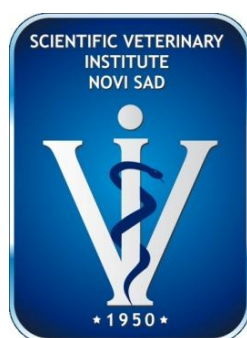


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INSTITUTE OF VETERINARY MEDICINE OF SERBIA

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THE ROLE OF VETERINARY MEDICINE IN THE “ONE-HEALTH” CONCEPT

Branka Vidić¹, Sara Savić¹, S. Boboš², Nadežda Prica¹, M. Radinović²

1. Scientific Veterinary Institute “Novi Sad”, Novi Sad, Serbia

2. Department of veterinary medicine, Faculty of Agriculture, University of Novi Sad, Serbia

* Corresponding author: branka@niv.ns.ac.rs

Abstract

Lately, a great number of challenges have been introduced to human community, which has a great impact to human and animal health and environment. During the last few decades, there has been an increase of the number of new, unknown infectious diseases, but also diseases of humans and animals which were considered eradicated or under control. These diseases have a negative influence to human and animal health worldwide and they can cause great economical damage. The consequences are always greatest in the poorest countries! After the analysis of collected data it has been proved that 64% out of 1.400 pathogens are the ones which can threaten human health and 73% of emerging human pathogens are directly or indirectly zoonotic in nature.

Globalisation and climate changes have a huge impact in the world on the occurrence and development of infectious diseases in humans and animals. Furthermore, changes in demography, people's behavior, technology progress, international transportation and trade, but also changes and adaptation of microorganisms, are all important factors for the occurrence of infectious diseases. These diseases are a consequence of emerging new pathogens or changed ones that have already existed before. Good health is a basic right of every human on Earth. Term or concept “One Health” is a strategy which covers several disciplines in all aspects of health protection of humans and animals and environmental protection. Cooperation and communication of experts from different disciplines such as human medicine, veterinary medicine, public services, environmental studies, wildlife protection and surveillance, ecology and food safety all have one aim - “One Health”.

In the future, veterinary medicine should have a great role in “One Health” concept. Veterinary experts have to monitor global trends which influence public health and occurrence of the diseases. They should also acquire necessary knowledge and expertise, to be efficient when diseases occur. World's need for food of animal origin is higher and higher every year. That is why attention of veterinary experts has to be adequate and constantly improved. Breeding and health protection of domestic animals necessarily has to be under monitoring and control of educated staff, who have a holistic concept of “One Health”, which integrates a unique approach to human and animal health and also environment protection.

Keywords: Animal health, emerging diseases, zoonoses, one health

Introduction

Globalization and climatic changes have a wide range of impacts on the occurrence and development of infectious diseases, both human and animal ones. Moreover, the changes in human interactions and demography, technology advancement, international transport and trade as well as changes and adaptability of microorganisms are important factors for the occurrence of infectious diseases resulting from the emergence of new pathogens, alterations of known pathogens as well as changes in the distribution and prevalence of known pathogens among new host population or territories.

Infectious diseases profoundly influence the health status of a population and economy in every country, affecting both humans and animals; however, the poorest (developing) countries

commonly suffer the most severe consequences. The rate of disease emergence and spread is difficult to predict, having in mind a wide range of important factors implicated in the mechanism of the disease. In that respect, records and analyses of previous epidemics as well as monitoring and updating of control and disease surveillance programmes using advanced technologies (satellite measurements) and new scientific accomplishments are highly relevant, as well as preparing of some potential intervention strategies in case of disease emergence. Human and veterinary service institutions should take effective steps and adequate measures for the prevention and control of infectious diseases and the development of new methods for early, rapid and accurate diagnosing (nanotechnologies, biosensors, etc.)

According to the World Health Organization (WHO), "*Health is a state of complete physical, mental and social well-being and not merely an absence of disease or infirmity*". Good health is the fundamental right of all people on Earth.

"One Health" has been defined as "the collaborative effort of multiple disciplines — working locally, nationally, and globally — to attain optimal health for people, animals and the environment". One Health is an interdisciplinary model integrating diverse disciplines such as medicine, veterinary medicine, public health, environment protection, wildlife protection, ecology, and food safety aimed at forming unified solutions applicable for the improvement of the health of humans, animals and the environment. Such an approach proved the best policy for health protection at global level.

Emerging infectious diseases

The emergence of new infectious diseases in the 20th is linked to increasing contact between humans and animals, intensification and integration of food production, and the expansion of international travel (Atlas 2003), as well as intensive climatic changes. Animals are the dominant factor implicated in the occurrence of infection and development of the diseases, thus, of the 1,415 microbes that are known to infect humans, 61 percent come from animals (Taylor et al, 2001). Consequently, and in light of some previous incidents a group of health professionals at Rockefeller University in New York developed the slogan "One World - One Health" with an aim of promoting and recognizing the association of animals and environmental factors and their effects on human health.

The avian influenza (HPAI H5N1) epidemic that began in Hong Kong in 1997, forced the global community to recognize that animal health and human health are closely linked. The HPAI H5N1 virus resurfaced in isolated outbreaks, and in late 2003, severe epidemic of highly pathogenic avian influenza was registered in South Korea. Delays in international reporting and poor public reaction in the region resulted in extensive virus spread across the region of Southeast Asia. As a response to the global threat posed by this pathogen, the Food and Agriculture Organization (FAO), World Health Organization (WHO), and World Organization for Animal Health (OIE) developed a strategy and tripartite agreement on mutual activities aimed at preventing infections related with the animal-human-ecosystem interface (FAO 2013). One Health is therefore an ideal model of joining health practitioners, veterinarians, ecologists and other profiles. Improvement of epidemiology centres and services as well as application of modern molecular methods will contribute to the development of effective measures and strategies for successful implementation of health protection programs worldwide (Atlas 2003).

Emerging diseases and zoonoses

Discovery and wide application of antibiotics and vaccination programs have long been considered to fully eradicate the infectious diseases, thus putting the emphasis on health protection programs

aimed at cardiovascular and non-infectious diseases. On the contrary, during the past few years we have been witnessing the emergence of new infectious diseases in both humans and animals, as well as the diseases that were considered eradicated or under control. The most important diseases, which represent a global health problem, include Human Immunodeficiency Virus (HIV), Severe Acute Respiratory Syndrome (SARS), West Nile virus, highly pathogenic avian virus H5N1, and recently identified influenza virus H1N1. The underlying cause of this phenomenon is complex and multifold (Brown 2004, Morse 2004) including close contacts between wild and domestic animals and humans, intensive livestock husbandry, inadequate biosafety measures in livestock production practice, emerging resistance of bacteria towards antibiotics, intensive people mobility and interactions, international trade, transport, changes of the eco-systems, etc.

Communication/mobility

Current air traffic enables reaching almost every place on Earth within 36 hours, which is much less than the incubation period for many of viral and bacterial diseases, suggesting the possibility of rapid global distribution of the infection even before the manifestation of a single clinical symptom. Consequently, the disease outbreaks can occur in the regions in which they have never been recorded before. Thus, West Nile virus was not known in North America before 1999, but it is widely known at almost all continents. This strongly suggests that health professionals and veterinarians should be acquainted with the epidemiological and clinical aspects of the diseases, which are still uncommon in their countries, and be able to recognize them. Such diseases encompass some highly contagious diseases such as foot and mouth disease, rinderpest (cattle plague), African swine fever, atypical avian pest, highly pathogenic avian influenza virus, etc (Jones 2008).

Modern communication and OIE health information system enabled fast flow of information of outbreak and spreading of infections, enabling identification of disease reservoirs and implementation of rapid and effective control measures by the veterinary service. Moreover, relevant information on the spread of the infection and measures (aimed at prevention and elimination of consequences) taken by the responsible authorities will be available to the public. In that respect, veterinary service must prepare effective and adequate plans and control strategies including adequately trained staff and communication resources to minimize potential hazards for human and animal health. Lack of proper coordination within the entire system for health protection can result in severe impact on the safety of foods of animal origin and the consumers, as well as substantial financial losses to the producers.

International trade

Dramatic increase in goods turnover on international market during the past few decades resulted from the efforts to remove the barriers and enable the access to world markets to all participants in the international trade. The global trade of animals and products of animal origin has enormously expanded as the result of reduction or elimination of import taxes as well as the advancements in the technology of storage and preservation of food. It is also linked with an increase in global consumption associated with the improved living standards, especially in economically developed countries.

Since the 1960, global meat production has tripled, milk production doubled and production of eggs is almost four times higher (Speedy, 2003). Intensive turnover and movement of animals and foods is associated with increased risk of the transmission of infectious diseases, above all food borne zoonoses. Considering the increased risk, WTO (World Trade Organization) has taken an active role in the development of regulations and policies aimed at protecting animal health and ensuring

food safety as the key elements of international trade. OIE provides scientific support on animal turnover regulation to WTO, whereas FAO and WHO (via Codex Alimentarius) provide the guidelines to the regulations pertaining to food products, including foods of animal origin.

Wars and terrorism

War is a restraining factor that influences animal health in many aspects. It may lead to failure of specific programs for disease control as well as total collapse of veterinary service and infrastructure. War conflicts cause serious problems related to food production, movement of refugees together with their animals to other regions. Bioterrorism added new and worrisome dimension in the process of disease control. The majority of potential agents used so far are of zoonotic nature, thus, both humans and animals would be endangered in case of biological warfare (Davis 2004).

Changes of the climate and other environmental factors

The relationship between the animal husbandry and environment and health is a bi-directional interaction. On one hand, animals may have negative effects on the environment, while on the other hand, animal health and productivity are greatly affected by the same ecological burden (Sherman 2010). Ruminants are an important source of gaseous emission, contributing to global warming. Livestock production has become an important factor in environmental degradation through deforestation, particularly in Latin America. In regions with intensive livestock production, excess animal waste (manure and slurry) may cause pollution of water streams. Overgrazing results in soil degradation, especially in semi-arid regions. At the same time, human and animal diseases can result from environmental impact or climatic changes. Global warming is associated with spread of Bluetongue disease in Europe (Purse et al. 2005), Hantavirus infection in North America, malaria epidemics in Africa and South America, Dengue fever in Asia and cholera in South Asia (Anyamba et al 2006).

The role of a veterinarian in the One Health concept

There are several phrases and terms associated with One Health such as “united health”, integrated health, one medicine, one world-one medicine; however, disregarding the definition, this concept should represent a global strategy of multidisciplinary collaboration in all aspects of human and animal health protection, and environment protection (Gibbs 2013). Such a multidisciplinary approach should be accomplished at local, national and global levels to provide adequate protection of human and animal health. Global trends and numerous technological advancements from the past few decades have contributed to increased development and worldwide spread of zoonotic diseases. In spite of substantial social advantages associated with globalization, it also posed a range of challenging issues in view of domestic animals, human health and environment protection.

Veterinary medicine should play crucial role in the future of the One Health concept. The professionals and expert in this field must follow global trends affecting animal health and diseases and improve their knowledge and expertise to effectively address future challenges (FAO 2013).

Veterinarians are the only health professionals whose formal training is based in comparative medicine, with in-depth studies of the health and diseases of multiple species (Chaddock 2012, Pal 2014) Veterinarians are also trained in public health as it pertains to livestock production and environmental assessments associated with animal health problems and diagnosis (water, feed, and air quality, etc...). Veterinarians are active in public health by working closely with physicians and other health professionals on disease investigation, surveillance and effective response to potential

disease outbreaks (Hoblet 2002, Pal 2014). Veterinarians in the zoo and wildlife sectors are acquainted with wild animal diseases, thus able to be a part of interdisciplinary teams composed of wildlife biologists, ecologists and other specialists (FAO 2013, Gibbs 2013).

Consequently, the veterinary medical profession needs to be actively involved in the One Health approach with an aim of human, animal and environmental well-being. Potential barrier for veterinarians and students of veterinary medicine might be the identification of career pathways and employment opportunities for working on One Health issues in a global context (Chaddock 2012). In addition to technical competence, other important attributes are strong leadership abilities, teamwork, foreign language proficiency, improved communication skills, cross-cultural experience, adaptability and flexibility and even advanced training in the other medical specialty areas such as epidemiology, toxicology or virology.

Conclusion

Veterinary medicine should play crucial role in the future of the One Health concept. The professionals and expert in this field must follow global trends affecting animal health and diseases and improve their knowledge and expertise to effectively address future challenges. As a consequence of modern technologies, some local changes or incidents may result in effects of global importance. This is particularly significant in case of disease outbreaks, since current globalization era is associated with increased number and incidence of infectious diseases, especially zoonoses. Intensive communication and trade with animals and agricultural products provided conditions for rapid transmission of the disease throughout the world. Infectious diseases arise as a consequence of mutual contact between humans and domestic and wild animals, as well as of environmental changes. To the purpose of preventing disease transmission and potential negative outcomes, comprehensive research and adequate actions are of vital importance. Multidisciplinary approach and mutual acting of veterinarians, physicians, biologists, agronomists and ecologists, is the prerequisite for successful addressing this issue.

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