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GENERAL

MONKEYPOX-AN EMERGING THREAT TO GLOBAL HEALTH

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What is Monkey pox?

Monkey pox is a **viral** as well as a **zoonotic disease** caused by the **mpox virus.** Zoonotic means this disease is capable of transmission from animals to humans as well as humans to animals. It belongs to the **genus Orthopoxvirus** and **family Poxviridae** which also include the variola virus (VARV, responsible for smallpox), vaccinia virus (VACV), camelpox virus (CMPV) and the cowpox virus (CPXV).

Types of Monkey pox

The virus was first identified in the year **1958** in **Denmark** in monkeys being used for research. Hence it is known as the monkey pox virus.

There are two main types of the mpox virus- the **West African virus** and the **Congo Basin virus** which is also called the Central African virus. The Congo Basin strain has been found to be the more severe and life-threatening between the two. On the basis of genetics, the West African strain is called the **Clade II strain,** and the Congo Basin strain is called the **Clade I strain**.

Transmission of mpox

Mpox spreads in the community mainly by the following ways:

1. **Human to human:** Close or intimate contact with an infected person such as kissing, cuddling, hugging, sexual intercourse which maybe oral, anal or vaginal. Prolonged face to face contact such as sitting close and talking to someone for a long time which can transmit the virus through respiratory secretions such as sneeze and cough. Touching the clothing, bedding of an mpox infected person or any object containing mpox can also spread the virus.
2. **Animal to human**: The mpox virus can transmit from animals to humans if the meat of such an infected animal is consumed and it has not been cooked thoroughly. Touching an infected animal?s fur, skin, blood etc. can also spread the virus. Getting bitten by an mpox infected animal will also transmit the virus.
3. **Pregnancy**: During pregnancy, the mpox virus can pass from the mother to the fetus through the placenta.

Susceptibility to monkey pox

Children under 8 years of age, people with weak immune systems such as those having HIV, which is not properly monitored and controlled, pregnant women, people with a history of eczema are more susceptible to monkey pox than others. Their symptoms are more severe, and chances of death are also higher.

Symptoms of monkey pox

After infection with monkey pox, the symptoms usually take between **5-21 days** to appear.

The most usual symptoms observed are:

1. **Fever (usually the first and the most common symptom).**

2. **Headache.**
3. **Sore throat.**
4. **Muscle ache, back ache.**
5. **Lymphadenopathy (swollen lymph nodes).**
6. **Exhaustion (low energy).**
7. **Chills.**

Rashes begin to appear about 1-3 days after the development of fever. In some people, rash may appear first followed by fever and vice versa. The rash commonly appears on the face, palms, genitalia, soles of the feet, mouth, eyes such as the cornea and conjunctiva and the anus.

Rashes are generally identified by presence of lesions which develop or progress in the following order:

1. **Macules or flat discoloured lesions.**
2. **Papules or slightly raised lesions.**
3. **Vesicles or bumps with clear fluid.**
4. **Pustules or bumps with yellowish fluid.**
5. **Scabs.**

The scabs formed after the drying of the lesions will eventually fall off and give way to new and healthy skin. Mpox symptoms will usually clear in a few weeks.

Severe symptoms and complications associated with monkey pox are pneumonia, corneal infection which may lead to loss of vision, difficulty in swallowing, sepsis (blood infection), diarrhea, infection of the brain (encephalitis), heart (myocarditis), rectum (proctitis), genitals (balanitis), urinary passages (urethritis). In rare cases, mpox can also be fatal.

Diagnosis of monkey pox

The main test used to diagnose/find out whether the patient has monkey pox is examination/analysis of viral DNA by polymerase chain reaction (PCR) test. This test involves taking samples such as fluid from lesions or dry scabs. Other tests include biopsy which involves removing a piece of skin tissue and examining it for the virus.

Blood tests are not recommended because the virus does not stay in the blood for a long time and hence it is inaccurate. Antibody detection methods are also not used because they are poor in distinguishing between different orthopoxviruses.

Treatment of monkey pox

In a healthy individual, monkey pox symptoms will resolve on their own in a few weeks without the need for any treatment. In those who are at the highest risk such as children, the elderly, those with a weak immune system such as AIDS patients, those with a history of skin diseases such as dermatitis, treatment may be needed. Though there is no specific treatment for monkey pox, a number of drugs used to treat smallpox have been used to treat monkey pox because of similar genetics of both viruses. They are:

1. **Tecovirimat**: Tecovirimat has been found to be effective against many orthopoxviruses including smallpox and monkey pox. **It has been shown to act against a protein called VP 37 which helps spread the virus in the body by helping it spread from one infected cell to another.** Tecovirimat is also called TPOXX and ST-246.
2. **Cidofovir**: Cidofovir, also known as **Vistide**, is a **prodrug** that is phosphorylated by enzymes of the cytoplasm after entry into the host cells into **cidofovir diphosphate (CDV-pp)**. Cidofovir diphosphate has a longer half life than cidofovir. **CDV-pp stops viral DNA replication by inhibiting the enzyme DNA polymerase. It also inhibits the enzyme DNA polymerase 3?-5? exonuclease activity**.

3. **Brincidofovir**: This is a **lipid conjugate of cidofovir**. After entry into the target cell, brincidofovir is cleaved by the enzyme phospholipase to give cidofovir. By two sequential phosphorylations, cidofovir monophosphate is formed followed by **cidofovir diphosphate (CDV-pp)**. CDV-pp will help in treatment of monkey pox by **suppressing synthesis of viral DNA by inhibition of the activity of the enzyme DNA polymerase.**
4. **Vaccinia immune globulin intravenous (VIGIV)**: This is an **FDA approved medicine**. The Centre for Disease Control (CDC) has approved its use if there is a monkey pox outbreak. More research is needed to determine its long-term effectiveness.

Monkey pox prevention

For the purpose of protection of our self from monkey pox and to avoid infecting others, here are specific precautions that need to be followed:

1. **If infected with monkey pox**:

- Always consult the healthcare provider for advice.
- Isolate in a clean, well-ventilated room.
- Regularly wash hands with soap and water or an alcohol-based hand sanitizer. This should be done without fail especially before and after touching sores.
- Avoid contact with other people such as family members, other contacts until the rashes have completely healed and have been replaced by new and healthy skin. This will help stop spread of the virus.
- Always keep the affected skin areas open. If with other people, always cover those areas.
- To manage pain, medicines such as paracetamol, ibuprofen should be taken when the need arises.
- Avoid sexual activity till full recovery has been achieved because monkey pox spreads through sexual contact.

1. **Other precautions that should be taken are**:

- Avoid touching or consuming the meat of any animals which look ill or are dead, especially if travelling to east, west or central Africa.
- When being around any person infected with monkey pox or a person who is a suspected case, avoid close contact (within a metre) and do not share bedding or towels.
- If travelled to west, east or central Africa, check regularly for any symptoms of monkey pox for at least three weeks from the date of arrival.
- If there is any outbreak of monkey pox, avoid sexual activity, especially sex with multiple partners.

Conclusion

As of **August 2024**, monkey pox cases have been detected in at least **120 countries with 1 lakh confirmed cases and around 210-220 fatalities**. Although extensive research is being carried out to help develop a cure such as a monkey pox vaccine, researchers have tasted limited success. A few vaccines such as a vaccine candidate by Tonix Pharmaceuticals known as **TNX-801** for the purpose of treatment of smallpox and monkey pox regarding which a patent application has been filed are still under testing in animals. Vaccines such as **C16L/B22R, C16L** that are based on targeting the genes responsible for the virus? infective ability are also in testing phase. Till date there is no concrete evidence and data to prove their effectiveness against monkey pox in humans. A majority of the monkey pox cases reported worldwide have been found in **men who have sex with other men (MSM)**. Due to a lot of stigma associated with monkey pox, the MSM population as well as the general population is reluctant to seek medical intervention, leading to spread of the virus and more deaths.

Monkey pox is fast becoming a global health concern. Hence, a vaccine that is specifically effective against monkey pox is the need of the hour. Accurate diagnostic methods also need to be developed quickly so that the disease can be detected, and treatment can be started as soon as possible. Diagnostic methods as well as treatment has to be made available as well as affordable worldwide as soon as possible so that monkey

pox does not become a global pandemic.

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Competing interests

The authors declare that they have no competing interests.

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