

DR BRUCE KAPLAN OF THE ONE HEALTH INITIATIVE COLLATED BOTH HIS OWN AND HIS COLLEAGUES' RESPONSES ON THE IMPORTANCE OF A WORLDWIDE ONE HEALTH APPROACH

Challenges and opportunities

The One Health concept is a worldwide strategy for expanding interdisciplinary collaborations and communications in all aspects of healthcare for humans, animals and the environment. The synergism achieved will advance healthcare for the 21st Century and beyond by accelerating biomedical research discoveries, enhancing public health efficacy, expeditiously expanding the scientific knowledge base, and improving medical education and clinical care. When properly implemented, it will help protect and save untold millions of lives in our present and future generations.

The One Health Initiative is a movement to forge co-equal, all-inclusive collaborations between physicians, osteopathic physicians, veterinarians, dentists, nurses and other scientific, health and environmental disciplines.

Recognising that human health (including mental health via the human-animal bond phenomenon), animal health, and ecosystem health are inextricably linked, One Health seeks to promote, improve and defend the health and wellbeing of all species by enhancing co-operation and collaboration between physicians, veterinarians, other scientific health and environmental professionals, and by promoting strengths in leadership and management to achieve these goals.

The internationally recognised One Health Initiative (OHI) team is currently comprised of two prominent physicians and two well-known veterinarians: Laura H Kahn, MD, MPH, MPP; Bruce Kaplan, DVM; Thomas P Monath, MD; (formerly, the late Jack Woodall, PhD); and Lisa A Conti, DVM,



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MPH (see: <https://goo.gl/rs7MjP>). Wildlife scientist/professor emeritus Thomas M Yuill, PhD (see: www.researchgate.net/profile/Thomas_Yuill) currently manages the ProMED Outbreak Reports OHI website page (see: www.onehealthinitiative.com/promed.php). Their Advisory Board (Hon.) consists of 34 extraordinary One Health professional leaders from the US and around the world (see: www.onehealthinitiative.com/advBoard.php).

Here Kaplan collates his and his colleagues' responses to PEN's questions. (Two previous One Health articles were published in *Pan European Networks: Science & Technology*, Sept 2017, issue 24, titled: Oncology – A 'One-Health' Approach, pg. 157 and One Health: A Ray of Hope, pg. 164).

What progress has been made in developing (and implementing) a One Health approach, and what have been the biggest developments in recent years?

We unequivocally subscribe to the fundamental truths of the One Health concept/movement: 'One Health is the collaborative efforts of multiple disciplines working locally, nationally and globally to attain optimal health for people, animals, plants and our environment ... the One Health implementation will help protect and/or save untold millions of lives in our generation and for those to come.'

One Health recognition has expanded respectably over the past few years globally; this is documented on the One Health Initiative Website (2008-2017) (see: www.onehealthinitiative.com). We can point to several significant developments including four International One Health Congress meetings worldwide beginning in Melbourne, Australia, in 2011. The fifth meeting is being scheduled for June 2018 in Saskatoon, Canada (see: <https://onehealthplatform.com/international-one-health-congress>) under the auspices of



the One Health Platform Foundation's (OHP) organising committee (see: <https://onehealthplatform.com/iohc/committees/organizing-executive-board>). I serve on this OHP committee as an OHI representative and participated similarly for the first congress. OHP has leadership locations in the Netherlands, Germany, Belgium and Australia.

In October 2012, the World Veterinary Association (WVA) and World Medical Association (WMA) signed a memorandum to collaborate in a unified approach to improve global health. Following the 2015 WVA-WMA inaugural Global Conference on One Health (GCOH) in Madrid, Spain, a second GCOH was held in Japan in 2016. Physicians and veterinarians worldwide exchanged information and considered effective countermeasures against global threats using a 'One Health approach'. The recognition stage for the 'One Health Concept' with a practical implementation stage was agreed to (see: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5476991/>).

Five international open access One Health Journals have also evolved, including:

- *Infection Ecology and Epidemiology*, The One Health Journal (Sweden) <http://www.infectionecologyandepidemiology.net/index.php/iee>;
- *Veterinary Sciences* (Switzerland) <http://www.mdpi.com/journal/vetsci>;
- *International Journal of One Health* (India) <http://www.onehealthjournal.org/>;
- *One Health Official Journal of the One Health Foundation* www.journals.elsevier.com/one-health; and
- *Journal of Animal Genetics, Transgenesis and Zoonoses* (JAGTZ) <http://www.obmpc.com/journals/jagtz>.

Outstanding One Health textbooks have similarly been published since 2010, including:

- *Human-Animal Medicine – Clinical Approaches to Zoonoses, Toxicants and other Shared Health Risks* (1st Edition 2010) (see: <https://www.amazon.com/Human-Animal-Medicine-Clinical-Approaches-Toxicants/dp/1416068376>);
- *Zoonoses – Protecting People and Their Pets* (1st Edition (2013) (see:

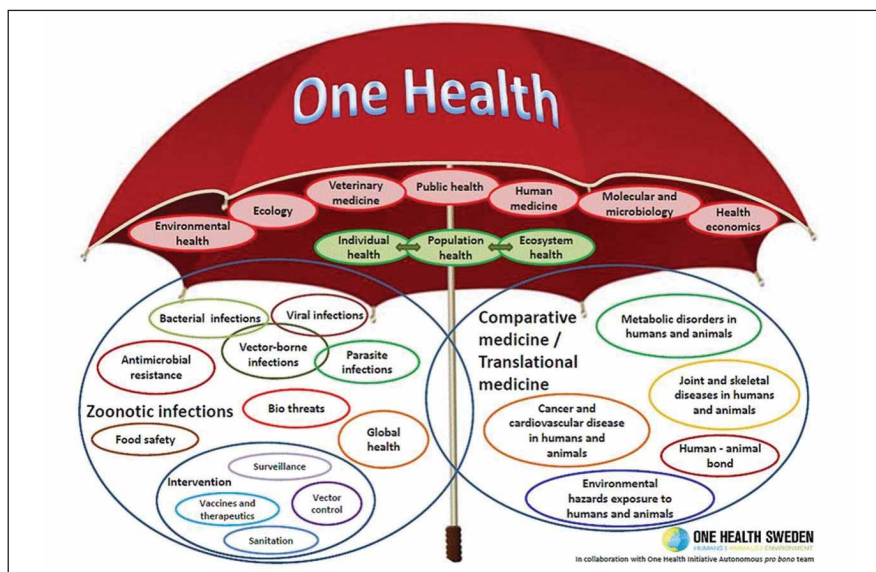
<http://www.cfsph.iastate.edu/Products/zoonoses-protecting-people-and-their-pets.php?lang=en>);

- *Zoonotic Tuberculosis: Mycobacterium bovis and Other Pathogenic Mycobacteria* (3rd Edition 2014) (see: www.wiley.com/WileyCDA/WileyTitle/productCd-1118474295.html);
- *Global Population Health and Well-Being in the 21st Century - Toward New Paradigms, Policy and Practice* (2015) (see: <http://www.springerpub.com/global-population-health-and-well-being-in-the-21st-century.html>);
- *One Health and the Politics of Antimicrobial Resistance* (2016) (see: <https://jhupbooks.press.jhu.edu/content/one-health-and-politics-antimicrobial-resistance>);
- *The Principles and Practice of Q Fever: The One Health Paradigm* (2017) (see: www.novapublishers.com/catalog/product_info.php?products_id=60886&osCsid= and www.onehealthinitiative.com/publications/The%20Principles%20and%20Practice%20of%20Q%20Fever%20978-1-53610-851-4.pdf); and
- *ONE HEALTH From AIDS to Zika* (2018) (see: <http://www.jblearning.com/catalog/9781284136746/>).

Dr Lisa Conti, deputy commissioner and chief science officer at the Florida Department of Agriculture and Consumer Services in the US, and co-manager of the One Health Initiative website, says: "In the US, I have witnessed three features that foster the development of a One Health (OH) approach – steps toward an OH education environment, recognition of transdisciplinary working groups, and technological advancements, particularly within communications.

"Several universities have added classes or activities wherein students are encouraged to participate with sister colleges. Academic leaders are finding ways to incentivise these relationships. Likewise, academic administrations are financially rewarding transdisciplinary working groups. Furthermore, while researchers spent much of the last century developing specialised and sub-specialised fields of study, recent Nobel recipients noted the incompatibility of most of the coveted prizes' restrictions to be awarded to individuals with growing transdisciplinary research and the need for the Nobel Prizes to acknowledge and encourage this approach. Finally, the connectivity permitted with communication technology sees collaborations with partners across the globe."

Dr Tom Yuill, manager for the One Health Initiative team's website 'ProMED Outbreaks Reports' page, adds: "In my area (arthropod-borne viruses and the diseases they cause), interdisciplinary efforts have historically been very good, with collaboration between veterinarians, physicians, entomologists, virologists and biologists/ecologists. A major development has been the inclusion of molecular biologists, which has given tools for better understanding epidemiological relationships and mechanisms of pathogenesis in humans and other animals as well for developing more effective vaccines, such as Ebola."



More than half of all infections that people get are spread by animals, and each year around the world it is estimated that zoonoses cause 2.5 billion cases of sickness and 2.7 million deaths. What are the best approaches to tackling this?

Approximately 60% of existing human infections are of animal origin, i.e. zoonotic. Over 75% of emerging infectious diseases of humans (including Ebola, HIV and influenza) evolve from animals. One Health leader Dr Lonnie J King (see: <https://vet.osu.edu/king-lonnie-j>) in a 2005 article titled *The Interface Between Human and Veterinary Public Health* (see: <http://studylib.net/doc/17645426/the-interface-between-human-and-veterinary-public-health->) observed that ‘we are facing “a microbial perfect storm”, consisting of the convergence of four factors underpinning Emerging Infectious Disease (EAD): genetic and biological, physical and environmental, ecological, and social, political, economic.’

In December 2013, One Health Sweden (see: <http://www.onehealth.se/ohs/>) and the OHI team together created the One Health Umbrella graphic (see: <http://www.onehealthinitiative.com/OneHealth2>), recognised as a worldwide recipe for tackling this serious societal problem via co-equal transdisciplinary collaborations.

Yuill noted: “Some two thirds of emerging zoonoses involve wild animal hosts. The population dynamics of these wild animals (mainly birds and mammals) is usually poorly understood as to how these dynamics affect the transmission, maintenance and spread of these pathogens in Nature. The increasing adaptation of several wild species to urban and suburban life further complicates these relationships.

“Disease surveillance in urban and rural populations of wildlife is needed with more close collaboration between wildlife biologists and wildlife veterinarians. Although populations of domestic animals are better understood, there are significant trends that affect prevalence of zoonotic pathogens.

“Production systems of food animals have changed dramatically over the past 50 years and are likely to continue. Both food animal veterinarians, companion animal veterinarians, animal scientists, food animal producers and the public in general need to understand what changes are occurring and how that influences health risks for

consumers and for pet owners. The challenge in informing the public is creating understanding without eliciting alarm and panic. Few scientists are trained to do this well, but should be.”

Conti adds: “We know the more wicked the problem, the more likely it will require a transdisciplinary approach to identify and implement solutions.”

How can antimicrobial resistance benefit from a One Health approach? How could this be better tackled in order to complement the race to develop new antibiotics?

Answers to this complex threat are contained in a comprehensive book about antimicrobial resistance (AMR) by physician OHI leader Dr Laura H Kahn: *One Health and the Politics of Antimicrobial Resistance* (2016) (see: <https://jhupbooks.press.jhu.edu/content/one-health-and-politics-antimicrobial-resistance>).

Kahn says: “One Health forces us to examine the complex subject of AMR in an interdisciplinary way. When we do that, we see unexpected trends emerge. First, tracking AMR genes is inadequate to determine the aetiology and epidemiology of AMR. We must use whole-genome sequencing of resistant microbes in all of our surveillance systems.

“Second, antibiotics have been touted as wonder drugs, and they certainly have saved many lives, but their use has come with costs including adversely affecting peoples’ microbiomes and potentially changing the microbial ecosystems of the planet. We need to start working with Nature and not against it. Antibiotics are analogous to fossil fuels. They are highly effective, but are damaging in the long-term.

“The natural foe of bacteria are bacteriophages. They are the most prevalent bioform on the planet. We need to develop them just as we need to develop clean, renewable energy. There has been growing interest in them. Research and development of bacteriophage pharmaceuticals needs to be significantly ramped up. We need to switch to phages in clinical medicine, food safety, food security, and public health.”

Conti adds: “Since antibiotics are used for humans, animals and even for plants (you can buy them in your local DIY store), and they find their ways into our waters, only a One Health

approach will identify solutions that address all of these sectors.”

It has been argued that weak governance and poor enforcement of policies and legislations have led to slow action on AMR in southeast Asia. What elements of best practice could be exported to help? Furthermore, how do AMR (and perhaps other One Health challenges) differ from region to region, and how important is it for inequalities to be addressed?

Kahn says: “Again, expecting people to cut back on antibiotic use is ultimately defeating. Developing phages for global use would make the AMR issue moot.”

Yuill adds: “Having had an opportunity to work internationally through much of my career, I have come to appreciate the social, economic and political complexity involved in human and animal health issues in developing countries. Attempts to impose solutions by the industrialised nations are not likely to be accepted or successful if tried. The development of policies and their implementation must come from within those countries. We can be helpful with training programmes, the provision of equipment and supplies, and advice when solicited.”

Conti says: “Kahn’s work certainly points toward the open defecation issue – calling for basic sanitation to help mitigate the need for access to antibiotics. Currently, while healthcare providers may not be on every corner, access to antibiotics appears to be in developing countries. In developed countries, solutions are needed for issues such as dispensing only what is needed, removing antibiotics and their metabolites from the waste stream, and alternate solutions to antibiotic use.”

Collaboration among all the health sciences to address critical needs is crucial, especially between the veterinary medical and human medical professions. What are the biggest barriers to this, and could more be done on the part of the different sectors?

One Health supporters (see: <http://www.onehealthinitiative.com/supporters.php>) recognise the urgency for a ‘One Health

approach’. However, among some actively operating One Health institutional silos (worldwide), there remains a reluctance to share resources, credit others or allude to other major players active within the One Health movement. Former environmental consultant for the Florida Department of Health, US, Dr Mary Echols wrote in *Veterinaria Italiana*, 2009 (see: http://www.izs.it/vet_italiana/2009/45_3/377.pdf): ‘...no single person, no single health profession, no single organisation, no single nation or people invented or owns One Health...’.

Yuill says: “The barriers are often best described as defence of ‘turf’ between professions and specialties.”

Conti adds: “Barriers include changing the environment to support these collaborations. As noted in the first question, (much) progress is being made, but leadership and incentives (resources and recognition) are all needed to continue fostering this change.”

What have been the biggest challenges encountered by the One Health Initiative since its inception, and what are your hopes for the future?

“There are still plenty of silos that need to be opened. This is easier said than done,” Kahn says.

Yuill adds: “I am optimistic that the One Health concept will continue to increase and spread. The Wildlife Disease Association, in which I have been active for over 40 years, now states on its website that ‘WDA is all wildlife diseases, all conservation, all One Health, all the time’. Perhaps my biggest concern is the drive in science for ever-increasing speciality at the expense of teamwork. Funding agencies focus on work done by highly specialised individual investigators and their internal groups, and most sponsored projects are short-term, whereas most problems require long-term efforts to solve them.

“Award of tenure for faculty at universities is too often based on what the individual has accomplished alone, rather than their contributions to a team effort working on a practical problem. Of course, we need imaginative specialists, but accomplishing a good balance between basic and applied research is not easy. The latest advances in molecular biology are ‘sexy’. Applying those advances to define and solve problems in the field is too often considered pedestrian (unless there is a crisis with lots of dead bodies on the landscape).”

Summing up, Conti says: “OHI success would be a world where humans, animals and the environment are healthy and thriving. We face huge challenges, including basic needs of food, clean water and sanitation across the globe. Clearly, the One Health approach is critical to pooling resources and tapping into talent.”



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