



Review Article

ZOONOSES IN INDIA: A REVIEW

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ABSTRACT

The re emerging pathogens majority of which have animal origin and are zoonotic have been discussed. Veterinarians have been prompted to involve themselves in areas like food borne disease control, food safety, zoonosis control, communicable disease, epidemiology and population medicine, comparative biomedicine animal welfare and environmental medicine. Veterinary and environmental medicine. Veterinary and human health professionals who are focussed over individual health care and explore deeper into biomedical research have been instigated to indulge in close collaboration amongst themselves, agricultural professionals and national policy making personnel. The concept of one health has been upheld which encompasses the human, animal and ecosystem health which in its complete sense encourages inter-disciplinary collaborations.

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INTRODUCTION

Zoonoses are diseases and infections that are naturally transmissible between vertebrate animals and man (WHO, 2006). They exert dual impacts on human population that are livestock dependent. This could be either through direct risk of infection by zoonoses or through reduced production of the livestock resulting in food insecurity and poverty (Molyneux *et al.*, 2011). It is estimated that over 600 million people worldwide are livestock-dependent, and represent up to 70% of the marginalized and poor population (FAO, 2004). Zoonotic diseases continue to represent an important health hazard in most parts of the world, where they cause considerable expenses and losses for the health and agricultural sectors. Even though the situation is improving in the industrialized world, zoonoses prevention and control will remain an area of major concern in most developing countries including India. Veterinary public health is a part of public health activities committed to the application of professional veterinary skills, knowledge, and resources for the protection and improvement of public health. There can be little doubt that the majority of veterinarians and human health professionals have a basic knowledge about zoonoses and have some theoretical understanding of the threat that they might pose to human health. But it is also apparent that in practice many health workers either fail to consider the possibility that they may be

dealing with a zoonosis or ignore the public health implications of this type of infection. In addition, the significance or potential significance of zoonoses is often ignored by public health strategy and limited resources are available to investigate them. Veterinarians should play an important role to control and prevent zoonotic diseases. The main scientific and applied disease control areas where the unique knowledge and position of veterinary medicine in natural science has proved useful for the protection of human health are: foodborne diseases control-food safety, zoonoses control, communicable disease epidemiology and population medicine, comparative biomedicine, animal welfare, and environmental protection. This review focuses on role of veterinarians in controlling zoonoses as one of the most important components of veterinary public health with emphasis on a collaborative approach. However, closer collaborations are needed between veterinarians, physicians, and public health professionals in three areas viz. individual health, population health, and comparative medicine research for control of zoonotic diseases. In recent times, India had to mobilize a sizeable proportion of its precious resources and trained manpower from developmental activities to win the nagging war against bird flu (HPAI caused by H5N1 strain) since 18th Feb., 2006 when it was first reported from Navapur Dist. of Maharashtra, and subsequently from other places including Jalgaon (Maharashtra), Gujarat and MP in 2006; Imphal (Manipur) in July, 2007, West Bengal, Assam and Tripura in 2008, Sikkim on 19th January, 2009, and recently from Tripura in 2011-12.;

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Brain fever (JE) which has become endemic in the central eastern part of U.P. and NE region of the country had killed approximately 1016 children and left many crippled with permanent neuromuscular retardation in 2005.

Factors Influencing the Emergence of Zoonotic Diseases

At least 11 pathogens have emerged or re-emerged in India during 1992-2009, majority of which were of animal origin. In India, agriculture and animal husbandry workers such as farmers, livestock owners, animal handlers, veterinary extension workers and veterinarians had been found to commonly contract approximately 40 zoonotic diseases. Similarly, people engaged in production and processing of livestock products such as personnel working in abattoir, dairy, poultry enterprises and piggery suffer frequently with about 22 zoonotic diseases including rabies, JE, Kyasanur forest disease (KFD), anthrax, brucellosis, plague, TB, Leptospirosis, Salmonellosis, Campylobacteriosis, listeriosis, verotoxin *E. coli* and Clostridial infections. The following factors are responsible for emergence or re-emergence of bacterial zoonotic diseases.

- Etiological changes in man's environment and agricultural operations e.g. Leptospirosis, plague, Rift Valley fever, Kyasanur Forest Disease etc.
- Increased movement or traveling of man e.g. amoebiasis, giardiasis, colibacillosis, salmonellosis, SARS, Yellow fever etc.
- Handling animal byproducts and waste e.g. anthrax, chlamydiosis, dermatophytosis, tularaemia
- Culture anthropological norms e.g. dermatophytosis, food borne infections, brucellosis etc.
- Increased in density of animal population e.g. dermatophytosis, tuberculosis etc.
- Increased trade in animal products e.g. anthrax, brucellosis, salmonellosis, Hantaan virus, Bird flu etc.
- Drug resistant organisms e.g. *E. coli*, *Staphylococcus aureus* etc.
- Changing livestock farming practices e.g. *E. coli* O157:H7, Salmonellosis, Listeriosis etc.
- Changing environmental conditions including climate and disaster e.g. plague, Leptospirosis etc.
- Pathogen changes like genetic shift and drift e.g. Influenza, *E. coli*, *Staphylococcus aureus* etc.

Natural animal habitats like national park and sanctuaries are also frequent sources of disease transmission. The major factor involved in the increase in zoonoses, whether new or old, include population shifts and growth; changes in behavior; group urbanization, poverty and crowding; changes in ecology and climate; evolution of new strains of microbes; inadequacy of the public health infrastructure, modern tourism and liberalized trade. Many of these factors are interrelated. There are many examples of zoonoses that were probably prevalent previously with silent foci but have either surfaced recently or just recognized. On the other hand, many emerging zoonoses are not easily identified because the clinical signs observed are not specific or distinguishable from other clinical infections or the animals are healthy carriers with no apparent clinical signs.

The avian flu has hit our poultry industry severely (in Maharashtra, West Bengal and other states) and despite the most appropriate methods of controlling the disease, new areas keep coming in the grip of the disease. It is because our borders are porous, and at every moment, there is possibility of introduction of new disease from neighboring countries, like avian flu from India. New animal diseases are not only emerging or re-emerging in our country at an alarming rate but are potentially dangerous to humans such as HPAI (highly pathogenic Avian Influenza); Nipah, Hendra, Hantaan, norovirus, SARS and recent outbreak of Crimean Congo hemorrhagic fever in Ahmadabad, Gujarat since 18th January, 2011. Vector borne diseases like Japanese encephalitis, dengue, West Nile virus, KFD and Rift Valley fever are also spreading to a much wider area. Therefore, all challenges of existing diseases coupled with newer challenges increase the responsibilities of researchers, scientists, disease diagnosticians and field veterinarians.

One Health approach

The introduction of the concept of 'One Health' which takes a holistic approach to address human, animal, and ecosystem health, again emphasizes the role of a veterinarian as a leader in present society by addressing the risk and emergence of zoonotic diseases and promoting basic health care needs of the world. The One Health approach aims to enhance global efforts to mitigate and counter the emergence of zoonoses and other diseases. The approach calls for strong multisectoral and multidisciplinary collaboration, which moves beyond the strengthening of veterinary-public health systems to more clearly encompass disease prevention, with greater emphasis on safer food production, distribution and marketing practices, and adoption of sustainable animal agriculture and natural resource management (Papadopoulos and Wilmer, 2011). It includes research on prevention, control, diagnosis, and treatment of diseases of animals on the basic biology, welfare, and care of animals. It is broad in scope and truly multidisciplinary and focuses on agro-and bio-terrorism, agriculture and animal sciences, antimicrobial resistance, basic and translational research, biomedical research, clinical medicine, combating existing and emerging diseases and zoonoses, comparative medicine, consumer support, diagnosis, surveillance, control, response and recovery directed at natural orientational threats that are chemical, toxicological, or radiological in nature, entomology, ethics, food safety security, global food and water systems, global trade and commerce, health communications, health of the environment and environmental preservation, implications of climate change, infectious disease ecology, integrated system for diseases diagnosis, land use and production systems and practice, mental health, microbiology education, occupational health, public awareness and public communications, public health and public policy, regulatory enforcement, scientific discovery and knowledge creation, support of biodiversity, training, veterinary and environmental health organizations and wildlife protection (AVMA, 2010). One Health is very much an overarching concept that spans many disciplines, professions, and areas of interest that includes the protection of animal health, the relief of animal suffering, the conservation of livestock resources, the promotion of public health, and the advancement of medical knowledge. Close cooperation and interaction between veterinarians, occupational health physicians and public health operators is thus necessary,

for a worldwide strategy to expand interdisciplinary collaborations and communications in all aspects of health care for humans, animals and the environment. This is what the One Health Approach is intended to be (Rabozzi *et al.*, 2012). Veterinary medicine is approximately one-tenth the size of the human medical profession and its ability to be optionally and simultaneously successful in areas such as biomedical research, agro-terrorism, food safety and security, and public health is challenging at best. Even though, incorporating One Health into their existing specialities is considered daunting, local human and veterinary medical associations can meet more frequently to discuss topics of mutual interest in their communities, under the common banner of One Health and can catalyze the concept to trickle down to clinicians at the local levels. Veterinarians are well grounded in population health, comparative medicine, and preventive medicine. The concept of One Health has become a rallying call in response to the failing health care need of our world and lack of collaborative effort of our veterinary and human professionals who in turn are focused over individualized health care and explore deeper into biomedical research have made the situation even worse.

Conclusion

To confront the threats of emerging zoonotic diseases, much can be done by education, and in particular by growing the awareness of different health professionals, and facilitating communication and collaboration between veterinary, public health, agricultural and national policy making personnel. This will help us to approach and control zoonotic diseases in as efficient and effective a way as possible. There should be enhanced communication between veterinary, health and environmental services as well as community associates to secure exchange of relevant epidemiological information and reports on prevention and control activities for zoonotic diseases.

The successful control of zoonoses is impossible without acceptable standards of life and social welfare in developing country like India. Veterinary public health may, therefore, be considered as an indicator of the nation-wide of social well-being in a country.

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