



HUMAN MONKEYPOX: AN EMERGING AND RE-EMERGING ZOOONOSIS.

Microbiology

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ABSTRACT

The ongoing 2022 multicounty outbreak of monkey pox is an emerging and re-emerging Zoonotic disease, which draw world attention because of the increasing occurrence of human outbreaks recently. The incubation period of the disease can be 5 to 21 days. In the current 2022 outbreak, the presentation of monkeypox has had atypical feature in many patients. So, it is important to update knowledge of this zoonotic infection, including case finding, contact tracing, laboratory investigation, clinical management, isolation and implementation of infection prevention control measures and prophylaxis to understand the broader implication of the current outbreak. CDC allows use of stockpiled Tecovirimat to treat monkeypox during an outbreak. VIGIV is licenced by FDA for the treatment of complications due to vaccinia vaccination. A newer vaccine based on modified attenuated vaccinia virus (Ankara strain) was approved for the prevention of monkeypox in 2019.

KEYWORDS

Emerging disease, Monkeypox, Zoonosis.

INTRODUCTION

In the last decades, several viral zoonoses, such as bird flu, Ebola haemorrhagic fever, Hanta virus disease, Nipah virus disease, Rift Valley fever, infection, severe acute respiratory syndrome, swine flu, west Nile fever etc., have emerged from different part of world and attracted the attention of public health authorities⁽¹⁾. Poxviruses include several zoonotic pathogens, such as cowpox virus, buffalopox virus, goatpox virus, monkeypox, and camelpox that affect both animals and humans in many regions of the world. Poxviruses cause four diseases in nonhuman primates; monkeypox being the most common⁽²⁾. Monkeypox is a sylvatic zoonosis that causes sporadic human infections in forested areas of Central and west Africa⁽³⁾.

Monkeypox is an emerging and re-emerging zoonotic infection of public health significance⁽⁴⁾. It caused the two outbreaks of pox-like disease in research colonies of monkeys, hence the name 'monkeypox' was given⁽⁵⁾. The 2022 outbreak of monkeypox which involve multiple countries is the largest in history to occur outside of Africa. This is the first time that chains of transmission are reported in Europe without known epidemiological link to west or central Africa, where this disease is endemic⁽⁶⁾.

Monkeypox virus first identified in 1958 in nonhuman primates kept for research in Denmark⁽⁷⁾. The first case in human was reported in 1970 in the Democratic republic of Congo⁽⁸⁾. In the Democratic Republic of Congo, a large outbreak occurred in 1996-97. Monkey pox cases were confirmed in the Midwest of the United States of America in the spring of 2003, marking the disease first recorded incidence outside of Africa⁽¹⁾.

It is serologically linked to smallpox in humans; hence a smallpox vaccination can prevent monkey pox. The virus causes epithelial papular and vesicular lesions in humans. The animal and the owner both are to be vaccinated for protection⁽²⁾. Monkeypox has the potential to spread from person to person and could be used in bioterrorism⁽⁴⁾. According to CDC, 1 in every 10 cases of monkey pox will result in death. Risk factors for severe case include children, having prolonged exposure to virus, immunocompromised person. The primary goal of this mini-review is to delineate the emerging position of the monkeypox virus as a Zoonotic pathogen of public health importance.

Global scenario

According to World Health Organization (WHO), Monkeypox has been reported as endemic in several other central and western African countries such as: Cameroon, Central African Republic, Cote d'Ivoire, Democratic Republic of the Congo, Gabon, Liberia, Nigeria, Republic of the Congo, and Sierra Leone. This has been also reported in certain non-endemic countries e.g., USA, UK Belgium, France, Germany, Italy, Netherlands, Portugal, Spain, Sweden Australia, Canada, Austria, Canary Islands, Israel and Switzerland.

There are 8 reported cases of monkeypox virus in India till date as on 4 August 2022. Confirmed cases are from Kerala and Delhi. The WHO declared, monkey pox as a global health emergency on 25 July, 2022. However, India needs to be prepared in view of the increasing reports

of cases in non-endemic region.

Epidemiology

Agent: Monkeypox virus (MPXV) is an enveloped double-stranded DNA virus that belongs to the Orthopoxvirus genus of the Poxviridae family (Figure-1). Orthopoxviruse (OPXV) are large (140-150nm) viruses with a brick-like structure and a genome consisting of approximately 200-500 kbp⁽⁹⁾. There are two distinct genetic clades of the MPXV, the Central African (Congo Basin) clade and the West African clade. The Congo Basin clade has historically caused more severe disease and was thought to be more transmissible and having high case fatality ratio as 10%. The geographical division between the two clades has so far been in Cameroon- the only country where both virus clades have been found⁽⁹⁾.

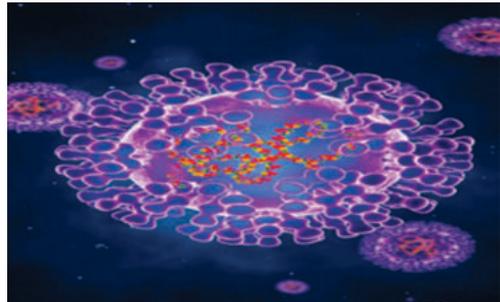


Figure- 1 Monkey pox virus

Source—www.google.com/monkeypox virus

Host: Natural reservoir is yet unknown. It infects a range of animal including birds, reptiles, insects and mammals. However, certain rodents (including rope squirrels, tree squirrels, Gambian pouched rats) and non-human primates are known to be naturally susceptible to monkeypox virus.

Incubation period: usually from 6 to 13 days but can range from 5 to 21 days.

Period of communicability: 1-2 days before the rash to until all the scabs fall off/gets subsided.

Mode of transmission: Human-to-human transmission is known to occur primarily through large respiratory droplets generally requiring a prolonged close contact. It can also be transmitted through direct contact with body fluids or lesion material, and indirect contact with lesion material, such as through contaminated clothing or linens of an infected person. Animal-to-human transmission may occur by bite or scratch of infected animals like small mammals including rodents (rats, squirrels) and non-human primates (monkeys, apes) or through bush meat preparation.

Clinical feature

Monkeypox is usually a self-limited disease with the symptoms lasting from 2 to 4 weeks. Historically, patients typically presented with

prodromal symptoms having fever, headaches, chills, malaise, respiratory symptoms (e.g., sore throat, nasal congestion, or cough) and lymphadenopathy, followed by development of a characteristic rash. The rash usually starts in the mouth, and then spreads to the face and extremities, including the palms and soles. Each lesion begins as a macule and then progresses to papules, vesicles, pustules, and scab (figure-2). Pain and pruritus can occur when the lesions are in the healing stage. Patients are infectious from the time symptoms start until the lesions scab and fall off, with a new layer of skin being formed⁽¹⁰⁾. Lymphadenopathy during the prodromal stage of illness can be a clinical feature to distinguish monkeypox from chickenpox or smallpox (Table -1).



Figure -2 Stages Of Skin Rashes In Monkey Pox .
 Source –www.google.com/monkeypox virus

In the current 2022 outbreak, the presentation of monkeypox has had atypical feature in many patients. For example, the characteristic rash is still present, but it can be limited to the genital, peri genital, and perianal areas and present at different stages of development⁽¹¹⁾. In addition, patients may present with only mild or absent prodromal symptoms which may begin after onset of a localised rash⁽¹¹⁾. Recently, the world has witnessed a sudden surge of monkey cases that have been almost exclusively diagnosed among men who have sex with men (MSM). This has led researchers to explore altered clinical characteristics of the monkeypox infection during the current outbreak.

Table 1-Showing comparison between monkeypox, chickenpox and smallpox.

	MONKEY POX	CHICKENPOX	SMALLPOX
Virus	Monkeypox virus orthopoxvirus family	Varicella-zoster virus	Varola virus, orthopoxvirus family
Fever	1-5 days before rash	1-2 days before rash	2-4 days before rash
Rash appearance	Often Starts on face then spreads to other areas, including palms and soles. Then forms a scab and falls off.	Itchy, blister-like rash-first on chest, back, and face, and then spreads over the entire body. Absent on palms and soles.	Starts as small red spots on tongue/mouth. Then appears on face and spreads to arms/legs and then palms/soles. Then forms a scab that falls off.
Swollen lymph nodes	Yes	No	No
Time before symptoms	5-21 dys	10-21 days	7-19 days
Length of illness	2-4 weeks	4-7 days	Up to 5 weeks
Death	1-10% of cases, depends on strain	Rare	Up to 30% of cases, depends on type

Source –www.google.com/monkeypox virus

Complications: bacterial superinfection, encephalitis, Pneumonia, sepsis, Corneal involvement (may lead to loss of vision).

Differential Diagnosis: Varicella, disseminated herpes zoster, disseminated herpes simplex, measles, molluscum contagiosum, chancroid, secondary syphilis, hand foot mouth disease, infectious mononucleosis.

Diagnosis:

1. Monkeypox specific real time PCR is the preferred laboratory test due to its accuracy and sensitivity. For, this optimal diagnostic sample for monkeypox are from skin lesions-the roof or fluid from vesicles and pustules, and dry crust.
2. Cell culture which provides virus strains for further characterization, but it is restricted to accredited bio safety level 3 reference laboratories.
3. Serological testing- it can be helpful in epidemiologic investigations, retrospective diagnosis of past infections, and diagnosis of late clinical manifestations, such as encephalitis.

Clinical management:

The mainstay of clinical management for typical monkeypox infection is supportive care. Which includes-

1. Maintenance of adequate fluid balance (because of the possibility of increased insensible fluid losses from the skin, decreased oral intake, and vomiting or diarrhea).
2. Hemodynamic support, supplemental oxygen, or other respiratory support.
3. Treatment of bacterial superinfections of skin lesions when indicated.
4. Currently, Tecovirimat, Cidofovir, and (VIGIV) vaccinia immunoglobulin intravenous are available from(EA-IND) Expanded Access Investigational New Drug protocols held by the Centres for Disease Control and Prevention (CDC) for treatment of OPXV infections in an outbreak scenario⁽¹²⁾.

There are no vaccines specifically designed to protect against monkeypox infection and disease. The vaccines being considered for use (Vaccinia virus-based vaccines) to prevent (MPXV) monkeypox were developed for smallpox.

1. Before 2019, ACAM 2000 was the only OPXV vaccine available in United States. ACAM2000 is made from a live, replication-competent Vaccinia virus, a member of the OPXV genus. Due to its replication competent property, there is a risk for serious adverse events associated with its use (e.g., progressive vaccinia, eczema vaccinatum, and myopericarditis)⁽¹³⁾.

2. Jynneos (Imvamune and Imvanex) is a nonreplicating modified Vaccinia Ankara virus vaccine. It was licensed for both prevention of monkeypox and smallpox in the United States in 2019. Jynneos is considered safer for use in immunocompromised individual⁽¹⁵⁾.

CONCLUSION:

Monkeypox has a wide host range, and if the ongoing outbreak is prolonged, there is reasonable concern that it could establish new ecological niches in wild animals in geographies outside of Africa, thus broadening its enzootic and endemic range.

As half of the world's population has no immunity against orthopoxviruses. So, early isolation of suspected and confirmed cases and closely monitoring and vaccinating their close contacts and healthcare workers with high-risk exposures as appropriate will be important for limiting new infections and disrupting transmission chain. Waste from monkeypox is considered a Category A substance (pathogen that is life-threatening or causes permanent disability), handling and management of clinical waste should be done in accordance with US Department of Transportation Hazardous Materials Regulations. With regards to pets, Current recommendations are to quarantine pet rodents for 21 days.

It is unlikely that the ongoing monkeypox outbreaks will lead to a global pandemic on the scale of COVID-19. As MPXV is not a novel virus, and there is experience from previous outbreaks regarding how to prevent propagation of the infection. More importantly, the transmission of monkeypox is also substantially different from SARS-CoV-2. However, monkeypox is new to many clinicians, who understandably do not have extensive experience in identifying or treating cases of the disease.

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