One Health Une santé

Launching a One Health column

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The suggestion that *The Canadian Veterinary Journal (The CVJ)* should establish a One Health column was made at a CVMA Strategic Planning workshop in March 2019 and later that year, independently, in a survey of *The CVJ* readers. The CVMA Editorial Committee discussed and endorsed this initiative in the spring of 2020. Karin Orsel, the CVMA representative on the Editorial Committee, noted that Herman Barkema at the University of Calgary would be an excellent choice to lead the effort. The Committee agreed and Herman was asked.

My high school principal in Jamaica used to say, "If you want something done, ask a busy person." We are delighted that, despite an extremely busy schedule, Herman was enthusiastic in his response to our invitation. He observed that "We have a great One Health team here and very good contacts with the other Canadian teams."

The veterinary profession in Canada has taken a leadership role in promoting improved understanding of the interrelationships among animal health, human health, and ecosystem health. The CVMA has been very supportive of the One Health concept and approach and currently has an active role, with programs on antimicrobial stewardship, tick awareness and Lyme disease, importation of dogs, and adaptation to climate change.

The CVJ has been a part of the CVMA's initiatives and has published numerous articles on various aspects of One Health in recent years. This column is an important addition to the range of writings on One Health and we are grateful to the experts who have agreed to make this a regular feature in the *The CVJ*.

What is One Health?

Michele Anholt, Herman Barkema

Vulnerable groups are being vaccinated against SARS-CoV-2. The swift development of a vaccine is an astonishing accomplishment achieved by the global cooperation of many highly skilled scientists. Society also has much of the knowledge to have prevented the emergence of SARS-CoV-2 but this is a more difficult problem to solve. Disease emergence is a complex, or "wicked", problem. It arises at the intersection of people, animals, and the environment; the science explaining disease emergence crosses disciplinary lines; there is incomplete and contradictory knowledge; it is interconnected with other problems; and disease emergence, as well as its possible solutions, imposes a large economic burden. Investment in reductionist science has led to the development of vaccines, but it is time to also invest in systems science. There are various names applied to systems science at the human — animal — environment interface, each with a slightly different focus, but the label One Health has been gaining favor (1).

A One Health approach is necessary to effectively address disease emergence as well as other complex problems such as antimicrobial resistance, sustainable food production, food

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One Health will be a regular feature in *The CVJ*. Future articles will be submitted by One Health researchers and practitioners from across Canada and the world. If you have a topic you would like included or would like to contribute to this column, please contact us, Michele Anholt and Herman Barkema, at onehealth@ucalgary.ca

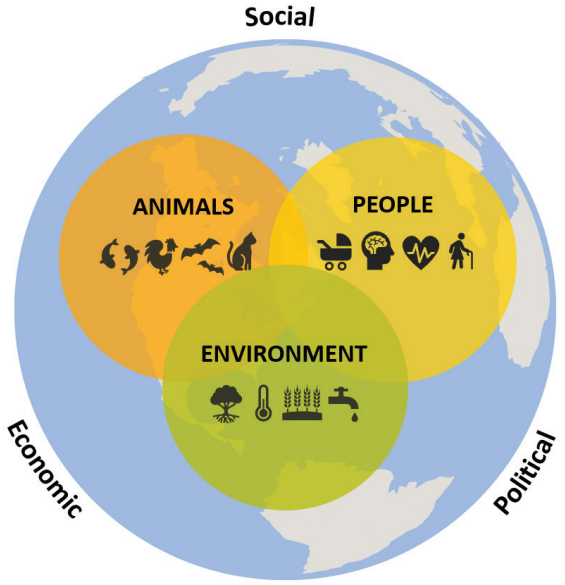

Figure 1. Depiction of One Health and the interconnectedness of animals, people, and the environment within the social, economic, and political contexts which can either promote or inhibit wellness.

security and safety, biodiversity loss, maintenance of healthy water ecosystems, and the consequences of climate change. One Health examines interacting systems, each embedded in natural, economic, social, and political environments (Figure 1). In public health, the economic, social, and political factors that can either constrain or promote wellness are known as the determinants of health. Although not commonly applied to the health and resilience of animals, animals are also affected by characteristics of their physical environment and the anthropogenic imposition of social, cultural, and economic expectations. For example, intensification of animal production systems has occurred to increase efficiency, meet global demands for animal protein, and improve profitability. However, there is evidence that increased animal density can be detrimental to animal health (2).

One Health uses a transdisciplinary approach with investigators from various branches of knowledge and diverse backgrounds and perspectives collaborating to solve a common issue. Ciesielski et al (3) define a transdisciplinary approach as "the generation and utilization of research frameworks and admixed ideas that could not come from, or fit into, any one field." The blending of disciplines in a transdisciplinary approach is greater than what is observed in interdisciplinary ("integration, adaptation, and harmonization of ideas that come from distinct fields"), or multidisciplinary ("the aggregation of fully formed ideas that come from distinct fields") approaches (3). The fruit smoothie, fruit salad, and bowl of fruit have been commonly used as a metaphor to illustrate degrees of disciplinary integration (4).

Another approach to understanding transdisciplinarity has been described by Max-Neef (5), who described the degree of coordination of the disciplines as levels of a pyramid. The base of the pyramid asks, *"What exists?"* These are the specialized disciplines in biology, mathematics, physics, chemistry, ecology, geology, sociology, economics, etc. At this empirical level, reductionist science is used to explain natural phenomena in terms of their underlying molecular, biochemical, or physical processes (6).

The second level is composed of the technical disciplines that explore the question, *"What are we capable of doing?"* At this level, knowledge attained by researchers at the empirical level is used by practitioners (physicians, veterinarians, engineers, architects, agrologists, industry, etc.) to heal, build, and grow. This is a pragmatic level that develops vaccines, builds bridges, and produces enough food to feed billions with enormous benefit to mankind. The question not asked at this level is whether we always should, just because we can.

The third level aims to answer the question, *"What is it we want to do?"* Inquiry at this normative level integrates the researchers and practitioners from the empirical and technical levels throughout the research process. There should be meaningful inclusion of all perspectives when developing the research questions, throughout planning and conducting the study, and during communication of the results. Collectively, the research team seeks the best ways to achieve their shared aims, goals, and purposes of the study.

Citizens also have a voice at this level because it is society that ultimately determines what is acceptable. In democratic societies in which authority lies with the general population, how this question is answered is decided through environmental impact assessments, policy debates, plebiscites, or elections. Through these platforms, stakeholders have access to accurate information and are given fair and meaningful opportunities to comment on and influence decisions (5). Decision-makers (government or citizens) make their respective decisions with the expectation that information will be shared without manipulation; this is fundamental to liberal democracies (7). Therefore, care must be taken not to influence the outcome by providing biased information (8).

The question at the fourth level contemplates the wider implication of decisions made and asks, *"How should we do what we want to do?"* At this value level, coordination between scientists, practitioners, and decision makers at all levels of the pyramid work together to move society from knowledge towards wisdom. The goal is to better address these important questions: i) how we can meet the needs of the present and future generations in Canada and around the world; ii) could our actions and the chaotic nature of systems result in unintended and unwelcome consequences; iii) does our response address social injustices; and iv) do our actions respect nature and environmental limits? The aspiration behind these questions is sustainability of the response(s).

It has been tiring and sorrowful living during this pandemic; can we prevent another? How could a One Health approach mitigate the risk of future zoonotic disease emergences? Collaborations of scientists at the empirical level of the pyramid (virologists, ecologists, and molecular scientists) and the pragmatic level (epidemiologists, pathologists, veterinar-

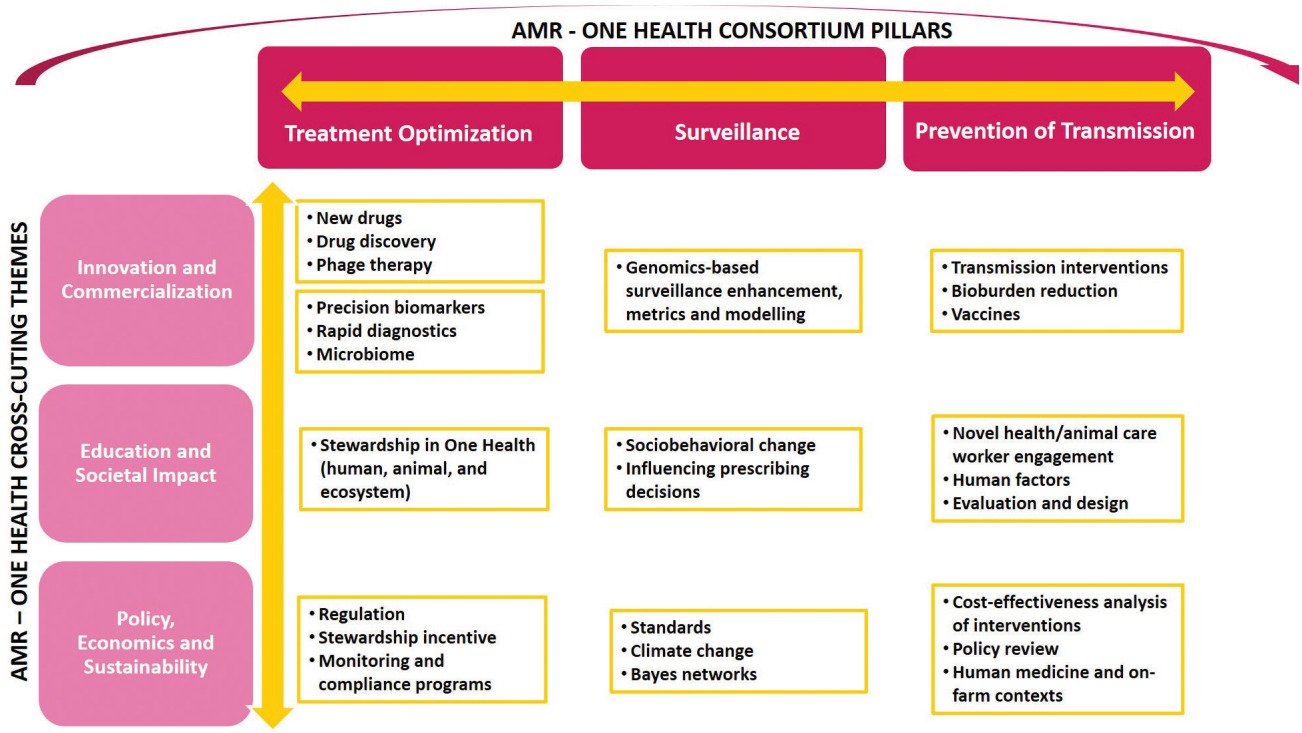

Figure 2. The pillars and themes summarizing the 30 projects within Alberta's AMR – One Health Consortium (https://research.ucalgary.ca/amr). Research questions posed by these projects also reflect the hierarchal level of disciplines posed by Max-Neef's transdisciplinary pyramid (5). Starting from the base of the pyramid and moving upwards, we ask: i) What exists; ii) What can we do; iii) What do we want to do; and iv) How should we do what we want to do? Integration of disciplines from all 4 levels reflects a transdisciplinary approach.

ians, and physicians) have concluded that SARS-CoV-2 likely emerged at the intersection of horseshoe bats, pangolins, and people at a traditional wet market in Wuhan, China (9,10). What can we do to reduce the future potential of pathogen transmission between wildlife and people? And how do we want to do that? How should we address the challenges of habitat loss and exploitation of wildlife populations that has increased animal-human-environment interactions? One suggestion has been to close wet markets across Asia (11). However, this will impose excessive restrictions on cultural expectations and compromise food security for a very large population; not a sustainable solution (12). A better approach would be a transdisciplinary collaboration that includes biological scientists as well as sociologists, economists, and decision-makers who can collectively address the questions from all levels of the pyramid for an ethical and sustainable solution that will reduce the risk of zoonotic disease transmission.

Investment in One Health is growing. In just the past 2 y, Canada has seen the creation of One Health at UCalgary (https://research.ucalgary.ca/one-health) and the One Health Institute at the University of Guelph (https://onehealth.uoguelph.ca/). Increasingly, funding opportunities require a One Health approach, such as a recent Emerging Infectious Diseases Modelling Initiative that encourages applicants "to establish multi-disciplinary collaboration that demonstrate integration of the One Health approach" (https://www.nserc-crsng.gc.ca/Professors-Professeurs/Grants-Subs/EIDM-EIDM_eng.asp). A quick Google search of "One Health" will result in many examples of programs and projects across the globe that advocate a One Health approach. These investments and collective action are the hope for a better future for all.

One Health in action

A complex blend of economic, social, and bio-physical factors has led microbes to develop resistance to drugs that have enabled intensive animal production, made invasive medical procedures such as surgery and dialysis possible, and minimized the outcome of many infectious diseases. Antimicrobial resistance (AMR) poses a global threat to human and animal health (https://www.oie.int/fileadmin/Home/eng/Media_Center/docs/pdf/PortailAMR/EN_OIE-AMRstrategy.pdf). The AMR — One Health Consortium (https://research.ucalgary.ca/amr) is a pan-Alberta initiative with 67 researchers from 11 institutions working across 30 projects. Funding was provided by Alberta's Minister of Jobs, Economy and Innovation ($6.315M) plus $9.254M in matching funds from many other revenue sources. To realize its vision of a future in which AMR is contained, the Consortium's projects collectively address multiple mitigation strategies and the 4 levels of Max-Neef's (5) transdisciplinary pyramid (Figure 2).

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