



One Health

A part of the LRIC White Paper Series

May 2021

Written by:

Mike McMorris and Chloe Neudorf
Livestock Research Innovation Corporation

Contributing Editor:

Dr. Heather Murphy
Associate Professor in Pathobiology at Ontario
Veterinary College

What is it?

The University of Guelph's One Health Institute defines One Health as both a concept and an approach. As a concept, One Health focuses on the integration and relationships between animal, human and environmental health. As an approach, One Health is the collaborative effort of multiple professionals across many disciplines for overall health of the planet. It requires a comprehensive view of the natural environment and the one we have built which includes social structures such as political, financial and social.

One Health is a holistic multi-approach and disciplinary method working to protect the well-being of our ecosystem. It requires understanding human, animal and environmental interactions to prevent illnesses and disease outbreaks. The One Health approach can lead to diminishing diseases, regenerating degraded ecosystems, ensuring food safety and security, combating antimicrobial resistance (AMR) and dealing with the challenges of climate change. At the heart of One Health is research, collaboration and education. The approach is far-reaching and aims to understand the relationship of the human environment with other living organisms. Educating the general public and assembling professionals in divergent fields relevant to the initiative, is fundamental to the One Health objective.

One Health in the News:

In January 2020 the world was just hearing of a new virus in China affecting thousands. A new form of coronavirus, with origin in animals had transferred to humans, and was causing disease in humans: COVID-19. By early 2021 the world was taking advantage of vaccines with efficacy up to 95% at targeting the novel Coronavirus (Levenson & Howard, 2020). Pandemics tend to occur every 100 years, but at the 2018 One Health conference in Saskatoon it was revealed that the likelihood of a pandemic is greater than ever before. In fact, since 1970, new infectious diseases have been discovered at a rate of one every eight months (Osterhaus et al., 2020). The global population, as of February 2021, is 7.8 billion, and there is a larger mass of animals and livestock on the planet. Additionally, animals in the wild are being forced into smaller habitats due to deforestation and industrialization. As the global population increases, the number of livestock on earth will increase to feed the growing population, thus the chances of interaction between humans and animals where transmission can occur is more likely than ever.

Why it matters to the Ontario livestock industry:

As the global population continues to increase, overcoming food insecurity on a global level involves Canadian and Ontario producers. A One Health philosophy for livestock production is critical to continue providing a safe and healthy supply of Ontario meat and dairy for consumption. This approach is also critical in helping to avoid the development of AMR while maintaining good health of animals and farm workers by addressing impacts of production on the environment and wildlife residing in close proximity to farms.

Zoonoses:

Zoonoses are diseases that can be transmitted from animals to humans (or vice versa). In recent years 60% of emerging infectious diseases in humans have been sourced from animals (Osterhaus et al., 2020). Domesticated animals present a small risk to human health, however, this risk can be mitigated through proper training, use of personal protective equipment (PPE), and maintaining herd and animal health (Daszak et al., 2001).

Land use for agriculture reduces spaces available for wildlife and increases mingling between species. With the addition of the changing climate and warming temperatures, some infectious zoonotic diseases are thriving. Global warming, along with increased movement of humans, animals and products are creating ideal environments for transmission. For example, transmission of the West Nile Virus, which originates from mosquitoes, has been occurring more frequently in areas where it was never present before. Due to the increased warming, the survival of the mosquitoes that spreads the disease is more likely (Filho et al., 2019).

Antimicrobial Resistance:

The threat of antimicrobial resistance is an additional worry for the livestock industry and requires a One Health approach to be tackled sustainably. See LRIC's white paper on antimicrobial use and resistance for a more detailed description of its consequences and effects in the livestock industry.

Social Impacts:

There are social consequences that go hand in hand with risks to public health. Some social effects that have been observed in the COVID-19 pandemic, SARS and Ebola are: a sense of panic, stigmatization of those first associated with the virus and mistrust towards the scientific community. These social consequences are important to the livestock industry because panic, stigmatization and mistrust of the scientific community become challenges for food production. One Health is utterly important to prevent disease outbreaks from happening at such large extents.

There are also global and political aspects to pandemics, whereas AMR and COVID-19 do not have these boundaries making the global response more complex. There are a few programs and organizations working to vaccinate smaller countries mainly in Africa, Asia and Latin America, the largest being COVAX with the World Health Organization. The larger issue of disproportionate vaccine roll-out globally is that as travel opens up, poorer countries will have the ability to create new variants allowing them to move around with potential travellers. The current vaccines are effective against today's variants (although slightly less effective); however, they hold no promise to be effective against new variants. Active genomic surveillance and information sharing is necessary to mitigate this issue (United Nations, 2021). In the case of a global pandemic, to successfully recover, collaboration between countries is necessary to prevent further transmission of COVID-19 and ensure equitable access to vaccines using a One Health approach. Therefore, in order to protect Ontario livestock workers in the long run, we need to pay attention to what is happening globally and advocate for global initiatives.

History of One Health:

- Calvin Schwabe wrote the book *Veterinary Medicine and Human Health* in 1984, introducing the idea of One Medicine. Schwabe proposed a combined medical and veterinary approach to zoonotic disease.
- Ecosystem Approaches to health came before One Health and have been used for over 20 years. In 2001 Waltner-Towes, a professor emeritus at the University of Guelph, published an article on the subject. He stated that a research and development strategy using an ecosystem approach has implications for development policies and control of tropical and emerging diseases (2001).
- One Medicine and the Ecosystem Approach to Health evolved into One Health. The interaction of the environment with humans and animals is now a valued priority to the One Health approach. Introducing the environment and wildlife population to the discussion captured topics such as sustainable development and the surrounding environment.
- In 2004 The Wildlife Conservation Society Conference was held and the *Manhattan Principles* and One World, One Health were created.
- Through a number of conferences and the continued development of One Health, objectives were clearly defined by founding organizations. Elements of One Health such as disease surveillance, emergency response and communication saw more collaboration between health sectors.
- In 2011 the International One Health Conference proposed broadening the scope of One Health. Topics such as food security, community participation and the collaboration with economics and social sciences were suggested to expand the scope of One Health.
- Conferences on One Health now include professionals from human health, animal health and environmental sectors as well as policy analysts, toxicologists, medical doctors, vets, social scientists, and geographers.
- In June of 2019 the University of Guelph established the One Health Institute with the mission to “enhance and promote academic, research and outreach programs to propel the University of Guelph to the forefront of One Health scholarship internationally.”

What can be done at the farm level?

- Develop a farm-level health plan that accounts for livestock, workers, the environment (water, soil) and wildlife
- Take mental health of family and workers into account as part of your health plan
- Ensure good biosecurity practices
- Implement proper vaccination programs
- Keep good records on health and movements
- Ensure proper use of antimicrobial drugs, reduce use where possible and ensure proper disposal of excess and empties
- Proper manure and deadstock management
- Implement farming practices that improve soil health and protect water supplies (e.g., regenerative agriculture, rotational grazing, low or no-till, etc.)

Research gaps

- Study of zoonotic diseases and transmission
- Effective disease prevention through production practices, inhibitors to infectious diseases and genetic selection for increased immune response
- Methods and modelling to better predict disease and AMR spill over, incidence and spread
- Vaccines to better protect against current and future pathogens
- Farming practices and the impact on zoonotic disease and AMR transmission

Innovation gaps

- Effective surveillance systems
- Improved traceability systems
- Improved genetic selection for immune response
- Greater health education regarding the interactions of people, farm animals, the environment and wildlife
- A resource of informed and experienced spokespersons on vaccination science and distribution issues which can educate citizens globally (Osterhaus et al., 2020)
- Pandemic prevention and comprehensive and practiced emergency management plans
- Evidence to support best management practices that promote improved animal, environmental and wildlife health

For more information

1. One Health Institute at the University of Guelph, onehealth.uoguelph.ca
2. Dr. Heather Murphy, Associate Professor in Pathobiology at Ontario Veterinary College
heather.murphy@uoguelph.ca

Additional resources

- One Health Institute Resources for student's document

<https://cpb-ca-c1.wpmucdn.com/sites.uoguelph.ca/dist/3/28/files/2021/01/CDC-One-Health-Student-Resources.pdf>

- One Health Commission Opportunities Page

https://www.onehealthcommission.org/en/resources__services/oh_opportunities_bulletin_board/

- One World One Health Canadian Public Health Association

<https://www.cpha.ca/one-world-one-health>

References

1. Levenson, E., & Howard, J. (2020). What we know about Moderna's coronavirus vaccine and how it differs from Pfizer's, *CNN*, Retrieved from <https://www.cnn.com/2020/12/17/health/moderna-vaccine-what-we-know/index.html>
2. Osterhaus, A. D. M. E., Vanlangendonck, C., Barbeschi, M. *et al.* Make science evolve into a One Health approach to improve health and security: a white paper. *One Health Outlook* 2, 6 (2020). <https://doi.org/10.1186/s42522-019-0009-7>
3. Daszak, P., Cunningham, A. A., & Hyatt, A. D. (2001) Anthropogenic environmental change and the emergence of infectious diseases in wildlife. *Acta Trop*, 23;78(2):103-16. doi: 10.1016/s0001-706x(00)00179-0. PMID: 11230820.
4. Filho, W. L., Scheday, S., Boenecke, J., Gogoi, A., Maharaj, A., & Korovou, S. (2019). Climate change, health and mosquito-borne diseases: Trends and implications to the Pacific Region. *International Journal of Environmental Research and Public Health*, 16(24):5114. <https://doi.org/10.3390/ijerph16245114>
5. Secretary-General calls Vaccine equity biggest moral test for global community, as Security council considers equitable availability of doses. (2021). *United Nations*, Retrieved from <https://www.un.org/press/en/2021/sc14438.doc.htm>
6. Waltner-Towes, D. (2001). An ecosystem approach to health and its applications to tropical and emerging diseases. *Cadernos De Saúde Pública*, 17(Suppl), Retrieved from <https://www.scielo.br/pdf/csp/v17s0/3878.pdf>