The Concept of One Health – a holistic approach

One Health is a global movement of practitioners and policy-makers to support a better understanding of the ecology of diseases at the animal–human–ecosystem interface. Globally, diseases such as severe acute respiratory syndrome (SARS), bovine spongiform encephalopathy (BSE) and highly pathogenic avian influenza (H5N1 HPAI) have resulted in significant human fatalities, animal deaths and multi-billion dollar impacts. Recent disease events in Australia also highlight the complexity of these issues, in particular, the outbreaks of Hendra virus in Queensland and northern New South Wales resulting in four human fatalities and dozens of horse deaths. At a broader level, Australia faces ongoing challenges with infectious diseases such as airborne influenza, antibiotic-resistant diseases and food-borne disease outbreaks which have regular impacts on public health. The complexity surrounding transmission of diseases at the animal–human–ecosystem interface highlights the need for multidisciplinary approaches – known as One Health approaches. While there has been some progress with advocacy of One Health in Australia, stronger political will is needed to break down sectoral and disciplinary silos and to enable more effective measures at the operational level.

One Health approaches for diseases at the animal–human–ecosystem interface

The health risks faced at the animal–human–ecosystem interface are increasingly complex, and the interdependency between humans, animals and ecosystems means that changes in any one of these groups will have a profound impact on the others. Recent examples from a global perspective include emerging pathogens such as severe acute respiratory syndrome (SARS), bovine spongiform encephalopathy (BSE) and highly pathogenic avian influenza (H5N1 HPAI) which have had large-scale impacts on human and animal populations across continents. Within the Australian context, diseases such as Hendra virus infections or endemic diseases such as Lyme disease or brucellosis have affected smaller numbers of people but also have potentially serious consequences on a larger scale. One Health approaches are not just limited to application with emerging infectious diseases. There are increasing risks with antibiotic resistant pathogens and food-borne diseases such as salmonella which benefit from a more holistic multidisciplinary approach. These examples illustrate the diversity of potential disease risks, all of which are part of complex chains of interdependent variables.

Over 60 per cent of new diseases arising between 1960 and 2004 were zoonotic diseases, and of these more than 71.8 per cent came from wild animal1. Emergence of zoonotic viruses from a wildlife reservoir requires four events: (i) interspecies contact, (ii) cross-species virus transmission (spillover), (iii) sustained transmission, and (iv) virus adaptation within the spillover species. These four transition events occurred during the SARS outbreaks and contributed to the rapid spread of a previously unknown disease around the world. SARS led to a significant loss of human life, from a disease originating in wild civets and bats2. BSE and H5N1 HPAI are also examples of zoonotic diseases, which have had dramatic impacts on animals and humans. Since 2003 the World Health Organization (WHO) has confirmed 608 human cases, with 359 deaths as a result of "bird flu" in 15 countries around the world3. Beyond the loss of lives, these diseases have caused direct losses estimated at US$10 billion, with indirect costs estimated at US$200 billion4.

In Australia, the increasing incidence of Hendra virus with clusters of disease outbreaks – affecting horses, humans and a domestic dog – has been the direct result of the spillover of a flying fox virus into horses and humans5 (Figure 1). Flying foxes are typically forest dwellers, but with suburbanisation, they have moved into backyards and pastures, resulting in closer contact

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with domestic animals and humans. At present these disease clusters remain limited to small numbers of animals and people, but it may only be a matter of time for these henipah viruses to evolve into pandemic strains with efficient transmission between humans. 

There are other emerging diseases of importance in Australia including mosquito-borne diseases such as Murray Valley encephalitis and dengue and an increasing prevalence of antimicrobial-resistant bacteria – such as campylobacter, salmonella and Escherichia coli – that can be spread through the food chain.

Diseases emerging at the animal–human–ecosystem interface are likely to increase in frequency and possibly magnitude over future decades. This is related to the increased level of inter-species contact and greater opportunities for pathogens to move between hosts. Factors contributing to emergence of diseases include intensive farming, increasing density of animal and human populations, increasing incursions into wildlife ecosystems, as well as increasing global movement of people, animals and animal products. These risks may also be exacerbated by increasingly complex trading patterns, migration movements and climate change.

A global initiative

One Health is a global movement of practitioners and policy makers to support a better understanding of the ecology of diseases at the animal–human–ecosystem interface.

One Health approaches are not new. There is evidence dating back 2,500 years when Hippocrates urged physicians to consider all aspects of a patient’s life including environment, lifestyle and diet. This early integrative thinking was lost as modern medical technology advanced and specialisation increased among practitioners.

In recent years there has been a resurgence of One Health conceptual thinking, emphasising epidemiology and public health, and the interrelatedness of human, animals and environmental health. Various approaches have emerged
including ecosystem approaches to health (International Development Research Centre, Canada), international Communities of Practice for Ecosystem Approaches to Health (CoPEHs), and the development of a One World, One Health (OWOH) movement (Wildlife Conservation Society)².

Two important milestones for the recent reinvigoration of One Health approaches include the 2004 OWOH development of the Manhattan Principles and the 2008 development of a global Strategic Framework for Reducing Risks of Infectious Diseases at the Animal–Human–Ecosystem Interface by six international organisations (United Nations Food and Agriculture Organisation, World Organisation for Animal Health, WHO, United Nations Systems Influenza Coordination, United Nations Children’s Fund – UNICEF – and the World Bank). Since 2008 there has been a global effort to bring One Health approaches to the attention of governments and practitioners globally. In 2010, at the 7th International Ministerial Conference on Animal and Pandemic Influenza, over 500 delegates from approximately 70 countries met to reaffirm global commitment to ensuring a world capable of preventing, detecting and responding to animal and public health risks attributable to zoonoses and animal diseases².

One Health in Australia – the way forward

The best way to manage these disease threats globally – and in Australia – given the inextricable links between human, animal and ecological health is to adopt a holistic One Health approach. The life sciences, food and agriculture, and health care sectors face the greatest impact of diseases at the animal–human–ecosystem interface. Individually and in collaboration with each other, these sectors and government bodies can mitigate potential impacts by:

• developing strategies for risk reduction based on an understanding of convergent factors that contribute to these diseases;

• strengthening detection and verification of pathogens using diagnostic capabilities in the field, in laboratories or in health settings; and

• ensuring rapid response to care for infected animals and humans, minimising exposure to the wider population, and the accidental or deliberate release of high-consequence pathogens.

Australia’s long interest in biosecurity reflects its status as an island relatively free of many significant diseases of livestock that have affected food production and productivity in other parts of the world. This situation is being challenged by a number of factors, including the significant movement of people, livestock and livestock products, and wildlife. Human populations are highly mobile, with national and international movement increasing the potential for rapid transmission of pathogens. The risks are increasing, and a One Health approach is considered the most effective way to manage these risks.

Australia has made some progress with advocacy of One Health approaches. The first One Health Congress hosted by the CSIRO in Melbourne in 2011 provided an opportunity for state governments, private sector organisations and academic institutions to engage on One Health approaches. Several peak bodies such as the Australian Veterinary Association (AVA) and the Public Health Association of Australia (PHAA) have recognised the importance of One Health through official endorsement of special interest groups responsible for national policy advocacy. However, more work is needed to support effective implementation of One Health approaches including:

- **Fostering political will** to drive the One Health concept forward.
- **Supporting partnerships and collaboration** to build new attitudes and encourage multidisciplinary collaboration.
- **Encouraging further research development** – building the evidence base.
- **Encouraging data sharing and integration** to eliminate “data silos”.
- **Building capacity** (infrastructure, knowledge and skills) including:
  - Early detection of high-consequence pathogens that may pose a threat to populations, food supplies or economies.
  - Establishment of integrated curriculum to foster transdisciplinary collaboration.
  - Improving wildlife health capacity for professionals across ministries of agriculture, environment, forestry and health.
  - Strengthening wildlife disease capacity evaluation tools.
  - Building legislative frameworks to support disease monitoring, outbreak investigation and control measures.
• Developing communication strategies/plans and engaging media as a partner for improved public advocacy and awareness of disease risks, preventative behaviours and reporting mechanisms.
• Providing incentives for reporting adverse events in a timely manner.
• Encouraging stakeholder and community engagement.
• Developing transboundary and regional approaches for surveillance and response – in addition to multidisciplinary/transdisciplinary approaches.

Most aspects of agricultural, aquaculture and environmental health in Australia have been brought together under "biosecurity" entities. Most of these entities remain focused on animal and plant health, however, and currently have minimal human health engagement, except in emergency committees (such as established for the 2011–12 Hendra outbreaks). The Hendra response would have benefited from the addition of human behavioural expertise, climate change specialists or urban planners to understand potential drivers for disease emergence. There is also minimal involvement of human health practitioners in wildlife organisations with the exception of specific outbreaks such as the recent links between human cases of tularemia and possums in Tasmania.

There are significant opportunities to improve implementation of One Health approaches in Australia by improving the policy-setting and implementation. This includes opportunities for improved collaboration in surveillance design, collection of exposure and risk factor data, and developing a better understanding of the social determinants of health.

Australia’s efforts with research and development have been one of the most successful areas for One Health approaches. The recent establishment of CSIRO’s Australian Animal Health Laboratory and the associated National Biosecurity Flagship utilised One Health approaches to develop a Hendra vaccine for horses. Three One Health Centres have also been established in Australia – in Brisbane, Sydney and Geelong, with potential for an overarching Australian Centre for Emerging Infectious Diseases (ACEID).

Although still in its infancy in Australia, there are moves towards curriculum development for education and training that incorporate One Health approaches. Several tertiary institutions offer postgraduate training in One Health at master’s level or integrated into veterinary training facilities. All seven veterinary schools in Australia offer study in the health of wildlife, biosecurity and public health. These elements also need to be incorporated into equivalent public health programs to support medical practitioner engagement nationally.

Conclusion

In summary, there is a need for greater political commitment and stakeholder engagement on One Health, with recognition of the complexity of the problems, and the need for strengthened collaboration across disciplines and sectors to address diseases occurring at the interface of animals-humans-ecosystems.

References


Biography

Julia Landford is an international development specialist, and has over six years’ international experience with One Health approaches. Ms Landford was the senior analyst and lead writer for the United Nations Systems Influenza Coordination (UNSC) 5th Global Progress Report on Animal and Pandemic Influenza; and the South East Asia regional coordinator for the Australian Agency for International Development (AusAID) pandemic and emerging infectious disease programs. She has worked with the United Nations Food and Agriculture Organisation (FAO), the World Organisation for Animal Health (OIE) and the International Development Research Centre (IDRC, Canada) on One Health approaches, and is currently the founding Co-Convenor for the Public Health Association of Australia’s Special Interest Group on One Health.