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The Concept of One Medicine

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Today's world is rapidly changing, complex, and progressively more interconnected. The convergence of people, animals, and our environment has created a new dynamic characterized by a profound and unprecedented interdependence in which the health of all three domains is now inextricably linked and elaborately connected. Over the last three decades, approximately 75% of new emerging human diseases have been zoonotic. The human–animal interface is expanding, accelerating, and becoming increasingly more consequential. At the same time, we have permanently altered a significant portion of our environment, ecosystems, and habitats and have created a new ecological milieu that is changing both the conditions of our human–animal interface and the conditions for microbial adaptation and the emergence and reemergence of infectious diseases worldwide.

Our new interdependence includes social, economic, political, and biological conditions that are creating new threats to the health of people, animals, and our environment. We can no longer focus on these threats separately from each other. Our contemporary challenge is to create and implement a new mindset and strategies to address our threats to health based on a holistic and integrated approach with a special emphasis on prevention and attacking problems closer to their origin that is often within the animal and environmental domains. This approach is the essence of the concept of One Health.

One Health can be defined as the collaborative effort of multiple disciplines – working locally, nationally, and globally to attain optimal health for people, animals, and our environment. The scope of One Health is impressive, broad, and growing. Much of the recent focus on One Health has been limited to emerging infectious diseases yet the concept clearly embraces environmental and ecosystem health, social sciences, biodiversity, ecology, noninfectious diseases and chronic diseases and much more.

While the concept of One Health is not new, it has enjoyed a new recognition based on today's complex challenges to our health. The veterinary profession is especially well equipped through our broad training in herd health, comparative medicine, epidemiology, problem solving, and disease ecology to play an important role in implementing new One Health strategies.

Factors Driving One Health

In a publication entitled *Microbial Threats to Health: Emergence, Detection, and Response*, authors from the Institute of Medicine suggested that a group of factors have simultaneously converged to create a “perfect microbial storm” [1]. The most important of these factors include:

- adaptation of microbes
- global travel and transportation
- host susceptibility
- intent to do harm
- climate change
- economic development and land use
- human demographics and behavior
- a breakdown of both public and animal health infrastructures.

The Human Domain

The world population has a growth rate of 1.2% per year and the next century will represent a period of exponential growth. We add approximately 10 000 people per hour to our global population every day. Approximately 90% of the world's population growth is occurring in the developing countries where we are most concerned about a lack of adequate public and animal health infrastructure. In addition, almost 1 billion people live in

periurban or slum settings in the developing world's largest cities and these sites are where the most rapid growth in our human populations will continue. Concurrently, there is unprecedented immigration, translocation, and movement of people worldwide. Unique diasporas have emerged and there are large numbers of immunocompromised individuals dispersed throughout the US and global populations who are especially susceptible to infections involving food- and water-borne illnesses.

The Animal Domain

While there is also legitimate concern about the approximately 800 million people who are undernourished, we are concurrently observing a relative increase in wealth in the developing world and as per capita incomes rise, people eat more calories and consume different products, including a demand for meat and protein from animal sources. Thus, a new agricultural phenomenon is emerging – the Livestock Revolution; we will need to increase protein from animal sources by 50% over the next several decades. We will also need to increase food-animal production with minimal impacts on the environment and our ecosystems. Veterinarians will be engaged with ecologists to help ensure the sustainability of our lands.

At the same time, companion animals and pets are also rapidly increasing globally and there are untold numbers of wildlife that are increasingly involved at the human–animal interface and responsible for carrying and transmitting more and more zoonotic diseases. West Nile virus, Lyme disease, Nipah, Hendra, and hantaviruses are some important examples.

With a new appreciation of the need for detecting and identifying human infectious disease threats at animal and ecosystem level, our scope of disease surveillance must also be expanded to include these domains. Currently, 80% of select agents are zoonotic which further emphasizes the need for integrating animal disease surveillance into human disease surveillance programs. In addition to the benefits of earlier detection and warning, surveillance within these domains will give us new insights and analyses on disease prediction and new possibilities to prevent future disease occurrences and exposures. Thus, animal disease surveillance has taken on a new importance and relevance.

Until we address the underlying factors that lead to disease emergence and reemergence, we will continue to address infectious disease problems one at a time and based on reactive responses. A new commitment is necessary to refocus our efforts to prevent and control diseases in ways that also address these underlying conditions and the animals, animal products, and their vectors.

For example, human exposure to *Borrelia burgdorferi*, the etiologic agent of Lyme disease, is maintained and spread based on the complex relationships among wildlife populations, tick life cycles, host preferences, habitat, ecosystem, and landscape design and other dynamics of this disease ecology. Effective prevention and control may need to focus on ecologic interventions rather than treating the human illness after exposure and infection. Thus, rather than a narrow focus on humans and their interactions with pathogens, we need to focus on the dynamic interplay among humans, animals, and animal products, and our changing environment – in other words, a One Health approach.

Role for Companion Animal Experts

The purpose of including this introduction on One Health for a text on internal medicine is to help create a new awareness of the concept across the veterinary profession and to suggest that companion animal practitioners also have new opportunities, as well as obligations, to support public health in the future.

Practitioners can be extremely helpful and contribute in the following ways:

- enhance surveillance for emerging and zoonotic diseases
- identify cases of zoonoses that will then prevent human illnesses
- educate clients regarding One Health and zoonotic diseases
- be involved in a potential surge capacity in case a significant epidemic or natural disaster calls for your support
- promote the human–animal bond but with knowledge of both the benefits and potential negative impacts of the human–animal interface, including wildlife.

Conclusion

Our global interdependence and growing convergence of animals, animal products, and people ensure that diseases will continue to be a significant threat to health. There is nothing on the horizon suggesting that the era of the perfect microbial storm will lessen or be abated. The factors creating this reality are well entrenched and emerging and reemerging zoonoses are growing and expanding in scope, scale, and impact. These diseases now have a much greater impact and influence beyond health. Global outbreaks of SARS and influenza have demonstrated how such diseases create immense economic losses in goods, services,

travel, and trade in addition to their profound health costs and consequences.

Contemporary societal issues such as global trade and commerce, movements and migrations of populations, changes and insults to our ecosystems, population growth in developing countries, the Livestock Revolution, and disruptions of the environment are helping to create a complex, nonlinear and disruptive world that is riskier and impacts health in the domains of people, animals, and our environment. The ability to improve and optimize health in the future will depend on working in these three domains concurrently, holistically, and synergistically. A One Health mindset and accompanying actions are now a necessity and no longer just a concept. In order to reconcile our significant contemporary challenges and threats with our habitual, narrow and traditional thinking in medicine, new levels of thinking across disciplines and professions will become the new normal. Veterinarians are becoming essential leaders in this

movement and a new concept of community health, including veterinary medicine, is emerging.

Public health and animal health are no longer the domain of any single discipline, profession or boundary; rather, they require the work of epidemiologists, clinicians, ecologists, veterinarians, entomologists, engineers, and many more experts coming together to provide new insights and perspectives using new scientific and technological tools. Addressing, predicting, and preventing diseases certainly demand the richness of new scientific and medical teams.

For veterinary medicine, our horizon has never been richer nor our possibilities more promising. Our profession's challenge is to be relevant and meet the changing needs of society regarding public health, global food systems, ecosystem management, and biomedical research. One Health is the framework, mindset, and new collective purpose to help define our expanding responsibilities, including, and beyond, traditional clinical medicine.

Reference

- 1 Institute of Medicine Committee on Emerging Microbial Threats to Health in the 21st Century, Smolinski M, Hamburg MA, Lederburg J. *Microbial Threats to Health:*

Emergence, Detection, and Response. Washington, DC: National Academies Press, 2003.

