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Popular Article

Role of Veterinarians and One Health in Fight Against Zoonoses

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Abstract

One health is the notion of combining human, animal, and environmental components to address global health challenges that have an ecological interconnected method. The most prominent issues putting pressure on global health today include the dramatic emergence and spread of zoonotic diseases, contamination of food, water and soil, bioterrorist events and degradation of resources and habitats. Current global health challenges have prompted a call for more holistic, collaborative, action-oriented approaches towards the goal of logical and practical solutions. Veterinarians have pivotal obligations, opportunities and contributions to make in enhancing public health, recognizing and responding to zoonotic disease transmission, maintaining food and water quality and promoting wildlife and ecosystem health.

Introduction

One health is defined as “The collaborative effort of multiple disciplines to obtain optimal health for people, animals and our environment” as per One Health Commission. In another definition, the One Health Initiative Task Force (OHITF) defines one health as “the promotion, improvement, and defense for the health and well-being of all species by enhancing cooperation and collaboration between physicians, veterinarians and other scientific health professionals and by promoting strengths in leadership and management to achieve these goals (Attrey, 2017). One health is a concept that aims to bring together human, animal and environmental health. Researchers including Louis Pasteur and Robert Koch and physicians like William Osler and Rudolph Virchow demonstrated the collaborative links between animal and human health. More recently, Calvin Schwabe reviewed the concept of “One Medicine”. As the traditional boundaries between medical



and veterinary practice continue to pervade society there is a need for the practical application of one health. It has been proven that at least 75% of emerging diseases have a zoonotic origin, having diverse animal species as their primary reservoirs. Striking examples of these zoonoses include epidemics and/or pandemics such as the Spanish flu, H₁N₁, SARS, MERS and Ebola. All the etiological agents involved in those cases were originally found in animals and spread in humans. When a pathogen crosses species barrier, in most cases, the disease may not sustain or establish in the heterogenous host. However, occasionally, there is a potential risk that it becomes more pathogenic and virulent, with consequences almost impossible to predict, as was experienced with the HIV virus (Ettinger and Feldman, 2010). The number of potential human lives lost as well as the high morbidity and imminent risks of epidemics/pandemics converging to result in the emergence of new diseases makes it imperative and necessary to intensify studies, in which veterinarians have the responsibility to identify and reveal the risks, critical points and other epidemiological aspects involved in the transmission of an infectious agent from the animal, environment and human interfaces (Bidaisee *et al.*, 2014).

Zoonosis

According to the WHO, a zoonosis is an infectious disease that has spread from a non-human animal to people, Zoonotic pathogens may be bacterial, viral or parasitic, or may involve unconventional agents and can spread to humans through direct contact or through food, water or the environment. There are over 200 known types of zoonotic diseases and zoonoses comprise a large percentage of new and existing diseases in humans, some zoonoses, such as rabies, are 100% preventable through vaccination and other methods. It has been proven that at least 75% of emerging diseases have a zoonotic origin, having diverse animal species as their primary reservoirs.

- Commonly occurring canine and feline vector borne diseases that also affects human are as Leishmaniosis, Borreliosis, Bartonellosis, Ehrlichiosis, Anaplasmosis, Dirofilariosis, Yersiniosis, Tularaemia, Coxiellosis, Tick-borne encephalitis, West Nile virus encephalitis, Trypanosomiasis (Kahn *et al.*, 2007)
- Emerging and reemerging pathogens presently challenges for public health systems worldwide. When considering animal interaction, the complexity of these challenges becomes even more evident. Despite the integration of the OIE and the WHO in the context of the One Health concept in 1960, the idea is still poorly explored in underdeveloped countries.



- Investment in studies that prioritize the investigation of the infectious agents present in wild animals associated with hotspots does not represent, at this moment a priority strategy for the prevention of pandemics by public health agencies. The implementation of this type of action would allow for the early identification of potential pathogens and the development of actions that could block and reduce opportunities for the pathogens to circulate freely and repeatedly among primary hosts and become highly infectious to humans (Buttke *et al.*, 2015)

One health approach

- The word "One Health" has been discussed recently and has grown significantly in prominence and popularity. However, the concept of one health has existed since the beginning of time. One health is a global initiative which encourages collaboration between all health disciplines with a goal of attaining optimal health for people, animals and the environment. One health involves interaction between veterinary and human medicine (Osburn *et al.*, 2009). One Health concept, which considers the interactions between humans, animals and the environment, and recognizes that human health, is closely related to animal and environmental health. It is in these interfaces that veterinarians can play a relevant role in the prevention and detection of new zoonoses and determine which ones deserve at least some consideration (De Melo *et al.*, 2020). It is the collaborative effort of multiple health professions, together with their related disciplines and institutions-working locally, nationally and globally- to attain optimum health for people, domestic animals, wild life, plants and our environment” (One Health Commission).
- “Collaborative and an all-encompassing way to address when relevant, animal and public health globally. This collaboration should not be limited to only the international level, but must be translated as a new and fundamental paradigm at national levels” (OIE). “A collaborative, international cross-sectoral, multidisciplinary mechanism to address threats and reduce risk of detrimental infectious diseases as at the human-animal-ecosystem interface” (FAO).
- “Improving the health and well-being through the prevention of risks and mitigation of effects of crisis that originate at the interface between humans, animals and their various environments” (One Health global network).
 - (A) Studies to monitor multiple factors (environmental, temporal, and others) available in Geographic Information Systems that allow indicating changes for the modeling and forecasting of diseases.



- (B) Environmental control that indirectly interferes in the control of vectors and/or hosts amplifying agents that transmit zoonotic diseases.
- (C) Monitoring of wildlife through research that evaluates changes in the host and potential pathogens.
- (D) In vitro investigation regarding the evolution of the characteristics of infectious agents over time.
- (E) Health education through clarification to the population about the risks and care to be taken in human-animal contact.
- (F) Production of diagnostic tests and vaccines using animal models based on comparative medicine.
- (G) Application of translational medicine and zoonoticity in the exchange of experiences between teams of multi health professionals.
- (H) Sanitary control in pets and production animals.
- (I) Inspection and control of food of animal origin.

Rabies is one of the most important zoonotic diseases:

- Rabies is a highly fatal, infectious but preventable viral disease. It is primarily a disease of carnivores. All warm-blooded animals are susceptible to it and it is caused by Lyssa virus, a bullet shaped, single stranded RNA virus. Rabies has been eradicated from England and some Scandinavian countries by strict quarantine rules. It can spread to people and pets if they are bitten or scratched by a rabid animal, In the United States, rabies is mostly found in wild animals like bats, raccoons, skunks and foxes. If a person does not receive the appropriate medical care after a potential rabies exposure, the virus can cause disease in the brain, ultimately resulting in death.
- The Rabies virus incubation period depends on site of bite and it can be from 2 weeks to 9 months. So, the quarantine period followed is 1 year. Symptoms include fever, headache, excess salivation, muscle spasms, paralysis and mental confusion. Diagnosis is made based on clinical signs and PCR tests and it can be prevented by vaccinating pets, staying away from wildlife, and seeking medical care after potential exposures before symptoms start.

Role of the Veterinarian in Public Health/ Zoonosis

Most veterinarians contribute directly or indirectly to public health goals and outcomes. Veterinary public health contributions can be categorized into six core domains, described below *i.e.*, Diagnosis, Surveillance, Epidemiology, Control, Prevention and Elimination of Zoonotic Diseases. Veterinarians contribute to public health during routine practice, both large and small animal practitioners become skilled diagnosticians for acute and chronic diseases of animals that may affect the owners and their families and the surrounding communities. Specific examples of public health



activities include performing routine health examinations, maintaining immunization regimens, implementing parasite control programs, advising on the risks of animal contact for immunocompromised individuals, facilitating the use of guide and service dogs for people with disabilities, and promoting the benefits of the human-animal bond for the disabled and elderly, as well as war veterans and others suffering from post-traumatic stress disorder.

- Communities are best served when veterinarians approach collective health issues with a “herd health” perspective, applying relevant epidemiologic principles. In addition to these direct services, veterinary practitioners report disease events and trends to state public health and regulatory agencies collaborate with human medical counterparts on zoonotic diseases, and advise local health boards and commissions. These relationships would not exist if not for the inextricable link between animal and human health. In addition to managing direct zoonotic diseases in animals, veterinarians also diagnose, investigate, and control indirect zoonoses and non-zoonotic communicable diseases that affect human health. Examples include West Nile disease and coccidioidomycosis among pet animals, and bovine leukosis, foot and mouth disease, fowlpox, and many other diseases that affect the food supply, the national economy, and the livelihood of the nation’s farmers (Radostits *et al.*, 2006)

Conclusion

Role of Veterinarians in one Health is crucial, as now a days various zoonotic diseases are emerging out with complex nature. To minimize the future outbreaks, detail study regarding nature and types of diseases, their transmission, pattern of distribution, signs and symptoms, their early diagnosis and methods of prevention are cornerstone in one health programme.

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