

Reverse zoonosis and its relevance to the monkeypox outbreak 2022

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Other orthopoxviruses with reservoirs in wildlife have the ability to infect humans and allow for the genetic adaptation of the virus to humans to resume [1]. Non-human primates are simply incidental hosts of the monkeypox virus (MPXV), despite the fact that the animal reservoirs for the virus have not yet been discovered [2]. However, it is highly hypothesized that various rodents and African squirrels are the primary, if not the only, reservoirs for the virus [2–4]. Most human cases of monkeypox in Africa have historically been transmitted by contact with diseased animals, such as rodents rather than through person-to-person transmission. The UK Health Security Agency (UKHSA) advises that monkeypox patients should avoid contact with their pets for 21 days [5]. According to reports from the USA, animals from all four major continents—North America, South America, Asia, and Africa can be hosts for the MPXV [6]. Although while this occurrence carries a low risk, transmission could still occur covertly because infected animals typically do not exhibit the same obvious signs as humans [7]. MPXV can infect a wide range of hosts, and interspecies transmission could be a result of monkeys mingling

with different rodent species [8]. The animal-to-human transmission of the MPXV infection during the 2003 monkeypox outbreak in the USA was recorded [9]. Infections using respiratory and/or mucocutaneous exposures, percutaneous and/or inoculation exposures, or both, were all feasible [10].

The first incidence of human-to-animal transmission of monkeypox has been documented in a dog during the ongoing outbreak [11]. The United States' public health organization, the Centers for Disease Control and Prevention (CDC) has modified its prevention advice for infected individuals who own dogs [12]. The 4-year-old Italian greyhound sick dog was discovered at a Paris hospital with skin lesions, notably mucocutaneous lesions, including abdominal pustules and thin anal ulceration [13]. It is still unknown if dogs may transfer the infection to other dogs or people. The dog shared a bed with two males who were non-exclusive sexual partners and lived in the same home. In late May of this year, the persons were diagnosed with monkeypox (MPX) after exhibiting fever, headaches, and anal ulcerations. After around 12 days, the dog started to exhibit symptoms and was immediately examined. Since the commencement of their own symptoms, the men said that they had taken precautions to keep their dog away from interacting with other animals and people. The virus that infected one of the men was shown to be genetically identical to the virus that infected the greyhound by genetic analysis.

The world health organization labeled monkeypox infection a global public health emergency in July 2022 [14]. Intimate contact with an infected person, infectious rashes or lesions,

body fluids, respiratory droplets, and now likely sexual contact have all been known to spread monkeypox among humans. However, the specific dynamic of transmission in this instance is not yet identified [15,16]. The overwhelming majority of recent epidemic cases have involved persons having intercourse with other men (MSM). The MPXV can infect and spread to anyone, regardless of sexual orientation or behavior, thus this pattern does not prove that the infection is only transferred through sexual activity [17]. Governments and health authorities have issued warnings against sharing bed linen or clothing with sick individuals. Only wild animals (rodents and primates) have been identified to carry the monkeypox virus in endemic regions. Infection in dogs and cats and other domesticated animals has not before been recorded (Fig. 1).

This is the first example of its kind to isolate diseased pets. The most important issue is to prevent the infection from transmitting from one species to another so that it does not affect other species. Because during their evolution, viruses swiftly adapted to the new species. In light of the fact that just one case has been documented yet, in the recent article, the authors have advocated for more research on secondary transmissions through pets. Nonetheless, the CDC has urged specific precautions, stating that it is possible for infected humans to transmit the monkeypox virus to animals via intimate contacts, such as stroking, caressing, hugging, kissing,

licking, sharing sleeping places, and feeding [12]. Those with signs of monkeypox or who have recently tested positive must avoid close contact. If the pet has not been in close vicinity to the owners, they may be moved to another location for the duration of the healing period, which is around 21 days. Future studies should focus more on secondary transmission via pets or situations in which a pet has the virus and can spread it to humans [18].

MPXV is a zoonotic disease for which the animal reservoir is unknown [19], and going to infect a variety of animal hosts in Europe or North America, could cause a worrisome situation. Scientists are afraid that MPXV could establish a long-term foothold in Europe or North America, allowing it to infect some animal hosts. Once the virus is circulating among these animals, it can continue jumping back into humans who might come into contact with infected animals [14]. The wide host range of MPXV is concerning, since it may make it easier for the virus to adapt to new hosts in new areas.

By monitoring the changes in infection patterns and their severity, looking into potential reservoirs, and managing the response to vaccination in the current outbreak, it will be easier to manage emerging and re-emerging infectious diseases in the future. In light of the resurgence of MPXV, it is necessary to adopt a one-health approach by quickly assessing the risk

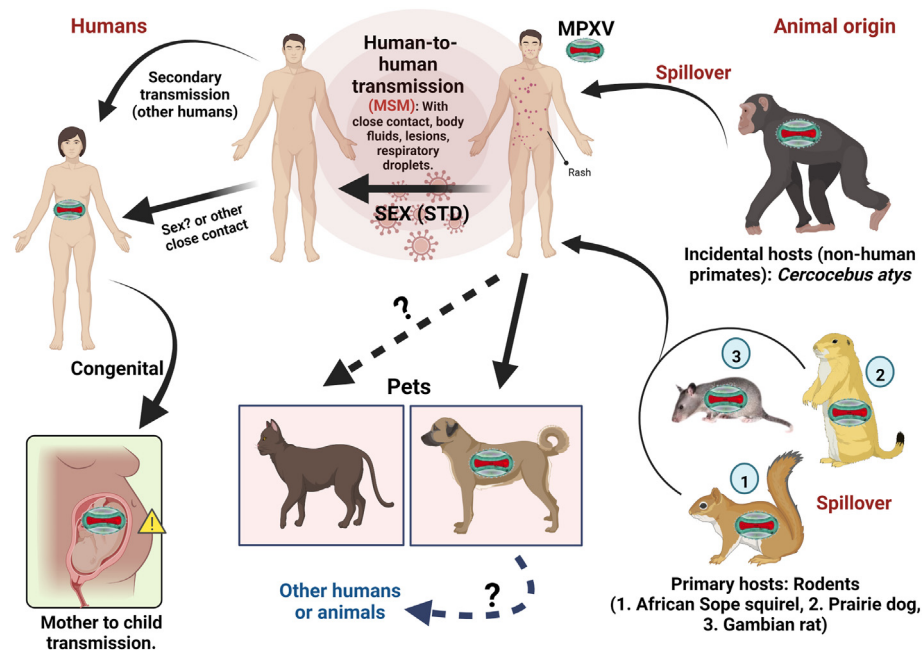


FIG. 1. Routes of transmission for the 2022 monkeypox endemic outbreak.

associated with animal-human and human-animal interphases [20].

Ethical approval

This article does not require any human/animal subjects to acquire such approval.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.nmni.2022.101049>.

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