ZOONOTIC THREATS: UNITING ONE HEALTH FOR A SAFER TOMORROW

Priya Khandelwal[1]*, Kuldeep Singh Gurjar[2], Rati Jalutharia[3]
1,2 Assistant Professor, Veterinary Clinical Complex, Apollo College of Veterinary Medicine, Jaipur-302031
3 M.V.Sc scholar, Post Graduate Institute of Veterinary Education and Research (PGIVER), Jaipur-302031
Corresponding author email: *priyakhandelwal601@gmail.com*
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ABSTRACT

Zoonoses are the "diseases and infections that are naturally transmitted between vertebrate animals and man," Zoonoses are important to Public Health because of their number, their frequency, and their severity in relation to human health. There are more than 250 zoonoses according to the WHO Zoonoses Expert Committee. The One Health concept aims to bring together communities, disciplines, and sectors at different societal levels to work together to address risks to human health and ecosystems and to promote well-being. The prevention and control of zoonotic diseases has a three-tier action – the direct protection of humans, reduction or elimination of the infection in the animal reservoir, and anti-vector measures. Feed hygiene and the elimination of pests and vermin must be performed continuously to control all types of zoonoses, especially pherozoonoses and saprozoonoses.

INTRODUCTION

Zoonoses is derived from the greek word **"zoon," meaning animal, and "nosos", meaning illness**. Zoonoses are the "diseases and infections that are naturally transmitted between vertebrate animals and man," as defined in 1951 by the World Health Organization (WHO) Expert Committee on Zoonoses. At the end of the nineteenth century, Rudolph Virchow came up with the term "zoonosis" to describe diseases that humans acquire from animals. Measles in nonhuman primates, which is a serious concern in any major primate center, is one example of a vertebrate animal disease that should be included in the term due to human exposure. In 2004, the One Health Initiative was launched with the goal of promoting collaboration between experts in human and animal health.

WHY ZOONOSIS IS IMPORTANT ?

Zoonoses are important to Public Health because of their number, their frequency, and their severity in relation to human health. There are more than 250 zoonoses according to the WHO Zoonoses Expert Committee.

Zoonoses are of interest because they are often previously unrecognized diseases or have increased virulence in populations lacking immunity. The West Nile virus first appeared in the United States in 1999, in the New York City area. Bubonic plague is a zoonotic disease, as are salmonellosis, Rocky Mountain spotted fever, and Lyme disease.

- The 2014 Ebola crisis resulted in over 11,000 fatalities and caused $2.2 billion in economic setbacks worldwide.
- Meanwhile, rabies claims nearly 59,000 lives each year and leads to $8.6 billion in global financial losses.

These zoonotic diseases profoundly impact both human and animal populations, underscoring the critical need for a unified One Health approach that bridges human medicine, veterinary care, and environmental stewardship. Example of most common viral zoonosis are West Nile Fever, Rabies, Nipah, Monkey Pox, Rift Valley Fever, Ebola and example of common bacterial zoonosis are Anthrax, Lyme disease, Plague, Brucellosis, Leptospirosis.

In today's scenario there is a new term emerging zoonoses which is defined as zoonotic diseases caused either by apparently new agents or by previously known microorganisms appearing in places or in species in which the disease was previously unknown.

WHAT'S ONE HEALTH?

The One Health Initiative (OHI) was established in 2021 to ensure a unified WHO One

Health position. In 2022, WHO together with the Food and Agriculture Organization of the United Nations, the World Organisation for Animal Health (founded as the Office internationale des Epizooties) and the United Nations Environment Programme, signed a groundbreaking agreement to establish the Quadripartite collaboration on One Health.

WHO has taken a pivotal role in advocating for and advancing the One Health agenda. Many departments and regional offices of WHO have been working extensively on One Health topics for decades. The 4 organizations bring together complementary mandates and expertise in human, animal, plant and environmental health to achieve the common goal of promoting One Health at all levels and ensuring a cohesive response to health threats through strong coordination among all partners, sectors and stakeholders.

The One Health concept aims to bring together communities, disciplines, and sectors at different societal levels to work together to address risks to human health and ecosystems and to promote well-being. It recognizes how the well-being of plants, animals, and ecosystems—both domestic and wild—is interdependent. Zoonotic diseases, or infections that are transferred from animals to humans, are a major contributor to emerging infectious diseases.

The One Health approach has applications in many human and veterinary medical specialties. It is used in veterinary medicine to improve food safety, prevent the spread of zoonotic diseases, and promote the welfare and health of animals. In human medicine, it is used to prevent and control the spread of infectious illnesses, improve public health outcomes, and promote environmental health.

ZOONOTIC TRANSMISSION

Transmissibility also separates communicable diseases, where human and animal contamination happen from a common source without an epidemiological relationship, from true zoonoses, which require epidemiological proof of direct or indirect transmission from animal to human.

- In direct zoonosis the disease is directly transmitted between non-humans and humans through the air (**influenza**), bites and saliva (**rabies**), faecal-oral transmission or through contaminated food. Contact with soil during gardening or childhood play carries a risk of infection with pathogens that reside temporarily or permanently in the soil, such as ***Toxocara* spp or *Sporothrix schenckii*.**
- Non-traditional pets have a particularly high risk of being infected with zoonotic agents, especially when captured directly from the wild. During an outbreak of **monkeypox** in the US, this virus spread from exotic African rodents, imported as pets, to pet dogs and then to humans.
- Activities that bring humans into closer contact with wildlife, including hunting, fishing, and camping, can result in exposure to organisms carried in wild animals (eg, ***Francisella tularensis*, *Yersinia pestis***, and ***Leptospira* spp**) or transmitted by arthropod vectors (eg, ***Borrelia burgdorferi***).

CLASSIFICATION

On the basis of zoonosis maintenance cycle

1. **Direct zoonoses (orthozoonoses)** are transmitted from an infected to a susceptible vertebrate host by direct contact, by contact with a fomite, or by a mechanical vector. Direct zoonoses may be perpetuated in nature by a single vertebrate species, such as dogs or foxes for rabies or cattle, small ruminants or swine for brucellosis.
2. **Cyclozoonoses** require more than one vertebrate species, but no invertebrate host, in order to complete the developmental cycle of the agent. Examples are human taeniases or pentastomid infections. Most of the comparatively few cyclozoonoses are cestodiases.
3. **Pherozoonoses (also called metazoonoses)** are zoonoses that require both vertebrates and invertebrates for the completion of their infectious cycle. In pherozoonoses, the infectious agent multiplies (propagative or cyclopropagative transmission) or merely develops (developmental transmission) in the invertebrate; there is always an extrinsic incubation period in the invertebrate host before transmission to a vertebrate host. Examples are arbovirus infections, plague, Lyme borreliosis, or rickettsial infections.
4. **Saprozoonoses** have both a vertebrate host and an inanimate developmental site or reservoir. The developmental reservoir is considered nonanimal, such as organic matter, including food, soil, and plants. In this group of zoonoses, direct infection is usually rare or absent. Examples are

histoplasmosis, *Erysipelothrix* infection, or listeriosis.

There are other ways to categorize zoonoses, such as occupational zoonoses (which happen when people get infected while working; for example, brucellosis in farmers, veterinarians, or slaughterhouse workers, Lyme disease in foresters, or rabies in wildlife trappers or taxidermists); zoonoses linked to recreational activities (such as plague, hantavirus infection, Lyme disease, tularemia, or parasitic larva migrans); domestic zoonoses (diseases contracted from pets); or accidental zoonoses (some extremely rare and unusual circumstances of infection, as well as foodborne outbreaks).

CAN YOU PREVENT ZOONOTIC DISEASES?

Ways you can reduce your risk of infection with a zoonotic disease include:

- The prevention and control of zoonotic diseases has a three-tier action – the direct protection of humans, reduction or elimination of the infection in the animal reservoir, and anti-vector measures.
- **Ensure vaccines are up-to-date**. If you are at danger of contracting zoonotic diseases such as mpox, rabies, or Ebola, you can get vaccinated to help prevent yourself from infection. Many zoonotic diseases do not have vaccinations.
- **Protect yourself from insect bites**. Wear long sleeves and pants, apply DEET-containing bug spray, check yourself and your pets for ticks after being outside, and see your veterinarian about tick and flea prevention for your pets.
- **Always use gloves when handling animals**, whether alive or dead. Never pick up a wild animal with bare hands. Even if you're using gloves, wash your hands completely after working with animals.
- **Observe safe food preparation procedures**. Bring meat to a safe temperature. After preparing food, always wash your hands, utensils, and surfaces. Never use untreated water to cook or drink. Avoid consuming unpasteurized milk or meals prepared with it.
- **Avoid contact of bodily fluids that are contaminated**. This entails wearing protective gear (mask, goggles, apron, and gloves) when tending to an infected person for some severe diseases (like Ebola). Even if you are wearing gloves, wash your hands after handling any bodily fluids. Steer clear of anything that might have come into contact with bodily fluids that are infectious.
- **Avoid eating bush meat**, which is the flesh of untamed animals.
- **Aim to prevent scratches** and bites from animals. Consult a medical professional if an animal could.
- The direct protection of humans applies mainly to occupational diseases in the laboratory, the workplace, or the rural environment. Preventive measures include the wearing of protective clothing, including gloves and glasses or goggles, appropriate air filtration systems, regular disinfection, vector (e.g., insect or rodent) control, and water treatment.
- Feed hygiene and the elimination of pests and vermin must be performed continuously to control all types of zoonoses, especially pherozoonoses and saprozoonoses.

ONE HEALTH IN GOVERNMENT AND POLICY

- The National Centre for Disease Control (NCDC) alongside the Ministry of Health & Family Welfare (MoHFW) are jointly spearheading the National One Health Programme for Prevention and Control of Zoonoses (NOHP-PCZ). A major focus of this initiative is to enhance the surveillance and diagnostic capabilities for zoonotic diseases across national, state, and district levels. This will be accomplished by creating a comprehensive network of Sentinel Surveillance Sites on Zoonoses (SSSZ) to monitor and respond effectively.
- The National One Health Programme for Prevention and Control of Zoonoses is the new name of the existing Central Sector Scheme of "Ministry of Health and Family Welfare approved in the 12th Five-year Plan as 'Strengthening Inter-Sectoral Coordination for Prevention and Control of Zoonotic Diseases'

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