

Prevalence of Monkeypox in Animals and Pets: A Comprehensive Overview

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Introduction

Monkeypox is an emerging zoonotic viral disease transmitted from animals to humans caused by the monkeypox virus (MPXV), which belongs to the Orthopoxvirus genus in the Poxviridae family. First discovered in captive monkeys at the State Serum Institute in Copenhagen, Denmark in 1958. Monkeypox has been discovered to impact various mammal species, underscoring its importance as a pathogen capable of infecting different species. Recent outbreaks in various regions outside of Central and West Africa have caused worries about the disease spreading to pets, despite its main presence in tropical rainforests of those areas. Humans can become infected when they have close contact with animals carrying the virus. Although monkeypox is mainly transmitted by animals, worries have developed about the possibility of it spreading to pets during human outbreaks, especially in areas where the virus is not commonly found.

What is Monkeypox?

Monkeypox was initially recognized after captive monkeys in Copenhagen showed symptoms similar to smallpox, which resulted in the identification of a new virus. Although called "monkeys," these animals are not the virus's original host. Throughout time, research has indicated that African rodents, like rope squirrels and Gambian pouched rats, are the main carriers, while primates only occasionally host the disease. The virus was thought to be a localized pathogen in Central and West Africa until a major outbreak in the United States in 2003 showed its ability to spread outside its usual areas. The origin of this epidemic can be traced back to African rodents that were brought into the country. These rodents then infected pet prairie dogs, resulting in numerous human infections and prompting a reevaluation of the dangers of owning exotic pets. Nevertheless, the surge in human cases outside Africa has sparked worries about the disease spreading to animals and pets in different areas.

Morphology and Structure of the Monkeypox Virus

The monkeypox virus bears a structural resemblance to other orthopoxviruses. It has a unique form that is brick-like or oval, with measurements around 200–250 nanometers. This configuration helps maintain the virus's stability in various environmental situations.

The virus consists of multiple essential parts:

- **Center:** Includes enzymes and transcription factors needed for viral reproduction.
- **DNA genome:** made up of two strands: It is about 197 kilobases in length and contains about 180 proteins.
- **Outer membrane:** serves to shield the viral structure.
- **Envelope of lipoprotein:** Encloses the virus and helps it bind to host cells.

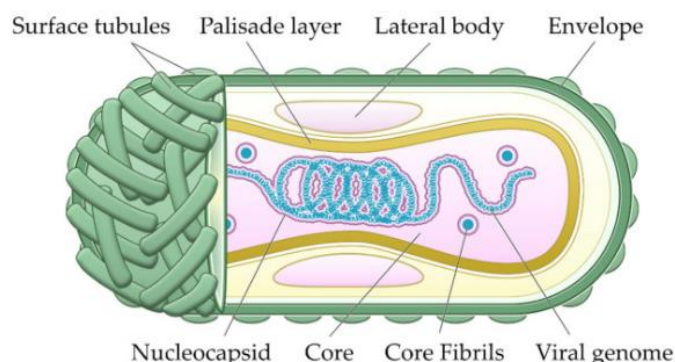


Fig. 1. Schematic representation of MPXV virion structure

(Source: Harpan et al., 2022)

Prevalence of Monkeypox in Animals and Pets in India

Monkeypox primarily spreads in wild animals, specifically rodents and non-human primates. Direct contact with infected animals or their bodily fluids can result in transmission of the virus to humans. In areas where the disease is common, people frequently get infected by coming into contact with these animal sources. Nevertheless, in regions that are not native to the virus such as India, worries have arisen regarding the potential transmission of the virus to household animals and pets, particularly during outbreaks in humans. Recently, there has been

worry about the virus spreading to non-endemic areas such as India due to global outbreaks. Although there have been documented cases of human monkeypox in India, especially during the 2022 global outbreak, there is not much information available on the prevalence of monkeypox in animals and pets in the country.

Can pets get infected with Monkeypox?

Indeed, pets have the potential to get monkeypox if they are exposed to infected humans or wild animals. Pets such as dogs, cats, and small mammals (i.e., hamsters, guinea pigs) are susceptible to infection from coming into contact with bodily fluids, skin wounds, or contaminated surfaces and bedding. While there are few cases of monkeypox in household pets, it is important to not ignore the potential risk. In 2003, there was a significant outbreak in the United States caused by the virus being brought in by African rodents and then spreading to pet prairie dogs. This occurrence resulted in several human infections and emphasized the possible danger of exotic pets spreading zoonotic illnesses. Recently, a pet dog tested positive for monkeypox after being in close contact with infected individuals, highlighting the importance of awareness and vigilance among pet owners.

Possible animal carriers for monkeypox in India

India has a wide range of wildlife species, such as rodents, primates, and other mammals that could act as hosts for the monkeypox virus. The main hosts of the monkeypox virus are mainly wild rodents and other small mammals in their natural habitat. Rodents such as hamsters, guinea pigs, African squirrels, Gambian pouched rats, and dormice, along with Non-Human Primates like monkeys, as well as dogs and cats, are the main animal hosts. Rodents are seen as more vulnerable to monkeypox compared to other animals because of their genetic resemblance to known wild hosts. These animals carry the virus and can pass it on to humans through bites, scratches, or contact with their bodily fluids.

Transmission and Susceptible Animal Species

The monkeypox virus can spread through various routes, including direct contact with infected animals, exposure to contaminated materials, and consumption of undercooked meat. The virus can also be transmitted among animals through the fecal-oral route, respiratory droplets, or wounds. The disease

affects a broad array of mammals, including Rodents, Nonhuman primates and Domestic pets.

Transmission from humans to pets: Infected individuals, especially those who caught the virus in areas with outbreaks, have been known to pass the virus on to their animals. This might happen due to proximity, sharing bedding, or contaminated surroundings. In Europe in 2022, the first confirmed instance of monkeypox being transmitted from humans to animals was documented when a dog caught the virus from its sick owners. Although there have been no reported cases in India, this emphasizes the potential for the virus to spread to pets, especially in homes where humans are infected.

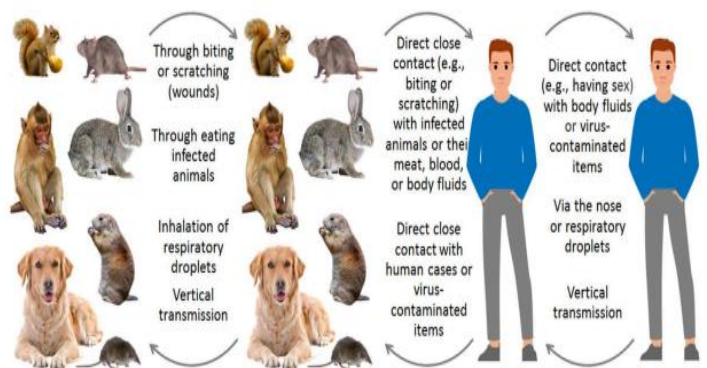


Fig. 2. Transmission routes of monkey pox in animals and humans

(Chen et al., 2022)

Signs and Symptoms of Monkeypox in Animals

The incubation period for monkeypox in animals usually lasts between 7 and 14 days, with infected animals not displaying any apparent symptoms of sickness. After symptoms start showing, they may differ based on the type of species but commonly involve Fever and lethargy, Swollen lymph nodes (a key symptom distinguishing monkeypox from smallpox), Respiratory indications (Cough, runny nose, and pink eye), Decreased appetite. As the illness advances, animals with it might experience a distinct skin rash that goes through various phases such as Macules, Papules, Vesicles, Pustules, and Scabs before they eventually shed. Results for animals that are infected can vary in severity depending on factors such as species, age, and health condition. Monitoring and identifying the disease can be difficult due to the fact that certain animals may exhibit only mild symptoms or be carriers without showing any signs, while others may experience severe systemic illness.



Fig. 3. Skin and mucosal lesions in dog with monkeypox virus

(Seang et al., 2022)

Preventing Monkeypox in Pets and Domestic Animals

- **Pet Owners:** Pet owners in regions experiencing monkeypox outbreaks should take precautions to minimize the risk of transmission. This includes avoiding close contact with pets if they or someone in the household has contracted the virus, ensuring good hygiene, and consulting veterinarians if their pets show signs of illness.
- **Veterinary Surveillance:** In areas where monkeypox is prevalent, increased surveillance of wildlife and pets is essential. This includes monitoring animals that may have come into contact with infected individuals or animals, as well as instituting quarantine measures for exposed animals. However, to prevent monkeypox transmission to pets and other animals, certain precautions are recommended:
 1. **Isolation:** Infected individuals should avoid contact with animals, including pets, until they have fully recovered.
 2. **Quarantine:** Any animal exposed to an infected person should be quarantined and monitored for signs of illness.
 3. **Personal Protective Equipment (PPE):** Wear gloves, masks, and other protective gear when handling potentially infected animals.
 4. **Safe Handling and Disposal of Waste:** Properly dispose of bedding, food, and waste from infected animals to prevent environmental contamination.
 5. **Disinfection:** Environments and materials that could be contaminated by the virus (e.g., bedding, cages).

6. **Surveillance and quarantine of animals,** particularly in regions experiencing outbreaks, to prevent potential spread.

Current Trends and Future Considerations

Monkeypox is a rising concern in animals and pets. The increasing incidence of the disease in regions outside its traditional endemic areas, coupled with its broad host range, highlights the need for robust surveillance and preventive measures. Educating the public on the signs, transmission routes, and precautions for managing infected pets can play a pivotal role in preventing monkeypox from becoming a larger health concern. While there is currently no documented prevalence of monkeypox in animals or pets in India, the potential risks, especially during human outbreaks, cannot be ruled out. Indian health authorities have taken steps to increase surveillance and preventive measures to ensure that pets and wildlife are monitored for any signs of the virus. Pet owners, especially those who keep rodents, are advised to maintain good hygiene and take preventive actions if monkeypox cases are reported in their community. Continued research and surveillance are crucial to understanding the full scope of monkeypox transmission in animals and pets in India.

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