



Clinical Features & Management of Monkeypox in Healthcare Settings

August 11, 2022

Presentation Objectives

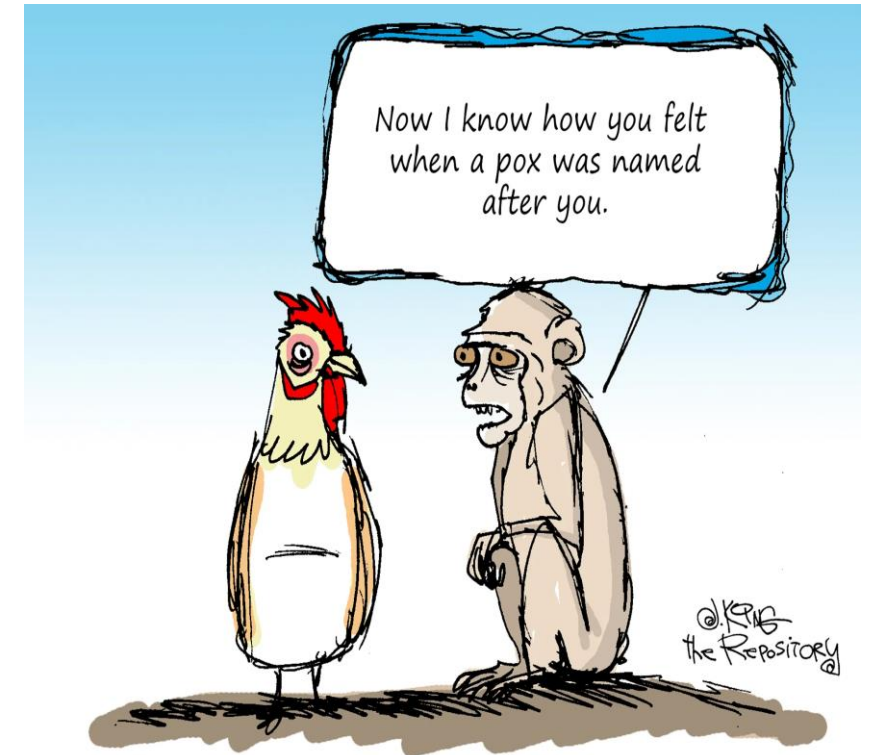
- Describe the clinical characteristics and epidemiology of monkeypox
- Understand the current testing, prevention and treatment options for monkeypox
- Explain the current infection control recommendations in healthcare facilities and how to manage monkeypox exposures among healthcare personnel

Monkeypox: Epidemiology & situation update

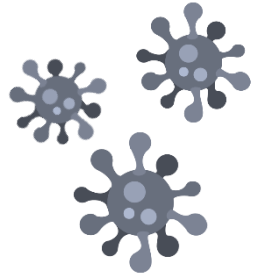
Jayne Griffith

Monkeypox Background

- Monkeypox is a zoonotic infection, caused by the monkeypox virus, double-stranded DNA virus, in the Orthopoxvirus genus
 - Less contagious, less severe than smallpox
- Discovered in 1958 in research monkeys
 - Name is a misnomer – monkeys (and humans) are susceptible
 - Rodents (i.e., Gambian pouched rats, dormice) are the likely reservoir



Monkeypox Background



- First human case - 9 month-old in Zaire, 1970
- Number of cases and outbreaks have been increasing since the 1980s, possibly due to waning smallpox vaccine immunity
 - Most early cases occurred in children who had no smallpox immunity
 - Smallpox vaccine likely provided protection; a 1980s study in Zaire indicated smallpox vaccine was approx. 85% effective in preventing MPX infection in close contacts and reducing disease severity
- Endemic in 10 countries in tropical rainforest areas of West and Central Africa

Monkeypox Background

- Few cases in Europe, U.S. prior to 2022
 - Travelers infected in endemic countries
 - U.S. outbreak in 2003 - 71 cases
 - Pet prairie dogs infected when housed next to MPX-infected Gambian pouched rats imported from Africa



Steve Kautzer holds his 3-year-old daughter Schyan as his wife Tammy (right) holds their prairie dog Chuckles on June 9, 2003, in Dorchester, Wisconsin. Photo by Mike Roemer / Getty Image

<https://www.smithsonianmag.com/history/what-you-need-to-know-about-the-history-of-monkeypox-180980301/s>

Monkeypox Background

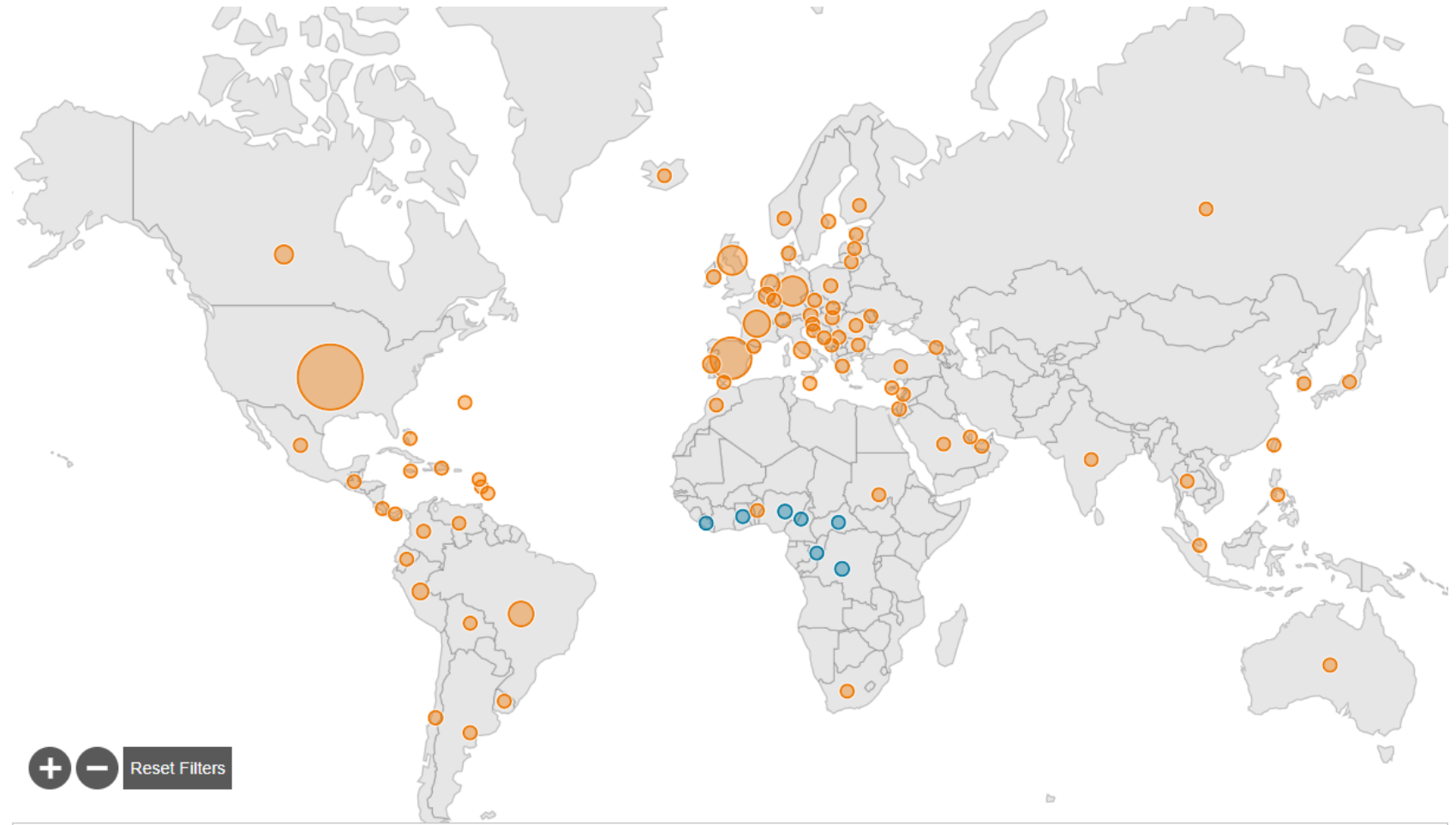
- Ongoing outbreak in Nigeria since 2017
- 2022 outbreak – May 7th, case identified in London in a traveler from Nigeria
 - 4 more cases found within a week, all MSM, none connected to the initial case or had travel history
- May 18th, first US case, MA



Monkeypox cases, globally as of August 10, 2022

31,800 cases

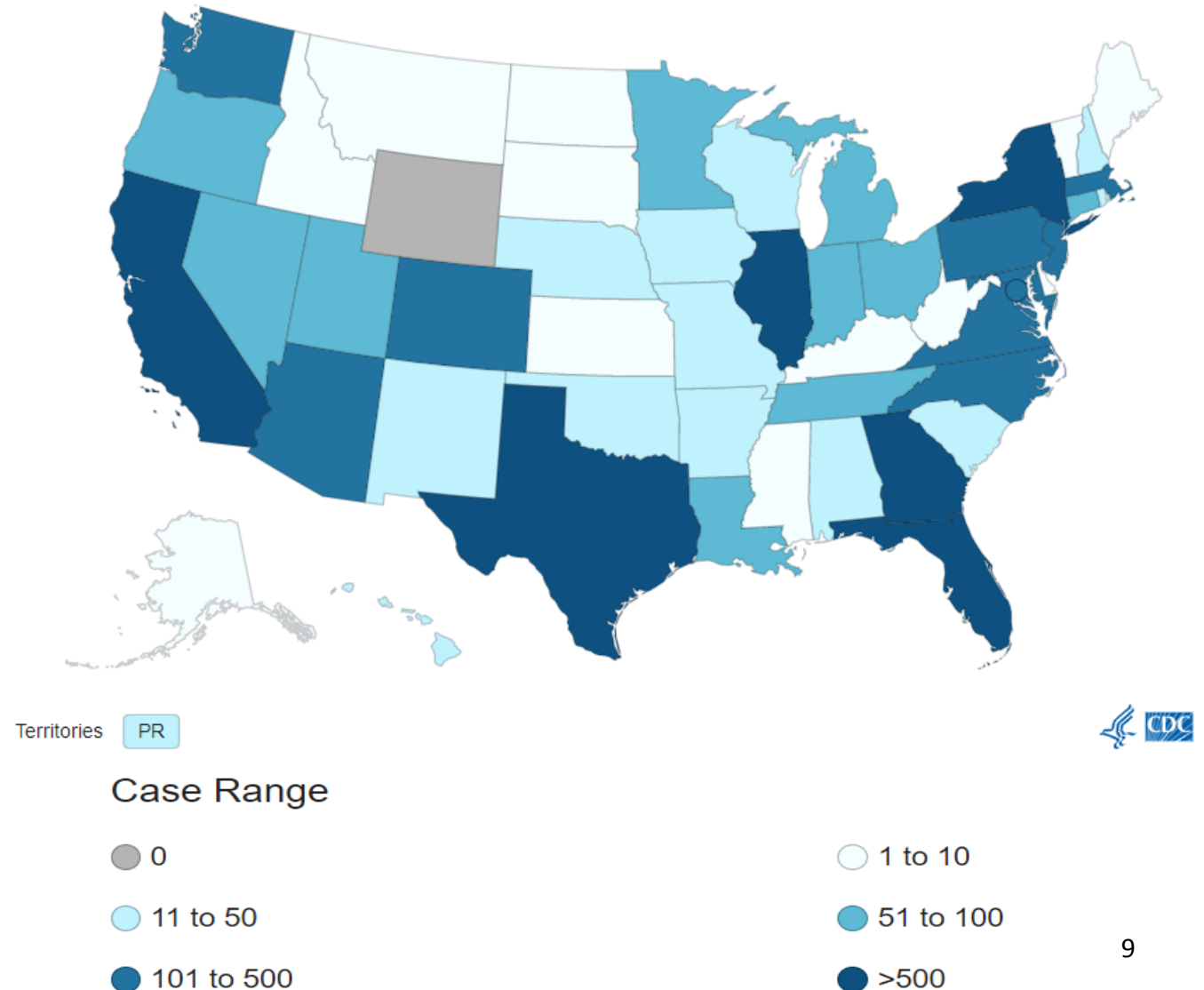
- 31,425 (99%) in locations that have not historically reported monkeypox
- Likely circulating well before outbreak was detected



Monkeypox cases, nationally as of August 10, 2022

10,392 cases

- Florida, California, New York, highest



How Contagious is Monkeypox?



"We have no idea what you have, Mr. Schaad, but whatever it is, it's extremely contagious."

Monkeypox Disease

- Person-to-person transmission

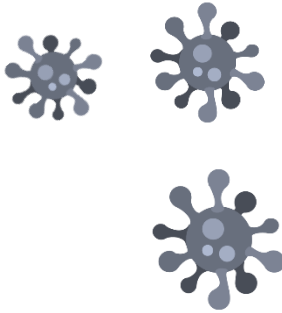
- Direct contact with lesions or body fluids (i.e., skin to skin contact) most common
- Respiratory droplet transmission can occur but typically requires prolonged face-to-face contact
- Fomite contact uncommon (scabs, lesion material)
- Not clear yet if can be transmitted through sexual transmission

- Incubation period

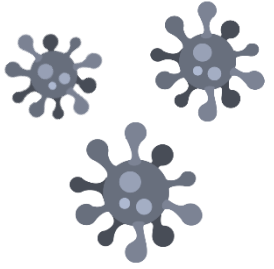
- Symptom onset approximately 7-9 days after exposure (range 3-17 days)

- Infectivity

- Starts at symptom onset, ends when scabs fall off and new skin develops
- About 2-4 weeks
- May be decreased if treated with Tecovirimat

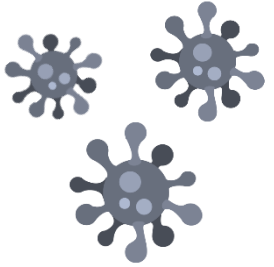


Monkeypox Disease



- No evidence yet to suggest that the monkeypox virus has evolved or become more infectious
- Monkeypox is a DNA virus, which is more stable, compared to an RNA virus like COVID-19
 - An RNA virus is much more likely to have transcription errors copied and those mutations may lead to versions that are more transmissible

Monkeypox Disease



- Severity

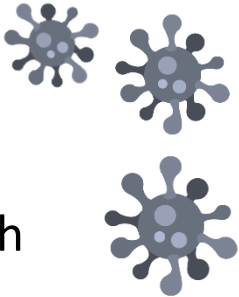
- Most cases are mild
- Some need supportive care (pain control, itching)
- Some report severe pain, particularly those with anal lesions

"It felt like there was a hot poker in my rectum, it felt like that for days but one day was the worst and I was crouched on the floor crying and screaming for hours"

- A couple have had severe lymphadenopathy; groin pain so severe as to prohibit walking
- Those at risk for severe disease include persons with immunosuppressive conditions, pregnant women, children
- West African clade: 1% mortality; no deaths in U.S.

Monkeypox Symptoms

- Symptoms in this outbreak are different than classic MPX symptoms
 - Classic: resembles smallpox; illness starts with prodromal symptoms (fever most common), including lymphadenopathy (which distinguishes it from smallpox), followed by rash onset; rash develops in same stages, multiple lesions in many body areas
- May/may not have prodrome, or symptoms start after rash
- Rash may develop in different stages, or skip a stage
 - Macular-papular-vesicular-pustular-crusting
- May only have rash in one area (i.e. anogenital region)
- May have one or only a few lesions
- Rash may be mistaken for syphilis, herpes, varicella



Monkeypox Rash



[Monkeypox \(who.int\)](https://www.who.int)

[MONKEYPOX CASE STUDY \(cdc.gov\)](https://www.cdc.gov)



From Basgoz N, Brown CM, Smole SC, et al. Case 24-2022: A 31-Year-Old Man with Perianal and Penile Ulcers, Rectal Pain, and Rash. Epub ahead of print. Copyright © Jun 15 2022. Massachusetts Medical Society. Reprinted with permission from Massachusetts Medical Society

Monkeypox lesions, United States 2022



Shared with permission from patients, CDC 2022

Health

Related Condition Centers [Monkeypox](#)

I Was Diagnosed With Monkeypox and the Symptoms Are Pretty Brutal

"It's become very real, very quickly."



Monkeypox lesions can initially present as a pimple. Photo courtesy of Matt Ford

<https://www.self.com/story/monkeypox-experience-essay>

Current Outbreak: Case Characteristics



Morbidity and Mortality Weekly Report

Early Release / Vol. 71

August 5, 2022

Epidemiologic and Clinical Characteristics of Monkeypox Cases — United States, May 17–July 22, 2022

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Monkeypox, a zoonotic infection caused by an orthopoxvirus, is endemic in parts of Africa. On August 4, 2022, the U.S. Department of Health and Human Services declared the U.S. monkeypox outbreak, which began on May 17, to be a public health emergency (1,2). After detection of the first U.S. monkeypox case, CDC and health departments implemented enhanced monkeypox case detection and reporting. Among 2,891 cases reported in the United States through July 22 by 43 states, Puerto Rico, and the District of Columbia (DC), CDC received case report forms for 1,195 (41%) cases by July 27. Among these, 99% of cases were among men; among men with available information, 94% reported male-to-male sexual or close intimate contact during the 3 weeks before symptom onset. Among the 88% of cases with available data, 41% were among non-Hispanic White (White) persons, 28% among Hispanic or Latino (Hispanic) persons, and 26% among non-Hispanic Black or African American (Black) persons. Forty-two percent of persons with monkeypox with

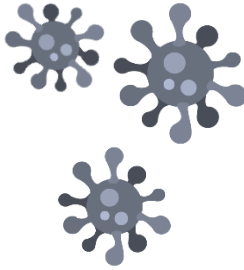
genital involvement. CDC and other federal, state, and local agencies have implemented response efforts to expand testing, treatment, and vaccination. Public health efforts should prioritize gay, bisexual, and other men who have sex with men, who are currently disproportionately affected, for prevention and testing, while addressing equity, minimizing stigma, and maintaining vigilance for transmission in other populations. Clinicians should test patients with rash consistent with monkeypox,[†] regardless of whether the rash is disseminated or was preceded by prodrome. Likewise, although most cases to date have occurred among gay, bisexual, and other men who have sex with men, any patient with rash consistent with monkeypox should be considered for testing. CDC is continually evaluating new evidence and tailoring response strategies as information on changing case demographics, clinical characteristics, transmission, and vaccine effectiveness become available.[§]

On June 3, 2022, CDC released a case report form for

- During May 17–July 22, 2022, a total of 2,891 U.S. monkeypox cases were reported by 43 states, Puerto Rico, and DC
- Case report forms received for 1,195 (41%) cases
- Median age - 35 years
- 1181 (99%) were men (cisgender and transgender)
- Among 1,054 cases for which race and ethnicity were reported, 41% were White, 28% Hispanic, 26% Black, 5% Asian
- Of 358 men with information on sexual behaviors, 337 (94%) reported sex or close intimate contact with a man/men during the 3 weeks before symptom onset

https://www.cdc.gov/mmwr/volumes/71/wr/mm7132e3.htm?s_cid=mm7132e3_x

Monkeypox cases - MN



Of 58* cases identified in current outbreak:

- 56 are adult males, 2 adult females
- 56 cases living in Twin Cities metro area, 2 in greater MN
- 3 cases were hospitalized (pain management, secretion management)
- MN cases mirror national case characteristics, with the vast majority of the reported cases in the U.S. and Minnesota among gay, bisexual, or men who have sex with men

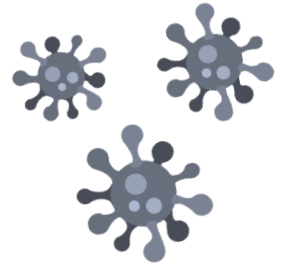
*Data are preliminary and subject to change

Testing, Vaccine & Treatment

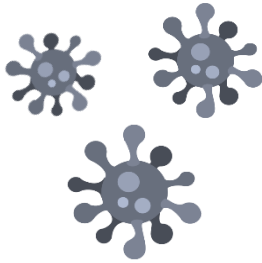
Ali Ruprecht

Monkeypox should be suspected in

- **An individual with a new unexplained acute rash OR**
- **An individual who within 21 days of symptoms has had:**
 - Contact with a person or people with a similar appearing rash or who received a dx of confirmed or probable MPX
OR
 - Close or intimate in-person contact with individuals in a social network experiencing monkeypox activity, this includes men who have sex with men (MSM) who meet partners through an online website, digital application (“app”), or social event (e.g., a bar or party)
OR
 - Traveled outside the US to a country with confirmed cases of MPX or where MPX virus is endemic
OR
 - Contact with a dead or live wild animal or exotic pet that is an African endemic species or used a product derived from such animals (e.g., game meat, creams, lotions, powders, etc.).



Testing for monkeypox: reporting and turnaround



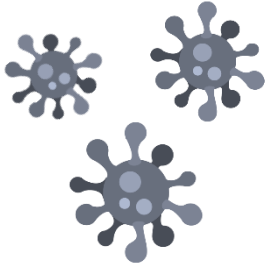
- **MDH-Public Health Laboratory:**

- Prior approval for testing is no longer required.
- Call MDH at 651-201-5414 or 1-877-676-5414 to provide information on the suspected case
- Turnaround time for testing at MDH-PHL is 1-3 days.

- **Additional reference laboratories offering testing**

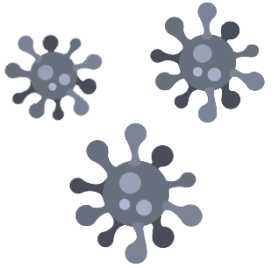
- At this time, Labcorp, ARUP, Quest and Mayo Clinic Laboratories also offer monkeypox testing and additional commercial reference labs are expected to offer monkeypox testing soon.

Monkeypox: sample collection for MDH-PHL



- **Collect multiple sites/stages of lesion development.**
 - Lesion fluid, lesion surface, and/or lesion crust.
 - Swab lesions vigorously
- **Dry swabs. Two per lesion. Put both in a single tube.**
 - Break swabs into a sterile, screw-cap tube
 - Only swabs in the tube. No VTM/UTM, no extra foam.
- **Put tubes/specimens into the fridge within 1 hr. of collection.**
- **For each specimen (i.e., vial containing 2 swabs), fill out and send:**
 - One form per tube. Mark anatomic location on the form and the tube.
 - More guidance on testing at MDH found here:
<https://www.health.state.mn.us/diseases/monkeypox/hcp.html#test>

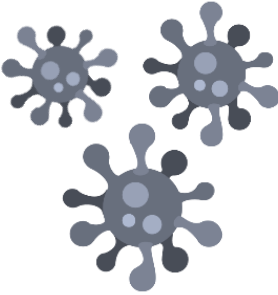
TPOXX antiviral for monkeypox



- **Tecovirimat or TPOXX – antiviral**
- **TPOXX is available through the Strategic National Stockpile**
 - To request TPOXX, providers can contact MDH or CDC directly
 - Intravenous and oral formulations available
- **Some MN healthcare systems have preemptively ordered doses to have on hand**
- **Can be considered for treatment of monkeypox patients.**
 - People with severe disease/severe pain
 - People who may be at high risk of severe disease
 - Any lab confirmed monkeypox patient

TPOXX: Efficacy and Side Effects

- Efficacy studies in animal models have demonstrated survival benefit when given early in the disease course
- Observational evidence of reduced illness duration
- Adverse Reactions
 - Clinical trials have demonstrated a mild side effect profile
 - Headache most frequently reported side effect followed by gastrointestinal symptoms (nausea, abdominal pain and vomiting)
 - Administration site reactions (IV formulation)
- Intravenous injection contraindicated in patients with severe renal impairment

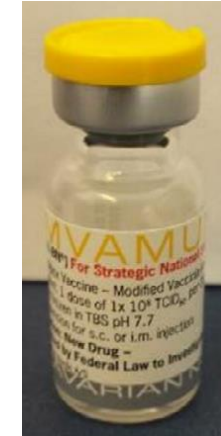


Monkeypox (MPX) vaccines

- 2 vaccines licensed by the FDA for preventing MPX infection and available via the Strategic National Stockpile (SNS)
 - ACAM2000
 - Available under an expanded access investigational new drug protocol for MPX
 - Not being supplied at this time
 - JYNNEOS (pronounced Gin-nay-os)
 - Currently supplied over ACAM2000 due to less severe adverse events, use in people with contraindications to ACAM2000 and ease of administration.
 - Also known as Imvamune (Canada) or Imvanex (Europe and UK), or MVA (Modified Vaccinia Ankara)

JYNNEOS vaccine

- JYNNEOS is a live vaccine produced from the strain Modified Vaccinia Ankara-Bavarian Nordic (MVA-BN), an attenuated, non-replicating orthopoxvirus.
- Licensed by FDA in September 2019
- Indicated for prevention of smallpox and monkeypox disease in adults ages 18 years and older
 - Currently requires submission of a single patient expanded access investigational new drug (IND) application for children under 18 years old.
- 2-dose primary dose series, separated by at least 4 weeks and administered as a subcutaneous injection.
 - Planning for intradermal administration



[Monkeypox Informational Session - Medical Countermeasures, ACIP, June 23, 2022](#)

JYNNEOS: Efficacy and Side Effects

- No data available on effectiveness in the current outbreak
- Effectiveness against monkeypox is inferred from immunogenicity data from a clinical study and efficacy data from animal studies
 - Similar immunogenicity against vaccinia as ACAM2000, which is estimated to be at least 85% effective in preventing monkeypox
- Adverse Reactions
 - Most common side effects are injection site reactions, muscle pain, headache and fatigue
- Can be administered during pregnancy and to persons with immunocompromising conditions

MDH vaccination guidance

1. Post-exposure prophylaxis (PEP)

- Prioritized for people exposed to known MPX cases.
- Vaccine to be given within 4 days from 1st date of exposure for the best chance to prevent onset of disease.
- If given between 4 and 14 days after the 1st date of exposure, may reduce symptoms of disease, but may not prevent the disease.

2. Expanded post-exposure prophylaxis (PEP++)

- For people at high-risk, with a high potential for exposure to a case.

3. Pre-exposure prophylaxis (PrEP) at risk for occupational exposure

- At this time, most clinicians, health care workers and laboratorians are NOT recommended for PrEP vaccination because adequate PPE is readily available. Regardless of whether they get PrEP, clinicians and laboratorians should use recommended infection control practices.

Expanded post-exposure prophylaxis (PEP++)

- Guidance for PEP++ is broad, inclusive of highest risk
- Not enough vaccine to meet the demand of those eligible for PEP++
- Focus should be on most vulnerable (e.g., >1 sex partner and HIV or immunocompromised)
- Promote message of prevention, even if vaccinated

The current recommendations are for people 18 years and older*, without symptoms of MPX infection, and who meet the criteria listed below. We expect to broaden these recommendations as more vaccine becomes available.

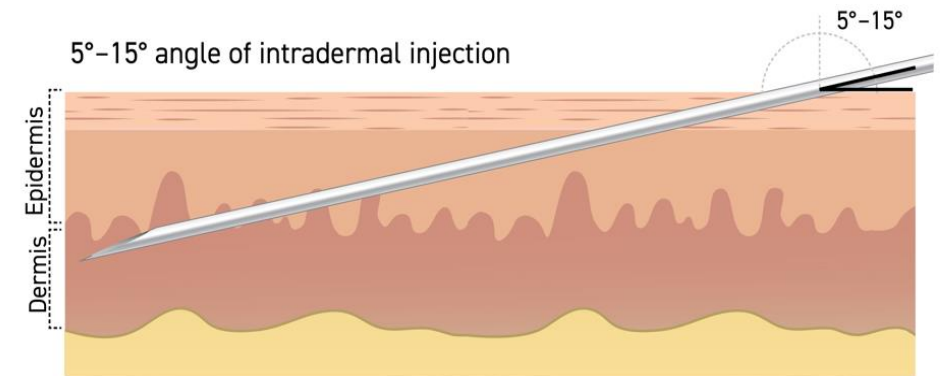
Person identifies as gay, bisexual, or other man (including trans) who has sex with men (MSM) and has at least one of the following:

- Attended an event/venue in the last 21 days where intimate, sexual contact with >1 partner occurred.
- Has been treated for a sexually transmitted infection (STI) in the last 14 days.
- Has had >1 partner in the past 14 days and reports at least one of the following:
 - HIV positive or on HIV PrEP.
 - Immune-compromising condition (leukemia, lymphoma, generalized malignancy, solid organ transplantation, therapy with alkylating agents, antimetabolites, radiation, tumor necrosis factor inhibitors, high-dose corticosteroids, being a recipient with hematopoietic stem cell transplant <24 months post-transplant or ≥24 months but with graft-versus-host disease or disease relapse, or having autoimmune disease with immunodeficiency as a clinical component).
 - People who engage in sex work.
 - Or deemed at a higher risk for MPX infection per clinical judgement or public health recommendation.

*For people <18 years of age, contact MDH for consultation.

JYNNEOS: Alternative Dosing Strategy

- FDA issued an emergency use authorization on August 9, 2022
 - Alternative dosing regimen that will expand the number of doses available
- Based on evidence that a **fifth of the current dose** produced a comparable response when **administered intradermally (ID)**
 - Same two-dose schedule as the previous approach
- Lack of familiarity with this technique among providers
 - Training and resources will be needed
- MDH discussing strategies for provider training



www.cdc.gov/monkeypox



CS 333451 08/09/2022

Vaccine resources

- [Monkeypox \(MPX\) - Minnesota Dept. of Health \(state.mn.us\)](https://state.mn.us)
 - [MDH Interim Monkeypox \(MXP\) Vaccination Guidance](#)
 - [Monkeypox \(MPX\) Vaccine in Minnesota - Minnesota Dept. of Health \(state.mn.us\)](https://state.mn.us)
- [Monkeypox and Smallpox Vaccine Guidance | Monkeypox | Poxvirus | CDC](#)
- [Package Insert - JYNNEOS \(fda.gov\)](https://fda.gov)
- [Smallpox/Monkeypox Vaccine \(JYNNEOS\) Information Statement | CDC](#)
- [Use of JYNNEOS \(Smallpox and Monkeypox Vaccine, Live, Nonreplicating\) for Preexposure Vaccination of Persons at Risk for Occupational Exposure to Orthopoxviruses: Recommendations of the Advisory Committee on Immunization Practices — United States, 2022 | MMWR \(cdc.gov\)](#)

Infection Control, Exposure Assessment & PEP

Emily Banerjee

PATCHES

33
A self-administered
re status, immune response

Evaluation of human-to-human transmission of monkeypox from infected patients to health care workers

Infection Control in Healthcare Settings – PPE

- Standard Precautions should be used when MPX patients are suspected
- IP should be notified
- Recommended PPE for HCW entering patient's room:
 - Gown
 - Gloves
 - Eye protection (either face shield or goggles)
 - NIOSH-approved particulate respirator equipped with N95 filters or higher



Infection Control in Healthcare Settings – PPE (cont.)

- Why is an N95 recommended if MPX is not considered airborne?
 - Potential for aerosolization of infectious lesion material during swabbing procedure
- Why recommend PPE for healthcare workers? Didn't you just say you're not seeing transmission in healthcare workers?
 - Though most transmission in outbreak has involved close, prolonged contact; no reason for HCW to not take precautions when evaluating suspect MPX cases
- Why not just consider PrEP for healthcare workers?
 - At this time, vaccine supply is still limited, and PPE supplies are not.

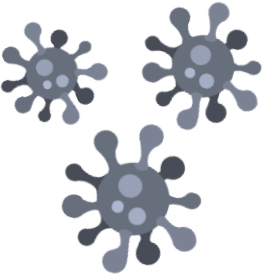
Isolation Recommendation for Patient

- Patient should be instructed to isolate at home until result is known and monkeypox is ruled out.
- Patients with MPX should continue to isolate and follow prevention practices until cleared by public health officials after all lesions have resolved, the scabs have fallen off, and a fresh layer of intact skin has formed
 - The illness typically lasts 2-4 weeks



Considerations for inpatient settings

- Patient should be placed in single room with dedicated bathroom, closed door
- Transport limited to medically essential purposes
 - If patient transported – mask and cover lesions
- Procedures likely to spread oral secretions should be performed in an airborne infection isolation room



Environmental Infection Control

- Standard cleaning and disinfection can be done using an EPA-registered hospital-grade disinfectant - emerging viral pathogen claim
- Soiled laundry:
 - Should be handled in accordance with recommended standard practices:
<https://www.cdc.gov/infectioncontrol/pdf/guidelines/environmental-guidelines-P.pdf>
 - Should be contained in a laundry bag – never shaken or handled in a way that could disperse infectious material
- Activities such as dry dusting, sweeping, or vacuuming should be avoided. Wet cleaning methods are preferred.

Exposure Risk Assessment

- When a case of monkeypox is identified in a healthcare setting, we utilize CDC tiers for assessing risk: <https://www.cdc.gov/poxvirus/monkeypox/clinicians/monitoring.html>
- Healthcare workers in any tier should at minimum be notified of potential exposure
- Healthcare workers who have unprotected exposures (i.e., not wearing PPE) to patients with monkeypox do not need to be excluded from work duty, but should self-monitor for symptoms
- IP, occupational health, employee health should be notified
- Healthcare workers identified in intermediate and high risk tiers can be considered for PEP (vaccine within 4-14 days of exposure)

Low Risk Exposure Definition

Degree of Exposure: Low/Uncertain

Recommendations

- Monitoring⁵
- PEP[¶] – None

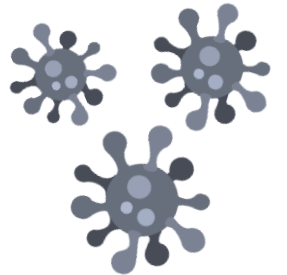
Exposure Characteristics

- Entered the patient room without wearing eye protection on one or more occasions, regardless of duration of exposure -OR-
- During all entries in the patient care area or room (except for during any procedures listed above in the high-risk category), wore gown, gloves, eye protection, and at minimum, a surgical mask -OR-
- Being within 6 feet of an unmasked patient for less than 3 hours without wearing at minimum, a surgical mask -OR-
- Exposure that, at the discretion of public health authorities, was recategorized to this risk level based on unique circumstances (e.g., uncertainty about whether Monkeypox virus was present on a surface and/or whether a person touched that surface)

Low Risk Exposure Example

Patient came into a clinic; clinic had not suspected monkeypox in this patient as patient was being screened for STIs. Patient had penile lesions and a singular lesion on hand, and one on face. Two providers were in and out of room for less than 20 minutes and interacting very little with patient. Both providers wearing gloves, surgical masks, and goggles.

- Risk category: Low risk
- PEP recommended: No



Intermediate Risk Exposure Definition

Degree of Exposure: Intermediate

Recommendations

- Monitoring⁵
- PEP[¶] – Informed clinical decision making recommended on an individual basis to determine whether benefits of PEP outweigh risks ^{¶¶}

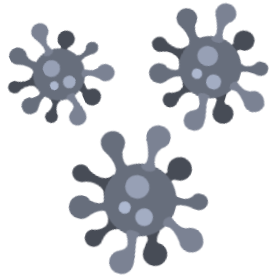
Exposure Characteristics

- Being within 6 feet for 3 hours or more of an unmasked patient without wearing, at a minimum, a surgical mask -OR-
- Activities resulting in contact between sleeves and other parts of an individual's clothing and the patient's skin lesions or bodily fluids, or their soiled linens or dressings (e.g., turning, bathing, or assisting with transfer) while wearing gloves but not wearing a gown -OR-
- Exposure that, at the discretion of public health authorities, was recategorized to this risk level because of unique circumstances (e.g., if the potential for an aerosol exposure is uncertain, public health authorities may choose to decrease risk level from high to intermediate)

Intermediate Risk Exposure Example

Same clinic exposure situation as noted in previous slide. A different provider who did swab the patient was placed in intermediate category as they were not wearing full PPE during the swabbing procedure (they were only wearing a surgical mask and gloves). At the time – they believed they were just swabbing the patient for STI screening; no suspicion for monkeypox.

- Risk category: Intermediate
- PEP recommended



High Risk Exposure Definition

Degree of Exposure: High

Recommendations

- Monitoring⁵
- PEP[¶] – Recommended

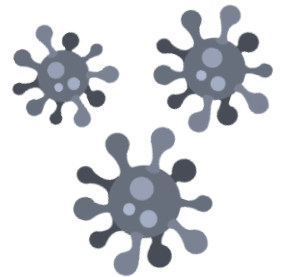
Exposure Characteristics

- Unprotected contact between a person's skin or mucous membranes and the skin, lesions, or bodily fluids from a patient (e.g., any sexual contact, inadvertent splashes of patient saliva to the eyes or oral cavity of a person, ungloved contact with patient), or contaminated materials (e.g., linens, clothing) -OR-
- Being inside the patient's room or within 6 feet of a patient during any procedures that may create aerosols from oral secretions, skin lesions, or resuspension of dried exudates (e.g., shaking of soiled linens), without wearing an N95 or equivalent respirator (or higher) and eye protection -OR-
- Exposure that, at the discretion of public health authorities, was recategorized to this risk level (i.e., exposure that ordinarily would be considered a lower risk exposure, raised to this risk level because of unique circumstances)

High Risk Exposure Example

A provider called MDH to consult about a situation in which a staff member was splashed with urine in the eye from a confirmed monkeypox case. The staff member who was exposed was not wearing goggles or a face shield.

- Risk category: High risk
- PEP recommended
- Note about the importance of proper eye protection and PPE!



Healthcare worker exposure assessment - Review

- When we advise healthcare systems on exposure assessment, the key individual(s) we look for are:
 - The person(s) collecting the specimen(s)
 - They would be at highest risk of exposure
 - If not wearing all 4 PPE elements during specimen collection – can be considered for PEP
- Most other HCW will fall into the low-risk category and can be advised to self-monitor for symptoms only
- Contact our infectious disease reporting line with questions: 651-201-5414 or toll free 1-877-676-5414

Thank you!