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Popular Article

Monkeypox: An Emerging Zoonotic Disease

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Abstract

Monkeypox is a member of the orthopoxvirus family, the double-stranded DNA virus was first noted in monkeys in the 1950s and has a wide host range, notably including rodents. Monkeypox spreads in different ways. The virus can spread from person-to-person through: direct contact with the infectious rash, scabs, or body fluids, respiratory secretions during prolonged, face-to-face contact, or during intimate physical contact. This represents the incubation period and typically lasts 7 to 14 days with an upper limit of 21 days. Symptom onset correlates with a secondary viremia leading to 1 to 2 days of prodromal symptoms such as fever and lymphadenopathy before lesions appear. Symptoms like Fever, Headache, Muscle aches and backache, Swollen lymph nodes, Chills, Exhaustion and A rash that can look like pimples or blisters that appears on the face, inside the mouth, and on other parts of the body, like the hands, feet, chest, genitals, or anus. A definitive diagnosis is accomplished via polymerase chain reaction testing of skin lesions or fluid. There are no treatments specifically for monkeypox virus infections.

Keywords: monkeypox virus, double-stranded DNA virus

Introduction

Monkeypox is a zoonotic disease, meaning that it can spread between animals and people, and is caused by *Monkeypox virus*, an *Orthopoxvirus*. While the animal reservoir is unknown, small mammals (rope and sun squirrels, giant-pouched rats, African dormice) are thought to maintain the virus in the environments of West and Central Africa (Moore MJ, et al. 2022). People can get infected with the virus through direct contact with infected animals, often while hunting, trapping, and processing infected animals or the infected body parts and fluids of animals. Small mammals can carry the virus, sometimes without apparent symptoms, while non-human primates can get sick with monkeypox and have signs of disease like humans.

In 2003, an outbreak of monkeypox in domesticated prairie dogs occurred after they shared bedding and caging with a shipment of infected small mammals from West Africa. This led to 47 human cases in 6 states in the United States. Instances of animal-to-animal and animal-to-person spread, such as the 2003 outbreak, demonstrate the need to reduce the risk of secondary infections to and from animals by isolating infected people as well as exposed and infected animals.

The first human case of monkeypox was recorded in 1970. Prior to the 2022 outbreak, monkeypox had been reported in people in several central and western African countries. Previously, almost all monkeypox cases in people outside of Africa were linked to international travel to countries where the disease commonly occurs or through imported animals. These cases occurred on multiple continents.

Etiology

Monkeypox is from the family: *Poxviridae*, subfamily: chordopoxvirinae, genus: orthopoxvirus, and species: Monkeypox virus. On electron microscopy, the monkeypox virus is relatively large (200-250 nanometers). Poxviruses are brick-shaped, surrounded by a lipoprotein envelope with a linear double-stranded DNA genome (Alakunle E, et al. 2020 and Kugelman JR, 2014) Aside from their reliance on host ribosomes for mRNA translation, poxviruses include all necessary replication, transcription, assembly, and egress proteins in their genome.

Transmission

Monkeypox spreads in different ways. The virus can spread from person-to-person through:

- direct contact with the infectious rash, scabs, or body fluids
- respiratory secretions during prolonged, face-to-face contact, or during intimate physical contact, such as kissing, cuddling, or sex
- touching items (such as clothing or linens) that previously touched the infectious rash or body fluids
- pregnant people can spread the virus to their fetus through the placenta

It's also possible for people to get monkeypox from infected animals, either by being scratched or bitten by the animal or by preparing or eating meat or using products from an infected animal.

Monkeypox can spread from the time symptoms start until the rash has fully healed and a fresh layer of skin has formed. The illness typically lasts 2-4 weeks.

Pathophysiology

Following viral entry from any route (oropharynx, nasopharynx, or intradermal), the monkeypox virus replicates at the inoculation site then spreads to local lymph nodes. Next, an initial viremia leads to viral spread and seeding of other organs. This represents the incubation period and typically lasts 7 to 14 days with an upper limit of 21 days.

Symptom onset correlates with a secondary viremia leading to 1 to 2 days of prodromal symptoms such as fever and lymphadenopathy before lesions appear. Infected patients may be contagious at this time. Lesions start in the oropharynx then appear on the skin. Serum antibodies are often detectable by the time lesions appear (Hutson CL, et al. 2015).

Symptoms

Monkeypox is a rare disease caused by infection with the monkeypox virus. Monkeypox virus is part of the same family of viruses as smallpox. Monkeypox symptoms are similar to smallpox symptoms, but milder; and monkeypox is rarely fatal. Monkeypox is not related to chickenpox.

Symptoms of monkeypox can include:

- Fever
- Headache
- Muscle aches and backache
- Swollen lymph nodes
- Chills
- Exhaustion
- A rash that can look like pimples or blisters that appears on the face, inside the mouth, and on other parts of the body, like the hands, feet, chest, genitals, or anus.

The rash goes through different stages before healing completely. The illness typically lasts 2-4 weeks. Sometimes, people get a rash first, followed by other symptoms. Others only experience a rash.

Fig.1: Gross photograph showing blisters like lesions on face.

Diagnosis

Given the current unfolding outbreak, clinicians seeing patients with new onset of febrile illness and rash should consider monkeypox, especially if lymphadenopathy is also present. The rash typically starts in the mouth, then moves to the face, followed by the extremities (including the palms and soles) in a centrifugal pattern. A definitive diagnosis is accomplished via polymerase chain reaction testing of skin lesions or fluid. These tests are available at state public health laboratories. There is no commercially available test (Sklenovská N, et al. 2018).

Treatment

There are no treatments specifically for monkeypox virus infections. However, monkeypox and smallpox viruses are genetically similar, which means that antiviral drugs and vaccines developed to protect against smallpox may be used to prevent and treat monkeypox virus infections. Antivirals, such as tecovirimat (TPOXX), may be recommended for people who are more likely to get severely ill, like patients with weakened immune systems.

Prevention

The smallpox vaccines are effective in the prevention of monkeypox and as post exposure prophylaxis. A newer-generation smallpox vaccine, JYNNEOS (Bavarian Nordic), has an FDA indication for the prevention of monkeypox, and the older-generation ACAM2000 can be used off-label for the same

purpose. In prior outbreaks, vaccination of close contacts has successfully limited transmission. Administration of prophylactic vaccine as early as immediately after possible exposure can abort infection or significantly attenuate it. In cases in which smallpox vaccine is contraindicated, vaccinia immune globulin may be given as an alternative postexposure prophylaxis agent (Sklenovská N, et al. 2018).

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