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**Review**

# Exploring Zoonotic Diseases: Bridging the Gap Between Animals and Human Health

**Dodda Sreeja, Panala Tejasri Mahalaxmi, Priyanka Tatikonda, Akhil Akkenapally, Bandi Nandeeshwar, Saroyar Reja, Mandepudi Lakshmi Chandini***

*Omega College of Pharmacy, Edulabad, Ghatkesar, Hyderabad, Telangana, India.*

*Author for Correspondence: Dr. Mandepudi Lakshmi Chandini
Email: chandinimandepudi72@gmail.com

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## Abstract

Most humans are in contact with animals in a way or another. A zoonotic disease is a disease or infection that can be transmitted naturally from vertebrate animals to humans or from humans to vertebrate animals. Zoonotic diseases are infections, which are transmitted through zoonotic pathogens from animals to human beings. Almost more than 60% of human pathogens are zoonotic in origin. A wide variety of pathogens like Bacteria, fungi. Viruses, protozoa, parasites are included. Some of the factors like urbanization, change in climate, animal migrations, trade travel, vector biology etc are greatly influenced. We also highlight about the infections like Corona virus (COVID-19) and Nipah virus, in this Bats are the main reservoir for this virus, which can cause disease in humans and animals. Currently there is no effective of therapeutics, supportive care and prevention are the mainstays of management. As we review about the etiology of major zoonotic diseases and their impact on human health. The implementation of One Health measures is highly recommended for the effective prevention and control of possible zoonosis.

**Keywords:** Corona virus, Nipah virus, Zoonotic diseases, one health, pathogens, urbanization.

## INTRODUCTION

Humans, animals, and the environment play a significant role in the emergence and transmission of different infectious diseases. Most of the infectious diseases affecting humans are of animal origin. The “Asia Pacific strategy for emerging diseases: 2010” report estimated that around 60% of the emerging human infections are zoonotic in nature and among these pathogens more than 70% originated from wildlife species. The newly emerged diseases in humans in recent decades were of animal origin and were directly associated with animal origin foods.

Zoonotic diseases are also called as Zoonosis. These can be transmitted through direct contact with animals, which are infected and through bites like dogs, mosquitoes, arthropod bites also by consumption of infected water and food. One of the classical examples for the direct contact of disease is Rabis, which is transferred from the dogs. Across the global around 60% of human infections are zoonotic in nature among these 70% of are human pathogens are origin. As we discussed above, the major causes for zoonotic diseases are water and food. some of the water and foodborne pathogens are Campylobacter, Salmonella, Yersinia, Shiga toxin-producing *Escherichia coli* (STEC) and *Listeria monocytogenes*, *Vibrio cholera*, *Pseudomonas aeruginosa*. The factors which influence the food and waterborne diseases are cross contamination, poor hygienic, time and temperature [1-3].

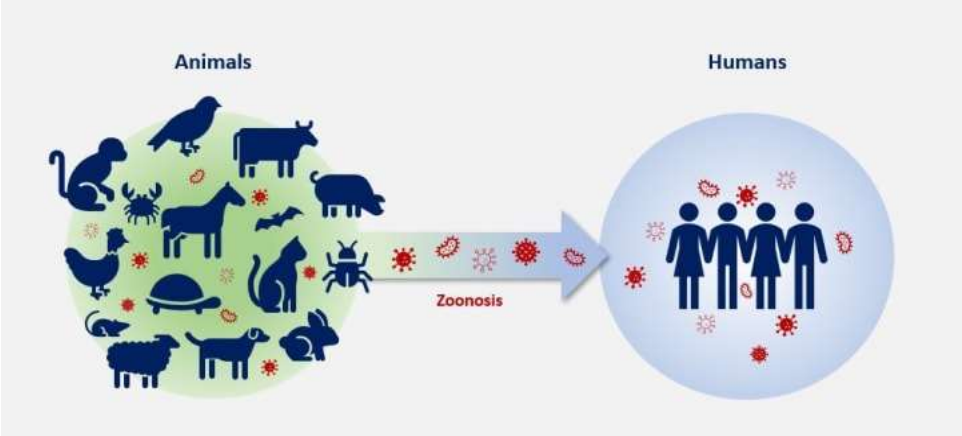


**Fig 1: Zoonotic pathogen transmission from diverse animal reservoirs to humans**

**Classification of zoonotic diseases**

Based on their etiology and hosts, the zoonotic diseases are broadly classified into wide varieties, some of them are: Bacterial, Protozoal, Viral parasitic, fungal, Rickettsial, chlamydial, and Acellular non-viral pathogenic agents. In this some are very dangerous infection causing diseases to the humans.

**Bacterial zoonoses**

In bacterial zoonoses the diseases include such as Anthrax, Tuberculosis, Brucellosis, Bubonic plague, leprosy, lyme, salmonellosis, vibriosis, cat scratch disease. As these are caused by the zoonotic pathogens like cattle, dogs, sheep, pigs, chicken and other mammals. The major symptoms for these diseases are vomiting, nausea, fever, GI issues, diarrhea, sweating, red eye, abscess, etc.

**viral zoonoses**

Rabies, Ebola, chikungunya, dengue, AIDS, SARS syndrome, Monkey pox, Avian influenza, Nipah virus, Covid-19 are comes under this. These are caused by dogs, monkeys, rabbits, wolves, ducks, chimpanzees, bats, cats, squirrels, Gambian poached rats etc, are the viral zoonotic pathogens. The symptoms are conjunctivitis, pneumonia, muscle pain, sore throat, liver and kidney failure etc.

**Parasitic zoonoses**

Trichinellosis, hydatidosis, cryptococcosis, fascioliasis are the parasitic zoonoses which are caused through pigs, dogs, wood rats, buffaloes, shepherd dogs, sheep, deer, and other ruminants. These pathogenic agents cause GI issues, coughing, shortness of breath, abdominal pain, malaise, swollen liver etc.

**Mycotic zoonoses**

Ringworm infection, Aspergillosis, Blastomycosis, Histoplasmosis are the fungal zoonoses. These are occurred by the animals like sheep's, cat, goat, horses, ferrets, bottle-nosed dolphins and sea lions etc. The symptoms skin lesions, verrucous skin lesions, meningitis, erythema multiform, photophobia, neck stiffness, weight loss, hepatosplenomegaly etc.

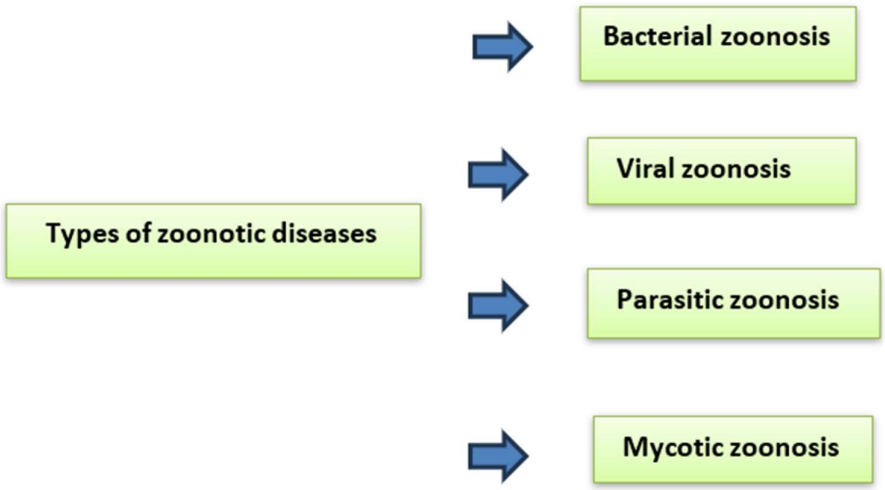


**Fig 2: Classification of zoonotic diseases**

Noticeably, approximately 99% of the endemic zoonotic infections are originated from animals to humans, within in the anthropogenic environments, moreover these can be contagious through directly or indirectly. Authors and writers are also concluded that the Corona virus and Nipah viruses are also triggered by the bats and fruit birds. Mostly humans are infected through direct contact with bat's saliva, urine, faeces, or by consuming fruits which are eaten by bats.

In some cases, not only with animals, humans are also causing these zoonotic diseases. These diseases have substantial public health concerns because they can cause severe cause of illness and even death too, they also raise a significant burden on society due to costs of treatment lost productivity and disease control measures.

Some of the factors which are relating to infections causing zoonotic diseases are already mentioned above. Even though close contact with the animals, like pets, domestic and wild animals are the root causing factors which spreads zoonotic diseases. Due to direct and indirect contact with the animals can risk human health. One of the best examples to illustrate the spreading diseases from animals is Sporotrichosis, it is an emerging disease that spreads by scratches of cats infected with the dimorphic fungus Sporothrix.

Certain virulent zoophilic dermatophytes are capable of causing infections in humans directly, but they can also survive for extended periods in the environment and transmitted indirectly through fomite.

But in recent years the most advanced techniques, appropriate treatments, and vaccines had come to treat these diseases, with regarding prophylaxis and controlling. Despite these advancements, global surveillance and reporting systems require further strengthening to ensure swift outbreak direction and containment. Persistent research gaps highlight the necessity for sustained investment in zoonotic disease studies to protect public health and mitigate future pandemics. Effective prevention demands collaboration across disciplines, involving public health experts, veterinarians and other key stakeholders [4-7].

**Impacts of zoonotic diseases**

- ✓ Public Health: Primary contributors to new and re-emerging infectious diseases (COVID-19), Ebola, and Avian influenza cause a great deal of illness and death around the world, particularly in those with limited resources.
- ✓ Economic Burden: Damage world trade, tourism and economies (e.g., COVID-19 pandemic). It's a big issue; the costs associated with health and with losses of livestock and disease control are quite massive.
- ✓ Food Security and Livelihoods: Affect around 1 billion people, affecting livestock and poultry industries and food supply and income for farmers. Rural communities are likely to be hit hard.
- ✓ Environmental and Ecological Impact: Disruption in the ecosystem and loss of biodiversity may lead to an increased risk of zoonotic spillover. That is because deforestation and trade in wildlife both help spread such diseases.
- ✓ Global Security: Can become pandemics and demand the collaboration of all nations to control and contain. Significant focus for international health initiatives (Such as One Health approach.

Provide safe production of animal-based food, and minimise the number of open meat markets, particularly in developing and third-world countries. Contain infections, economic harm, and, ultimately, human victims. Enhanced Animal Health Systems-Harder sanitary measures should be observed at the quarantine sites and borders [8-10].

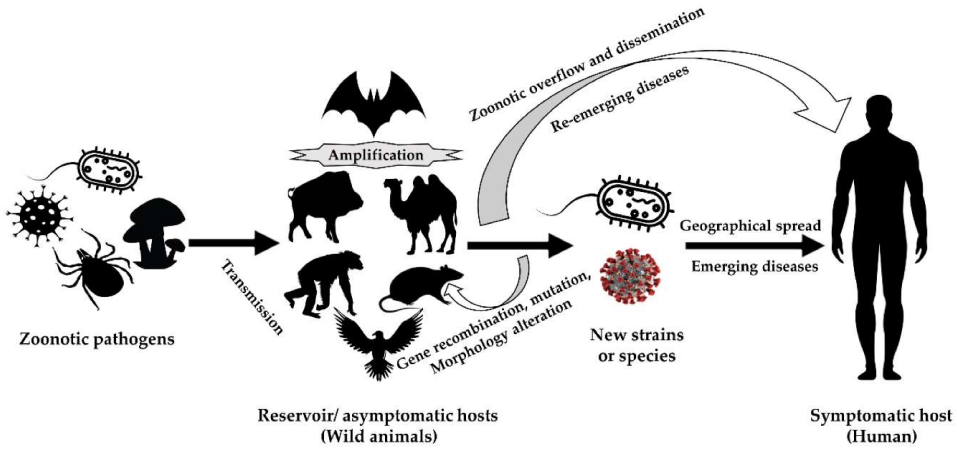


**Fig 3: Role of wild animals in the transmission and amplification of zoonotic pathogens, which contributes to emerging and reemerging diseases**

**Recommendations**

Zoonotic diseases represent a serious public health concern. Many zoonoses are currently under control but there is gap in our knowledge about many diseases especially on the disease distribution, etiology, pathogen, host, vector biology, dynamics, transmission cycle, predisposing factors, and risk factors. The equilibrium exists among the host, agent, and environment may be disturbed at any point due to various anthropogenic activities of increasing human population and natural activities to evoke emission of zoonoses. With the existing knowledge we cannot accurately predict the time or the impact of the next pandemic of a zoonoses may occur. The following activities need to be ensured or strengthened for our preparedness to overcome such pandemic.

- Active and wider zoonoses surveillance and monitoring with advanced tools like satellite-based remote sensing system and molecular epidemiological tools.
- Disease reporting and notification service.
- Giving priority to zoonoses and action team formation.
- Available diagnostic facilities and skilled manpower.
- Cooperation at regional, national, subnational, and international levels.
- One health-based approach comprising both veterinarians and medical doctors in addition to environmental experts and other professionals.
- Ensuring adequate regular and emergency funding.
- Mass campaigning on public awareness on zoonoses.
- More research on disease epidemiology, risk factors, pathogen virulence, host biology, and vector biology.
- Wildlife monitoring and wildlife protection.
- Ensure safe food production of animal origin [11-14].

**Control of zoonoses**

Zoonoses present a serious health threat to the international community. About 58–61% of the human diseases are communicable and up to 75% are zoonotic (transmitted from animals). Zoonosis involves the interaction of humans, animals, and environment, and therefore a multi-sectorial approach is required to ensure effective control measures.

Surveillance is crucial to prevent and control zoonotic diseases. It can be used to detect early infection, affected humans and animals, reservoirs, vectors, and endemic areas including the “hotspots”. It helps in the adaptation of control strategies against emerging and re-emerging diseases to improve human health status, to manage disease properly, and to minimize morbidity and mortality of humans and animals. Since zoonoses (such as SARS and HPAI) can spread swiftly across the globe to affect global communities, coordinated surveillance approaches at local, regional, national, and international levels are essential to control zoonoses. All potential sources of zoonoses including exotic animals and birds, pet and companion animals, aquatic animals, wildlife, and rodents need to be subject to surveillance [15-18].

## CONCLUSION

Zoonotic disease, or that which transfers disease from animals to humans, has been a major public health issue for centuries. A variety of pathogens, including viruses, bacteria, parasites, and fungi, can induce these

diseases. Zoonotic transmission of diseases can be as a result of bite and scratches from animals, consumption of contaminated food, agents like larval vectors (mosquitoes), and the environment. Famous zoonotic diseases include rabies, Ebola, Lyme disease and, most recently, COVID-19. The emergence of zoonotic diseases has been driven by a number of factors including human interaction with animals, deforestation, and climate and urbanization, providing new pathways (as well as new mutants of pathogens) for organisms to emerge. Successful prevention and control of zoonotic diseases demand the integrated One Health approach that acknowledges the convergence of human, animal and environmental health. Surveillance, screening, information and awareness and Prevention for safe food handling and animal care are important measures for decreasing zoonotic risk. Strengthening healthcare systems and better coordination between animal and human health professionals are also essential for rapidly responding to outbreaks.

Zoonoses are paramount challenges to the overall public health worldwide. The complexity of these strategies require a multisectoral approach to minimize transmission risk and prepare for future outbreaks. With expanding human populations and increased human incursions into habitat. In conclusion, zoonotic diseases represent a significant challenge to public health globally. Their complex nature demands a coordinated, multidisciplinary approach to reduce transmission risks and prepare for future outbreaks. As human populations continue to grow and encroach on natural habitats, the likelihood of emerging zoonotic diseases will remain a pressing concern for the foreseeable future.

**Conflicts of interest**
None

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