

ROLE OF VETERINARIANS IN PREVENTING ZOO NOTIC DISEASES: ONE HEALTH

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Abstract

Zoonosis is any disease or infection that is naturally transmissible from vertebrate animals to humans. There are over 200 known types of zoonoses. One health is an integrated, unifying approach that aims to sustainably balance and optimize the health of people, animals and ecosystem. By monitoring the frontlines of zoonotic spillover-where 60% of existing human infectious diseases and 75% of emerging ones originate-veterinary professionals serve as an early warning system against global pandemics. From tracking avian influenza in wild migratory paths to managing antimicrobial resistance in livestock ecosystems, their diagnostic and preventative expertise acts as a shield for public health.

Keywords: zoonotic diseases, veterinarians, disease prevention, one health, disease surveillance, Biosecurity, Biosurveillance, Antimicrobial resistance monitoring, Global health risk

Introduction

What is One Health? Simply stated, the One Health concept addresses the health of humans, animals, and ecosystems collectively, viewing these ordinarily separate domains as interdependent parts of a single system. Operationally, it emphasizes collaboration among professionals in diverse disciplines to optimize management of resources for jointly beneficial outcomes.

This collaborative approach is a natural fit for zoonotic diseases, whose prevention, surveillance, and control also demand joint action across traditional sectoral borders. Zoonoses are diseases that are transmitted from vertebrate animals to humans. The term broadly encompasses infections and infestations belonging to all categories of infectious agents—viruses, bacteria, fungi, protozoa, helminths, arthropod and so on—even those that are primarily animal ailments. Transmission routes are equally diverse. Zoonoses can be passed directly from animals to people or through indirect contact with contaminated

food, water, or the environment. In many cases, vectors, such as mosquitoes or ticks, act as bridges between animal reservoirs and human hosts. Some zoonotic pathogens do not cause overt manifestations in animal populations and may therefore circulate undetected until a spillover event triggers human disease.

Veterinarians as Frontline Responders in Surveillance

Veterinarians serve as frontline responders in the Ecosystem Health Model, focusing on early outbreak detection. Their efforts integrate human health surveillance with veterinary monitoring of epidemic-prone diseases, utilizing permanent sentinel networks to document infectious hazards. This integrated surveillance includes animalborne diseases that may not yet trigger human surveillance alarms. Surveillance Cascade logic highlights the flow of disease information across health sectors. Data must support various constituencies, allowing agencies to allocate resources

effectively. Seasonally adapting dynamics is crucial for enhancing veterinary engagement and connectivity.

Integrated animal–human surveillance functions best either when interactions occur frequently, as with typical vaccine-preventable diseases, or at least annually, as with some other zoonoses, or building on intensive linkages through HPAI (highly pathogenic avian influenza) and rabies. A permanent core of lower-cost background data feeds all participants, whilst high-temporal-resolution systems respond to affordable opportunities. Information flow delivers timely data capture and monitoring reactively enabled by the epidemic hazard-signaling response-team network. Other sectors then integrate the alert status into their response planning. Information in both directions can flow quickly and informatively, dedicated agents in each sector enabling cross-sectoral interpretation, implications assessment, information placing, conceptual disturbance opportunities, and preemptive communication.

Role of Veterinarians in Health Education and Extension

Training new veterinary practitioners and disseminating new capabilities to those already in practice falls largely on the nation's academic (especially land-grant) institutions. At the collegiate level, this increasingly involves multidisciplinary relationships between schools of medicine, veterinary medicine, sociology, and basic sciences.

Most epidemiologists are employed by governmental or industrial stakeholders, but virtually all veterinarians help educate the public on the threat of infectious and noninfectious diseases. Veterinary practitioners have a responsibility to remain knowledgeable about disease threats and credible sources of that knowledge for their communities. Enabling appropriate knowledge and awareness among the public requires a blend of risk perception and awareness, especially because community

stakeholders play important roles in risk resolution.

Zoonotic disease prevention and preparedness

Zoonotic diseases such as avian influenza and monkey pox underscore the urgency of effective prevention systems including robust surveillance, early detection and risk reduction mechanisms. In 2024, FAO and its partners intensified efforts to build national capacities for disease early warning, tracking, diagnostics and technical workforce development particularly in high-risk and biodiversity hotspots. Technologies like real-time digital monitoring tools offer promise, but coverage remains uneven. Political instability and limited public health infrastructure in many regions impede progress. However, upcoming funding from the pandemic fund supported by the World Bank, offers a chance to scale early warning and national laboratory systems worldwide.

Antimicrobial Stewardship and Responsible Use in Veterinary Practice

Veterinarians contribute to pandemic prevention by monitoring antimicrobial resistance and enabling stewardship-focused regulatory frameworks. Antimicrobial use in veterinary medicine, albeit lower than human medicine, constitutes a major driver of resistance in animal pathogens. Infection prevention and biosecurity interventions decrease the need for antimicrobials; where they remain necessary, responsible use reduces the risk of resistance development. Indicators of stewardship outcomes, resistance trends, and the impact of stewardship interventions across animal populations guide veterinarians toward effective stewardship decisions. The interpretation of treatment guidelines according to the Five Domains Model promotes animal welfare without overlooking the need for judicious prescribing. A One Health approach thus recognizes that reductions in propensity to develop infection, combined with responsible use of remaining antimicrobials, hold the

greatest potential understood by veterinarians to mitigate resistance.

Case Studies: Successes and Lessons Learned

Veterinarians contribute to pandemic prevention through preventive vaccination, integrated surveillance, and biosecurity measures. Successful examples include Nipah virus vaccination in pigs in South-East Asia and oral rabies vaccination of wildlife in Canada and Europe, reducing zoonotic disease transmission. Veterinary oversight ensures vaccine quality, safety, and effective application. Integrated One Health surveillance systems combining animal, human, and environmental data have improved early detection and risk assessment of diseases such as Ebola, Marburg, cholera, Rift Valley fever, and anthrax. These case studies demonstrate the importance of veterinary expertise in early warning, disease control, and public health protection.

Biosurveillance Systems and Data Integration

Effective pandemic prevention requires integrating veterinary data with human, wildlife, and environmental health information to detect zoonotic threats early and assess spillover risks. Interdisciplinary collaboration and data sharing are essential for comprehensive surveillance. Standardized reporting through the One Health zoonotic disease reporting template developed by the Food and Agriculture Organization, World Organisation for Animal Health, and World Health Organization supports data integration across sectors. Advances in information technology and big data further enable real-time biosurveillance, strengthening early warning and rapid response to emerging diseases.

One Health capacity building

Intersectoral collaboration is essential for managing health risks at the animal–human interface. Organised in partnership with the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO), the National Bridging Workshops aim to foster One Health capacity

building and planning at national level, by creating synergies between the animal health and human health sectors.

Managing Zoonotic Disease Risks: A One Health Approach

The Goal: Achieve sustainable, cross-sector collaboration to address zoonotic disease challenges at the human-animal-environment interface.

The Guide: Jointly developed with the UN Food and Agriculture Organization (FAO) and WHO, the guide is titled "Taking a Multisectoral, One Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries".

Scope & Utility:

Provides principles, best practices, options, and real-world lessons for country-level prevention, preparedness, detection, and response.

Flexible enough to cover other health threats like food safety and antimicrobial resistance (AMR).

Supporting Resources: Accompanied by online training and operational tools to offer practical guidance on strengthening the One Health framework.

WOAH as a key member of the Quadripartite collaboration on One Health

Since 2010, the World Organisation for Animal Health (WOAH) has partnered with the FAO and WHO, expanding in March 2022 alongside the UN Environment Programme to form the Quadripartite collaboration on One Health. This strategic framework coordinates efforts across human, animal, and ecosystem health to deliver guidelines, action plans, and global initiatives. Solidifying its leadership role, WOAChaired the Quadripartite Secretariat from 2024–2025, driving key projects in One Health implementation, advocacy, science, investment, and capacity building.

Veterinary Public Health Governance and Policy

Veterinary Public Health (VPH) governance and policy form the crucial

framework that bridges animal health, human well-being, and environmental sustainability under a unified One Health approach. Effective governance establishes clear regulatory standards, cross-sectoral collaboration, and robust surveillance systems necessary to detect, prevent, and manage zoonotic diseases, food safety risks, and antimicrobial resistance. By translating scientific evidence into enforceable national and international policies, it ensures rapid emergency response, secures global food supply chains, and safeguards communities from emerging biological threats. Ultimately, strong VPH policy is not just an animal welfare initiative—it is a cornerstone of global health security.

Training Health Professionals on One Health

We have partnered with the World Health Organization (WHO) to advance national Veterinary Services and build a collaborative, global One Health learning community.

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Key Initiatives

Joint Training Seminars: Delivering multi-sectoral national seminars designed to bridge the gap and strengthen collaboration between human and animal health sectors.

Dedicated WHO/WOAH Working Group: Driving international networking to foster long-term cooperation, shared values, and peer-to-peer learning among members.

Conclusion

Veterinarians are the linchpin of the One Health framework. By actively managing health at the animal-human-environmental interface, they mitigate the catastrophic risks of zoonoses—which account for 60% of existing infectious diseases, 75% of emerging pathogens, and 80% of bioterrorism threats. Ultimately, veterinary surveillance, mass vaccination, and antimicrobial stewardship are not merely measures for animal welfare; they are foundational, non-negotiable requirements for global human pandemic prevention and biosecurity.