



Role of Veterinary Professionals in One Health: Protecting Human Health, Animal Welfare and the Environment

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Human health does not begin and end inside a hospital. It also depends on the health of livestock and wildlife, the safety of food, the quality of water, and the condition of the ecosystems that sustain life. The One Health approach recognises these connections and promotes coordinated action across human medicine, veterinary science, environmental science, agriculture and public health. Veterinary professionals occupy a central position in this framework because they work at the interface of animals, people, food systems and the environment. Their responsibilities extend beyond diagnosing and treating animals to include zoonotic disease surveillance, food safety, antimicrobial resistance (AMR) management, animal welfare, environmental protection and community education. This article examines the expanding role of veterinary professionals in One Health, with particular emphasis on emerging health threats, interdisciplinary collaboration and practical applications in India. It also discusses how digital surveillance, genomic tools, responsible livestock production and stronger institutional partnerships can improve disease prevention and public health preparedness.

Keywords: One Health, veterinary professionals, zoonotic diseases, antimicrobial resistance, food safety, environmental health, public health.

Introduction: Why the Health of One Species Depends on Others

Imagine a dairy farmer who notices that several animals in the herd have developed a fever. The farmer loses milk production, the household loses income, and neighbouring farms face a potential disease threat. If the infection can spread to people, the consequences may extend to farm workers, milk handlers and the wider community. If the farmer uses antibiotics without veterinary guidance, resistant bacteria may also enter the food chain or environment. A problem that began in a cowshed can therefore become an agricultural, environmental and public health concern. This interconnected reality explains the need for One Health, an integrated approach that seeks to sustainably balance and optimise the health of people, animals and ecosystems. The concept draws on the longstanding relationship between human and veterinary medicine and now includes environmental science, ecology, agriculture and social sciences (World Health Organization [WHO] et al., 2022). The modern veterinarian must therefore serve two complementary purposes: protect the individual animal and help prevent risks that extend beyond it. This broader responsibility makes veterinary science an essential part of public health, food security and environmental sustainability.

Detecting Disease Before It Reaches the Human Population

Zoonotic diseases—those that spread naturally between animals and humans—remain a major reason for closer cooperation between veterinary and medical professionals. Rabies, brucellosis, leptospirosis, avian influenza and Nipah illustrate different ways in which animal infections can threaten human health.

Veterinarians often encounter the earliest clues. A sudden increase in abortions among cattle, unusual deaths in poultry, neurological signs in animals or a change in wildlife mortality may indicate a developing outbreak. These observations become far more useful when veterinarians report them promptly and public health teams connect them with human cases, laboratory findings and environmental information. Think of disease surveillance as a smoke detector distributed across an entire landscape. A veterinarian notices the first sign of smoke in a herd; a laboratory identifies the likely source; epidemiologists trace possible transmission routes; and public health authorities coordinate the response. No single professional can complete this chain alone.

Modern surveillance increasingly combines conventional field investigation with molecular diagnostics, genomic sequencing, geographic information systems (GIS) and digital reporting. These tools can help investigators identify related pathogens, map disease clusters and understand transmission patterns. However, technology cannot replace field observations, reliable sampling, trained personnel or prompt reporting.

Protecting the Food Chain and Preserving the Power of Antibiotics

Every glass of milk, portion of meat and egg travels through a chain of biological and human decisions. Healthy animals, clean water, hygienic handling, appropriate processing and safe storage all contribute to food safety. Veterinary professionals help protect this chain through herd health programmes, disease control, inspection, residue monitoring and farmer education.

Pathogens such as Salmonella, Campylobacter, pathogenic Escherichia coli and Listeria monocytogenes can cause foodborne illness. Veterinary action can reduce contamination risks at the farm level, while food technologists, public health officials and regulators manage other stages of production and distribution. Veterinarians also help protect consumers from veterinary drug residues. They guide farmers on appropriate drug selection, dosage, administration and withdrawal periods—the required interval between the last treatment and the point when milk or meat can safely enter the food chain under the applicable product instructions and regulations.

The objective extends beyond preventing illness. Better animal health reduces avoidable production losses, protects farmers' incomes and supports a dependable supply of nutritious food (Alders et al., 2017).

Antimicrobial resistance: when the medicine stops working

Antimicrobial resistance (AMR) develops when microorganisms evolve mechanisms that allow them to survive medicines that once controlled them. Antibiotic use in people and animals can select for resistant bacteria. These bacteria or their resistance genes may then spread through direct contact, contaminated food, manure, wastewater and other environmental routes.

Veterinarians must therefore practise antimicrobial stewardship. They should diagnose infections carefully, select appropriate drugs, follow evidence-based treatment protocols and avoid unnecessary or inappropriate use. Vaccination, improved housing, nutrition, hygiene, biosecurity and effective parasite control can prevent disease and reduce the need for treatment. Antibiotics remain essential when animals need them; responsible use means treating genuine infections effectively rather than withholding necessary care.

The World Organisation for Animal Health (WOAH) supports coordinated AMR surveillance, prudent antimicrobial use and stronger veterinary services. Its guidance also recognises that animal health, human health and environmental health depend on one another (WOAH, n.d.).

Connecting Animal Welfare, Agriculture and Environmental Health

One Health extends beyond infectious diseases. It also asks how farming practices, climate, biodiversity, nutrition and animal welfare influence the health of entire communities.

Consider a farm that stores manure beside a drinking-water source. Heavy rainfall can carry nutrients, pathogens and antimicrobial residues into nearby water bodies. The resulting contamination may affect livestock, people, aquatic organisms and downstream agricultural production. Veterinary professionals can help farmers design safer manure storage, composting, biogas and waste-management systems, while environmental scientists assess contamination and recommend suitable mitigation.

Climate change creates additional challenges. Heat stress can reduce feed intake, milk production, fertility and immune function in livestock. Changes in temperature, rainfall and humidity can also alter the distribution or seasonal activity of vectors such as mosquitoes and ticks. The direction and magnitude of these effects vary by pathogen, vector, animal species and local ecology, so surveillance must rely on regional evidence rather than assumptions. Veterinary professionals can help farmers adapt through heat-abatement measures, reliable water supplies, improved housing, suitable feeding strategies, vaccination where appropriate and early detection of disease. They can also work with crop scientists to improve the use of crop residues and agricultural by-products as livestock feed, provided those materials meet nutritional and safety requirements.

Alders et al. (2017) highlight another important connection: veterinary professionals can link livestock health with food and nutrition security. Healthy animals support the production of nutrient-rich foods and rural livelihoods. Yet sustainable food systems must also consider resource use, environmental impacts, affordability and dietary quality. One Health does not prescribe a single farming system; it encourages evidence-based decisions that account for benefits, risks and trade-offs across the whole system.

One Health in India: From Veterinary Clinics to National Preparedness

India's large livestock sector, diverse wildlife, dense human populations and varied agricultural systems create both opportunities and challenges for One Health. Diseases can affect farmers' livelihoods, food availability and public health simultaneously. Effective responses therefore require coordination among veterinary services, medical institutions, laboratories, agriculture departments, wildlife authorities and environmental agencies. Veterinary professionals can contribute to this national effort in several practical ways:

Integrated surveillance: Share animal disease information with public health authorities and support joint outbreak investigations.

Laboratory collaboration: Coordinate diagnostic sampling, pathogen identification and data interpretation with veterinary and human health laboratories.

Farmer engagement: Explain vaccination, biosecurity, safe milk handling, responsible medicine use and timely disease reporting.

Applied research: Study disease patterns, animal–wildlife interfaces, antimicrobial resistance and climate-related livestock risks.

Policy and extension: Translate scientific findings into practical recommendations for farmers, local authorities and decision-makers.

These activities need functioning communication systems, trained personnel, accessible diagnostics and clear protocols for sharing data. Collecting information alone does not guarantee early detection; authorities must also interpret the information and act on it quickly.

Emerging trends that are reshaping veterinary One Health

1. Genomic surveillance and advanced diagnostics

Molecular tests and pathogen sequencing can help identify infectious agents and compare isolates across outbreaks. When teams combine these findings with animal and human case data, they can investigate possible transmission links more effectively.

2. Digital disease reporting

Mobile reporting, electronic records, GIS mapping and linked databases can improve the speed and geographical reach of surveillance. Their value depends on data quality, privacy safeguards, connectivity and timely action.

3. Prevention-centred livestock health

Better vaccination coverage, biosecurity, nutrition, housing and welfare can reduce avoidable disease and improve resilience. Preventive management also supports more responsible antimicrobial use.

4. Climate and environmental surveillance

Combining livestock records with weather, vector, wildlife and water-quality data can help identify changing risks. Such systems require local validation and should distinguish demonstrated transmission pathways from suspected associations.

The global direction also supports this multidisciplinary approach. The One Health Joint Plan of Action, developed by the Food and Agriculture Organization of the United Nations (FAO), United Nations Environment Programme (UNEP), WHO and WOA, originally covered 2022–2026. In August 2026, the four organisations agreed to extend its implementation through 2029, reinforcing continued international cooperation across health systems, zoonoses, food safety, AMR and the environment.

Conclusion: The Future of Veterinary Medicine Is Bigger Than the Clinic

Veterinary professionals protect more than animal health. They help detect outbreaks, prevent foodborne illness, preserve the effectiveness of antimicrobials, support animal welfare, strengthen farmers' livelihoods and reduce environmental health risks. Their contribution becomes most effective when they work alongside physicians, public health specialists, agricultural scientists, ecologists, policymakers and communities.

For veterinary education, this means combining clinical competence with epidemiology, food safety, environmental awareness, data interpretation and communication skills. For farmers, it means accessible veterinary advice and practical preventive measures. For governments and institutions, it means investing in surveillance, laboratories, workforce development and systems that allow different sectors to act together.

One Health is not simply a response to the next epidemic. It is a way to prevent avoidable harm before it spreads across species, communities and ecosystems. Veterinary professionals are essential to making that principle work in practice.

Table 1. Veterinary actions and their One Health benefits

Area	Veterinary action	Wider benefit
Zoonotic disease	Early detection, reporting and vaccination	Fewer animal and human infections
Food safety	Hygiene, inspection and residue monitoring	Safer milk, meat and other animal products
AMR	Prudent prescribing and resistance surveillance	Preservation of effective treatments
Animal welfare	Better handling, housing and pain management	Improved welfare and more resilient production
Environmental health	Safe manure, carcass and farm-waste management	Reduced contamination of soil and water

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