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Monkeypox and Healthcare Workers: The Dos and Don'ts of the Mpox Virus

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Abstract

Possibly more in danger of contracting the monkeypox virus are healthcare workers. Most healthcare workers come into direct contact with the disease's infected people, which can spread directly and indirectly. Healthcare professionals must contact patients with the disease and any infected objects or fluids to manage the disease, further increasing the transmission risk effectively. It is crucial to put safety measures in place and protect healthcare workers. To stop the spread of the monkeypox virus, countries must develop the necessary safeguards and countermeasures. In this emergency, healthcare systems must be strengthened. All healthcare systems should offer staff sufficient Personal Protective Equipment (PPE) and facilitate risk assessment among those with a high risk of exposure. Any suspected case of monkeypox requires caution on the part of healthcare professionals. They must abide by infection control safety rules and protective measures. This commentary aimed to highlight healthcare workers' dos and don'ts of the monkeypox virus.

Introduction

Monkeypox is a zoonotic disease caused by a virus that belongs to the Poxviridae family. The monkeypox virus (*Orthopoxvirus monkeypox*) is an enveloped virus with a double-stranded DNA genome that belongs to the Orthopoxvirus genus of the Poxviridae family. The Orthopoxvirus genus also includes vaccinia virus, cowpox virus, variola virus, and several other animal pathogen poxviruses [1]. There are two genetically distinct clades described for MPXV: clade I, formerly called the Congo Basin (Central African) clade, with sub-clades I (a) and Ib [2], and clade II, formerly called the West African clade, with sub-clades IIa and IIb [3,4]. Genetic differences between the viral genomes of the two clades might explain differences in viral clearance and pathogenesis [4-6]. Clade I has been associated with more severe disease and higher mortality [7-10].

It is a viral infection that can spread between people, mainly through close contact, and occasionally from the environment to people via things and surfaces that have been touched by a person with Mpox. In settings where the monkeypox virus is present among some wild animals, it can also be transmitted from infected animals to people who have contact with them. Taking its name from an initial detection among monkeys in a Danish laboratory in 1958 [11], the Democratic Republic of the Congo (DRC) in 1970 first diagnosed monkeypox in humans, later the virus became endemic in Western and Central Africa, but few cases were detected outside Africa in 2003 when the first monkeypox case was detected in the US. This ongoing multi-country monkeypox outbreak, which was first documented in the United Kingdom in May 2022, has quickly spread across the globe [12]. This resulted in gaining global attention and, sub-

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sequently, the WHO declaring it a Public Health Emergency of International Concern (PHEIC) [13]. As of 18 November 2022, more than 80,328 cumulative cases of monkeypox have been documented worldwide, alongside 53 deaths [14].

Poxviruses show extraordinary resistance to drying [15], and a higher temperature and pH tolerance compared to other enveloped viruses. These characteristics strongly impact their environmental persistence. Viruses of the Orthopoxvirus genus are known to have long-lasting stability in the environment [16], and viable MPXV can be detected on household surfaces at least 15 days after contamination of the surfaces [17]. Vaccinia virus (the virus contained in the smallpox vaccine) is rapidly inactivated in sewage [18]. Despite these characteristics, poxviruses are sensitive to common disinfectants. However, they can be less sensitive to organic disinfectants compared to other enveloped viruses. MPXV is considered an 'agent with high threat for deliberate release' using the matrix developed by the European Commission task force on Bioterrorism (BICHAT) [19].

Clinical features and symptoms

Based on studies in Central and West Africa, the incubation period for mpox is described as usually lasting from 6–13 days, but may also range from 5–21 days [20]. Human mpox often begins with a combination of symptoms, which common symptoms include a rash that may last for 2–4 weeks. This may start with, or be followed by, fever, headache, muscle aches, back pain, low energy, and swollen glands (lymph nodes) [12,21]. In cases in endemic areas (Africa), a centrifugal maculopapular rash starts from the site of the primary infection within three days after the onset of prodromal symptoms. It rapidly spreads to other parts of the body and progresses to develop vesicles. Palms and soles are involved in cases of the disseminated rash, which are characteristic of the disease. The number of lesions may range from a few to thousands [22], and an increasing number of lesions is correlated with increased disease severity.

The rash looks like blisters or sores and can affect the face, palms of the hands, soles of the feet, groin, genital and/or anal regions. These lesions may also be found in the mouth, throat, anus, rectum, or vagina, or on the eyes. The number of sores can range from one to several thousand. Some people develop inflammation inside the rectum (proctitis) that can cause severe pain, as well as inflammation of the genitals that may cause difficulties urinating [12].

In most cases, the symptoms of mpox go away on their own within a few weeks with supportive care, such as medication for pain or fever. However, in some people, the illness can be severe or lead to complications and even death [22]. Newborn babies, children, people who are pregnant, and people with underlying immune deficiencies such as from advanced HIV disease may be at higher risk of more serious mpox disease and death [21].

Severe disease due to mpox may include larger, more widespread lesions (especially in the mouth, eyes, and genitals), secondary bacterial infections of the skin or blood, and lung infections. Complications can include severe bacterial infection from skin lesions, mpox affecting the brain (encephalitis), heart (myocarditis) or lungs (pneumonia), and eye problems. People with severe mpox may require hospitalization, supportive care, and antiviral medicines to reduce the severity of lesions and shorten the time to recovery [21].

According to available data, between 0.1% and 10% of people with mpox have died. It is important to note that death rates in different settings may differ due to several factors, such as access to health care and underlying immunosuppression [12]. On 31st July 2024, Kenya confirmed its first case of Mpox at the Taita Taveta border post with Tanzania. The virus was detected in a person traveling from Uganda to Rwanda through Kenya. As of 13th August 2024, a total of 14 suspected cases had been identified, one case had tested positive for MPXV Clade Ib, 12 suspected cases had tested negative, and the test result for one case was pending. This is the first Mpox case ever identified in Kenya [23].

Healthcare workers, such as laboratory technologists, medical microbiologists, doctors, dentists, pharmacists, nurses, midwives, paramedics, administrators, support workers, and community health workers are the core of health systems worldwide and play a significant role in reacting to global health emergencies like the current monkeypox outbreak [24]. In the diagnosis, treatment, and direct management of patients with suspected or confirmed monkeypox infection healthcare workers are inextricably involved, though a significant number of them are reported to lack confidence regarding the sample collection, disease diagnosis, and management [25]. Since the common individual symptoms suspected such as the eruptions or rashes are often similar in appearance to measles, chickenpox, and sexually transmitted diseases it is always difficult for the health workers to clinically diagnose the disease [26]. Currently, Monkeypox is diagnosed through analysis of fluid swabbed from those eruptions or rash sites but this may be difficult to carry out in limited-resource settings since the capacity to diagnose the disease requires advanced laboratory infrastructure and specialized equipment such as Polymerase Chain Reaction (PCR) assays, nucleic acid amplification tests, and GeneXpert assays, thereby hindering the disease diagnosis, and potentially exposing healthcare workers [27].

Transmission

From person to person:

Mpox spreads from person to person mainly through close contact with someone who has mpox. Close contact includes skin-to-skin (such as touching or sex) and mouth-to-mouth, or mouth-to-skin contact (such as kissing), also include being face-to-face with someone who has mpox (such as talking or breathing close to one another, which can generate infectious respiratory particles) [3]. During the global outbreak that began in 2022, the virus mostly spread through sexual contact. People with mpox are considered infectious until all their lesions have crusted over, the scabs have fallen off and a new layer of skin has formed underneath, and all the lesions on the eyes and in the body (in the mouth, throat, eyes, vagina, and anus) have healed too, which usually takes from 2 to 4 weeks [24].

It is also possible for the virus to persist for some time on clothing, bedding, towels, objects, electronics, and surfaces that have been touched by a person with mpox. Someone else who touches these items may become infected, particularly if they have any cuts or abrasions or touch their eyes, nose, mouth, or other mucous membranes without first washing their hands [4]. Cleaning and disinfecting surfaces/objects and cleaning your hands after touching surfaces/objects that may be contaminated can help prevent this type of transmission. The virus can also spread during pregnancy to the fetus, during or after birth through skin-to-skin contact, or from a parent with mpox to an infant or child during close contact [5].

Although getting mpox from someone who is asymptomatic (not showing symptoms) has been reported, there is still limited information on whether the virus can be transmitted from someone with the virus before they get symptoms or after their lesions have healed. Although live virus has been isolated from semen, we do not yet know the extent to which infection can spread through semen, vaginal fluids, amniotic fluids, breast milk, or blood [8].

From animals to humans:

Someone who comes into physical contact with an animal that carries the virus, such as some species of monkeys or a terrestrial rodent (such as the tree squirrel) may also develop mpox. Exposure by such physical contact with an animal or meat can occur through bites or scratches, or during activities such as hunting, skinning, trapping, or preparing a meal. The virus can also be caught by eating contaminated meat that is not cooked thoroughly [26].

The risk of getting mpox from animals can be reduced by avoiding unprotected contact with wild animals, especially those that are sick or dead (including their meat and blood). In countries where animals carry the virus, any food containing animal parts or meat should be cooked thoroughly before eating [25].

From humans to animals:

There have been a few reports of the virus being identified in pet dogs. However, it has not been confirmed whether these were true infections or whether the detection of the virus was related to surface contamination. Since many species of animals are known to be susceptible to the virus, there is the potential for spillback of the virus from humans to animals in different settings. People who have confirmed or suspected mpox should avoid close physical contact with animals, including pets (such as cats, dogs, hamsters, and gerbils), livestock, and wildlife [26].

Diagnostics

Real-time polymerase chain reaction (real-time PCR) on skin lesion materials (e.g. swabs, exudate, or lesion crusts) is used to diagnose mpox. Several real-time PCR assays for the specific detection of MPXV, or generic orthopoxvirus detection are available [28-33]. Mpox laboratory diagnostics are well established in several laboratories in Europe (see Emerging Viral Diseases-Expert Laboratory Network – EVD-LabNet [34]).

Serological tests have limited value in mpox diagnostics due to immunological cross-reactivity between human-pathogenic orthopoxviruses [35], although they can be useful for excluding a recent or past orthopoxvirus infection. For contact investigations and population serosurveys, Immunoglobulin M (IgM) and Immunoglobulin G (IgG) detection by Enzyme-Linked Immunosorbent Assay (ELISA) or Immunofluorescent Antibody assay (IFA) is available in some laboratories.

Diagnostic procedures for MPXV and manipulation of specimens suspected to contain MPXV should be performed in Biosafety Level (BSL)-2 facilities as a minimum requirement [36,37]. MPXV is classified as a safety group 3 biological agent. Activities involving the handling of MPXV should, therefore, only be done in working areas corresponding to at least containment level three [37].

Who is at risk of the Mpox virus.

People who have close contact with someone who has mpox are at risk of infection. Close contact includes skin-to-skin (such as touching or sex) and mouth-to-mouth, or mouth-to-skin contact (such as kissing), and can also include being face-to-face with someone who has mpox (such as talking or breathing close to one another, which can generate infectious respiratory particles). People who have contact with clothing, bedding, towels, objects, electronics, and other surfaces that have been touched by someone with mpox are also at risk [38].

Anyone living with someone who has mpox should take steps to reduce the risk of becoming infected. A person who has been diagnosed with mpox should be assessed by a health care provider to determine if they are well enough to be cared for at home and if isolation can be safely managed at home. Health workers should follow infection prevention and control measures to protect themselves while caring for patients with mpox (by wearing appropriate personal protective equipment and adhering to the protocol for safely swabbing lesions for diagnostic testing and handling sharps such as needles) [39].

Case management and treatment

Newly identified cases of mpox should undergo a medical assessment for severity and risk factors (e.g. underlying conditions or medications affecting immune competence, untreated HIV infection, etc.). Those at increased risk of severe disease from mpox may require hospitalization and/or treatment with antivirals. Population groups at increased risk for severe disease include infants and young children, pregnant women, the elderly, and severely immunocompromised persons.

Cases should be instructed to isolate until their rash heals completely, which indicates the end of infectiousness. Recommendations mainly include the following:

Cases should remain in their room, when at home, and use designated household items (clothes, bed linen, towels, eating utensils, plates, glasses, etc.), which should not be shared with other household members.

- They should avoid contact with immunocompromised persons and others at risk for severe disease (such as infants and pregnant women) until their rash heals completely.
- They should be monitored by public health authorities (e.g. via telephone calls or other means, according to national guidance).
- They can temporarily leave their home (e.g. for medical appointments and necessary outdoor exercise for the stability of their mental health), provided they wear a medical face mask, and their rash is covered (e.g. by wearing long sleeves and trousers).
- They should practice careful respiratory hygiene and wear a medical face mask when in contact with other people. In addition, mpox cases and their household contacts should practice careful hand hygiene at all times.
- They should abstain from sexual activity until their rash heals completely i.e. no new lesions appear, scabs have fallen off, and new skin has formed. Condoms should be used for 12 weeks after recovering from a mpox infection.
- They should avoid contact with any mammalian animals (see also section on 'Special considerations to mitigate the risk of

animal-to-human and human-to-animal transmission').

Treatment is primarily symptomatic and supportive (alleviation of fever, pruritus pain, and hydration), including the prevention and treatment of secondary bacterial infections. Tecovirimat is the only antiviral drug with market authorization in the EU [37] with an indication for the treatment of orthopoxvirus infections, including mpox. Brincidofovir and cidofovir are other antiviral drug options for severe mpox cases but have significant side effects [38].

Our efforts will include:

- Raising awareness of steps to prevent the spread of disease.
- Collaborating with community groups and training local leaders to ensure widespread dissemination of critical information.
- Increasing medical referrals for people with mpox-like symptoms.
- Supplying hygiene kits to help people prevent and control infections.

Public health control measures

Public health authorities can take several public health measures to mitigate transmission:

- Raise awareness by appropriately targeting communication aimed at those most at risk for transmission or severe disease, including the active involvement of key stakeholders at the community level.
- Facilitate the early detection of cases by contact tracing in outbreak settings [40].
- Facilitate the isolation of mpox cases.
- Facilitate the early diagnosis of cases through easy access to healthcare services with well-informed clinicians, accessible diagnostics, and management guidance.
- Implement partner notification and contact tracing, in line with national recommendations.
- Implement appropriate infection prevention and control measures in healthcare settings [41].
- Implement a national vaccination strategy against mpox.
- Provide travel advice for people visiting or returning from countries with confirmed MPXV clade I outbreaks.
- Continue implementing risk communication activities and working with civil society organizations to engage population groups at higher risk of infection.

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Competing interests

The authors declare no competing interests.

Authors' contributions

All authors wrote, read, and approved the final version of the manuscript.

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