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Zoonotic Vector-Borne Diseases: A Short Overview

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ABSTRACT

Zoonotic vector-borne diseases are infections transmitted from animals to humans by blood-feeding arthropods such as mosquitoes, ticks, fleas, sand flies and tsetse flies. Mosquitoes and ticks are the dominant vectors, and key pathogens include RNA viruses (*Flaviviridae, Bunyaviridae, Togaviridae*), rickettsial and other bacteria, and protozoa such as *Plasmodium, Leishmania, Trypanosoma, Babesia* and related parasites. Because VBZDs link human, animal and environmental health, effective response requires an integrated One Health approach, combining enhanced surveillance, ecological and climate-informed risk modeling, vector control, vaccination where available, and improved environmental management.

Keywords: Zoonotic, Vector-borne diseases, Management

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Introduction

Zoonotic vector-borne diseases (VBZDs) are infections that pass from animals to humans via blood-feeding arthropods such as mosquitoes, ticks, sandflies, fleas and tsetse flies. They are caused by a wide range of viruses, bacteria and parasites and account for a large share of emerging infectious diseases worldwide [1,2,3]. They are responsible for a disproportionate share of emerging infectious diseases, driven by land-use change, climate change, globalization, and shifting wildlife–livestock–human interfaces [4].

What are zoonotic vector-borne diseases?

A disease is:

- Zoonotic when it is naturally transmitted between animals and humans.
- Vector-borne when transmission requires a vector, typically an arthropod that acquires a pathogen from an infected animal and passes it to another animal or a human while feeding [3,5].

Important examples include malaria, dengue, Zika, yellow fever, West Nile virus, Lyme disease, leishmaniasis, Chagas disease and Crimean-Congo hemorrhagic fever [6,7].

Why are they important?

- Cause substantial morbidity and mortality globally; over 17% of all infectious diseases are vector-borne, and they are disproportionately represented among emerging infections [2,8].
- Threaten both human and animal health, leading to major economic losses in livestock and public health systems [1].
- Are expanding into new regions due to climate change, land-use change, urbanization, international travel and trade, and social factors such as poverty [8,9].
- Show strong inequalities, with higher burdens in low-income, conflict-affected and tropical regions [10].

Main vectors and pathogens

- Mosquitoes and ticks are the most important vectors worldwide. Mosquitoes transmit arboviruses such as dengue, Zika, chikungunya, yellow fever and West Nile, as well as malaria parasites [1,5,11].
- Ticks transmit Lyme borreliosis, tick-borne encephalitis, rickettsioses, Crimean-Congo hemorrhagic fever and other bacterial and viral infections [8].

Drivers of emergence

- Land-use and ecological change (deforestation, agriculture, urban sprawl) that alter vector and wildlife habitats [1,3].
- Climate change, which affects vector survival, reproduction and geographic range [3,7].
- Globalization and mobility, moving infected humans, animals and vectors to new areas [12].

Control and the One Health approach

Because these diseases involve humans, animals and the environment, effective management requires a One Health approach that integrates veterinary, medical, and environmental sectors [3,13], Priority actions include:

- Strengthening surveillance in humans, animals and vectors [11,14].
- Vector control (environmental management, insecticides, personal protection) and improved housing and sanitation [2].
- Vaccination where available (e.g., yellow fever; developing dengue and other vaccines) [15,16].
- Addressing underlying drivers such as uncontrolled urbanization, climate change and poverty [4, 7,17].

Conclusion

Zoonotic vector-borne diseases are therefore a growing global health challenge, tightly linked to environmental change and human activities, and demand coordinated, long-term, One Health solutions.

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