, culminating in the release of the full global report in December 2015. The regional application of tools for this type of estimation and comparison will enable prioritization of focused, science-based and coordinated action to efficiently lowering this disease burden. This presentation will describe and discuss the WHO Global estimates of foodborne disease burden.
Rabies

Bernadette Abela-Ridder

In December, 2015, the World Health Organization (WHO), the World Organisation for Animal Health (OIE), the Food and Agriculture Organization of the United Nations (FAO), and the Global Alliance for Rabies Control (GARC) endorsed a global framework to eliminate human deaths from dog-mediated disease by 2030. The decision was reinforced by the OIE in May this year. A business plan by the key organisations to quantify the costs of reaching zero rabies deaths across the world is under development.

This Global Conference on Rabies recognised the important need for a multi-pronged initiative to realise the reduction of the rabies burden, which not only bridges the animal-human interface but mandates a broad and inclusive multi-sectoral program of work as reflected in the five rabies elimination pillars (STOP-R). The target of attaining zero human rabies deaths by 2030 includes mass vaccination of dogs as one of the essential building blocks.

Decades of experience highlighted at the conference, has shown that investment in controlling rabies at its source through dog vaccination, is the pathway to breaking disease transmission. Reaching appropriate levels of dog vaccination (70% coverage) in high enzootic areas is a major public health intervention in addition to improving health and welfare of animals. The joint OIE/WHO mechanism for regional vaccine banks should be promoted and supported to ensure the timely provision of quality vaccines to facilitate the implementation of regional/national programs.

Rabies is most prevalent in rural and underserved communities. Correspondingly, these people and their animals have least access to human and animal health services. Care for dogs is often further neglected as they are not perceived to have the same monetary value as livestock. However, programs which encourage good dog management and promote responsible pet ownership are integral to successful canine and human rabies elimination programmes.
Being a neglected disease, rabies surveillance and global data is rather poor and patchy. With greater program activity, data quality and volume will improve to guide action and measure success.

Rabies elimination is achievable, and will be a great public health accomplishment consistent with the six principles of The Global Vaccine Action Plan (GVAP) - ownership, partnership, equity, integration, sustainability and innovation. The tools are available but success will depend on implementation of the five pillars, and a sustained effort.
One Health - Time to Think Horizontal as well as Vertical

Mark Stevenson

One Health can be defined as collaboration between multiple disciplines to address issues that affect (or are likely to affect) humans, animals and the environment (Grace 2014). To date this concept has been realised through numerous successful collaborations involving the medical and veterinary professions, particularly those related to the management of zoonoses such as rabies, brucellosis and avian influenza. "Ecohealth" is closely aligned to One Health, defined as a systemic, participatory approach to understanding and promoting both health and wellbeing in the context of social and ecological interactions (Zinsstag et al. 2011). A key paradigm common to both One Health and Ecohealth is multidisciplinary problem solving which, in most cases, involves vertical collaboration between health disciplines. While this approach is useful I argue that further opportunities for solving the world's "wicked problems" can be obtained by thinking horizontally (i.e. looking backward and forward in time) as well as vertically. In this context, the idea of looking backward in time is to make a concerted effort to learn from history, identifying reasons for the successes and/or failures of past disease control efforts. To look forward in time promotes a proactive approach to problem solving: essential in the face of global warming, land use change, increases in urbanisation and enhanced human (and animal) mobility. One Health - Ecohealth has been enormously successful. Let's continue that success by re-defining the concept of "One" to cover all directions of the factors influencing human, animal and environmental health. Grace D (2014) The business case for One Health. The Onderstepoort Journal of Veterinary Research. 81: E1-E6. Zinsstag J, Schelling E, Waltner-Toews D, Tanner M (2011) From "One Medicine" to "One Health" and systemic approaches to health and well-being. Preventive Veterinary Medicine. 101: 148-156.
One Health and Ecohealth have had limited penetration into academic medical centers. Most academic One Health efforts in the United States are based in veterinary medical schools, often without significant collaboration from their human medical counterparts. We report on subjective observations based on three years of experience developing a Center for One Health Research in an academic medical center that includes a medical school and a school of public health, but not a veterinary medical school. Human health professionals in the developed world tend to see zoonotic disease as rare and irrelevant to daily practice. Traditional divisions between clinical medicine and public health slow the adoption in medical schools of One Health competencies that have recently been endorsed by national public health commissions. At the same time, there is enthusiasm for the One Health approach among students and faculty. Specific areas showing potential for further development include the occupational health of animal workers, antibiotic resistance surveillance in humans, animals, and the environment, the role of service and therapy animals, and the effects of climate change on human and animal populations.
Community Engagement in Early Detection

Tim Low\textsuperscript{1}

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Since the Nairn Review, quarantine has been promoted as a whole of community responsibility. With some pests more likely to be detected in the landscape than at the border, informed citizens can play a useful role, as they have for tramp ants and weeds. Those in the community best equipped to detect new organisms have natural history skills, and their concerns are mainly about environmental pests. Any new weed they detect is more likely to have spread from legal cultivation than from a quarantine breach. Most new weed detections do not lead to control, undermining the morale of those who find them. Biosecurity is skewed towards stopping economic rather than environmental pests. A recent example was the failure to mount an eradication of the smooth newt after a public detection in Melbourne in 2011. There needs to be more government commitment to environmental biosecurity if the community is to be properly engaged. The potential is good to engage citizens to detect environmental pests such as black-spined toads and giant honeybees. The citizen science movement is growing, and quarantine authorities can tap into that.
Perspectives on health and climate change in the post-Paris UN agreement and post-2016 US election era

Jonathan Patz

The urgency of the global climate crisis was apparent in December, 2015, when a record number of world leaders convened in Paris for the United Nations' 21st Conference of the Parties (COP21) on Climate Change. Business leaders also attended, as did healthcare CEOs with a unified message for a healthy low-carbon economy. But confronting global climate change will continue to demand all rational arguments. Environmental and economic arguments alone are not moving climate change policies fast enough. Focusing on the problems of and solutions to climate change through the lens of health not only compliments the environmental and economic efforts, but by taking a health perspective, more common ground can be elucidated across diverse constituencies. Health benefits of the actions done to limit greenhouse gas emissions must be emphasized, particularly considering global rates of chronic diseases (like, diabetes, obesity, cancer and heart disease); these are on the rise in nearly every region of the world. And many of these diseases are linked to fossil fuel combustion, be the connection through air quality, sedentary lifestyles or high-meat diets. U.S. President-elect Trump has expressed some doubt about climate change as a problem, and recent studies suggest that many do not view climate change as a risk to human health. Herein lies the importance of showing the evidence of health linkages to climate change, as well as potentially large reductions in disease burden by policies and actions toward a low-carbon global economy.
The state of play of the emergence and ecology of Mycobacteria ulcerans and the link to possums

Daniel O'Brien

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Mycobacterium ulcerans is the third most common mycobacteria worldwide and is endemic in at least 33 countries. It causes destructive lesions of skin and soft tissue, known internationally as Buruli ulcers and locally as Bairnsdale ulcers. These lesions frequently require reconstructive surgery and often result in permanent disability. The first case was reported in Australia in 1948, and more than 6,000 cases worldwide are reported annually to the World Health Organisation. In Africa, the number of reported cases have decreased in recent years, but in Australia cases are increasing and the endemic area enlarging. However the environmental reservoir and mode of transmission of the organism remain unknown. This talk will focus on the situation in Victoria, Australia, and explore its epidemiology in this setting, including what is known about the interaction between the environment, animals and humans in relation to disease acquisition. An update on current treatment for Mycobacterium ulcerans in the Australia setting will also be provided.
Government cost-recovery frameworks that are not based on economic principles have the potential to deliver sub-optimal outcomes with regard to allocative efficiency and equity. This presentation outlines a principles-based government biosecurity decision framework that is designed to produce objectively determined decisions. The framework is an extension of past research by the Productivity Commission into cost-recovery by government agencies. It equips the decision maker to determine whether a role exists for government to intervene in relation to a biosecurity problem being considered. The framework encourages the application of a market failure test and then guides the decision maker to both identify the most appropriate biosecurity initiative to put in place and to establish the most efficient cost-recovery mechanism. The framework has been adopted by the NSW Department of Industry for program evaluation purposes and within the NSW Biosecurity Strategy. This framework would be suitable for application to all government programs/initiatives across all tiers of government.
Principle-based and general duties regulation

Arie Freiberg

Faculty of Law, Monash University

Regulatory design must take into account both the legal nature and source of regulatory tools and the way in which they are expressed.

Over recent years there have been significant changes in the preferred forms of regulation, away from rule-based or prescriptive regulation towards performance-based, principle-based and process-based regulation). In any given regulatory context, it is likely that a number of these forms of regulation will be used in conjunction, or differentially within the same Act.

Principle-based regulation describes the method of achieving a regulatory outcome by setting a general objective or a standard, or describing a general duty, but without specifying the means of achieving that outcome, leaving it to other bodies to interpret the meaning of the principle in a particular context.

Modern bio-security legislation is making increasing use of general duties regulation. This presentation examines some of the strengths and weaknesses of this form of regulation.
Delivering a larger world food system with a lower resource footprint is one of the greatest challenges being faced in the 21st Century. A projection of global food demand to 2050, with assumptions on population growth, dietary shifts and biofuel expansion, provides an estimate of the amount of additional food needed over the next 40 years to satisfy human needs. In a similar manner to how the global carbon demand has been expressed, a conceptual model uses wedges to express the likely contribution or stabilization of future demand through different technological approaches. The 'Food Security Wedge' concept includes three main types of stabilizations, reducing the demand trajectory, filling the production shortfall and avoiding losses from the current production levels. Given the tremendous challenge that global food security represents, it is likely that all three of these main wedges or stabilizations will be required. The global food supply chain is extremely complex and many biosecurity issues are also food safety issues. With a large proportion of emerging human infectious diseases originating from animal sources, there is also an increasing need to consider both animal and human health as a 'one health' issue. In addition to important global public health impacts, there are many circumstances where the loss of food safety and/or biosecurity has the potential to cause major losses or disruptions to the food supply chain. Food safety and biosecurity should therefore be considered as a major stabilization or wedge towards avoiding losses from the current production levels. It is important that food safety and biosecurity are enablers and not inhibitors of global food security.

This paper will highlight how developments and trends related to food safety and biosecurity will impact the food and agribusiness sector and ultimately the ability of the sector to deliver food security.
Agriculture has been transformed at various points in history. From the so-called green revolution, which massively increased yields of crops supported by fossil fuels, to the livestock revolution which transformed the provisioning of animal source foods. These were steps which were critical to maintaining food security that underpinned human population growth. However, the intense focus since the mid-20th Century on production has been at huge environmental costs with unintended consequences which range from soil degradation to disease emergence. And the final nail in the coffin is because modern agriculture is dependent on mechanisation, fertilisers and large volumes of water, which is unsustainable. Human society is reaching planetary boundaries and agriculture must enter another transformative phase. This is demonstrated by the shift in narrative from food security to nutrition security, sustainable and climate neutral agriculture. Looking towards no more land take or soil sealing, soil recovery, greater diversity of food products, a cyclical, waste free principle, and reductions in meat production and consumption per capita in many countries where cheap food is abundant and contributes to obesity epidemics and raised GHG emissions. In addition, welfare concerns over intensified systems of livestock is driving the politics of food, and dietary shifts and research towards e.g. cultured petri-dish meat, whilst limits on land availability is encouraging soil-less crops, grown vertically in cities. All this is necessary if we are to avoid complete land transformation to food production and human infrastructure which is causing the 6th global extinction event. This is not an option, the result of the loss of biological resilience is an uncertain future for all. The nature of agriculture must become the agriculture of nature and utterly change. A little talked about element of transformation is the revisiting of the role of natural production or wild foods in future human ecosystems. A proper environmental account of agricultural systems is needed to evaluate the most efficient and effective pathway(s) to
future food including natural harvests. A powerful example of the potential for harvest of wild food is shown with the African buffalo.
Change and its Complexities

Gabriele Bammer

Australian National University

Guidance to thinking about change is dispersed across disciplines, professions and problem domains. It's no-one's mandate to pull it together. Six key attributes of change will be discussed, along with different kinds of change and responses to them. There will be a brief discussion about how policy change occurs. There will also be a discussion of unintended consequences, especially why they arise and ways to mitigate their effects.
Engagement for resilience in indigenous communities

Ruth Wallace

Indigenous communities in both Australia and New Zealand are constantly facing biosecurity threats from both naturally occurring new incursions and the human-mediated spread of existing pests, diseases and weeds. These incursions can have disastrous effects on commercial, traditional subsistence and niche-market cropping systems, with the latter often occurring in relatively remote indigenous communities. For biosecurity programmes to be implemented, it is essential that effective communication, understanding and cooperation is achieved between the agencies charged with controlling the incursions and the communities affected by them. This paper presents the outcomes from a project that developed an indigenous engagement model for use by biosecurity agencies. The overall aim was to enhance the ability of indigenous communities and relevant regulatory authorities and industries to better manage social, cultural, environmental and economic impacts of biosecurity threats, and to participate in biosecurity strategies by describing and evaluating bicultural engagement models that build empowerment and ownership in indigenous communities and their response to those threats.
Using genomics to track and reduce antimicrobial resistance

Deborah Williamson

University of Melbourne

The use of whole genome sequencing is revolutionising public health and clinical microbiology. Through illustrative case studies, this talk will provide a brief outline of how genomics can be used to track antimicrobial resistance in human and animal populations.
A human antibody therapy and a ‘One Health’ vaccine approach against Hendra virus and Nipah Virus

Christopher Broder

Nipah virus (NiV) and Hendra virus (HeV) are bat-borne zoonotic paramyxoviruses that emerged in the 1990s that possess broad species tropism and an ability to cause fatal respiratory and/or neurologic disease in humans and animals. Since their initial appearances, spillovers of these viruses into humans and animals have occurred almost annually. There are also two distinct strains of NiV, Malaysia (NiVM) and Bangladesh (NiVB) associated with outbreaks, and transmission patterns and mortality rates suggest that NiVB may be more pathogenic. HeV and NiV employ an attachment (G) and fusion (F) glycoprotein to facilitate host cell infection, and these glycoproteins have been the major target of countermeasure development. Our studies have demonstrated that a cross-reactive human monoclonal antibody, m102.4, targeting the G glycoprotein is an effective post-exposure treatment against HeV and NiV infection and has been given to 11 individuals by emergency use protocols. A Phase I clinical trial of m102.4 has recently been completed in Australia. We have also developed and extensively tested a soluble form of the HeV G glycoprotein (HeV-sG) as a subunit vaccine. Vaccination with HeV-sG can provide complete protection against either HeV or NiV infection in several animal models. Recently, a One Health approach was implemented to counter the threat posed by HeV in Australia to horses and humans using HeV-sG (Equivac® HeV, Zoetis Inc.). Vaccination studies in nonhuman primates with HeV-sG has also shown it to afford complete protection against either HeV or NiV infection, providing pivotal data supporting its development for human use.
Zoonoses: a systems perspective

Mike Nunn¹

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Zoonoses are clearly an issue that should attract attention from professionals working on the health of animals, humans or the environment. 'One Health' and 'EcoHealth' approaches are increasingly being used to improving human health. However, an even broader systems perspective is needed to improve human livelihoods. Such a perspective requires inputs from a wide range of disciplines. For example, food technologists are needed to minimise 'post-harvest' losses and to reduce the risks of contamination with zoonotic pathogens or parasites. Human geographers, anthropologists, gender specialists and behavioural economists help us understand how households make decisions. Human nutritionists and maternal and child health nurses provide insight into the effects of household decisions on nutrition and health. Specialists in risk communication are needed to explain risks and risky behaviour, and to help devise messages to target specific risks. Such teams are not easy to build and members need time to understand their different 'languages' and to appreciate and respect what each discipline offers. Despite the difficulties involved, such teams are needed to provide the broader systems perspective necessary to reduce the effects of zoonoses on people's livelihoods.
The importance of the one health approach during infectious disease outbreaks

Maria Van Kerkhove¹

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Human and animal health and the viability of ecosystems are inextricably linked; 75% of emerging infections are zoonotic. The emergence and re-emergence of SARS, H5N1, MERS-CoV, and Ebola have repeatedly reminded us that multi-sectorial collaboration for investigations and research of zoonotic viruses are necessary to improve the rapid detection of pathogens, identification of animal reservoirs/intermediaries, provide information on transmission between species, and provide knowledge to develop appropriate mitigation options.

Much effort to achieve this has taken place at the global level between FAO, OIE and WHO. However, this high level of commitment does not necessarily translate into sufficient consideration and implementation at national and local levels. Here I will present examples multi-sectorial investigations of avian influenza in Asia, MERS-CoV in the Middle East, and ZIKV in the Americas and how these investigations have shaped policy decisions to limit the impact of these epidemic threats.
Social dimensions of supporting health systems to protect against emerging infectious disease

Barbara McPake

Nossal Institute for Global Health

Common definitions and conceptualisations of health systems, such as those of WHO, ignore the essentially social nature of those systems: they are designed, constructed and above all operated and used by people whose behaviours are socially determined. In contrast, the 'dynamic responses' health system model puts those centre stage. The relationship between the de jure system of organisational structures, intended incentives and management procedures and the de facto system experienced by those who use it is determined by how people (users and providers) react and interact in response to formal structures and rules. In 2000-2001, Uganda dealt well with its Ebola outbreak while in 2014-15, Sierra Leone (along with its neighbours, Liberia and Guinea) failed to do so. Critical differences in the social dimensions of health systems operations in the two cases illustrate their importance. These include elements of health workforce motivation, relationships between government and media organisations, co-operation and trust between the population and the health system, the development stage of political institutions, and human behavioural factors in the global public health system. Health system strengthening to protect against emerging infectious disease will require engaging with such social dimensions if it is to succeed.
Understanding the risks of zoonotic disease from agricultural production systems

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Despite the emergence and re-emergence of zoonotic infection from livestock, the risk factors for human infection from agricultural production systems remain unclear. Using influenza in pigs as an example, the challenges of identifying potential risk factors will be explored. Across Asia, consumption and production of pigs has increased dramatically in recent years, with livestock systems undergoing rapid change. The implications for the emergence and spread of zoonotic pathogens with pandemic potential, such as influenza, remain unclear. Research and surveillance on infectious diseases at the human-livestock interface is particularly needed in countries undergoing rapid rises in swine production, and in areas where avian influenza is prevalent in poultry, such that cross-species transmission to pigs is of concern for pandemic emergence. To identify where risks of zoonotic transmission and reassortment of influenza viruses are highest, and how changing livestock practices may influence these risks, information on pig distributions, movements, and husbandry practices from small backyard farms to large-scale units is needed. Longitudinal epidemiological surveys to measure seroprevalence and the incidence of influenza infection in pigs and humans, combined with phylogenetic analyses conducted to investigate virus evolution and spread are also required. These data would allow us to estimate viral transmission among pigs and the force of infection between pigs and humans. Mathematical models, fitted to the epidemiological and genetic data, can then be used to anticipate the impact of livestock intensification on the ecological and evolutionary dynamics of influenza at the livestock-human interface, and guide the formulation of strategies to reduce zoonotic and pandemic disease risk.
Bridging One Health: The taste for food of arbovirus vectors - A case about Australian Culicoides

JB Duchemin\textsuperscript{1}

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The blood-feeding arthropods act as intermediate hosts bridging between potentially different vertebrate hosts of arboviruses in different, wild or human, environments. From the host-seeking phase up to the successful bite, sequential behaviours are implemented and may vary according to environments and availability of blood sources. Different methodological approaches could be employed to explore the blood-feeding behavioural process. As an example, and in the context of \textit{Culicoides} - borne Australian arboviruses, this study case investigates \textit{Culicoides} attractiveness for urine of sheep and cattle in tropical and temperate environments by light traps for the host-research phase. At the other side of the feeding behaviour, once the female midge has blood-fed, the origin of blood meals was identified by sequencing the cytochrome b gene of host DNA. More than 10,000 Culicoides specimens were caught during 63 night-traps gathering 27 different species. Four species were abundantly captured: \textit{Culicoides brevitarsis} in the tropical zone, \textit{C. victoriae} gp in the temperate environment and \textit{C. marksi} and \textit{C. austropalpalis} in both regions. Except for \textit{C. brevitarsis}, males were repulsed by urine compared to water as control. For the sheep urine, this repulsive effect observed for the males was different between regions, especially for \textit{C. austropalpalis}. The effect of age on urine choice was present for all species except \textit{C. brevitarsis}: aged females tended to be relatively more caught by urine-baited traps than younger females. These results could be interpreted as marks of innate and genetically driven behaviour but also as some degrees of plasticity issued by some forms of memory. From the blood-meal analysis, \textit{Culicoides} species could be identified in three different groups: respectively birds, marsupials and ruminants feeders. Human were more frequently found associated with \textit{Culicoides} species having fed on introduced ruminants than with those feeding on endemic birds or marsupials.
A Team of 4.7 Million: the New Zealand approach to shared responsibility for biosecurity

Julie Collins¹

¹Ministry for Primary Industries

Shared responsibility is a key feature of New Zealand's biosecurity system. Over recent years, we have established industry collaborations, a network to support incursion response operations, and significant partnerships, such as the Government Industry Agreement between government and primary industry organisations to manage readiness and response activities. However, the pressures on New Zealand's biosecurity system are growing - these include increasing volumes and changing origins of goods and passengers crossing the border, more established pests, climate change and increasing social diversity. To ensure the biosecurity system remains resilient to the challenges the future will bring, the Ministry for Primary Industries recently led a project to review and set a forward-focused direction for the system. The Biosecurity 2025 project led to the development of five strategic directions for the system to focus on over the next ten years. The central strategic direction is a biosecurity team of 4.7 million - broadening participation and responsibility for biosecurity to every New Zealander. Working towards this strategic direction will mean engaging businesses, industry, iwi, the New Zealand public and travellers. The Predator Free 2050 initiative, that aims to rid New Zealand of stoats, rats and possums, is an example of the approach to collaboration, community involvement and shared responsibility that we will see more of in New Zealand in the future.
Translating Policies into Actions to Improve Global Health

Julianne Cowley

Department of Foreign Affairs and Trade

Translating policies into actions to improve global health is a challenge for us all: Government, private sector, research institutes, multilateral organisations. In reflecting on the Australian Aid program's approach to translating health policy settings into actions to improve health in our Asia Pacific region, it is clear that a concerted effort to draw together diplomatic and development tools is required. This necessitates new and innovative ways of working with both longstanding and emerging partners; at global, regional and bilateral levels; and drawing in decision makers not just from the health sector but from agriculture, environment, defence, finance and foreign affairs. Key themes to be explored include the need for a strong evidence base, and working with trust and collaboration to achieve ambitious objectives.
Can One Health-Ecohealth Rise to Global Sustainability Challenges in Agriculture, Environment and Health?

Dominque Charron

Ecohealth and One health, part of a family of integrated approaches to sustainability and health, have come a long way from their beginnings in the 1990s. Despite landmark international agreements in 2015 on achieving sustainable development by 2030 and arresting global warming, global sustainability challenges have never been more urgent. Most everywhere in the world, there is a rise in parochialism and protectionism. One Health Ecohealth thinking, and other transdisciplinary approaches rooted in complexity theory generate understanding and evidence that can lead to solutions and transformative change. Improved food security in southern Ethiopia and the fight against the emergence of visceral leishmanial in South America illustrate the transformative potential. However business as usual, even in One Health and Ecohealth, is not sufficient. Solution-oriented arguments, anchored in stronger evidence and metrics and communicated in their language are needed by decision makers, civil society and businesses to meet the aspirations of both UN Sustainable Development Agenda 2030 and the Paris Accord on Climate Change.