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Monkeypox 2022: Another global outbreak

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Abstract: In May 2022, a global outbreak of monkeypox was identified in Europe and North America in individuals most of whom had no history of travel from monkeypox-endemic countries. This article provides an overview of monkeypox disease prevention guidance and treatment options available.

Keywords: monkeypox, monkeypox virus, orthopoxvirus, rash, vaccine

Monkeypox is a zoonotic infection caused by the monkeypox virus. It is endemic in West and Central Africa (Congo Basin); however, periodic cases of monkeypox are reported annually in nonendemic countries related to international travel from endemic areas or contact with infected animals or animal products.^{1,2} In May 2022, a global outbreak of monkeypox was identified in Europe and North America in individuals most of whom had no history of travel from monkeypox-endemic

countries.^{3,4} As of October 14 2022, more than 72,874 global cases have been identified in 109 countries including over 27,096 cases in 52 states and territories of the US.^{5,6} The number of reported cases in nonendemic countries continued to increase and most cases were not linked to travel, indicating community transmission.^{7,8} The CDC and the World Health Organization (WHO) continue to provide clinicians with monkeypox outbreak status updates, guidance, and

consultation. On July 23, 2022, the WHO declared monkeypox a global public health emergency of international concern.⁹ The US declared monkeypox a public health emergency on August 4, 2022.¹⁰ This article provides an overview of monkeypox disease, prevention guidance, and treatment options available. As of the publication of this article, the outbreak and public health response continue to evolve. Healthcare personnel should check the CDC and WHO for updates and follow the most current guidance.

Monkeypox

Monkeypox is a zoonotic infection caused by the monkeypox virus which is a member of the Orthopoxvirus genus.^{1,11,12} Variola, the causative agent of smallpox, is another orthopoxvirus. A zoonotic disease can be spread from animals to humans and between humans.^{1,11-13} Monkeypox was named after being first recognized in two colonies of research monkeys in 1958.¹ The first human monkeypox infection was discovered in 1970 in the Democratic Republic of Congo during the campaign to eradicate smallpox.^{1,11,12} While the exact animal reservoir of monkeypox is unknown, it is thought to be small animals, such as rope and sun squirrels, giant-pouched rats, and African dormice, in monkeypox-endemic areas of Africa.^{1,13}

Monkeypox is endemic in several countries in West and Central (Congo Basin) Africa; however, periodic cases of monkeypox are reported each year in nonendemic countries related to travel from monkeypox-endemic areas or contact with infected animals or animal products.^{8,12,14} Monkeypox is not endemic in the US where cases are usually rare.^{8,14} In the 2003 US outbreak, 47 confirmed cases of monkeypox were reported in six states following contact with pet prairie dogs that became infected

after being housed near imported small mammals from West Africa.^{13,14} The 2003 outbreak resulted in a restriction on the importation of African rodents into the US.¹⁴ Two cases of travel-associated monkeypox were reported in the US in 2021.¹⁴

Two monkeypox clades or viral genetic groups exist: the West African clade and the Central or Congo Basin African clade. The WHO announced new nomenclature for Monkeypox Virus clades on August 12, 2022.¹⁵ The West African clade will be known as Clade II. Clade II has two subclades which will be known as Clade IIa and IIb. Clade IIb is the virus clade associated with the current outbreak.¹⁶ The Congo Basin clade will be known as Clade I. Clade II is usually a milder illness with a case fatality ratio of about 1%.⁸ Clade I is more severe with a case fatality ratio as high as 10%.^{8,16} Immunocompromised persons may have a more severe infection and higher mortality.^{8,16}

Monkeypox is transmitted between humans by intimate skin-to-skin or mucous membrane contact with lesions that contain the virus or by contact with contaminated environmental surfaces or fomites, such as clothes, utensils, and bedding.^{12,16,17} Close, sustained skin-to-skin contact, including sexual contact, with a person with monkeypox or contact with contaminated fomites are the most significant risk factors associated with person-to-person transmission of the Monkeypox virus.⁸ Contact with respiratory secretions such as droplets and aerosols from prolonged face-to-face contact may also transmit the virus.^{12,17,18} Although not part of this outbreak, transmission from animal to human may occur by direct contact with infected animals or contaminated animal bedding.^{13,14}

Monkeypox virus DNA has been detected in multiples items sampled in two households of persons with

monkeypox in 2021 and 2022.^{19,20} In both reports, specimens yielded either very low or no level of the viable virus by viral culture as indicated by polymerase chain reaction amplification. These reports suggest that extensive environmental contamination with monkeypox virus on porous surfaces, such as bedding and clothing, may pose more exposure risk than nonporous surfaces like metal and plastic. The interval between symptom onset and environmental sampling in the two reports (15 and 20 days, respectively) in combination with cleaning and disinfection practices of the persons with monkeypox during the interval suggests that the virus' viability either decays over time or is inactivated by chemical disinfection.^{19,20}

Signs and symptoms

Monkeypox signs and symptoms include rash; fever; sore throat; chills; lymphadenopathy; exhaustion; headache; myalgia; backache; and respiratory symptoms, such as nasal congestion and cough.²¹ Patients may have some or all of these symptoms. The illness lasts for 2 to 4 weeks and is marked by several phases:²²

- **Incubation period:** An average of 3 to 17 days following exposure, though it can be as long as 21 days.^{22,23} The individual has no symptoms and is not infectious.^{22,23}

- **Prodrome (flulike symptoms before the onset of rash):** Sometimes rash occurs before the flulike symptoms.²¹ The patient is contagious at the onset of signs and symptoms.²³ Lymphadenopathy (generalized or localized) is characteristic of monkeypox.²³

- **Rash:** Characteristic firm, deep-seated, well-circumscribed lesions, sometimes umbilicated (a central depression on the top of the lesion) in the pustular stage (see *Examples of monkeypox rash*). The rash begins as macules, followed by papules, vesicles, pustules, then scabs or crusts. The

rash usually starts on the face or in the oral cavity and progresses through synchronized stages on each affected area with a concentration on the face and extremities including lesions on palms and soles. The patient is contagious while the rash is present.²²

- **Resolution:** Once all scabs fall off and there is healthy tissue underneath, the patient is no longer contagious.²³

To date, the clinical presentation of monkeypox infection in the current global outbreak differs from that reported in previous cases and outbreaks.^{8,23} Patients diagnosed with monkeypox in the US outbreak reported signs and symptoms including:^{7,24}

- Prodromal signs and symptoms
 - mild or may not have occurred at all
 - not all patients had fever or lymphadenopathy
 - rash may precede the prodromal symptoms
- While all patients had a rash,
 - the rash or enanthem often began in mucosal areas (such as genital, perianal, or oral mucosa)
 - some patients had lesions that were scattered or localized to specific body sites rather than diffuse rash and may not have involved the face or extremities
 - the number of lesions may be minimal
 - the lesions can be very painful
 - the lesions are sometimes in different stages of progression on a specific anatomic site (such as vesicles and pustules existing side-by-side)
 - The location of the rash/lesions may be associated with specific types of sexual practices reported.²⁵
- The presenting complaint frequently includes anorectal pain, tenesmus, and rectal bleeding associated with visible perianal vesicular,

Examples of monkeypox rash

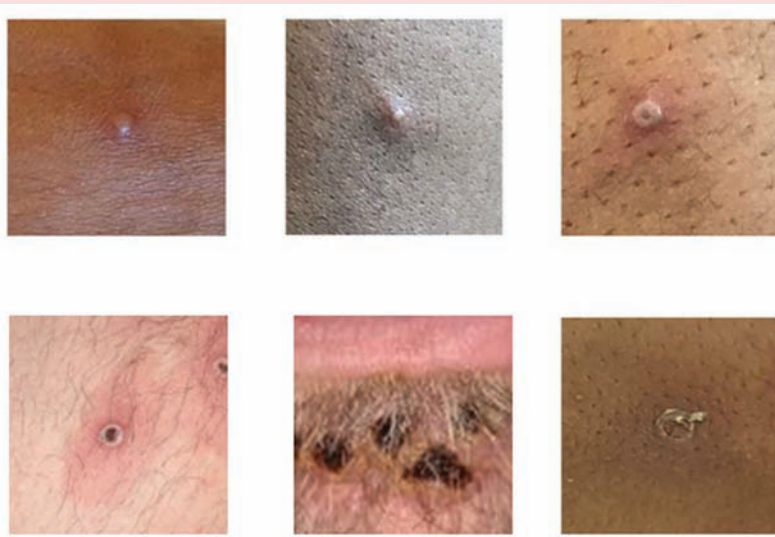


Photo Credit: CDC/UK Health Security Agency

pustular, or ulcerative skin lesions and proctitis. Similar presenting symptoms have been reported in patients from other countries.^{25,26}

Reported reasons for hospitalization included pain management or complications such as bacterial superinfection.^{25,26} As of October 14, 2022, 28 deaths associated with this outbreak have been reported globally.⁶

Diagnosis

The initial monkeypox clinical presentation may resemble a variety of common rash illnesses including varicella zoster (chickenpox) and pediatric molluscum contagiosum.^{8,27} Monkeypox presentation may be also confused with some sexually transmitted infections (STIs) such as syphilis, herpes, or lymphogranuloma.²⁷ A diagnosis of an STI does not rule out co-infection with monkeypox.^{8,18}

Diagnosis should include a history of epidemiologic risk factors and thorough full body skin and mucosal membranes assessments.⁸ Due to the variation in presentation of recent monkeypox cases, clinicians should evaluate all patients

with rashes consistent with monkeypox or epidemiologic risk factors for infection with monkeypox.^{24,27} Clinicians should also perform diagnostic tests per current CDC or WHO guidance to avoid missing cases.

Two swabs from two to three lesions should be obtained, preferably from different body sites or lesions that look different, and sent for lab testing.²⁷⁻²⁹ The usual method for specimen collection is using a dry synthetic swab to vigorously rub the surface of the lesion. It is not necessary to derroof or puncture the lesion; derroofing and puncture of lesions are not recommended due to the risk for sharps injuries.^{27,28} In some instances scabs or crusts may be submitted for testing; however, not all labs will accept crusts.^{27,28} Swabs should be placed in separate labeled plastic containers.²⁸ Contact the lab performing the test for specific information on acceptable specimen types and instructions for labeling and shipping.²⁸ At this time, testing for orthopoxviruses and monkeypox is only performed at Laboratory Response Network labs, the CDC, and designated commercial labs.^{28,29}

State or territorial health departments can advise on collecting and submitting specimens for testing. Swabs should be obtained when a rash consistent with monkeypox with or without epidemiologic risk factors is observed. Epidemiologic risk factors include contact with a person or people with a similar appearing rash or with a monkeypox diagnosis; close or intimate in-person contact with people in a social network experiencing monkeypox activity, such as men who have sex with men who meet partners through an online website, digital app, or social event; and a history of recent international travel to a country with many current cases.^{24,27}

Any person, regardless of gender identity or sexual orientation, can acquire and spread monkeypox. While most patients thus far in this outbreak have reported close sexual or intimate contact before the onset of illness, household contacts or others may acquire monkeypox via close nonsexual contact with infected patients or contaminated surfaces. Monkeypox has been reported in a small number of children in the US and globally during this outbreak.^{30,31}

Infection prevention and control in healthcare settings

Patients with a suspected or known monkeypox infection may present to a variety of healthcare settings for evaluation and care. Nurses should be aware of the appropriate precautions to be taken in each setting per the facility's protocols. Whether the healthcare setting is a clinic, provider office, ED, or inpatient care site, measures to prevent transmission of monkeypox infection include initiating precautions and wearing personal protective equipment (PPE), hand hygiene, and environmental cleaning and disinfection.^{32,33} Local, state, or territorial health officials should be notified and can provide consultation for patient management.



Diagnosis should include a history of epidemiologic risk factors and thorough full body skin and mucosal membranes assessments.

In ambulatory healthcare settings, triage the patient from the reception or waiting area into a single exam or treatment room. Provide the patient with a well-fitting medical mask (source control). Healthcare personnel entering the room should wear PPE that includes a gown; gloves; eye protection, such as goggles or a face shield that covers the front and sides of the face; and a National Institute for Occupational Safety and Health-approved particulate filtering facepiece respirator (N95 mask or equivalent) or higher-level respirator.^{34,35} Clean and disinfect all environmental surfaces using an Environmental Protection Agency (EPA)-registered, hospital-grade disinfectant with an emerging viral pathogen claim, such as those products listed in the EPA's Disinfectants for Emerging Viral Pathogens (EVPs): List Q.³⁶⁻³⁸ Follow the manufacturer's instructions for use of the products. Use only wet cleaning and mopping methods and do not use portable fans or vacuum any surfaces in the patient room because these activities could resuspend dried material from lesions.³⁴

Hospitalized patients with suspected or confirmed monkeypox

should be placed in a single-patient room with a dedicated bathroom and the door closed.³⁴ Special air-handling is not required; however, endotracheal intubation, extubation, and other aerosol-generating procedures should be performed in an airborne isolation room. The patient should only leave the room for medically necessary purposes. If the patient is transported outside the room, they should wear well-fitting source control, such as a medical mask, and any exposed skin lesions should be covered with a sheet or gown.^{34,35}

Wear PPE to handle soiled laundry including bedding, towels, and personal clothing, and avoid contact with lesion material that may be present in the laundry.³⁴ Soiled laundry should be handled without shaking and promptly placed in an appropriate laundry bag to prevent the dispersal of infectious material.

Waste, including dressings and PPE contaminated with Monkeypox virus Clade II (the virus clade associated with this outbreak) may be handled as regulated medical waste, such as red bag waste or isolation waste.^{34,39,40} If epidemiologic risk factors, such as a history of travel to the Democratic Republic of the Congo, the Republic of Congo, the Central African Republic, Cameroon, or Gabon in the prior 21 days, suggest risk for Clade I, the waste must be managed as Category A Infectious Substance and requires special handling for disposal.^{39,40} Facilities should follow local and state regulations for handling, storage, treatment, and disposal of waste contaminated with Category A infectious substances.^{34,39,40}

Food service items should be handled per routine procedures.³⁴ Maintain isolation precautions until all lesions have crusted, separated, and a fresh layer of healthy skin has formed underneath.³⁴ Healthcare facilities should consult with local or

state health departments when deciding to discontinue isolation.³⁴

Healthcare personnel responsible for the handling of specimens of monkeypox and human remains should utilize standard precautions including PPE and measures to minimize contact with infectious materials.^{28,41,42}

Infection prevention and control at home

Persons who do not require hospitalization should isolate at home for the duration of illness: from the onset of signs and symptoms until the rash has resolved, the scabs have crusted and fallen off, and a fresh layer of skin has formed.⁴³⁻⁴⁵ Factors influencing care at home include whether the patient is a child or an adult; the presence of other persons in the household, such as infected or uninfected persons or pets, people who are at higher risk for severe monkeypox disease including children, people who are pregnant, immunocompromised, or who have a history of atopic dermatitis or eczema; and the ability for the person with monkeypox and other people in the home to adhere to precautions.⁴³

Isolation precautions and infection control measures at home focus on limiting transmission via close, personal contact with the rash, scabs, lesions, body fluids, respiratory secretions, and potentially contaminated objects, surfaces, or materials.⁴³⁻⁴⁵

People with monkeypox should not leave the home except as required for medical care follow-up.

The person with monkeypox should:

- avoid close contact with others, including household members, visitors, and pets.^{43,45,46} Use a separate bathroom (if there is no separate bathroom, clean and disinfect bathroom surfaces after each use).
- not share dishes and other eating utensils; soiled dishes and eating utensils may be washed in a



Maintain isolation precautions until all lesions have crusted, separated, and a fresh layer of healthy skin has formed underneath.

dishwasher or by hand with warm water and soap.

- wear well-fitting source control such as a medical mask when in close contact with others at home; other household members should wear a respirator or well-fitting medical mask when in close contact (within 6 ft) with the person with monkeypox for more than a brief encounter.
- cover the lesions by wearing long sleeves or long pants.
- avoid the use of contact lenses to prevent inadvertent infection of the eye.
- avoid shaving rash-covered areas of the body to prevent the spread of the virus to other body sites.
- change their own bandages when possible. If assistance is needed with these activities, a household member should avoid extensive contact (such as wearing standard clothing that fully covers the skin) and wear at least disposable medical gloves and a well-fitting mask or respirator. Any clothing that contacts the rash during dressing changes should be immediately laundered. Gloves should be disposed of after use, followed by hand hygiene.
- not engage in sexual activity that requires direct physical contact.
- avoid contact with pets and animals in the household including

petting, hugging, kissing and licking, sharing sleeping areas, and sharing food.^{43,45,46} Monkeypox can infect a variety of mammal species.¹³ At least one case of monkeypox transmission from human to animal (dog) has been reported in this outbreak.⁴⁷

Limit transmission in the home by:⁴³⁻⁴⁶

- limiting exposure to others (people and pets) by isolating in a separate room or area and limiting the use of spaces, items, and food that are shared with household members.^{43,45}
- ensuring that everyone in the household performs hand hygiene with soap and water or alcohol-based hand sanitizer containing at least 60% alcohol.

Limit contamination within the household⁴³⁻⁴⁵

- Wear disposable gloves to routinely clean and disinfect commonly touched surfaces and items using an EPA-registered disinfectant.^{36,37}
- Hard surfaces such as tables, counters, door handles, toilet flush handles, light switches, and floor; hard surfaces of car interiors if used by the person with monkeypox.
- Include interior surfaces of refrigerator, freezer, other appliances, interior cabinet spaces, or drawers if they have been accessed by the person with monkeypox.
- Avoid contaminating upholstered furniture and other porous materials that cannot be laundered by placing coversheets, waterproof mattress covers, blankets, or tarps over these surfaces. Steam cleaning may be an option after the resolution of the illness.
- Use wet cleaning methods such as disinfectant wipes, sprays, and mopping; do not dry dust or sweep. A vacuum

with a high-efficiency air filter may be used. If not available, the person vacuuming should wear a well-fitting mask or respirator.

- Laundry may be washed in a standard washing machine with detergent, following label instructions.^{43,44} Laundry sanitizers may be used but are not necessary. Wear disposable gloves to handle soiled laundry.
 - Used contaminated clothing, linens and bedding materials, towels, and other fabric items should be contained in an impermeable container or bag that can be disinfected later, or a fabric bag that can be laundered along with the soiled items.
 - Handle soiled laundry without shaking.
 - Do not mix with the laundry of other members of the household.
 - Preferably the person with monkeypox can handle and launder soiled laundry. If another person does this task, they should wear standard clothing that covers all skin, a well-fitting medical mask or respirator, and gloves. Clothing that comes in contact with contaminated laundry should be washed immediately.
- Waste from homes, including those of people with monkeypox, should be contained in a plastic bag and discarded in municipal waste.⁴⁴
 - The person with monkeypox should use a dedicated, lined trash can in the room where they are isolating.
 - Place any soiled waste such as dressings, paper towels, food packaging, and other general trash items in a sealed bag.
 - Use disposable gloves when removing garbage bags and handling and disposing of trash.

- If professional cleaning services are used, consult with state or local health jurisdictions for guidance.

Unexposed persons without an essential need to be in the home should not visit. Household members who are not ill should limit contact with the person with monkeypox.

Regarding animals and pets in the household:⁴⁶

- Do not allow pets to have contact with the rash, dressings, linens, bedding, or other porous items (for example, fabrics) or surfaces used by the person with monkeypox.
- Pets that had close contact with a symptomatic person with monkeypox should be kept at home and away from other animals and people for 21 days after the most recent contact.
- If the person with monkeypox did not have close contact with pets after symptom onset, ask someone outside the home to care for the animal until the person with monkeypox fully recovers.
- Do not wipe or bathe pets with chemical disinfectants, alcohol, or other products such as hand sanitizers, disinfectant wipes, or surface cleaners.
- Observe the animal for potential signs of illness and consult with a veterinarian if the animal develops signs of illness including a new rash within 21 days of having contact with a person with suspected or confirmed monkeypox.

Congregate living and community settings

Congregate living settings are those where unrelated people reside in close proximity and share at least

one common room, such as a sleeping dorm, kitchen, living room, and bathroom.⁴⁸ Examples of congregate settings include correction and detention facilities, homeless shelters, group homes, dorms at institutes of higher education, or other such facilities. If healthcare services are provided on-site, healthcare personnel should follow recommendations similar to those for healthcare settings.³⁴ Congregate living facilities should provide information to staff, volunteers, and residents about monkeypox prevention, ensure that soap and water or hand sanitizer with at least 60% alcohol is freely available at all times; provide appropriate PPE for staff, volunteers, and residents; and clean and disinfect the environment per CDC guidance for monkeypox in the home.⁴⁴ Personnel should consult with their state, local, or territorial health department regarding people who have been exposed to monkeypox or are confirmed as being infected with monkeypox.⁴⁸

Currently, the risk of monkeypox in children and adolescents is low. The CDC has guidance for other community settings, such as schools, early care, education programs, and institutions of higher education.⁴⁹

Treatment

For most people with monkeypox, treatment consists of symptomatic management. CDC guidance for treatment includes considerations for pain management in addition to medical countermeasures specific for monkeypox.⁵⁰

Several antiviral agents and vaccines developed for patients with smallpox are available for use in special populations at risk for severe disease or specific patients with monkeypox upon consultation with the CDC.⁵¹ The CDC has also published general treatment guidance and considerations for individuals at high risk for severe disease including people who are severely

immunocompromised, children, pregnant and breastfeeding persons, and persons with HIV.^{30,50,52-54}

In the US, several medical countermeasures are available from the Administration for Strategic Preparedness and Response's Strategic National Stockpile (SNS).^{50,51} the vaccines JYNNEOS™ and ACAM2000, and treatments Tecovirimat (also referred to as TPOXX), vaccinia immune globulin intravenous (VIGIV), and cidofovir.

Vaccines

Two vaccines are licensed in the US for the prevention of smallpox.^{55,56} Because monkeypox is closely related to smallpox, these vaccines are at least 85% effective in preventing monkeypox if given before exposure as preexposure or primary preventive vaccination.^{6,55} ACAM2000 and the modified vaccinia Ankara (MVA) vaccine (known as JYNNEOS in the US, IMVANEX in the European Union, and IMVAMUNE in Canada) are live virus vaccines. JYNNEOS is the primary vaccine being used in the US during this outbreak.

JYNNEOS is an attenuated, non-replicating live virus vaccine approved for preventing smallpox and monkeypox.^{51,55,57,58} The standard vaccination regimen for JYNNEOS is two subcutaneous injections administered 28 days apart in adults 18 years or older determined to be at high risk for smallpox or monkeypox infection.⁵⁷ Since it is a nonreplicating virus vaccine, there is no visible “take” and therefore no risk of spreading to other parts of the body or other people. People who receive JYNNEOS are not considered fully vaccinated until 2 weeks after receiving the second dose of the vaccine. On August 9, 2022, the FDA issued an emergency use authorization (EUA) for JYNNEOS.⁵⁸ The EUA allows the use of JYNNEOS for children less than 18 years of age using the standard regimen and subcutaneous



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route of administration. The EUA also authorizes an alternative vaccination regimen via an intradermal route of administration with a lower dose for people 18 years and older.^{57,58} Two doses of JYNNEOS administered 28 days apart are required in both the standard and alternative regimens.^{57,58}

ACAM2000 is a live virus replicating vaccinia virus preparation indicated for active immunization against smallpox disease for people determined to be at high risk for smallpox infection.^{51,55,59} It is inoculated into the skin by pricking the skin surface with a bifurcated needle.

Following inoculation, a lesion develops at the site of vaccination (a “take”). The virus growing at the inoculation site can be spread to other parts of the body or other people; therefore, persons receiving vaccination with ACAM2000 must take precautions to prevent the spread of the vaccine virus. These patients are considered vaccinated within 28 days. The CDC has Expanded Access Investigational New Drug (EA-IND) Protocol to use ACAM2000 vaccine for nonvariola

Orthopoxvirus infections such as monkeypox during an outbreak.

If given within 4 days from the date of exposure, these vaccines may prevent the onset of monkeypox disease. If given between 4 and 14 days following exposure, vaccination may not prevent disease but may reduce symptom severity.^{51,55,57,59} Vaccination after the onset of symptoms has no benefit.^{51,56,57} People who are vaccinated should continue to use measures to protect themselves from infection by avoiding close, intimate contact with someone who has monkeypox.⁵¹ Duration of immunity for both vaccines is unknown.^{56,57} Individuals exposed to the monkeypox virus and have not received a smallpox vaccine within the last 3 years should consider getting vaccinated.⁵⁵

Vaccination strategies are prioritized for preventing monkeypox disease among people determined to be at high risk for infection.^{60,61} Public Health jurisdictions coordinate vaccination programs.

Most individuals receiving either vaccine have only minor reactions as compared with risks associated with monkeypox disease. Reported minor reactions include mild fever, fatigue, lymph node enlargement, erythema, and pruritus at the vaccine administration site.⁵⁵ The vaccines do have serious risks for some individuals; therefore, risk assessment and decisions for vaccination should be made in consultation with a patient's advanced practice clinician (APC) and health department officials.^{55,56} Countries other than the US should follow WHO guidance for patient management and vaccine use.^{62,63}

Medical countermeasures

CDC guidance recommends consideration for the treatment of individuals with selected clinical presentations, such as severe disease or involving anatomic areas with concern for scarring or strictures.⁵⁰ Examples of severe disease include

Additional resources:

- Case definitions[†] for use in the 2022 monkeypox response | Monkeypox | Poxvirus | CDC. www.cdc.gov. 2022. www.cdc.gov/poxvirus/monkeypox/clinicians/case-definition.html.
- Monkeypox | Disease Directory | Travelers' Health | CDC. wwwnc.cdc.gov. <https://wwwnc.cdc.gov/travel/diseases/monkeypox>.
- Monkeypox in multiple countries - Alert - Level 2, practice enhanced precautions - travel health notices | Travelers' Health | CDC. wwwnc.cdc.gov. <https://wwwnc.cdc.gov/travel/notices/alert/monkeypox>.
- Risk communication and community engagement (RCCE) for monkeypox outbreaks: interim guidance, 24 June 2022. www.who.int. www.who.int/publications/i/item/WHO-MPX-RCCE-2022.1.
- Multi-country outbreak of monkeypox, External situation report #6 - 21 September 2022. www.who.int. www.who.int/publications/m/item/multi-country-outbreak-of-monkeypox-external-situation-report-6--21-september-2022.

hemorrhagic disease, multiple lesions that are confluent, sepsis, encephalitis, ocular or periorbital infections, or other conditions that require hospitalization. Anatomic areas with concern for stricture or scarring include lesions of the pharynx (inability to control secretions or need parenteral feeding), penile foreskin, vulva, vagina, urethra, or rectum, and severe infections (for example, secondary bacterial skin infections). The CDC has also published an interim guidance for the prevention and treatment of monkeypox in persons with HIV infection.⁶⁴ Medical countermeasures from the Strategic National Stockpile (SNS) are the treatment options. Clinicians may consult with CDC regarding specific patient situations.

The following are available from the SNS for treatment of monkeypox:

- Tecovirimat (TPOXX)—an antiviral approved by the FDA for the treatment of human smallpox disease in adult and pediatric patients weighing at least 3 kg.^{65,66}
- Cidofovir (Vistide)—antiviral approved by the FDA for treatment of

cytomegalovirus retinitis in patients with AIDS. CDC has an EA-IND Protocol allowing use for the treatment of orthopoxviruses (including monkeypox) during an outbreak.⁶⁷

- Vaccinia Immune Globulin (VIGIV)—licensed by the FDA for treatment of complications related to vaccinia vaccination; the CDC has EA-IND allowing the use of VIGIV for treatment of orthopoxviruses (including monkeypox) in an outbreak.⁶⁸

Brincidofovir is an antiviral approved by the FDA for the treatment of human smallpox disease in adult and pediatric patients, including neonates.⁶⁹ As of this writing, the CDC is developing EA-IND to facilitate the use of brincidofovir as a treatment for monkeypox. This medication is not yet available from the SNS.

Requests for the above medications must be directed through state and territorial health authorities to the CDC.^{50,65}

Monitoring exposure

Individuals who have been exposed to confirmed cases of monkeypox should be monitored for signs or

symptoms consistent with monkeypox for 21 days after their last exposure.^{21,34,70} Monitoring should include a daily thorough skin and oral assessment.⁷⁰ If a rash develops, the individual should self-isolate and initiate prevention practices until the rash can be evaluated by an APC, and testing is performed, if recommended, and the results are negative. If other signs or symptoms are present but no rash is present, the patient should follow isolation and prevention practices for 5 days after the onset of any new sign or symptom, even if this 5-day period extends beyond the original 21-day monitoring period.⁷⁰ If a new sign or symptom occurs at any time during the 21-day monitoring period, including 5-day isolation if applicable, then a new 5-day period should begin where the patient follows isolation and prevention practices.

Asymptomatic contacts can continue routine daily activities but should not donate blood, cells, tissue, breast milk, semen, or organs while they are under symptom surveillance.⁷⁰

Decisions related to exposed healthcare personnel should be determined by the facility's occupational health program and public health authorities.³⁴ The type of monitoring should reflect the risk of transmission.⁶⁴ Asymptomatic healthcare personnel with exposure to monkeypox do not need to be excluded from work but should be monitored for signs and symptoms of monkeypox infection for 21 days after their last exposure. If a rash occurs, healthcare personnel should be excluded from work until the rash can be evaluated, testing performed if indicated, and the results negative. If other symptoms are present without a rash, the healthcare personnel should follow isolation and prevention practices for 5 days after the onset of any new signs or symptoms, even if

this 5-day period extends beyond the original 21-day monitoring period.³⁴

If a new sign or symptom occurs at any time during the 21-day monitoring period, including 5-day isolation if applicable, then a new 5-day period should begin where the healthcare personnel follows isolation and prevention practices.

Healthcare personnel with confirmed monkeypox infection should be excluded from work until all lesions have crusted, the crusts have separated, and a fresh layer of healthy skin has formed underneath.³⁴

Public health officials can assist with evaluating the exposure risk of persons exposed to patients with monkeypox in the community setting and provide recommendations for follow-up based on the degree of exposure.⁷⁰ All persons in contact with a suspected or confirmed case of monkeypox should self-monitor for symptoms for 21 days after their last exposure.⁷⁰ Postexposure vaccination may be recommended based upon an evaluation of the exposure risk in consultation with the CDC or public health jurisdictions.⁷⁰

Patient and community education

Patient education should be fact-based, avoid stigma, and support community engagement. Education topics include signs and symptoms of monkeypox, how it is spread, and measures to reduce exposure risk and prevent infection.^{17,21,32,49,71} Individuals should know what to do if they have been exposed to someone with monkeypox, such as how to self-monitor for signs and symptoms of monkeypox, what to do if they develop signs and symptoms consistent with monkeypox, how to get evaluated and tested if indicated, self-isolate, and notify contacts.^{70,71} They should know measures to take to prevent transmission to others including animals and pets in the household, such



Healthcare personnel with confirmed monkeypox infection should be excluded from work until all lesions have crusted, the crusts have separated, and a fresh layer of healthy skin has formed underneath.

as isolation and infection prevention practices including environmental disinfection.^{43-46,48,49,72} Patients should know about vaccines for monkeypox; public health strategies for vaccination; and vaccine-specific information, such as adverse reactions.^{57,58,60} If antiviral treatment is initiated, the patient should be educated on administration and any potential adverse reactions.

The CDC has communication resources appropriate for patient education.^{48,49} Local and state health jurisdictions in conjunction with community organizations and networks can also provide resources and updates.

Summary

Monkeypox is a zoonotic infection endemic to several countries in West and Congo Basin Africa. In May 2022, a global outbreak of monkeypox was identified in multiple countries. The outbreak appears to be related to international travel and subsequent person-to-person community transmission. The clinical presentation of monkeypox in the 2022 global outbreak differs from that of previous

monkeypox outbreaks. The CDC, WHO, and other public health organizations continue to monitor and respond to the outbreak.

Persons with suspected or confirmed monkeypox should be isolated until no longer infectious. Contacts with exposure to suspected or confirmed cases should consult with their APC and self-monitor for symptoms for 21 days postexposure. Medical countermeasures for monkeypox such as antiviral medications and vaccines are available in the US via the CDC.

The 2022 outbreak continues to evolve as more is learned and response efforts expand. Clinicians should stay abreast of the most current CDC or WHO updates and recommendations.⁷⁴⁻⁷⁶ They should be alert for persons with signs and symptoms consistent with monkeypox; contact local, state, or territorial health officials if they suspect a case of monkeypox; and consult for optimal management of the patient. ■

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