

## 'One Medicine–One Health': An Historic Perspective



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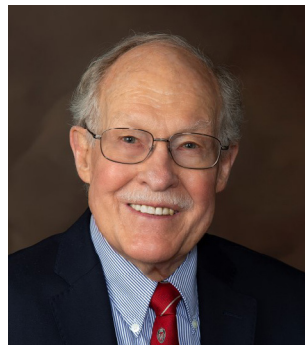
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*Adapted with permission from the One Health Initiative [1]*

As we reflect upon the array of global health challenges that affect morbidity and mortality rates, we recognize the need to better understand the determinants of health that influence health outcomes. The One Health concept offers a holistic perspective of the interconnectedness between

human, animal, and environmental health [2] (Figure 1). In short, One Health is defined by the One Health High Level Expert Panel (OHHLEP), supported by the World Health Organization (WHO), Food and Agriculture Organization (FAO), World Organisation for Animal Health (OIE), and the United Nations Environment Programme (UNEP) [2]:

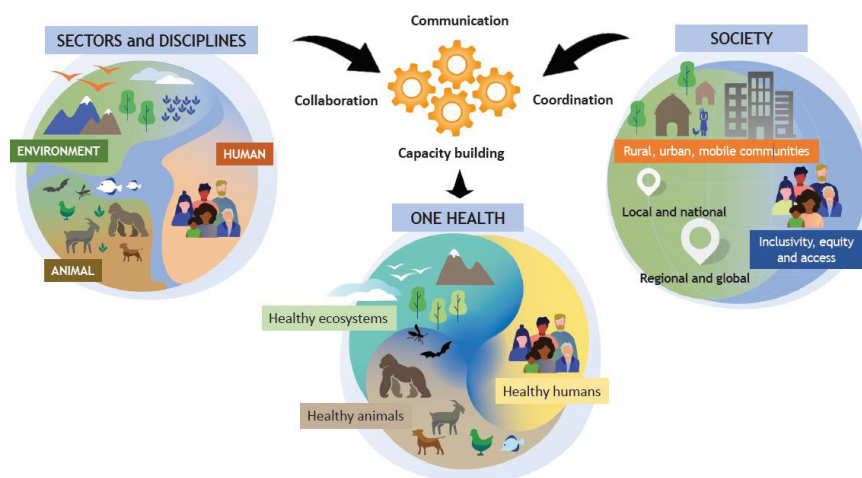


Figure 1. Definition of the One Health concept [2].

*“One Health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystems.*

*It recognizes the health of humans, domestic and wild animals, plants, and the wider environment (including ecosystems) are closely linked and inter-dependent.*

*The approach mobilizes multiple sectors, disciplines and communities at varying levels of society to work together to foster well-being and tackle threats to health and ecosystems, while addressing the collective need for clean water, energy and air, safe and nutritious food, taking action on climate change, and contributing to sustainable development.”*

The One Health implementation's *raison d'être* is to significantly help protect and save untold millions of lives in our current and future generations. The One Health Joint Plan of Action (2022–2026), which was published by the Quadripartite Organizations (WHO, FAO, OIE, UNEP) in October 2022, offers specific guidance on how to support the One Health concept in practice and strengthen resilience of local,

national, and global health systems [3]. In this article, authors will offer a historical review of One Health, where they will describe the main scientific leaders – from human, animal, and environmental health sciences – who propelled the One Health movement since the 1880s to present day.

## Before the Modern “One Health” Era

Two main scientists led efforts to expand the connections between human and animal medicine. First, Dr. Rudolf Virchow is recognised as the father of cellular pathology. He noted that disease transmission was possible from animals to humans and subsequently coined the term “zoonosis”. He stated that *“Between animal and human medicine there are no dividing lines--nor should there be. The object is different but the experience obtained constitutes the basis of all medicine”* [4]. Second, Dr. William Osler is known as the father of modern medicine and founder of veterinary pathology [5]. By 1884, Dr. Osler had made significant strides in medical and veterinary sciences, academic teaching, and laboratory sciences.

## Origin of the Present Day’s “One Health” Concept

Two leading 20th century national and international veterinarian leaders paved the way as influential synergistic One Health champions. Dr. James H. Steele, who is recognised as the Father of Veterinary Public Health, was founder of the U.S. Centers for Disease Control and Prevention (CDC)'s Veterinary division in 1947 [6]. This division advocated for One Health principles, zoonotic disease management, and other prioritised global health endeavours. Dr. Calvin W. Schwabe, who is recognised as the Father of Veterinary Epidemiology, had monumental intellectual contributions, including coining the “One Medicine” term [7].

On 24 July 2007, Dr. Steele wrote a note to the author saying, *“Congratulations. You have moved OH [One Health] to a higher level with your [OHI team] campaign, One World, One Medicine, One Health.”* Deliberately, Dr. Steele routinely included the term One Medicine prior to One Health, in oral communications with the author, during the late 20th and early 21st centuries. As a former OHI Advisory Board member, Dr. Steele followed Dr. Schwabe's One Medicine concept, and helped usher in the historically modern-day One Health movement. These steps subsequently eventually led to the American Veterinary Medical Association (AVMA) and American Medical Association (AMA), together adopting and highlighting the 21st century's most significant One Health forefront.

In the One Health vanguard, many luminous One Health leaders emerged, including physicians, and highlights the *‘lest we forget’* phrase about other physician and veterinarian historic One Medicine–One Health



pioneers [8,9]. Early appreciation and acknowledgment of comparative medicine and translational research [10] – now recognised in the One Health umbrella (Figure 2) – was presciently discussed in Dr. Schwabe’s book, *Cattle, Priests, and Progress in Medicine*, which was published in

*a much greater role in the training of persons for research in human medicine.*

*To illuminate the historical link between animals and man in medical progress, Professor Schwabe recounts highlights in the history of medicine from ancient times onward. He describes the early history*

The 21st century physician trailblazer, instrumental in establishing the modern One Health movement, was the late Dr. Ronald M. Davis, who was the former president of the American Medical Association (AMA) and former director of the Henry Ford Health System’s Center for Health Promotion and Disease Prevention [12]. A visionary physician One Health leader, Dr. Davis adroitly guided the passage of the landmark AMA One Health resolution that has propelled further into the 21st century “One Health” movement lexicon.

On 3 July 2007, Dr. Davis and the AMA shared a message with the OHI team: “I’m delighted that the AMA House of Delegates has approved a resolution calling for increased collaboration between the human and veterinary medical communities and I look forward to seeing a stronger partnership between physicians and veterinarians. Emerging infectious diseases, with the threats of cross-species transmission and pandemics, represent one of many reasons why the human and veterinary medical professions must work more closely together.” Dr. Davis’ prophetic coalition with Dr. Roger Mahr, the former president of the American Veterinary Medical Association, signaled the re-emergence of the human medical profession’s participation in the rekindling of a One Health surge for the betterment of humankind, animals, and the environment.

In 2006, Dr. Laura Kahn, a physician and policy researcher at Princeton University, published *Confronting Zoonoses, Linking Human and Veterinary Medicine* in the *Emerging Infectious Diseases* journal [13]. Dr. Bruce Kaplan, a veterinarian, contacted her to discuss the implications of the article. Their conversations led them to co-found the One Health Initiative, a *pro bono*

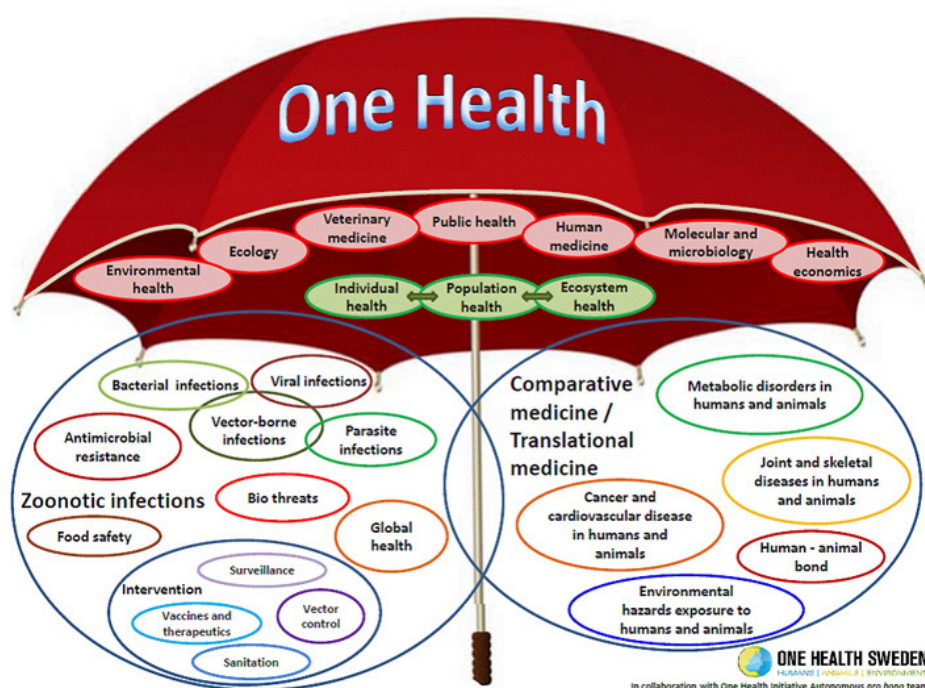


Figure 2. One Health umbrella (Credit: <https://onehealthinitiative.com/the-one-health-umbrella/>)

1978. This book was an expansion of the 1977 fourth series of Spink Lectures in Comparative Medicine, especially the fourth volume of the Wesley W. Spink Lectures on Comparative Medicine that highlighted Dr. Spink’s work as a physician who “maintained a deep interest in comparative medicine for almost forty years...” [11], as stated:

*“...The author [Dr. Schwabe] shows that over the centuries many of the most significant breakthroughs in improving human health have been closely associated with observations and experiments on animals other than man. Because human medical progress has been so dependent on veterinary studies, he urges that schools of veterinary medicine assume*

*of man in terms of animal cultures, focusing on the prehistoric Nile Valley, and points to similarities in medical knowledge between present-day “cattle” societies in Northeastern Africa and the ancient people of the Nile. He discusses the comparative healers of ancient Egypt, the comparative foundations of Greek medicine, the Arabic contribution, Sicily and the beginnings of modern medicine, and subsequent developments through the Renaissance. Bringing the history down to modern times, Professor Schwabe emphasizes the role of veterinary medicine in medical research. He outlines specific reforms in the curricula of schools and colleges of veterinary medicine which would provide for the education of medical investigators.”*

group of individuals dedicated to promoting the One Health concept. Dr. Kahn has served as a columnist with the *Bulletin of the Atomic Scientists* (<https://thebulletin.org/biography/laura-h-kahn/>) and has authored several books, including *Who's in Charge? Leadership During Epidemics, Bioterror Attacks, and Other Public Health Crises and One Health and the Politics of Antimicrobial Resistance* [14,15]. She has also created a free, online Coursera course entitled, *Bats, Ducks, and Pandemics: An Introduction to One Health Policy* (<https://www.coursera.org/learn/onehealth>). Currently, she is working on her next book using the One Health concept as a framework to examine coronaviruses.

## Important “One Health” 21st Century Events

The AMA One Health resolution was originally drafted by Dr. Kahn, with guidance by Dr. Davis, and contributions by Dr. Kaplan and Dr. Thomas P. Monath. Dr. Davis, Dr. Mahr, and Dr. Kahn testified at the AMA convention in Chicago, urging the organisation to support the resolution. After the AMA unanimously passed the resolution, Dr. Davis and Dr. Mahr led the historic One Health liaison between the AVMA and the AMA. In response, the AVMA passed a One Health resolution concomitant with the AMA House of Delegates annual meeting on 24 June 2007.

One highly influential on the world scene was the 2012 World Medical Association (WMA) and World Veterinary Association (WVA) One Health statement published in 2012 [16]. Dr. Cecil B. Wilson (<https://www.wma.net/blog-author/cecil-b-wilson/>), who was the WMA president at the time and AMA past president, led this Memorandum of Understanding, together with the

current and past WVA presidents, in October 2012.

In November 2012, the American Association of Public Health Physicians (AAPHP) (<https://www.aaphp.org/OneHealth/>) became a supporter of OHI and the One Health concept/approach. Dr. Virginia “Ginny” Dato, who served as AAPHP president and Dr. Dave Cundiff who was the AAPHP’s AMA representative, strongly endorsed One Health. This lent considerable impetus to the validity of implementing and institutionalising the One Health approach for efficaciously expediting national and global public health and clinical research endeavours. Dr. Wilson and Dr. Dato are members of the OHI Advisory Board (Hon.).

The World Bank recognised the One Health concept, noting that, “*Public health systems have critical and clear relevance to the World Bank’s twin goals of poverty eradication and boosting shared prosperity. ...*” [17]. Detailed documentation and evaluation guidelines helped established an essential financial underpinning and support for the One Health concept [18-19].

In August 2022, Dr. Kahn, co-founding physician member of the OHI team, collaborated with the OHI team’s prolific new member associate and eloquent wordsmith. Together with Mr. Richard Seifman, former World Bank Senior Health Advisor (<https://onehealthinitiative.com/former-senior-health-adviser-at-the-world-bank-joins-one-health-initiative-team/>), they published a far reaching proposal with, expressing the vision that “*A new World Bank/WHO Fund could treat prevention as a priority and for which the One Health interdisciplinary approach is critical*” [20].

An important One Health

concept is the development of disease countermeasures through coordinated efforts of veterinary and human medicine, that benefit both animals and humans. Examples of specific products that address diseases common to both include vaccines for prevention of rabies in raccoons, foxes, dogs, cats and humans, and ivermectin for prevention of heartworm and other parasites of animals and of onchocerciasis (river blindness) in humans. Other examples are vaccines in development against West Nile virus disease in horses and humans; against coccidioidomycosis in dogs and people; and against Lyme disease in dogs, wild rodent reservoir hosts and humans. Vaccination of animals plays a potentially expanding role in the prevention of zoonotic diseases affecting humans [21-24].

In 2018, Dr. Fauci notified the OHI team that he recognised and endorsed the One Health concept (<https://onehealthinitiative.com/again-follow-dr-faucis-lead/>).

## Important “One Health” 21st Century Leaders

Three visionaries – Dr. Schwabe, Dr. Steele, and Dr. Davis – were arguably the historic titans of the expanded and dynamic One Health era in today’s 21st century. Other health scientists have helped propel the One Health movement over the next years.

Dr. Roger Mahr [25] and Dr. Lonnie King (<https://vet.osu.edu/deanking>), select members of the 2008 AVMA One Health Task Force, and European and Asian leaders contributed immensely during the 21st century. These countries included Australia, Canada (<https://onehealth.uoguelph.ca/>), China, Greece, India, Japan, Portugal (<https://onehealth.icbas.up.pt/en/>), South America, Sweden, Switzerland, and the United Kingdom [26-35]. A promising



newcomer to the world's One Health scene is Africa [36].

Since 2010, the One Health Commission (OHC) ([https://www.onehealthcommission.org/en/leadership\\_\\_board\\_of\\_directors/](https://www.onehealthcommission.org/en/leadership__board_of_directors/)) and One Health Platform (OHP) leaders have staunchly helped elevate and propel the One Health movement in the United States and worldwide. Since 2013, Dr. Cheryl M. Stroud has served as OHC executive director and developed a comprehensive educational website (<https://www.onehealthcommission.org/>), and together with the OHI and OHP, initiated the popular One Health Day concept (<https://onehealthday.com/>). During the last two decades, EcoHealth Alliance (<https://www.ecohealthalliance.org/senior-leadership>) leaders of a major environmental and wildlife silo have given One Health impetus.

The One Health for One Planet Education Initiative (1 HOPE) has been indefatigably led by Dr. George Lueddeke (<https://onehealthinitiative.com/wp-content/uploads/2022/08/22.08.2022-pdf-1-HOPE-Updated-Regional-Consortia-1.pdf>). Dr. Lueddeke's publications have included *Survival: One Health, One Planet, One Future* (Routledge Studies in Sustainability), *Planet Earth: Averting a Point of No Return?*, and a three-part *Reflections on the Transformation of Higher Education in the 21st Century* [37–39].

Another remarkable trailblazer physician One Health contributor has been and is Dr. Gregory Gray. Among many extraordinary One Health accomplishments, including the Duke One Health Newsletter (<https://onehealthinitiative.com/duke-one-health-newsletter/>), Dr. Gray had established the first

in One Health (<https://egh.phhp.ufl.edu/education/degree-programs/phd-in-one-health/>), while directing the University of Florida's One Health program (<https://onehealth.ifas.ufl.edu/>). Dr. Gray recently left Duke University and launched an extraordinary One Health Program at the University of Texas Medical Branch (UTMB) at Galveston, Texas (United States) (<https://www.utmb.edu/one-health>).

The landmark textbook, *Human-Animal Medicine: Clinical Approaches to Zoonoses, Toxicants, and Other Shared Health Risks* (2010), was prepared by Dr. Peter Rabinowitz (<https://deohs.washington.edu/faculty/peter-rabinowitz>) and the late Dr. Lisa A. Conti [40]. This physician-veterinarian collaboration set a high bar in the scheme of One Health textbook publications. Other important textbook contributions followed ([https://www.onehealthcommission.org/en/resources\\_\\_services/one\\_health\\_library/books/](https://www.onehealthcommission.org/en/resources__services/one_health_library/books/)), including excellent international educational endeavours of 1 HOPE and One Health Lessons (<https://onehealthlessons.org/>).

One major physician One Health leader, Dr. Monath, an internationally recognised virologist and vaccinologist [41], co-founder of the OHI team, and AVMA taskforce member, voiced a suggestion to members of the new OHI team alliance (2007) regarding the value of instituting a unique DVM (VMD)/MD (DO) degree program. There are many examples of where various individuals have attained both degrees and went on to become exceptionally prominent and productive international health care participants.

One such dual degree professional is Dr. Steven W. Atwood, who practises veterinary medicine at Animal Health Care Associates in West Tisbury,

Massachusetts (United States). Dr. Atwood, an avid One Health advocate (<https://onehealthinitiative.com/portrait-of-a-dedicated-u-s-one-health-leader/>), co-authored a paper discussing Dr. Monath's suggestion of combining medical and veterinary medicine programs [42]. This article was revised and reprinted in the *One Health & Implementation Research* journal. Also, one renowned physician is Dr. Gary S. Roubin, who served as an interventional cardiologist, with the Cardiovascular Associates of the Southeast Birmingham in Alabama, endorsed the One Health concept [43].

A strong longstanding One Health advocate, Dr. Myron “Mike” G. Schultz, a trained veterinarian and physician, detected a cluster of pneumonia cases in the early 1980s, which helped public health officials identify the acquired immunodeficiency syndrome (AIDS) epidemic [44]. As an infectious disease epidemiologist with the U.S. CDC, Dr. Schultz created the Parasitic Diseases Drug Service to provide physicians with medicines to treat rare illnesses, including pentamidine. Prescribed for patients with African sleeping sickness, it was also made available to treat patients with pneumocystis pneumonia in the early years of the AIDS epidemic, when few alternatives were available. He published more than 110 papers and book chapters, including epidemiology and the history of medicine, in the *New England Journal of Medicine*, the *Journal of the American Medical Association*, the *American Journal of Tropical Medicine & Hygiene*, and the *Emerging Infectious Diseases* journal. He also served as an epidemiology consultant to the WHO, the Pan American Health Organization, and the Ministries of Health of the Egypt, Federal Republic of Germany, Haiti, Indonesia, Israel, Poland, People's Republic of China,

Republic of China (Taiwan), Republic of South Vietnam, Saudi Arabia, and Zimbabwe.

An excerpt of his career path was shared in the *Emerging Infectious Diseases* journal: “...With DVM and MD degrees in hand, Mike interned at the US Public Health Service Hospital (Boston, MA, USA). This internship led to his recruitment by Alexander D. Langmuir (1910–1993) and a transformative 2-year stint in Langmuir’s Atlanta-based Epidemic Intelligence Service (EIS) training program at the (then-named) Center for Disease Control (CDC). Mike’s EIS experiences included a 1964 deployment to Vietnam to investigate infectious disease threats in the war and an important friendship with James Harlan Steele, DVM (1913–2013), the renowned veterinary epidemiologist/epizootiologist whose leadership helped to formulate their shared concept of “One Health”—the idea that humans, animals, and the environment are all part of an intertwined ecosystem with respect to disease occurrence and microbial evolution—and to shape the conceptualization of emerging infectious diseases...” [44]. His biography continues to inspire future generations in veterinary medicine and environmental health sciences [44]. In July 2018, Dr. Schultz was posthumously awarded the American Veterinary Epidemiology Society’s (AVES) (<https://www.avesociety.org/>) coveted Gold Headed Cane award.

The One Medicine–One Health extensive 20th century dissertations and public speaking engagements – inspired by Dr. Schwabe’s and Dr. Steele’s work – examined disease transmission among humans, domestic animals, and wildlife. This was reaffirmed and expanded upon in 2004, with the organisation of the One World, One Health

conference in New York ([http://www.oneworldonehealth.org/sept2004/owoh\\_sept04.html](http://www.oneworldonehealth.org/sept2004/owoh_sept04.html)), which aimed to explore how to best combat health threats to humans and animals from disease transmissions, using a One Health approach. This was widely documented well before the 21st century surge in awareness and recognition, with various quests for exclusive provincial nomenclature credit and tribalism.

Indeed, the author personally recalls telephone conversations in the 1990s, wherein Dr. Steele expressed the phrase, “One World–One Medicine–One Health”, in the context of discussing Dr. Schwabe’s contribution to One Health origins [45]: “...I met and spent part of a morning and lunch with Dr. Schwabe at the home of one of his close friend(s) [a leading New Jersey Department of Health]—public health authority in Princeton, N.J. (USA), Oscar Sussman, DVM, MPH, JD...in the early 1960s...” (<https://onehealthinitiative.com/20th-century-public-health-leader-and-unheralded-early-one-health-practitioner-dies>). Memorably, veterinarian Dr. Sussman and his arbovirus research physician collaborator, then New Jersey’s laboratory director Dr. Martin Goldfield, helped inspire this author and contributor to further appreciate the potent influence a One Medicine–One Health approach (i.e. transdisciplinary paradigm offered to ‘grease the skids’ for advancing society’s health care strategic management).

A foundational public health physician and One Health leader, Dr. D. A. Henderson, professor of medicine and public health at the University of Pittsburgh, collaborated extensively with Dr. Steele. He is the late legendary leader of the worldwide smallpox eradication program. On 22

April 2007, he commented to the OHI team: “I thank you for your email and congratulate you and your colleagues in promoting the “One Medicine” concept. It is an initiative that is long overdue but, at the same time, I don’t personally identify dramatic solutions that are apt to change the landscape in the short term. I would note that when one has had the good fortune to have enjoyed the tutelage of Jim Steele during my tenure at CDC and periodically ever since, as a friend, the one medicine concept becomes well engrained. Indeed, when I came to Hopkins as Dean in 1977, I cast about to determine how we might link up with a veterinary school for research and educational purposes. Unfortunately, geography was simply too great a hurdle to overcome. Bottom line: I would be more than happy to do whatever I could in support of your efforts” (<https://onehealthinitiative.com/endorsements/>).

There were abundant descriptive publications and lectures from both iconic leaders, Dr. Steele and Dr. Schwabe, cogently and powerfully voicing the One Medicine–One Health concept during the latter half of the 20th century. Dr. Steele continued promoting One Health activities for 13 years into the 21st century, which were documented in his biography [46–48].

The essence of how Dr. Steele and Dr. Schwabe influenced the One Health movement was captured by Dr. King, Chair of the AVMA One Health Initiative Task Force, in his special report [49]. Dr. King was recognised as a living “giant” in the One Health movement, as the then director of CDC National Center for Zoonotic, Vectorborne, and Enteric Diseases (<https://www.cdc.gov/nceid/index.html>) and member of the AVES Board of Directors. In 2009, he proposed and established the CDC One Health Office (<https://>

[www.cdc.gov/onehealth/index.html](http://www.cdc.gov/onehealth/index.html)). Currently, Dr. Casey Barton Behravesh is the director of the CDC One Health Office.

The author suggests that readers review the History of the One Health Initiative CDC’s One Health Resource Library, which offers comprehensive websites including the historic One Health chronicle [50–51]. More than ample generational evidence exists to literally scream out, “Why was this One Health modality not widely implemented much earlier? While exponentially expanded on the world stage today, why is it still not ramrodded above and beyond its current status?! Additional resources can be found in the *Impakter Magazine* collection of One Health articles (<https://impakter.com/tag/one-health/>), including a brief analysis on innovative applications of artificial intelligence for the future [52].

## Conclusion

As we join forces in the One Health movement, we appreciate the complementary poetic words by two authors. Lewis Carroll wrote the “Walrus and the Carpenter” poem, where he highlighted the urgency of the moment: “*The time has come,*” *the Walrus said*” [53]. Edwin Milliken published the “Finest Hour 131, Summer 2006” poem, where he reflected on a train wreck and individual responsibility: “*Who is in charge of the clattering train?*” [54]. Adapting these poetic references to the One Health concept, we must act promptly, take responsibility for our actions, and promote transdisciplinary collaborations to develop innovative solutions to complex global health challenges.

Hence, to the crewmen of the world’s political and health establishments’ powers-that-be, WAKE UP!

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