



## One Health: Why Human, Animal, and Environmental Health Are Connected

**Haris Ayoub<sup>1</sup>,  
Vibha Singh<sup>1</sup>,  
Rishabh Mehta<sup>1</sup>,  
Akash Mote<sup>1</sup>**

<sup>1</sup>Division of Veterinary Public Health, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly-243122, Uttar Pradesh, India



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\*Corresponding Author

**Haris Ayoub\***

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### INTRODUCTION

Health is often thought of in terms of hospitals, medicines, and doctors. However, the reality is that human health is influenced by many factors beyond the healthcare system. The animals we interact with, the food we consume, the air we breathe, and the environments we live in all play a crucial role in determining our well-being. Increasingly, scientists and public health experts recognize that the health of humans cannot be separated from the health of animals and the environment.

This understanding forms the basis of the One Health concept, a holistic approach that emphasizes the close interconnection between human health, animal health, and environmental health. Instead of addressing health problems in isolation, the One Health approach encourages collaboration among different sectors including medicine, veterinary science, environmental science, agriculture, and public health. By working together, these sectors can better prevent and control diseases that emerge at the interface of humans, animals, and ecosystems.

The importance of this interconnected approach has become more evident in recent decades. A significant proportion of infectious diseases affecting humans originate in animals. Diseases such as rabies, avian influenza, Nipah virus infection, brucellosis, and leptospirosis are examples of zoonotic diseases, meaning they can be transmitted from animals to humans. Scientific estimates suggest that nearly 60% of known infectious diseases in humans are zoonotic, and about three-quarters of emerging infectious diseases have their origins in animals, particularly wildlife.

Human activities are also contributing to the increasing emergence of such diseases. Rapid urbanization, deforestation, expansion of agriculture, climate change, and increased movement of people and animals have intensified interactions between humans, domestic animals, and wildlife. These changes create new opportunities for pathogens to cross species barriers and spread among populations.

In countries like India, the relevance of the One Health approach is particularly significant. India has one of the largest livestock populations in the world and a vast diversity of wildlife and ecosystems. Millions of people depend on livestock farming, dairy production, and animal husbandry for their livelihoods. At the same time, close human–animal contact in rural and peri-urban areas increases the risk of zoonotic disease transmission.

Recent outbreaks of diseases such as Nipah virus in Kerala, Kyasanur Forest Disease in the Western Ghats, avian influenza in poultry, and the persistent burden of rabies and brucellosis highlight the complex interactions between humans, animals, and the environment. These events demonstrate that preventing and controlling such diseases requires coordinated efforts across multiple sectors.

The One Health approach therefore provides a practical framework for addressing modern public health challenges. By integrating surveillance, research, and control strategies across human, animal, and environmental health sectors, it is possible to detect diseases earlier, prevent outbreaks, and protect both public health and ecosystem health.

Understanding and promoting the One Health concept is essential not only for scientists and policymakers but also for the general public. Greater awareness about the connections between human activities, animal health, and environmental sustainability can play an important role in reducing the risk of future disease outbreaks and ensuring healthier communities.

### **How Our Health Is Connected to Animals**

Animals play an essential role in human life. Livestock provide milk, meat, and livelihoods to millions of farmers. Pets offer companionship and emotional support. Wildlife maintains ecological balance in forests and natural habitats. However, animals can also carry diseases that sometimes infect humans. These diseases are called **zoonotic diseases**, meaning diseases that can pass between animals and people.

In fact, scientists estimate that **about 60% of infectious diseases affecting humans originate**

**in animals**, and nearly **75% of emerging infectious diseases** come from wildlife.

Examples include:

- Rabies from infected dogs
- Brucellosis from livestock
- Nipah virus from fruit bats
- Avian influenza from birds

These diseases remind us that protecting animal health is also an important step in protecting human health.

### **The Environment's Role in Disease**

The environment forms the link between humans and animals. Changes in the environment can create conditions that allow diseases to emerge or spread more easily.

For example:

- **Deforestation** brings humans closer to wildlife habitats.
- **Urbanization** increases contact between people, animals, and waste.
- **Climate change** allows disease-carrying mosquitoes and ticks to expand into new areas.

When forests are cleared or wildlife habitats are disturbed, animals may move closer to human settlements, increasing the chances of disease transmission.

Environmental pollution can also contaminate water, soil, and food chains, affecting both animals and humans.

### **Importance of One Health in Preventing Pandemics**

Recent global health crises have highlighted the importance of the One Health approach. Many emerging infectious diseases that caused major outbreaks in humans are believed to have originated from animal sources.

Early detection of diseases in animals, wildlife surveillance, and environmental monitoring can help identify potential threats before they escalate into large-scale outbreaks. By integrating veterinary science, human medicine, and environmental science, the One Health approach strengthens global preparedness and response to emerging diseases.

### **One Health in Action**

Several countries and international organizations are now adopting One Health strategies to

address complex health challenges. Collaborative surveillance systems, integrated disease monitoring programs, and joint research initiatives are being developed to track zoonotic diseases and environmental risks.

In many regions, interdisciplinary teams consisting of veterinarians, physicians, epidemiologists, and environmental experts work together to investigate disease outbreaks and implement control measures.

These coordinated efforts not only help prevent disease outbreaks but also improve food safety, control antimicrobial resistance, and promote sustainable agricultural practices.

### Examples from India

India has experienced several disease outbreaks that highlight the importance of the One Health approach.

#### 1. Nipah Virus Disease

Nipah virus is a highly fatal zoonotic disease that has caused several outbreaks in India. The natural reservoir of the virus is fruit bats (*Pteropus* species). Humans can become infected through contact with bat secretions, contaminated fruits, or infected animals.

India has reported outbreaks in West Bengal (2001 and 2007) and Kerala (2018, 2019, 2021, and later sporadic cases). The 2018 Kerala outbreak resulted in a high case fatality rate and required rapid public health intervention.

Managing Nipah virus requires a One Health approach because it involves monitoring wildlife reservoirs (bats), studying environmental factors that influence bat behavior, and strengthening human disease surveillance systems. Veterinarians, wildlife experts, epidemiologists, and medical professionals all play a role in preventing future outbreaks.

#### 2. Kyasanur Forest Disease (KFD)

Kyasanur Forest Disease, often called “Monkey Fever,” is another example of the One Health interface in India. It is a tick-borne viral disease endemic to the Western Ghats region, particularly in Karnataka, Kerala, Goa, and Maharashtra.

The virus circulates between ticks, small mammals, and monkeys, while humans become infected when they enter forest areas and are

bitten by infected ticks. Environmental changes such as deforestation, agricultural expansion, and increased human activity in forest ecosystems have contributed to the spread of this disease.

Control of KFD requires cooperation between forest departments, veterinary services, and public health agencies, highlighting the importance of integrating environmental and animal health surveillance.

#### 3. Brucellosis

Brucellosis is a bacterial zoonotic disease that affects both livestock and humans. In India, the disease is mainly caused by *Brucella abortus* in cattle and *Brucella melitensis* in small ruminants. Humans usually become infected through direct contact with infected animals, aborted materials, or consumption of unpasteurized milk and dairy products. The disease is common among farmers, veterinarians, dairy workers, and laboratory personnel.

Brucellosis not only causes chronic illness in humans but also leads to significant economic losses in livestock production due to abortions, infertility, and reduced milk yield. Because the disease affects both human health and livestock productivity, its control requires coordinated efforts such as livestock vaccination, food safety measures, and surveillance in both animals and humans.

#### 4. Avian Influenza

Avian influenza (bird flu) is another example where animal health directly impacts human health. India has experienced multiple outbreaks of highly pathogenic avian influenza (H5N1 and other strains) in poultry farms and wild birds since 2006.

Although human infections are rare, the virus poses a potential pandemic threat because influenza viruses can mutate and adapt to humans. Controlling avian influenza requires continuous monitoring of poultry farms, migratory birds, and human health systems.

During outbreaks, authorities often implement measures such as culling infected poultry, restricting movement of birds, and enhancing surveillance, demonstrating the need for coordination between veterinary and public health sectors.

## Challenges and Future Directions

Despite its importance, implementing the One Health approach faces several challenges. Coordination between different sectors is often limited, and institutional barriers may prevent effective collaboration. In many developing countries, surveillance systems and diagnostic capacities are still inadequate.

Strengthening interdisciplinary collaboration, improving disease surveillance systems, and promoting awareness about the One Health concept are essential for its successful implementation. Governments, research institutions, and public health agencies must work together to integrate human, animal, and environmental health policies.

## CONCLUSION

The health of humans, animals, and the environment is deeply interconnected. Addressing modern health challenges requires moving beyond traditional disciplinary boundaries and adopting a collaborative approach. The One Health concept provides a framework for understanding and managing these complex interactions.

By promoting cooperation among different sectors and disciplines, One Health offers a powerful strategy for preventing zoonotic diseases, protecting ecosystems, ensuring food safety, and improving global health security. Recognizing and strengthening these connections will be essential for building a healthier and more sustainable future.

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