

Transboundary animal diseases (TADs) continue to challenge veterinary systems worldwide due to their far-reaching effects on livestock health, human well-being, food security, and international trade. As defined by the Food and Agriculture Organization (FAO), these are highly contagious diseases that can rapidly spread across national borders, disrupt economies, and demand coordinated international action for their control and eradication.

Broadly, TADs fall into two categories: those that affect only animals and those that are zoonotic, posing risks to both animals and humans. Prominent examples include Foot-and-Mouth Disease, African swine fever, Rift Valley Fever, Peste des petits ruminants, Nipah virus infection, SARS, and Bovine spongiform encephalopathy.

What Drives the Emergence and Spread of TADs?

The spread of TADs is not caused by a single factor but rather a complex interplay of biological, environmental, and human-driven elements.

Global trade and market expansion have significantly increased the movement of live animals and animal products. While this boosts economies, it also creates pathways for pathogens to enter previously disease-free regions through infected livestock or contaminated materials.

Pathogen characteristics further complicate control efforts. Certain viruses are remarkably resilient—able to survive processing, storage, and extreme environmental conditions. For instance, pathogens responsible for diseases like African swine fever and Foot-and-Mouth

Disease can persist in animal products for extended periods, making eradication challenging.

Environmental and climatic changes also play a crucial role. Shifts in temperature, rainfall, and ecosystems influence the distribution of hosts and vectors, sometimes introducing diseases into new geographic areas. A classic example is the emergence of Nipah virus infection, where habitat disruption altered bat behavior, increasing contact with livestock.

Human activities, including deforestation, urbanization, and increased travel, further accelerate disease spread by disrupting natural ecosystems and increasing interactions between wildlife and domestic animals.

Additionally, **wildlife migration, illegal trade of animals**, and **weak biosecurity practices** at the farm level contribute significantly to disease transmission. Cultural practices such as communal grazing and live animal markets also create opportunities for infections to spread rapidly among animal populations.

Strengthening Control and Management Strategies

Despite ongoing efforts, TADs persist globally, underscoring the need for stronger, more coordinated control measures.

Smarter Trade Regulations- Controlling the international movement of animals and animal products is fundamental. Imports from infected regions must be carefully regulated or restricted to protect disease-free zones. Global bodies such as the World Organisation for Animal Health, World Health Organization, and World Trade Organization play a vital role in monitoring outbreaks and guiding international policies.

Effective Quarantine Systems- Quarantine remains a frontline defense. Animals entering a country should undergo strict observation and testing for a period aligned with disease incubation times. This helps prevent silent introduction of infections.

Surveillance and Early Warning- Timely detection is key to containment. Strong surveillance networks, rapid reporting systems, and quick response mechanisms allow veterinary authorities to act before outbreaks escalate.

Vaccination: A Proven Shield- Vaccination continues to be one of the most reliable tools in disease prevention. Carefully planned immunization campaigns, particularly in endemic areas, help build herd immunity and reduce transmission. Advances in vaccine technology are making these programs more efficient and accessible.

Biosecurity at the Farm Level- Good biosecurity practices are essential to keep diseases out. Limiting farm access, maintaining hygiene, isolating sick animals, and carefully introducing new stock are simple yet highly

effective measures. When consistently followed, they significantly reduce disease risk.

Educating Farmers and Communities- Awareness is a powerful tool in disease control. Farmers and livestock handlers must be equipped to recognize early signs of diseases such as Rift Valley Fever and Nipah virus infection. Training programs, extension services, and community engagement help ensure timely reporting and better compliance with control measures.

Regulating Animal Movement Within Countries- Internal movement control is just as important as international regulation. Strategies like zoning (dividing areas into infected and disease-free zones) and compartmentalization (maintaining disease-free production systems) help contain outbreaks. These approaches are widely used in managing diseases such as Foot-and-Mouth Disease.

Safe Disposal Practices- Improper disposal of carcasses can turn them into sources of infection. Methods like burial, incineration, and rendering ensure that pathogens are destroyed and do not contaminate the environment—particularly important in diseases like African swine fever.

Vector Control Measures- For diseases transmitted by insects, controlling vectors is essential. Integrated strategies—including insecticides, biological control agents, and environmental management—help reduce populations of mosquitoes and ticks, thereby limiting the spread of infections such as Rift Valley Fever.

Overall, TADs pose a serious threat to animal health, public health, food security, and global trade due to their rapid spread across borders. Diseases such as Foot-and-Mouth Disease and African swine fever demonstrate their major economic impact. Their emergence is driven by

globalization, climate change, and human activities. Effective control requires coordinated international efforts led by organizations like the Food and Agriculture Organization and World Organisation for Animal Health. Key strategies include surveillance, vaccination, biosecurity, quarantine, and movement control. Active participation of farmers and veterinarians is essential. A strong, integrated approach is crucial to safeguard animal and human health globally.

