Mpx Training for Clinical Providers

June 2023
Acknowledgments

This training package has been developed through the
• USAID-funded EpiC project led by FHI 360.

This training event is being sponsored by:
• XXX

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Technical resources

The training materials are based on the following resources:

• Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance. 10 June 2022, World Health Organization (WHO).


• Laboratory testing for the monkeypox virus: Interim guidance. 23 May 2022, WHO.

• Vaccines and immunization for monkeypox Interim guidance. 16 November 2022, WHO

• Surveillance, case investigation and contact tracing for mpox (monkeypox): Interim guidance. 22 December 2022, WHO.
Goal of this curriculum

• Enhance capacity of health care providers to fulfill their roles and implement the recommended protocols for the diagnosis, treatment, and prevention of monkeypox (mpox).
Objectives of this curriculum

Participants who master the learning objectives of the training will demonstrate an understanding of the background, epidemiology, mode of transmission, diagnosis, treatment, and prevention of mpox.
Training etiquette

• Come prepared to engage in the learning process.
• Be on time.
• Keep an open mind.
• If you bring a laptop or tablet, don’t cause a distraction to others by keyboarding or checking email.
• Leave your cell phone on vibrate or off and in your pocket or handbag.
• Participate; ask questions, speak so everyone in the room can hear you.
• Take notes.
• Return to your workplace prepared to discuss and implement what you learned.
• Provide evaluation feedback about the training experience and how it can be improved.
• During virtual training sessions, keep yourself muted and your video off to reduce background noises and improve internet connectivity. Use the chat box and icons; mute/unmute yourself and use video features as appropriate when interacting with the facilitator(s) and other participants.
## Training Agenda

<table>
<thead>
<tr>
<th>Module</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPENING</td>
<td></td>
</tr>
<tr>
<td>1   Background</td>
<td>15 min</td>
</tr>
<tr>
<td>2   Epidemiology</td>
<td>15 min</td>
</tr>
<tr>
<td>3   Modes of transmission</td>
<td>15 min</td>
</tr>
<tr>
<td>4   Signs and symptoms</td>
<td>1 hr</td>
</tr>
<tr>
<td>5   Diagnosis</td>
<td>30 min</td>
</tr>
<tr>
<td>6   Case definition</td>
<td>15 min</td>
</tr>
<tr>
<td>7   Exposure</td>
<td>1 hr</td>
</tr>
<tr>
<td>8   Treatment</td>
<td>1 hr</td>
</tr>
<tr>
<td>9   Prevention</td>
<td>1 hr</td>
</tr>
<tr>
<td>10  Special considerations</td>
<td>30 min</td>
</tr>
<tr>
<td>11  Infection prevention and control</td>
<td>15 min</td>
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<tr>
<td>12  Communication and literacy</td>
<td>15 min</td>
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<tr>
<td>13  Surveillance, monitoring, and evaluation</td>
<td>30 min</td>
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<tr>
<td>14  EpiC response (optional)</td>
<td>15 min</td>
</tr>
<tr>
<td>CLOSING</td>
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</table>
Module 1: Background
Learning objectives

At the end of this module participants will be able to:

• Describe the background and history of mpox
• Describe the genetic clades of mpox
• Explain when, why, and who declared mpox a public health emergency
Monkeppox virus (MPXV) is a double-stranded DNA virus, viral zoonotic disease (animals to humans), a member of the *Orthopoxvirus* (OPXV) genus within the Poxviridae family.

Poxviruses cause disease in humans and many other animals → lesions, skin nodules, or disseminated rash.

Other OPXV species pathogenic to humans include cowpox virus and variola virus.

*Vaccinia virus* is also an OPXV; it is source of the modern vaccine that was used to eradicate smallpox.

In November 2022, WHO introduced the term “mpox” to reduce the stigma associated with the term monkeypox.
### Mpox, background and history (2)

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tbody>
<tr>
<td>1958</td>
<td>Identified in laboratory monkeys in Denmark</td>
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</tbody>
</table>
| 1970 | Identified in humans in Demographic Republic of Congo  
Endemic in mammals in central and west Africa; cases occurring in humans with varying outbreaks |
| 1996 | Outbreak in DRC related to human-to-human transmission |
| 2003 | Outbreak in United States linked to prairie dogs and a rat from Ghana |
| 2017-19 | Outbreak in Nigeria |
Mpxo outbreak

• Beginning May 13, 2022, a high proportion of mpxo cases were reported from countries without previously documented mpxo transmission. This was the first time that cases and sustained chains of transmission were reported in countries without direct or immediate epidemiological links to areas of west or central Africa.

• Rapid expansion (especially in countries where cases were never previously reported) was noted in several European countries and North and South America.

• The outbreak was declared a Public Health Emergency of International Concern (PHEIC) by WHO on July 23, 2022.
Mpxox is endemic in central and west Africa

<table>
<thead>
<tr>
<th>Country</th>
<th>Cumulative confirmed cases, 01Jan22–05Jun23</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benin</td>
<td>3</td>
</tr>
<tr>
<td>Cameroon</td>
<td>29</td>
</tr>
<tr>
<td>Central African Republic</td>
<td>30</td>
</tr>
<tr>
<td>Congo</td>
<td>5</td>
</tr>
<tr>
<td>Democratic Republic of Congo</td>
<td>739</td>
</tr>
<tr>
<td>Ghana</td>
<td>127</td>
</tr>
<tr>
<td>Liberia</td>
<td>13</td>
</tr>
<tr>
<td>Nigeria</td>
<td>842</td>
</tr>
<tr>
<td>Sudan</td>
<td>19</td>
</tr>
</tbody>
</table>

Epidemic curve for Africa

[Graph showing the epidemic curve for Africa with data as of 19 May 2023 17:00 CEST. The graph includes data for various countries such as Benin, Cameroon, Central African Republic, Congo, Democratic Republic of the Congo, Ghana, Liberia, Mozambique, Nigeria, and South Africa.]

Source: WHO

Genetic clades of mpox virus

- Two clades: **West African** and **Congo Basin** (or Central African)
- Geographic ranges overlap in **Cameroon**

<table>
<thead>
<tr>
<th>Countries which reported cases</th>
<th>West African clade 1</th>
<th>Central African clade 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infectiousness</td>
<td>Limited</td>
<td>Up to 7 generations</td>
</tr>
<tr>
<td>Case fatality ratio</td>
<td>Up to 6%</td>
<td>Up to 11%</td>
</tr>
</tbody>
</table>
Q&A
Module 2: Epidemiology
Learning objectives

At the end of this module participants will be able to:

• Describe the recent epidemiological evolution of mpox
• Categorize the regions based on the risk
• Present the key epidemiological global figures and trends
• Present the global case profile
• Describe the country context
Overview (1)

• Since 1 January 2022, cases of mpox have been reported from 111 member states across all 6 WHO regions.

• Since 13 May 2022, a high proportion of these cases have been reported from countries without previously documented mpox transmission.

• As of 05 June 2023, a total of 87,929 laboratory confirmed cases and 1,095 probable cases, including 146 deaths, had been reported to WHO.

• Current outbreak primarily affects men who have sex with men (MSM) who reported recent sex with one or multiple partners. No signal suggesting sustained transmission beyond these networks.

• Confirmation of one case of mpox in a country is considered an outbreak.

• Unexpected appearance of mpox in absence of epidemiological links suggests undetected transmission.

WHO assesses the global risk as moderate.

The IHR Emergency Committee on the multi-country outbreak of mpox held its fifth meeting on 10 May 2023. Having considered the views of committee members and advisors as well as other factors in line with the International Health Regulations (2005), the WHO Director-General determined that this outbreak no longer constitutes a public health emergency of international concern and issued revised temporary recommendations for a transitional period towards a long-term mpox control strategy.

<table>
<thead>
<tr>
<th>Risk</th>
<th>Region</th>
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<tr>
<td>High</td>
<td></td>
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<tr>
<td>Moderate</td>
<td>Europe</td>
</tr>
<tr>
<td></td>
<td>Americas</td>
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<tr>
<td></td>
<td>Africa</td>
</tr>
<tr>
<td></td>
<td>Eastern Mediterranean</td>
</tr>
<tr>
<td>Low</td>
<td>Southeast Asia</td>
</tr>
<tr>
<td></td>
<td>Western Pacific</td>
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</table>

The report focuses on laboratory-confirmed cases as defined by WHO working case definition.

Recent Trends

The number of cases reported weekly declined substantially from the **global peak of 7,576 cases observed in the week of 08 Aug 2022**.

From 13 Mar 2023 to 04 Jun 2023:

- On average, at the global level, 117 cases have been observed weekly.

- The most affected region was the Region of the Americas, where 602 cases and 31 deaths have been reported.

- This is followed by the Western Pacific Region (368 cases, 0 deaths), and the African Region (341 cases, 2 deaths).

### Table: Countries 

<table>
<thead>
<tr>
<th>Countries</th>
<th>Mpox cases</th>
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<tbody>
<tr>
<td>USA</td>
<td>30,243</td>
</tr>
<tr>
<td>Brazil</td>
<td>10,948</td>
</tr>
<tr>
<td>Spain</td>
<td>7,556</td>
</tr>
<tr>
<td>France</td>
<td>4,146</td>
</tr>
<tr>
<td>Colombia</td>
<td>4,090</td>
</tr>
<tr>
<td>Mexico</td>
<td>4,020</td>
</tr>
<tr>
<td>Peru</td>
<td>3,800</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3,753</td>
</tr>
<tr>
<td>Germany</td>
<td>3,691</td>
</tr>
<tr>
<td>Canada</td>
<td>1,496</td>
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</tbody>
</table>

83.9% of global cases

Global cases epidemic curve
Confirmed cases of mpox
from 1 Jan 2022, as of 05 Jun 23

### Case profile as of June 2023

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Description</th>
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<tbody>
<tr>
<td>96.2%</td>
<td>of cases with available data are male, the median age is 34 years</td>
</tr>
<tr>
<td>51.9%</td>
<td>of those with known HIV status were HIV positive*</td>
</tr>
<tr>
<td>82.0%</td>
<td>of all types of transmission were through sexual encounter</td>
</tr>
<tr>
<td>84.1%</td>
<td>identified as men who have sex with men (MSM)</td>
</tr>
<tr>
<td>7.8%</td>
<td>of MSM identified as bisexual men</td>
</tr>
<tr>
<td>1,234</td>
<td>cases were reported to be health workers; most were infected in the community</td>
</tr>
<tr>
<td>66.4%</td>
<td>of all settings in which cases were likely exposed, the most common was in party setting with sexual contacts</td>
</tr>
</tbody>
</table>

*Note that information on HIV status is not available for most cases, and for those for which it is available, it is likely to be skewed towards those reporting positive HIV results.

Country context

- Describe what is known about mpox in your country, including the response from the government and other relevant agencies.
Knowledge check

1. How many cases of confirmed mpox should be reported in a country to call it an outbreak?

2. Does the unexpected appearance of mpox in the absence of epidemiological links suggest undetected transmission?

3. What risk category is assigned to this region?

4. What is the sex at birth and median age of most of the reported cases of mpox?

5. Are most of the mpox cases from a specific key population category? If so, which one?

6. What proportion of mpox cases are HIV positive?

7. What is the mode of transmission among most of the mpox cases?
Learning objectives

At the end of this module participants will be able to:

• List the animals associated with mpox infection

• Describe how mpox infection moves from animals to humans and from human to human

• Describe the main environmental and social factors for mpox emergence

• Refer to the modes of transmission when screening for mpox infection
Animals associated with mpox

- MPXV is named due to its initial detection in monkeys.
- MPXV can primarily be found in rodents, however the reservoir is undetermined.

Primary and secondary infection

Primary infection

Animal ➔ human

- Contact with infected animals
- Contact with contaminated animal products

Secondary infection

human ➔ human

- Contact with infected people
- Mother to fetus

Figure 2 in Titanji BK, Tegomoh B, Nematollahi S, Konomos M, Kulkarni PA. Monkeypox: a contemporary review for healthcare professionals. Open Forum Infect Dis. 2022;9(7):ofac310, p. 3.

Credit: Michael Konomos, visual medical education team leader, Emory University School of Medicine.
Environmental and social factors

- Deforestation
- Civil unrest and poverty
- Climate change
- Cessation of smallpox vaccination

Transmission

Unprotected contact with:
- Respiratory droplets
- Lesion material
- Body fluids
- Contaminated materials and surfaces

The virus can enter through:
- Respiratory tract
- Mucous membranes (eyes and mouth)
- Broken skin (e.g., animal bites)
Transmission: Intimate contact

- Oral, anal, and vaginal sex or touching the genitals (penis, testicles, labia, and vagina) or anus (butthole) of a person with mpox
- Hugging, massage, and kissing
- Prolonged face-to-face contact
- Touching fabrics and objects during sex that were used by a person with mpox and that have not been disinfected, such as bedding, towels, fetish gear, and sex toys
- From an infected pregnant mother to their fetus through the placenta
- From infected animals, either by being scratched or bitten by the animal or by preparing or eating meat or using products from an infected animal
Can mpox be transmitted through sexual activity?

- Mpox can be spread through oral, anal, and vaginal sex.
- In the past, mpox outbreaks have been linked to direct exposure to infected animals and animal products, with limited person-to-person spread.
- In the current mpox outbreak, the virus is spreading primarily through close personal contact from human to human.
- This may include contact with infectious lesions or respiratory secretions via close, sustained skin-to-skin contact that occurs during sex.
- However, any close, sustained skin-to-skin contact with someone who has mpox can spread the virus. The contact does not have to be exclusively intimate or sexual.

Can mpox spread through water in pools, hot tubs, or splash pads?

- No studies have found a clear link between mpox and water in pools, bathtubs, hot tubs, or splash pads; so, sharing waters carries low to no risk.

- The mpox virus is killed in water at the specific chlorine levels recommended for disinfection in recreational water, but not all public water sites may adhere to this recommended level.

- However, it is possible to spread mpox to others through close, skin-to-skin contact. It can also be spread by sharing objects that a person with mpox used, such as towels, kickboards, pool toys, or clothing.

Knowledge check

1. In which category of animals is MPXV found?
2. What is the MPXV reservoir?
3. What is the definition of primary and secondary infection?
4. What are the main environmental and social factors for mpox emergence?
5. How is mpox transmitted?
Q&A
Module 4: Signs and Symptoms
Learning objectives

At the end of this module participants will be able to:

• Describe the incubation period of mpox infection
• Describe the factors influencing the course of mpox
• Recognize the signs and symptoms of mpox infection and clinical progression
• Account for the atypical or uncommon manifestations
• Describe the possible differential diagnosis
• Offer skin care recommendations to clients with mpox infection
The incubation period is 5–21 days. During this time, a person does not have symptoms and may feel fine. The illness typically lasts 2–4 weeks.

Duration of the infectious period is until the skin lesions dry up, become crusts, and fall off, or mucosal lesions have disappeared.
Factors influencing the course of mpox

• Asymptomatic infection can occur

• Risk factors for severe illness
  – Children
  – Immunodeficiency
  – Invasive route of infection
  – Congo basin clade variant

• Protective factors: prior smallpox vaccination

• Case fatality ratio: 10% Congo basin clade 2

Symptomatology

- Severity depends upon health of individuals and route of exposure.
- West African clade 1 is associated with milder disease and fewer deaths.
- Most cases in current outbreaks presented with mild disease symptoms.
- MPX virus may cause severe disease in certain population groups; diagnosis of severe MPXV should prompt clinicians to perform HIV testing.
- Most common symptom is rash.
Signs and symptoms

• Rash

• Other symptoms:
  – Fever, chills, swollen lymph nodes, exhaustion, muscle aches and backache, headache
  – Respiratory symptoms

• An individual may experience all or only a few symptoms.

• Sometimes, people have flu-like symptoms before the rash.

• Some people get a rash first, followed by other symptoms.

• Others only experience a rash.

Proportion of cases with reported symptoms

Graph refers to:
All cases, male and female.

Any rash refers to one or more rash symptoms (systemic, oral, genital, or unknown location).

Any lymphadenopathy refers to either general or local lymphadenopathy.
Rash progression

- Macule
- Papule
- Vesicle
- Pustule
- Crust


Credit: Andrea McCollum / CDC

Credit: Toutou Likafi/ Kinshasa School of Public Health

Credit: P. Mbala / Institut Nationale de recherche biomédicale. DRC
Clinicians should be aware of how lesions may present on the spectrum of skin pigmentation.

Evolution of lesions over time
Development of solitary lesion on right upper inner thigh, tracking laterally to outer thigh.

- 53-year-old man
- HIV positive
- Viral load <200 copies/mL
- On ART
- Single skin lesion on the thigh
- Initially this was a small papule on the medial right thigh but developed into a painful mass with surrounding erythema

Cutaneous lesions on the nose, hand, and penis over time.

On day 17 there were fresh pustular lesions on the hand, a partly scabbed lesion on the face, and fully scabbed lesions on the penis.

- 48-year-old man
- Polymorphic skin lesions having first noticed a single erosion on the scrotum
- Spread to the penile base and foreskin

Synchronous evolution of the lesions

(A) Day 1                                        (B) Day 3                                     (C) Day 7

Evolution of cutaneous lesions in a person with mpox

- a1 and a2 show facial lesions
- b1 through b3 show a penile lesion
- c1 and c2 show a lesion on the forehead

Skin and soft tissue lesions
Skin and soft tissue features included:

- (A and D) vesicular or pustular lesions
- (B and C) macular lesions involving the palms and soles
- (D and E) a subungual lesion
- (F and G) more subtle papules and smaller vesicles
- (H) deep abscess (arrow, image obtained during ultrasound-guided drainage)

Symmetrical maculopapular rash of the torso, back, and buttocks

- 36-year-old man
- HIV positive
- Viral load <200 copies/mL
- On ART
- CD4 count >400 cells/μL
- Rapidly progressive maculopapular rash soon after developing perianal vesicles

• Positive treponemal antibodies
• Reactive rapid plasma reagin (RPR) test at a dilution of 1:1
• HIV negative
• *Neisseria gonorrhoeae* and *Chlamydia trachomatis* negative
• Panels A and B show scattered papulovesicular lesions on the chest that were present 2 days before admission.
• The lesions measure 2 mm in diameter, are filled with clear fluid, and have surrounding erythema.
• Panel C shows a lesion on the right palm that was present at the time of admission.
• Panel D shows a papulovesicular lesion on the left second finger, which was one of the last skin lesions to develop, approximately 2 weeks after the onset of symptoms.

a. Upper limb pustules and cicatrized lesion in venopuncture site (needle sharing with confirmed case). Below the cicatrized puncture lesion there is an abscess with isolation of methicillin-resistant *Staphylococcus aureus*

b. Anal umbilicated pustules and abundant exudation in a patient with proctitis

c. Three umbilicated lesions (small arrows) and moderate size painful ulcer in left lateral tongue side

d. Three umbilicated pustules in penis foreskin

e. Two trunk lesions in pustular and macular phases in a patient with diffuse trunk rash

f. Two hand lesions in pustular and umbilicated pustule phases

Mpox in women

Young woman with MPXV infection after sexual intercourse, pustules in:

- gluteal area (A)
- genital area (B, C)
- intravaginal area (D)
- arm and hand (E)
- finger (F)

*France, September 2022*

Morbilliform rash on

Buttocks (A)

Lower trunk (B)

Forearm (C)

Morbilliform rash on thigh with area of confluent rash (D)

Oral lesions
Oral and perioral lesions

- **a**: perioral umbilicated lesions
- **b**: perioral vesicular lesion on day 8, PCR positive
- **c**: ulcer on the left corner of the mouth on day 7, PCR positive
- **d**: tongue ulcer
- **e**: tongue lesion on day 5, PCR positive
- **f, g, h**: pharyngeal lesions on day 0, 3, and 21, respectively, PCR positive on day 0 and 3 and negative on day 21

Symmetrical erythematous maculopapular rash on back and upper arms, with areas of confluent erythema.

Right tonsillar enlargement with an overlying pustular lesion and yellow-green exudate with slight deviation of the uvula.

- Male aged 25
- Right-sided neck pain, quickly followed by an erythematous, pruritic rash over the trunk
- Subsequently developed fever, progressively worsening right submandibular swelling, and pain, and reported fatigue
- Swelling increased, resulting in dysphagia and difficulty breathing

Ocular lesions
Palpebral (white arrowhead) and caruncular (black arrowhead) lesions before (A) and 4 days after (B) treatment with tecovirimat.

Eyelid margin lesion before (A) and 4 days after (B) treatment with tecovirimat.

Timeline of clinical evolution and PCR positivity in biological samples collected

<table>
<thead>
<tr>
<th>Days from onset</th>
<th>Skin lesion Cq</th>
<th>Oropharyngeal swab Cq</th>
<th>Eyelid swab Cq</th>
<th>Conjunctival swab Cq</th>
<th>Serum Cq</th>
<th>Urine Cq</th>
<th>Sputum Cq</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18,69</td>
<td>35,49</td>
<td>32,96</td>
<td>18,99</td>
<td>37,81</td>
<td>NEG</td>
<td>26,01</td>
</tr>
<tr>
<td>2</td>
<td>25,20</td>
<td>36,22</td>
<td>21,45</td>
<td>35,62</td>
<td>35,65</td>
<td>NEG</td>
<td>29,05</td>
</tr>
<tr>
<td>11</td>
<td>30,12</td>
<td>32,25</td>
<td>28,41</td>
<td>34,93</td>
<td>34,93</td>
<td>NEG</td>
<td>31,79</td>
</tr>
<tr>
<td>12</td>
<td>19,02</td>
<td>30,02</td>
<td>36,11</td>
<td>NEG</td>
<td>NEG</td>
<td>NEG</td>
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<tr>
<td>14</td>
<td>22,61</td>
<td>NEG</td>
<td>NEG</td>
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<td>60</td>
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</tbody>
</table>

*CIDOFOVIR/Probencid* (Cidofovir 5 mg/kg associated with oral probenecid (2 g 3 hours before each cidofovir dose and 1 g at 2 hours and again at 8 hours after completion of cidofovir infusion)

• **Patient #1 (A)** diagnosed with mpox presenting with vesicle on the left upper eyelid (yellow arrow). Patient had positive reverse transcriptase-polymerase chain reaction (RT-PCR) for mpox from the skin lesions and conjunctiva.

• **HIV-positive patient (patient #2) (B)** with the diagnosis of mpox infection presenting with peripheral keratitis (blue arrows). Reverse transcriptase-polymerase chain reaction (RT-PCR) was positive for mpox from conjunctival swab.

• **HIV positive patient (patient #3) (C)** with the diagnosis of mpox infection with hyperemic conjunctiva and serous discharge. Reverse transcriptase-polymerase chain reaction (RT-PCR) was positive for mpox from conjunctival swab.

Lesions in HIV Infection
Morphological type of lesions:

A. Small pustule (chest)
B. Large pustule (leg)
C. Papulo-pustule (white center, hand)
D. Papulo-pustule (black center, neck)
E. Chancriform ulcer (anus)
F. Atrophic scar (forehead)

Topographical distribution of lesions:

A. Eyelid
B. Perioral
C. Tongue
D. Chest
E. Arm

Topographical distribution of lesions (continued):

(F) Abdomen, genital area, and thighs

(G) Abdomen, genital area, and thighs

(A) Day 4

(B) Day 8

Penile lesions
Clinical evolution of penile lesions

Figure 1: Evolution of cutaneous lesions in an individual with Human Monkeypox infection first presented with several penile lesions. A shows penile lesions, B1-B2 show evolution of penile lesions after diagnosis. PCR status is indicated where available.

Progression of penile lesions and penile oedema

- 34-year-old male
- Circumcised
- Multiple penile lesions with clinically significant associated oedema

• Macular rash and painful lymphadenopathy were observed in the right inguinal area (Panel A).

• Two ulcerated lesions and several umbilicated pustules were observed on the penis (Panel B).

• Additional examples of mpox genital lesions (Panels C and D).

Progression of penile confluent lesions

- 40-year-old man
- HIV positive
- Viral load <200 copies/mL
- On antiretroviral therapy
- CD4 count >500 cells/μL

Multiple lesions progressed to become confluent, subsequently forming a large ulcer

Secondary bacterial infection of penis due to *Staphylococcus aureus* and *Streptococcus dysgalactiae*

- 47-year-old man
- HIV positive
- Viral load <200 copies/mL
- On ART
- CD4 count 755 cells/μL
- Extensive genital lesions, penile swelling, and purulent penile discharge

Perianal, anal, and rectal lesions
• A: a tender perianal ulcer, measuring less than 1 cm in diameter, with raised, firm margins.
• B: an ulcer on the dorsum of the penile shaft, measuring 7 mm in diameter that is similar in appearance to the perianal ulcer.
• C: the ulcer has heaped margins around a central dry base.

*In all panels, the patient’s hands are shown.*

• **a:** anal and perianal lesions on day 6, PCR positive
• **b and c:** rectal and anal lesions in a single person, PCR positive
• **d:** perianal ulcers, PCR positive

• **e:** anal lesions
• **f:** umbilicated perianal lesion on day 3, PCR positive
• **g:** umbilicated perianal lesions on day 3, PCR positive
• **h:** perianal ulcer on day 2, PCR positive

Perianal pustules evolving into large ulcerative lesion (8 days)

- All individuals screened for MPXV were symptomatic and presented with pathognomonic skin lesions, either pustular papules with a central umbilicated dip, fluid-filled vesicles, ulcerations, or eschars.
- However, clinical presentation varied greatly according to the stages of mpox infection at the time of testing.

Penile lesions coalescing into large ulceration (8 days)

Lesions in children
Skin lesion in newborn infant

- Skin lesions on the hands and feet of a newborn infant
- Visible lesions range from vesicles to pustules; lesions that were beginning to form scabs are also shown
- Photographs were obtained on day 5 after the onset of rash


Smallpox. Credit: WHO/Isao Arita; https://www.who.int/health-topics/smallpox#tab=tab_1

Mpox. Credit: Nigeria Centre for Disease Control; https://www.who.int/health-topics/monkeypox#tab=tab_1.
• Age < 10 resident in Netherlands
• Chickenpox vax at age 5
• Returning from 1 week in Turkey
• No enlarged lymph nodes in the neck, armpits, or groin region
• Centrifugal distribution of 20 solitary, sharply demarcated, red-brown vesicles (left ear, left lower jaw, both forearms, both thighs, and on the back)
• No lesions in the oral cavity or genital region

A: two solitary lesions on the left lower jaw and cheek
B: right shoulder
C: right forearm
D: forearm zoomed in

Pictures were taken 10 days after appearance of the first lesion.

A: Blistering lesions with a total loss of epidermis and dermis and exposition of the tendon.

B: Vesicle, which evolved into a pustule, and later to an abscess in the gluteal region.

- 13-month-old boy
- Vomiting, diarrhea, and fever
- Purulent blistering lesion on a finger and crusty lesions on the scalp and on a toe
- No traveling abroad in the last months
- Blistering lesion was drained taking a sample for bacterial culture and oral amoxicillin-clavulanate was prescribed.
- Methicillin-resistant Staphylococcus aureus was isolated, and treatment was changed to trimethoprim-sulfamethoxazole.
- After 48 hours, he presented a new gluteal warm and swollen lesion. The lesion evolved into an abscess and was drained.
- Positive mpox PCR
Some atypical or uncommon manifestations with the current outbreak

• Few lesions or only a single lesion
• Absence of skin lesions, but with anal pain and bleeding
• Lesions restricted to genital or perineal/perianal area and do not spread further
• Rash appears at different (asynchronous) stages of development
• Lesions appear before the onset of fever, malaise, and other constitutional symptoms
Rash resolved

- Pitted scars and/or areas of lighter or darker skin may remain after scabs have fallen off.

- After all scabs have fallen off and a fresh layer of skin has formed, a person is no longer contagious.
Scabbed lesions

• **A:** On penis; note the varying stages of lesions present with adjacent pustule.

• **B:** Progression of ulcerated lesions; note the re-epithelization of the penile shaft lesion and scabbing of the pubic ulceration.

• **C:** Scabbed lesion

Resolution of lesions

- After scabs have fallen on, there is formation of new skin (A, B, C).

Long term consequences

- Long-term sequelae: pockmarks, scaring, or loss of pigmentation
- Corneli ulcer and blindness
- Complications of pregnancy: bleeding, miscarriage, stillbirth

Source: Mpx: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Practicum: Describe the lesions
Lesions appeared 1–3 days after systemic symptoms, clustered (anal area 1A) or isolated (skin or penis 1B-1C).

They typically began as raised, itchy papules secreting serous, with a central umbilication; over days, the central umbilication widened until the lesion opened and the scab formed about 2 weeks after symptom onset.

Flat red bumps
Firm fluid-filled raised bumps
Scabs that heal over many weeks

Dorsal surfaces of the hands of a mpox case patient, who was displaying the appearance of the characteristic rash during its recuperative stage.

Vesicular or pustular lesions

Macular lesions involving the palms and soles

Sub-ungual lesion and vesicular lesion

Sub-ungual lesion

More subtle papules and smaller vesicles

Numerous pustules on erythematous base with some central umbilication and acrofacial propensity
Maculo-papular-vesicular-pustular mpox skin lesions of varying sizes on the face
Papular-vesicular-pustular mpox skin lesions of varying sizes across the body.

Papular-pustular mpox skin lesions on the hands, legs, and feet

Extensive papulo-pustular mpox rashes with crust and scar formation

Single umbilicated pustular lesion on leg  
Multiple umbilicated pustular lesions

- MSM
- Majority were unaware of contact with known mpox case, reported inconsistent condom use in the 3 weeks before symptom onset and at least one new sexual partner during the same period
- None reported travel to sub-Saharan Africa
- Majority presented with at least one skin lesion on the genital or perianal skin

A and B: Pustule-like lesions on a limb and dorsal hand.

C: Cluster of papules, some with umbilication

A: Umbilicated lesion on penis.

B: Cluster of papules in the perianal region, many with umbilication

A: Ulcerations on palate and tonsil

B: Ulceration on penis

C: Ulcerations on penis and pubis

Additional atlas of images
The palms of a monkeypox patient from Lodja, Democratic Republic of the Congo.

Source: BBC/Reuters photo
A woman shows symptoms of mpox in 2008 in the Democratic Republic of Congo.

Credit: Jeff Hutchens Getty Images

Source: WHO training Mpx: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Source: WHO training Mpx: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Examples of other conditions that present with similar-appearing skin lesions at the different stages of development

- Herpes simplex virus
- Varicella zoster virus
- Molluscum contagiosum virus
- Enterovirus
- Measles
- Scabies
- Treponema pallidum (syphilis)
- Bacterial skin infections
- Medication allergies
- Parapoxviruses (causing or related conditions)
- Chancroid
<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Monkeypox</th>
<th>Chickenpox</th>
<th>Measles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>1-3 days before rash</td>
<td>1-2 days before rash</td>
<td>3-5 days before rash</td>
</tr>
<tr>
<td>Rash appearance</td>
<td>Lesions often in one stage of development</td>
<td>Lesions often in multiple stages of development</td>
<td>Lesions often in multiple stages of development</td>
</tr>
<tr>
<td>Rash development</td>
<td>Slow</td>
<td>Rapid</td>
<td>Rapid</td>
</tr>
<tr>
<td>Rash distribution</td>
<td>More dense on face; present on palms and soles</td>
<td>More dense on trunk; Absent on palms and sole</td>
<td>Starts on face and spreads, sometimes reaching hands and feet</td>
</tr>
<tr>
<td>Lymphadenopathy</td>
<td>Present</td>
<td>Absent</td>
<td>Occasional</td>
</tr>
<tr>
<td>Death</td>
<td>Up to 10%</td>
<td>Rare</td>
<td>Varies widely</td>
</tr>
</tbody>
</table>

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Wash skin with a mild soap and water. To avoid potential transmission, ask patients not to share towels, bath linens, or clothing with others.

Mpox lesions are considered infectious until they have healed. Scabs have fallen off and a fresh layer of intact skin has formed. Therefore, all rashes should be covered to the extent possible (for example, by wearing long sleeves and long pants).

Keep affected sites and individual lesions covered. In general, all lesions of mpox are considered infectious (capable of transmitting infection) through contact, and it is advisable to keep affected sites and individual lesions covered.

Antiseptics or antibacterial agents are only required if there is concern for bacterial infection.

If the lesion becomes infected, patients should contact the health care provider immediately.

Skin care (2)

**After lesions have healed,**
if there is concern for scarring, silicone-based gels or sheeting may also be used.

**Sun protection**
(broad spectrum SPF 30 or higher)
should also be emphasized for several months after lesion resolution to avoid hyper or hypopigmentation of lesions or scars.

**No scratching.**
Individuals with mpox lesions should be instructed not to scratch or unroof lesions or scabs, which may lead to secondary infection. Dermatologists should suggest keeping fingernails short to avoid unintentional scratching.

To help soothe skin, baths may be taken.
Alternatively, sitz baths and warm or cool compresses may help in soothing lesions in the anogenital region.

Knowledge check

1. What is the incubation period of mpox infection?
2. How long does the illness typically last?
3. What are the stages of the mpox infection?
4. What are the signs and symptoms of mpox infection?
5. What are the stages of the rash progression?
6. Can mpox infection present through oral, genital, anorectal lesions?
7. Can mpox infection present in newborn, infants, and children?
8. What are the atypical or uncommon manifestations of mpox infection?
9. When is a person considered no longer contagious?
10. What are the main differential diagnoses?
11. What are the key differences between mpox, chickenpox, and smallpox?
Q&A
Learning objectives

At the end of this module participants will be able to describe how to:

• Prescribe the correct test for the diagnosis of mpox infection
• Correctly collect the specimen for mpox test
• Comply with safety procedures
• Correctly store, pack, and transport mpox specimens
• Interpret the test result based on WHO algorithm
Any individual that meets the suspected case definition of mpox should be offered testing in appropriately equipped laboratories by staff trained in the relevant technical and safety procedures.

Confirmation of MPX virus infection is based on nucleic acid amplification testing (NAAT), using real-time or conventional polymerase chain reaction (PCR) for detection of unique sequences of viral DNA.

PCR can be used alone, or in combination with sequencing.
Diagnostic test overview

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Type of specimen

- Skin lesion material, including swabs of lesion surface and/or exudate, roofs from more than one lesion, or lesion crusts

- All test results, positive or negative, including laboratory tests awaiting confirmation, should be immediately reported to:
  - National authorities and member states
  - WHO, under the IHR 2005
Which specimen to collect and when

- **5-21 days**: Incubation period
  - No sample collected

- **1-4 days**: Febrile stage
  - Nasopharyngeal or oropharyngeal swab

- **2-4 weeks**: Rash stage
  - Lesion fluid, Lesion roof or Lesion crust

- **Days to weeks**: Recovery
  - Serum

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Specimen to be collected (1)

- Swab the **skin lesion** vigorously
- Both dry swabs and swabs placed in viral transport media (VTM) can be used
- Collect two lesions of the same type in one single tube
- Do not mix lesions, crusts, and vesicular fluids in the same tube
- Two tubes may be collected to minimize risk of poor sampling or inhibitors
- Collecting an **oropharyngeal swab** is encouraged

Source: Mpxo: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Specimen to be collected (2)

- Collection of additional specimen types for research purposes can be considered.
  - Urine, semen, rectal, and/or genital swab
  - EDTA blood

- Collection of a lesion biopsy during the macular stage should be considered only if clinically indicated.

- **Antibody detection** from plasma or serum should not be used alone for diagnosis of mpox.

- Recent vaccination may interfere with serological testing.
Lesion roofs and fluid - consumables

Alcohol wipe

Disposable scalpel or plastic scraper

Dry polyester transport swabs

Screw-capped plastic tube with O-ring

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Lesion roofs and fluid - procedures

Sanitize lesions
Remove lesion roof
Brush lesion base
Put swab in container
Put roof in container

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Lesions crusts - consumables

- Alcohol wipe
- Sterile scalpel, lancet, plastic scraper, curette or needle
- Screw-capped plastic tube with O-ring

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Lesion crusts - procedures

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Serum - consumables

Alcohol wipe

Sterile Syringe and needle

Serum separator tubes

Screw-capped plastic tube with O-ring

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Serum - procedures

Sanitize collection area

Draw blood

Allow to clot and centrifuge

Transfer serum into vials

Store tube at -20°C

Source: Mpx: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Oral/nasopharyngeal swabs - consumables

Dry polyester transport swabs

OR

Dry swab

+ Screw-capped plastic tube with O-ring

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Oral/nasopharyngeal swabs - procedures

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Safety procedures

• Specimens collected for laboratory investigations should be regarded as potentially infectious and handled with caution.

• Minimize risk of laboratory transmission.
  – Limit testing to staff with proven competency
  – Wear appropriate PPE
  – Use rigorously applied standard precautions
  – Avoid procedures that generate infectious aerosols

• Encourage vaccination among staff.

• Effective disinfectants include quaternary ammonium compounds and 0.5% (or 200 ppm) bleach (freshly made).

• Rigorously adhere to infection prevention and control guidelines during specimen collection and handling.

Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Specimen storage

- **Refrigerate (2–8°C) or freeze (-20°C or lower) specimens within one hour** after collection.
  - If storage > 7 days → store specimens at -20°C or lower.
  - If storage > 60 days → store specimen at -70°C.
  - If cold chain not available → store specimen in a dark, cool environment, though room temperature shipment is not recommended.
  - Avoid repeated freeze-thaw cycles that reduce quality of specimens.

- Other requisite materials and equipment: transport containers and specimen collection bags and triple packaging, coolers and cold packs or dry ice, labels and permanent markers, PPE, and materials for decontamination of surfaces.
Specimen collection and storage

<table>
<thead>
<tr>
<th>Specimen type</th>
<th>Collection materials</th>
<th>Storage temperature</th>
<th>Collection purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin lesion material, including:</td>
<td>Dacron or polyester flocked swabs with VTM or dry swab</td>
<td>Refrigerate (2-8 °C) or freeze (-20 °C or lower) within 1 hour of collection, -20°C or lower after 7 days</td>
<td>Recommended for diagnosis</td>
</tr>
<tr>
<td>– swabs of lesion exudates</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– lesion roofs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>– lesion crusts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oropharyngeal swab</td>
<td>Dacron or polyester flocked swabs with VTM or dry swab</td>
<td>See above</td>
<td>Recommended for diagnosis if feasible, in addition to skin lesion material</td>
</tr>
<tr>
<td>Rectal and genital swabs:</td>
<td>Dacron or polyester flocked swabs with VTM or dry swab</td>
<td>See above</td>
<td>To be considered for research (following ethics guidelines)</td>
</tr>
<tr>
<td>Urine</td>
<td>Sterile collection tube</td>
<td>See above</td>
<td>To be considered for research (following ethics guidelines)</td>
</tr>
<tr>
<td>Sputum</td>
<td>Sterile collection tube</td>
<td>Room temperature for &lt;1h (then -20 °C or lower)</td>
<td>To be considered for research (following ethics guidelines)</td>
</tr>
<tr>
<td>Whole blood</td>
<td>Sterile collection tube with EDTA</td>
<td>See above</td>
<td>To be considered for research (following ethics guidelines)</td>
</tr>
<tr>
<td>Serum</td>
<td>Serum-separating tubes</td>
<td>Refrigerate (2-8 °C) or freeze (-20 °C or lower) within 1 hour of collection, -20°C or lower after 7 days</td>
<td>To be considered for serology to aid diagnosis or research (following ethics guidelines)</td>
</tr>
<tr>
<td>Plasma</td>
<td>collection tube with EDTA</td>
<td>See above</td>
<td>To be considered for serology to aid diagnosis or research (following ethics guidelines)</td>
</tr>
</tbody>
</table>

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Packaging and shipment of clinical specimens

- Transport specimens as soon as possible after collection.
- Comply with any applicable national and/or international regulations.
- For international shipping, transport as Category A, UN2814 “infectious substance, affecting humans”.
- Use triple packaging, labelling, and documentation.
- Shipping requires a dangerous goods certified shipper.
Basic triple packaging system

- Primary watertight container
- Wrapped in absorbent material
- Secondary watertight packaging
- Final rigid outer box
- Cool box (or ice packs)
Triple packaging for mpox specimen

Sealed, leakproof primary receptacle

Absorbent material

Sealable, leakproof secondary packaging

UN Specification Mark

Outer packaging

Example of triple packaging materials that may be used for Category A infectious substances

OpenWHO.org
Laboratory testing methods and algorithm

• Confirmation of MPXV infection is based on nucleic acid amplification testing (NAAT), using real-time or conventional polymerase chain reaction (PCR) for detection of unique sequences of viral DNA.
• PCR can be used alone or in combination with sequencing.
• Several groups have developed validated PCR protocols for the detection of MPXV.
• Two-step protocols: first PCR detects OPXV; second PCR-based or sequencing to detect MPXV.
• Before an assay is utilized to test human clinical specimens within a laboratory, it should be validated and/or verified within the laboratory by appropriately trained staff.
Interpretation of laboratory results (1)

- Confirmation of MPXV infection should consider clinical and epidemiological information.

- Positive detection using an OPXV PCR assay followed by confirmation of MPXV via PCR and/or sequencing, or positive detection using MPXV PCR assay in suspected cases indicates confirmation of MPXV infection.

- While it is preferable to perform MPXV specific confirmatory testing, positive detection using OPXV PCR assay is considered sufficient for laboratory confirmation of suspected cases.

- When the clinical presentation and epidemiology suggest an infection with MPXV despite negative PCR results, serological testing may be useful to further investigate prior infection for epidemiological purposes.
Interpretation of laboratory results (2)

- Factors contributing to false-negative results: poor quality of specimen, wrong handling or shipping, technical reasons inherent to the test, e.g., DNA extraction failure.

- Genetic sequence data (GSD) provide valuable information to help understand the origins, epidemiology, and characteristics of the virus, for example, whether cases arise from a single introduction or multiple introductions from other locations.

- Sequencing of MPXV from as many positive specimens from as many different patients as possible is recommended at this stage.

- WHO encourages laboratories to share GSD.

- GSD can be generated using Sanger or next-generation sequencing (NGS) methods.
Knowledge check

1. What type of test is used to confirm mpox infection?
2. Is positive detection using OPXV PCR assay sufficient for confirming suspected cases?
3. What are the factors contributing to false negative?
4. What type of specimens are collected?
5. From how many lesions should specimens be collected?
6. Is antibody detection used alone for diagnosis of mpox?
7. Can recent vaccination interfere with serological testing?
8. At what temperature and within what time from collection should specimens be stored?
9. What temperature to use if storage is longer than seven days?
10. What type of packaging is needed for transportation?
Module 6: Case Definition
Learning objectives

At the end of this module participants will be able to:

• Present each case definition
Case definition

• Suspect case
• Probable case
• Confirmed case
A person presenting since January 1, 2022, with an unexplained acute skin rash, mucosal lesions, or lymphadenopathy.

- **Skin rash** includes single or multiple lesions in the anogenital region or elsewhere.
- **Mucosal lesions** include single or multiple oral, conjunctival, urethral, penile, vaginal, or anorectal lesions or inflammation (proctitis), pain, and/or bleeding.

Common causes of acute rash or skin lesions do not fully explain the clinical picture:
- Varicella
- Zoster
- Herpes zoster
- Measles
- Herpes simplex
- Bacterial skin infections
- Disseminated gonococcus infection
- Primary or secondary syphilis
- Chancroid
- Lymphogranuloma venereum
- Granuloma inguinale
- Molluscum contagiosum
- Allergic reaction (e.g., to plants)
- Other locally relevant common causes of papular or vesicular rash

OR

A person who is a contact of a probable or confirmed mpox case in the 21 days before the onset of signs or symptoms, AND who presents with any of the following:
- Acute onset of fever (>38.5°C)
- Headache
- Myalgia
- Back pain
- Profound weakness or fatigue

AND

A person presenting since January 1, 2022, with an unexplained acute skin rash, mucosal lesions, or lymphadenopathy.

A person who is a contact of a probable or confirmed mpox case in the 21 days before the onset of signs or symptoms, AND who presents with any of the following:
- Acute onset of fever (>38.5°C)
- Headache
- Myalgia
- Back pain
- Profound weakness or fatigue
Probable case

A person presenting since January 1, 2022, with an unexplained acute skin rash, mucosal lesions, or lymphadenopathy.

- **Skin rash** includes single or multiple lesions in the anogenital region or elsewhere.
- **Mucosal lesions** includes single or multiple oral, conjunctival, urethral, penile, vaginal, or anorectal, or inflammation (proctitis), pain, and/or bleeding.

AND

One or more of the following:

- **Epidemiological link** to a probable or confirmed case of mpox in the 21 days before symptom onset
- Identifies as *gay, bisexual, or man who has sex with men*
- **Multiple and/or casual sexual partners** in the 21 days before symptom onset
- Detectable levels of anti-orthopoxvirus (OPXV) IgM antibody (during the period of 4 to 56 days after rash onset); or a four-fold rise in IgG antibody titre based on acute (up to day 5-7) and convalescent (day 21 onward) samples in the absence of a recent smallpox/mpox vaccination or other known exposure to OPXV
- Has a positive test result for orthopoxviral infection (e.g., OPXV-specific PCR **without** MPXV-specific PCR or sequencing)
Confirmed case

• Laboratory confirmed MPXV by detection of unique sequences of viral DNA by real-time polymerase chain reaction (PCR) and/or sequencing

  • PCR on a blood specimen may be unreliable and should also not be used alone as a first-line diagnostic test.
  • If blood PCR is negative and was the only test done, this is not sufficient to discard a case that otherwise meets the definition of a suspected or probable case.
  • This applies regardless of whether the blood PCR was for OPXV or MPXV specific.
Discarded case

- A **suspected or probable** case for which laboratory testing of lesion fluid, skin specimens, or crusts by **PCR and/or sequencing** is negative for MPXV.

- Conversely, a retrospectively detected probable case for which lesion testing can no longer be adequately performed (i.e., after the crusts fall off) and no other specimen is found PCR positive, would remain classified as a probable case.

- A suspected or probable case should not be discarded based on a negative result from an oropharyngeal, anal, or rectal swab.
What is the case category?

• Male, aged 35, accesses clinic on February 5, 2022, because headache only

• He reports contact on January 26, 2022, with another male with positive test result for orthopoxviral infection
What is the case category?

• Female, aged 29, accesses clinic on February 5, 2022, because vaginal lesions only

• She reports multiple and/or casual sexual partners in the 10 days before the onset of the lesions
What is the case category?

- Male, aged 42, accesses clinic on February 5, 2022, because skin rash in anogenital area
- He self-identifies as “man who has sex with men”
- Laboratory reports a positive PCR test for mpox
Knowledge check

1. What is the definition of suspect case?
2. What is the definition of probable case?
3. What is the definition of confirmed case?
4. What is the definition of discarded case?
Q&A
Module 7: Exposure
Module 7.1: Occupational Exposure
Learning objectives

At the end of this module participants will be able to:

• Define occupational exposure
• Describe who is defined as occupationally exposed
• Properly manage occupational exposure
How is occupational exposure defined?

- **Needlestick injuries** with a probable, suspect, or confirmed case of mpox
- **Not wearing appropriate personal protective equipment** when in contact with a person who has a probable, suspect, or confirmed case of mpox
Who could be occupationally exposed?

- Health care providers
- Case managers, personal care workers, and healers and practitioners of traditional medicine
- Health management and support workers
- Social workers, peer outreach workers, community workers
- Other occupational groups whose members work in acute care facilities and long-term care or community-based care
Assessment and management plans

- The assessment and management plans should be in accordance with national or subnational policies.
- Providers should notify, through the direct supervisor, infection control and occupational health and public health authorities of possible exposures to receive a medical evaluation and instructions for follow-up.
Management of occupational exposure

Provider who had an occupational exposure

Asymptomatic

Surveillance for symptoms for 21 days post-exposure AND avoid working with vulnerable patients

Symptomatic

YES rash → isolate AND surveillance for symptoms for 21 days post-exposure

NO rash → exclude from work for 5 days after the development of any new symptom, even if this 5-day period extends beyond the original 21-day monitoring period

Asymptomatic or symptomatic exposed to a Confirmed Case

Medical evaluation AND consideration for possible interventions (vaccination within 4 days of exposure or PEP)

* Active surveillance of symptoms for 21 days post-exposure prior to reporting to work:
  - Monitor for signs and symptoms
  - Measure temperature at least twice daily

If 5 days have passed without the development of any new symptom and no rash → return to work.

If a new symptom develops again at any point during the 21-day monitoring period → exclude from work and start a new 5-day isolation period.
Knowledge check

1. Who could be occupationally exposed?
2. How is occupational exposure defined?
3. For how many days post-exposure should a person be monitored?
4. How often should the temperature be measured?
Module 7.2: Contact Tracing
Learning objectives

At the end of this module participants will be able to:

• Present key principles of contact tracing
• Recognize and categorize contacts by level of risk
• Elicit all contacts and fill in contact elicitation forms
• Anticipate contact tracing challenges and implement solutions
• Work with the contact tracing team to reach and manage contacts
Contact tracing: Key principles

- Contact tracing is a key public health measure to control mpox spread.
- It allows for interruption of transmission and identification of exposures.
- Interview people with cases to elicit contacts and venues.
- Contact identification and contact tracing should be initiated ASAP.
- Contacts should be notified within 24 hours of identification.
- If case is discarded, contact tracing may be stopped.
Contact definition

• A contact is defined as a person who has been exposed to an infected person during the infection period—i.e., the period beginning with the onset of the index case’s first symptoms and ending when all scabs have fallen off—and who has **one or more of the following exposures** with a person who has mpox.

• Providers potentially exposed WITH probable or confirmed case of mpox in the absence of proper use of appropriate personal protective equipment

• Newborns, infants, children of mothers with a case of mpox

*Close proximity* defined as someone who was less than 6 feet or 1.5 meters away from an infected person for 15 minutes or more over a 24-hour period.
<table>
<thead>
<tr>
<th>Exposure risk</th>
<th>Description of exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High</strong></td>
<td>Direct exposure of skin or mucous membranes to skin or respiratory secretions of a person with confirmed, probable, or suspected mpox, their body fluids (e.g., lesion vesicular or pustular fluid), or potentially infectious material (including clothing or bedding) if not wearing appropriate PPE. This includes: • inhalation of droplets or dust from cleaning contaminated rooms • mucosal exposure due to splashes from body fluids • physical contact with someone who has mpox, including direct contact during sexual activities. This includes face-to-face, skin-to-skin, or mouth-to-skin contact or exposure to body fluids or contaminated materials or objects (fomites) • normally sharing a residence (permanently or occasionally) during the presumed incubation period with a person who has been diagnosed with mpox, or • a penetrating sharps injury from a contaminated device or through contaminated gloves</td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td>No direct contact but close proximity in the same room or indoor physical space as a symptomatic patient with confirmed mpox if not wearing appropriate PPE</td>
</tr>
<tr>
<td><strong>Low, minimal</strong></td>
<td>Contact with a person with confirmed, probable, or suspected mpox or an environment that may be contaminated with MPX virus, while wearing appropriate PPE and without any known breaches of PPE or of donning and doffing procedures • community contact, such as being in an outdoor setting with a symptomatic case without any close proximity or physical contact • no known contact with a symptomatic mpox case in the last 21 days, or • laboratory personnel handling routine clinical blood samples or other specimens not directly related to mpox diagnostic testing</td>
</tr>
</tbody>
</table>

Contact tracing

List all contacts, recording:
- **Demographic** information
- **Date of contact** with a suspected, probable, or confirmed case
- **Type of exposure**
- **Date of onset** of fever or other prodromal symptoms or rash

Monitor closely for 21 days.

Source: Mpx: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021
Brainstorming

• How would you obtain history of sexual contacts (sexual history) in a culturally appropriate manner?
What are the contexts in which contact might have taken place?

- Cases can be prompted to identify contacts across several contexts, including:
  - Household
  - Workplace
  - School/nursery
  - Sexual contacts
  - Health care (including laboratory exposure)
  - Houses of worship
  - Transportation
  - Sports
  - Bars/restaurants
  - Social gatherings
  - Festivals
  - Any other recalled interactions

- Use attendance lists, passenger manifests, etc., to further identify contacts.
Travel-related contact tracing

- Public health officials should work with transportation authorities, travel operators and public health counterparts to assess potential risk of exposure and to identify contacts (passengers and others) who may have had exposure to a case while travelling.

- If a probable or confirmed case is reported in a long-distance travel conveyance (e.g., 6-plus hours), travelers seated in the same row, two rows in front, and two rows behind the sick traveler, as well as the cabin crew who served the individual, can be considered contacts.

- Any passenger or crew team member who did not report physical contact with a symptomatic case and was wearing PPE such as face mask for COVID-19 should not be considered a monkeypox contact.

- More specific evaluations for each scenario need to be assessed on a case-by-case basis by national and local health authorities.
Contact tracing challenges

- Multiple anonymous sexual contacts
- Limited human resources for contact tracing
- Lack of experienced personnel in contact tracing
- Timeliness of contact tracing
- Stigma associated with mpox and MSM and sex practices (sex between men, group sex, sexualized drug use, sex in commercial venues)
- Varying level of trust in public health authorities
Solutions menu (1)

- Trace as many contacts as possible within 3 weeks for the strategy of isolation and tracing of contacts to contribute to reducing transmission.
- Conduct case and contact interviews to identify risk factors and settings for targeted public health interventions.
- Train workforce in contact tracing.
- Collaborate with STI staff, who have experience in sexual health issues and have been trained on partner notification, to carry out contact tracing activities.
- Prioritize sexual contacts, contacts at higher risk of severe disease, household contacts, and providers who have experienced high-risk occupational exposure.
Solutions menu (2)

- Engage community-based organizations to help design solutions that integrate community perspectives to build understanding and acceptance of the strategy.
- Conduct risk communication activities targeting those groups with anonymous sexual contacts.
- Collaborate with civil society organizations and trusted community-based organizations to mitigate stigma.
- Use respectful and inclusive language that does not link disease transmission to sexual orientation or sexual practices.
Contact tracing procedures: Reaching contacts

Explain to case that the contacts can be reached through different modalities:

- **Directly by the case**, who can decide to inform or not the contact about their own clinical condition and refer the contact to the screening site (*Patient referral*).

- **Directly by the provider**, who, based on the case’s consent, can inform (*Provider referral*) or not the contact (*Anonymous notification*) about the case’s clinical condition and offer screening to the contact.
Contact tracing procedures: Tools

- **Patient referral**: The case can be given a referral letter and/or written information, videos, or internet links about mpox contact tracing to share with the contacts.

- **Provider referral**: The provider can use written information, videos, or internet links about mpox contact tracing with the contacts.

- **Anonymous notification**: Contacts can be reached through App, anonymous SMS and/or email, and/or social media-based messages.
Contact tracing procedures: Screening venues

- Health facility
- Community
  - Community center or drop-in center
  - Community venue, e.g., school, local government authorities’ office
  - Home
  - Any other community venue that meets safety and privacy standards
Contact tracing procedures: Infection prevention and control (IPC)

• Screening should be conducted maintaining a distance of at least 1 meter from patients and using a “no touch” approach.

• Where these measures cannot be implemented or maintained, the provider should conduct a risk assessment to determine the level of PPE required according to the IPC recommendations in the context of mpox.

• Providers performing screening should follow the **Hand hygiene in outpatient and home-based care and long-term care facilities: A guide to the application of the WHO multimodal hand hygiene improvement strategy and the “My Five Moments For Hand Hygiene” approach**
Contacts’ clinical monitoring

- Monitoring **daily for a period of 21 days from last contact** for signs and symptoms of concern → headache, fever, chills, sore throat, malaise, fatigue, rash, and lymphadenopathy.
- Contacts should monitor their **temperature twice daily**.
**Signs and symptoms:** Headache, fever, chills, sore throat, malaise, fatigue, rash, lymphadenopathy

---

**FLOW CHART 1**

**Asymptomatic contact**

- No isolation needed; daily clinical monitoring; temperature monitoring x 2 day for 21 days from last exposure

  - Does not develop symptoms → close the case after 21 days from last exposure and classify as NO MPOX

  - Develops symptoms → refer to flow chart 2 or 3

---

**FLOW CHART 2**

**Symptomatic contact WITHOUT RASH**

- Isolation needed; daily clinical monitoring; temperature monitoring x 2 day for 21 days from last exposure; PCR on oropharyngeal, anal, or rectal swab

  - PCR neg → Continue isolation; clinical and temperature monitoring for the next 5 days

  - PCR pos → CONFIRMED CASE

  - NO rash develops → close the case after 21 days from last exposure and classify as SUSPECTED CASE MPOX

  - YES rash develops within the remainder of the 21 days → refer to flow chart 3

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**FLOW CHART 3**

**Symptomatic contact WITH RASH ONLY or RASH AND OTHER SYMPTOMS**

- Isolation needed; daily clinical monitoring; temperature monitoring x 2 day for 21 days from last exposure; PCR on skin, mucosa swab

  - PCR neg → Continue isolation; clinical and temperature monitoring for the next 5 days

  - PCR pos → CONFIRMED CASE

  - PCR neg → close the case after 21 days from last exposure and classify as PROBABLE CASE MPOX

  - PCR pos → CONFIRMED CASE

  - Repeat PCR on skin, mucosa swab?

    - PCR neg → close the case after 21 days from last exposure and classify as PROBABLE CASE MPOX

    - PCR pos → CONFIRMED CASE
Assess risk of other infections

- Sexually transmitted infection (STI) within last 12 months
- Number of sexual partners within last 3 months
- Type of sexual contacts, e.g., new, occasional, established
- HIV status, ART/pre-exposure prophylaxis (PrEP) use
- Use of App to meet new partners
- Attending sex venues
- Having sex with men only or both men and women
Contact tracing management

Peer outreach team and health care providers, and case managers create awareness within the community and health facilities, respectively.

Health care providers and case managers develop the list of suspect, probable, and confirmed cases and facilitate contacts’ elicitation; document contacts in the contacts’ listing form.

Case manager distributes the list of contacts and the list of venue managers to be reached directly by the contact tracing team.

Contact tracing team reaches out to the contacts.

Contact tracing team collects swabs from the contacts, preferably at the contact’s home.

Case manager follows up on the lab test results and distributes to contact tracing team.

Contact tracing team transports the samples to the laboratory.

Contact tracing team daily monitors the contacts through virtual and/or in-person channels.

Contact tracing team informs contacts about the lab test result and continues monitoring; documenting the contacts’ follow-up in the contact monitoring form.

Contact tracing team informs case manager about contact’s outcome, upon ending the contact’s monitoring.

Contact Tracing Team includes:
- Peer outreach worker
- Health care provider (e.g., nurse)
Knowledge check

1. Why is contact tracing a public health measure to control mpox spreading?
2. What is the contact definition?
3. What are the contact risk categories and how are they defined?
4. What are the contact tracing challenges and solutions?
5. How can contacts be reached?
6. What are the screening venues?
7. How are contacts clinically monitored?
Q&A
Module 8: Treatment
Module 8.1: Treatment categories for mpox
Learning objectives

At the end of this module participants will be able to:

• Describe the key treatment categories for mpox

• Identify and prescribe correct medication, dosage, and formulation to treat individuals with mpox infection based on their clinical presentation

• Identify and manage complications and severe mpox
Treatment categories

- Symptomatic care
- Antimicrobial therapy
- Antivirals
Symptomatic care (1)

**Fever – paracetamol**
- **Adults:** 1g PO/IV every 6–8 hours. Maximum dose 4g every 24 hours or (2 g if history of chronic liver disease).
- **Neonates:** Oral dose 10–15 mg/kg every 6 hours. Maximum dose 40 mg/kg/day; IV dose 7.5 mg/kg every 6 hours, maximum dose 30 mg/kg day.
- **All other children:** 10–15 mg/kg every 6 hours, maximum dose 60 mg/kg/day.

**Mild pain control – paracetamol**
- **Adults:** 1g PO/IV every 6–8 hours. Maximum dose 4g every 24 hours or (2 g if history of chronic liver disease).
- **Children:** Orally or IV 10–15 mg/kg/dose every 4–6 hours as required, maximum usual dose 60 mg/kg/day, but 90 mg/kg/day can be given for short period with medical supervision.

**Severe pain control – tramadol**
- **Adults:** 50–100 mg PO/IV every 4–6 hours as needed, daily maximum 400 mg/day.
- **Children > 6 months:** 1–2 mg/kg every 4–6 hours, maximum 400 mg/day.

**Severe pain control – morphine** (oral dose preferred if patient can tolerate; only use immediate release tablets for acute pain)
- **Adults:** Oral dose is 10 mg every 4 hours as needed; maximum dose is 60 mg/day. IV dose is 1–4 mg SQ/IV every 4 hours as needed – monitor SBP and RR prior to administration of morphine (hold for low SBP or respiratory rate).
- **Children:** Oral dose is 0.2–0.4 mg/kg/dose every 4 hours. Titrate dose to pain. IV dose is 0.05–0.1 mg/kg/dose every 4–6 hours as required.

**Antihistamine**
- **Adults:** Loratadine 10 mg PO once daily.
- **Children (> 30 kg):** Loratadine 10 mg PO once daily.

Symptomatic care (2)

**Nausea and vomiting**

1. Ondansetron (associated with QT prolongation, thus it is important to note other medications that may also prolong the QT interval and to monitor regularly with ECGs if available).
   - **Adults:** 8 mg PO every 12 hours or 4 mg IV every 8 hours as needed.
   - **Children:** 0.15 mg/kg orally or IV 0.15 mg/kg every 12 hours, maximum dose 8 mg.
2. Promethazine
   - **Only for adults:** 12.5–25 mg orally every 4–6 hours as needed (can prolong QT interval).

**Dyspepsia**

   - **Adult:** Omeprazole 40 mg PO/IV every 24 hours.
   - **Child:** Omeprazole: 5–10 kg: 5 mg once daily; 10–20 kg: 10 mg once daily; ≥ 20 kg: 20 mg once daily.

**Diarrhoea**

- Diarrhoea should be managed conservatively. The use of anti-motility agents is not generally recommended given the potential for ileus.

**Anxiety**

This may be a symptom patients experience particularly related to being in isolation or due to worsening symptoms.

- First-line therapy is to talk with a mental health counsellor.
- For moderate to severe anxiety, diazepam can be considered, but an evaluation of the patient's mental status should precede its use. Benzodiazepines should not be given to patients with altered mentation.
  - **Adults:** Diazepam 5–10 mg PO every 8 hours as needed as long as mentation is unaffected.
  - **Children:** Diazepam 0.05–0.1 mg/kg PO every 6 hours as needed. Continual supervision by a health aid is indicated to keep the child calm. Sedatives should only be used if necessary to perform procedures and give interventions.

Antimicrobial therapy

• For treatment of impetigo, erysipelas, or cellulitis caused by a bacterial pathogen, as superinfection of a MPXV lesion

• Excludes skin infections caused by viral, fungal, or parasitic pathogens; necrotizing fasciitis; pyomyositis; severe infections with sepsis; and surgical site infections
## Adults

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cloxacillin (flucloxacillin)</td>
<td>500 mg orally every 8 hours</td>
</tr>
<tr>
<td>Cefalexin</td>
<td>500 mg orally every 8 hours</td>
</tr>
<tr>
<td>Amoxicillin-clavulanic acid</td>
<td>500–125 mg orally every 8 hours</td>
</tr>
</tbody>
</table>

If concern for community acquired MRSA consider following treatment:

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clindamycin</td>
<td>600 mg orally every 8 hours</td>
</tr>
<tr>
<td>Trimethoprim-sulfamethoxazole</td>
<td>800–160 mg orally every 12 hours</td>
</tr>
<tr>
<td>Doxycycline</td>
<td>100 mg orally every 12 hours</td>
</tr>
</tbody>
</table>

*Note: In the case of penicillin or beta-lactam allergy: use clindamycin or trimethoprim-sulfamethoxazole.*

## Children

<table>
<thead>
<tr>
<th>Weight</th>
<th>Amoxicillin-clavulanic acid</th>
<th>Cefalexin</th>
<th>Cloxacillin (flucloxacillin)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40–50 mg/kg/dose of amoxicillin component every 12 hours OR 30 mg/kg/dose every 8 hours orally</td>
<td>25 mg/kg/dose every 12 hours orally</td>
<td>in neonates: 25–50 mg/kg/dose twice daily; in children: 25 mg/kg/dose every 6 hours</td>
</tr>
<tr>
<td>3 &lt; 6 kg</td>
<td>250 mg of amoxicillin/dose twice daily</td>
<td>125 mg every 12 hours</td>
<td>125 mg every 6 hours</td>
</tr>
<tr>
<td>6 &lt; 10 kg</td>
<td>375 mg of amoxicillin/dose twice daily</td>
<td>250 mg every 12 hours</td>
<td>250 mg every 6 hours</td>
</tr>
<tr>
<td>10 &lt; 15 kg</td>
<td>500 mg of amoxicillin/dose twice daily</td>
<td>375 mg every 12 hours</td>
<td>250 mg every 6 hours</td>
</tr>
<tr>
<td>15 &lt; 20 kg</td>
<td>750 mg of amoxicillin/dose twice daily</td>
<td>500 mg every 12 hours</td>
<td>500 mg every 6 hours</td>
</tr>
<tr>
<td>20 &lt; 30 kg</td>
<td>1000 mg of amoxicillin/dose twice daily</td>
<td>625 mg every 12 hours</td>
<td>750 mg every 6 hours</td>
</tr>
<tr>
<td>&gt; 30 kg</td>
<td>Use adult dose</td>
<td>Use adult dose</td>
<td>Use adult dose</td>
</tr>
</tbody>
</table>

*Note: If concern for community-acquired MRSA consider clindamycin: neonates 5 mg/kg/dose every 8 hours; children 10 mg/kg/dose every 8 hours.*

Antivirals

Generally:

• No treatment approved specifically for mpox.

• Most people recover fully within 2 to 4 weeks without the need for medical treatment.

• Antivirals are mostly reserved for SEVERE cases (including individuals requiring hospitalization, children < 8 years, pregnant and breastfeeding women, PLHIV, and those with complications, aberrant infection, etc.).

• Efficacy of antivirals for treating orthopoxviruses was mostly from studies in-vitro/on animals. No evidence of efficacy in managing individuals with mpox infection.

Antiviral products (1)

- **Tecovirimat (TPOXX, ST-246)**
  - Developed for the treatment of smallpox in adults and children
  - Available as oral capsules and intravenous formulations

- **Brincidofovir (also known as CMX001 or Tembexa)**
  - For treatment of human smallpox disease in adult and pediatric patients, including neonates

- **Cidofovir (Vistide)**
  - Used for treatment of cytomegalovirus (CMV) retinitis in PLHIV

- **Trifluridine (also known as Viroptic)**
  - Licensed for treatment of herpes keratoconjunctivitis/keratitis
  - Case reports of use for ocular orthopoxvirus infection

- **Vaccinia Immune Globulin Intravenous (VIG-IV)**
  - Consider use in severe cases
## Antiviral products (2)

<table>
<thead>
<tr>
<th>Tecovirimat</th>
<th>Brincidofovir</th>
<th>Cidofovir</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Treatment dose, route, duration (adults) (65,66,71,73,76)</strong></td>
<td><strong>Dose</strong></td>
<td><strong>Dose</strong></td>
</tr>
<tr>
<td><strong>Oral</strong></td>
<td>600 mg PO every 12 hours</td>
<td>10 kg: 6 mg/kg</td>
</tr>
<tr>
<td><strong>Intravenous</strong></td>
<td>3 kg to &lt; 35 kg: 6 mg/kg every 12 hours</td>
<td>&lt; 10 kg: 6 mg/kg</td>
</tr>
<tr>
<td></td>
<td>35 kg to &lt; 120 kg: 200 mg every 12 hours</td>
<td>10–48 kg: 4 mg/kg</td>
</tr>
<tr>
<td></td>
<td>&gt; 120 kg: 300 mg every 12 hours</td>
<td>&gt; 48 kg: 200 mg (20 mL)</td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td>14 days</td>
<td>Once weekly for 2 doses, on days 1 and 8</td>
</tr>
</tbody>
</table>

*Must be administered over 6 hours

## Antiviral products (3)

<table>
<thead>
<tr>
<th>Treatment dose, route, duration (paediatrics) (65,66,71,73,76)</th>
<th>Tecovirimat</th>
<th>Brincidofovir</th>
<th>Cidofovir</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dose</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oral</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13–25 kg: 200 mg every 12 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25–40 kg: 400 mg every 12 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 40 kg: 600 mg every 12 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Intravenous</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3–35 kg: 6 mg/kg every 12 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35–120 kg: 200 mg every 12 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 120 kg: 300 mg every 12 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Duration</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14 days</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Antiviral products (4)

<table>
<thead>
<tr>
<th></th>
<th>Tecovirimat</th>
<th>Brincidofovir</th>
<th>Cidofovir</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dosage forms and strength</strong></td>
<td><strong>Capsules:</strong> 200 mg orange and black (65)</td>
<td><strong>Tablets:</strong> 100 mg, blue, oval shaped (73)</td>
<td><strong>Intravenous:</strong> supplied as single-use vials 75 mg/mL for intravenous infusion (76)</td>
</tr>
<tr>
<td></td>
<td><strong>Intravenous:</strong> IV injection single-dose 200 mg/20mL (71)</td>
<td><strong>Suspension:</strong> lemon-lime flavoured suspension containing 10 mg/mL (73)</td>
<td></td>
</tr>
</tbody>
</table>

### Antiviral products (5)

<table>
<thead>
<tr>
<th></th>
<th>Tecovirimat</th>
<th>Brincidofovir</th>
<th>Cidofovir</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Use in pregnancy</strong></td>
<td>No data from the use in pregnant women (65,66)</td>
<td>Not recommended</td>
<td>Pregnancy class C</td>
</tr>
<tr>
<td></td>
<td>Administration to small animals resulted in embryotoxicity, decreased embryo-fetal survival, and/or structural malformations. It is recommended to use an alternative therapy if feasible (73)</td>
<td></td>
<td>No adequate well controlled studies in pregnant women (76)</td>
</tr>
<tr>
<td><strong>Use in breastfeeding</strong></td>
<td>Unknown whether medicine or metabolites are excreted in human milk (65,66,70)</td>
<td>In studies with lactating rates, brincidofovir was detected in milk but not plasma of nursing pups (73)</td>
<td>Unknown (76)</td>
</tr>
<tr>
<td><strong>PEP dose, route, duration (adult)</strong></td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
</tr>
<tr>
<td><strong>Mechanism of action</strong></td>
<td>Inhibits activity of the orthopoxvirus VP37 protein and inhibits viral envelope formation (65,69,70,72)</td>
<td>Inhibits polymerase mediated synthesis of DNA (73)</td>
<td>Inhibits DNA polymerase (79,80)</td>
</tr>
<tr>
<td><strong>Licensed for monkeypox</strong></td>
<td>European Medicines Agency (2022) (65,70) US CDC (EA-IND protocol)</td>
<td>US CDC (EA-IND protocol)</td>
<td>US CDC (EA-IND)</td>
</tr>
</tbody>
</table>

Trifluridine (Viroptic)

- It may be considered in cases of MPXV conjunctivitis and is recommended in cases of MPXV keratitis, in consultation with an ophthalmologist.

- In patients with corneal disease, including corneal ulcer, consider topical lubricants and/or antibiotics to prevent bacterial superinfection, which can be a vision-threatening complication of corneal ulcer.

Source: CDC [Internet]. Considerations for ocular infection: treatment options. Atlanta: CDC [updated 2023 Mar 27; cited 2023 Apr 27].
Vaccinia Immune Globulin Intravenous (VIG-IV)

- Composed of antibodies from individuals inoculated with the smallpox vaccine.
- It is unknown if a person with exposure to mpox or with severe infection would benefit from VIG; if used it should be in a clinical research context with prospective data collection.
Treatment of complications

- Analgesia for anal/rectal pain, including lidocaine
- Laxatives and hydration
- Enemas for proctitis
- Vitamin A supplements
- Antibiotics
- Surgical incision and drainage for abscesses
- Urethral catheterization for urethral pain
- Antivirals
Knowledge check

1. What are the main medications used for symptomatic care and for what symptoms?
2. When is antimicrobial therapy indicated?
3. What are the main antibiotics used for adults and children?
4. Antivirals are used for what type of cases?
5. What antivirals are available?
6. What is the antiviral formulation?
Module 8.2: Complications and Severe Mpox
Learning objectives

At the end of this module participants will be able to:

• Recognize the danger signs and complications of mpox
• Differentiate between less and more common complications
• Use the clinical care pathway flow chart for clinical management
• Conduct closer monitoring and clinical care of cases with complicated mpox infection
• Offer clinical management of complications and severe forms of mpox
Complications of mpox

The course of the illness depends on overall health status.

- Bacterial infections of eye (4%) or skin (20%)
- Diarrhea and vomiting leading to dehydration (7%)
- Abscess with airways obstructions
- Bronchopneumonia
- Encephalitis, sepsis (<1%)
Danger signs

- Loss of vision
- Delirium, loss of consciousness, convulsions
- Respiratory distress
- Bleeding, inability to urinate
- Signs of sepsis
More common complications

- Painful rash
- Proctitis/tenesmus
- Secondary skin infections
- Pharyngitis
Less common complications

- Encephalitis
- Pneumonitis
- Keratitis
- Myocarditis
- Abscess
- Secondary bacterial infections
- Miscarriage
- Death
Eye infection and ulcer
Complications of mpox

A: Secondary infection of chin lesions

B: Appearance of infection shown in panel A 5 days later

C: Fissure and ulceration in the perianal region surrounded by papules and umbilicated lesions
Mpox clinical care pathway – decision-making algorithm to be used at any health care point
Vital signs and clinical features that need to be monitored

<table>
<thead>
<tr>
<th>Vital signs and pain assessment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature, heart rate, blood pressure, respiratory rate, peripheral oxygen saturation, level of consciousness using the alert, voice, pain, unresponsive scale (AVPU), point of care glucose, and body weight and height to calculate BMI and children’s mid-upper arm circumference (MUAC)</td>
<td></td>
</tr>
<tr>
<td>Pain scale</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General condition</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the patient able to eat and drink without support?</td>
<td></td>
</tr>
<tr>
<td>Is the patient able to sit and walk independently?</td>
<td></td>
</tr>
<tr>
<td>Has the patient had recent weight loss since onset of symptoms?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rash characterization</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage of rash: macules, papules, vesicles, pustules, crusted over, exfoliation</td>
<td></td>
</tr>
<tr>
<td>Location of the rash (face, arms, torso, genitalia, legs, mucosa)</td>
<td></td>
</tr>
<tr>
<td>Number of lesions (28,94):</td>
<td></td>
</tr>
<tr>
<td>Mild (&lt; 25 skin lesions)</td>
<td></td>
</tr>
<tr>
<td>Moderate (25–99 skin lesions)</td>
<td></td>
</tr>
<tr>
<td>Severe (100–250 skin lesions)</td>
<td></td>
</tr>
<tr>
<td>Very severe (&gt; 250 skin lesions)</td>
<td></td>
</tr>
<tr>
<td>If exfoliation present: % body affected (&gt; 10% is concerning)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Presence of bacterial secondary infection</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cellulitis, abscess, pyomyositis, necrotizing soft tissue infection</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neurologic status</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>AVPU, seizures, coma</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Volume status</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of dehydration: mild, moderate, or severe (see Table 9.2 for more details)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Signs of perfusion</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse rate, strength, capillary refill</td>
<td></td>
</tr>
<tr>
<td>Urine output (&gt; 0.5 mL/kg/hr = good in adults; 1.0 mL/kg/hr in children)</td>
<td></td>
</tr>
<tr>
<td>Mottling of skin</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Respiratory system</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory rate, SpO₂, signs of respiratory distress</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nutritional assessment</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in appetite, weight loss, body weight, height, calculation of BMI, MUAC in children</td>
<td></td>
</tr>
<tr>
<td>Signs of malnutrition — use standardized tool (e.g. Malnutrition Universal Screening Tool)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Laboratory tests</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Na, K, HCO₃, BUN, creatinine, AST, ALT, glucose, white blood count, Hg, platelet, PT/INR, CI, calcium, albumin</td>
<td></td>
</tr>
</tbody>
</table>

### Classification of dehydration

<table>
<thead>
<tr>
<th></th>
<th>Mild (3–5% volume depletion)</th>
<th>Moderate (6–9% volume depletion)</th>
<th>Severe (&gt; 10% volume depletion)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pulse</strong></td>
<td>Normal</td>
<td>Rapid</td>
<td>Rapid and weak or thready</td>
</tr>
<tr>
<td><strong>Systolic blood pressure</strong></td>
<td>Normal</td>
<td>Normal to low</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Buccal mucosa</strong></td>
<td>Slightly dry</td>
<td>Dry</td>
<td>Parched</td>
</tr>
<tr>
<td><strong>Skin turgor</strong></td>
<td>Normal</td>
<td>—</td>
<td>Reduced</td>
</tr>
<tr>
<td><strong>Urine output</strong></td>
<td>Normal</td>
<td>At or below</td>
<td>Markedly reduced to anuric</td>
</tr>
<tr>
<td></td>
<td>Adult (&gt; 0.5 mL/kg/hr)</td>
<td>Adult (&lt; 0.5 mL/kg/hr)</td>
<td>(&lt; 0.5 mL/kg/hr x 3 hours)</td>
</tr>
<tr>
<td></td>
<td>Child (&gt; 1 mL/kg/hr)</td>
<td>Child (&lt; 1 mL/kg/hr) x 3 hours</td>
<td></td>
</tr>
<tr>
<td><strong>Respiratory rate</strong></td>
<td>No change</td>
<td>Increased</td>
<td>Increased</td>
</tr>
<tr>
<td><strong>Ins and outs</strong></td>
<td>Outs &gt; ins</td>
<td>Outs &gt; ins</td>
<td>Outs &gt;&gt; ins</td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td>Increased thirst</td>
<td>Increased thirst</td>
<td>In infant, depressed fontanelle, cold skin</td>
</tr>
</tbody>
</table>

## Clinical management of complications and severe forms of mpox (1)

<table>
<thead>
<tr>
<th>Complication</th>
<th>Treatment</th>
</tr>
</thead>
</table>
| **Skin exfoliation**                | • Patients with heavy rash burden may develop exfoliation (in severe cases similar to partial thickness burns), that can be significant and lead to dehydration and protein loss.  
• Estimate % skin affected and consider treatment as used for burns.  
• Minimize insensible fluid loss and promote skin healing.  
• Ensure adequate hydration and nutrition.  
• Consult with appropriate consultants such as surgeon, dermatologist, and/or wound care specialists.  
• Bedside or surgical debridement as needed.  
• Skin grafting in rare and severe cases. |
| **Necrotizing soft tissue infection**| • This is a life-threatening condition of the deep soft tissue that affects the muscle fascia causing necrosis, tissue destruction, and systemic toxicity.  
• Suspect if patient develops oedema, crepitus, malodorous discharge, or pain out of proportion to appearance of infection.  
• Though can be caused by MPX virus, consider bacterial pathogens as well.  
• Start broad spectrum antibiotics to cover Staphylococcus sp. and Streptococcus sp.  
Consult surgeon for this surgical emergency. |

## Clinical management of complications and severe forms of mpox (2)

<table>
<thead>
<tr>
<th>Complication</th>
<th>Treatment</th>
</tr>
</thead>
</table>
| Pyomyositis                   | • This occurs when pus develops within the muscle and should be suspected when the patient has muscle tenderness.  
• Though this can be caused by MPX virus, it may also commonly be caused by skin flora such as Staphylococcus sp. or Streptococcus sp. Ultrasound can assist in diagnosis.  
• Collect blood cultures, start broad spectrum antibiotics, and proceed to surgical incision and drainage.  
• Send sample for microbiology and culture to support antimicrobial therapy selection.                                                                                                               |
| Cervical adenopathy           | • Can occur in up to 85.65% of cases with lymphadenopathy.  
• When large cervical adenopathy is combined with multiple oropharyngeal lesions patients may be at risk for complications such as respiratory compromise and retropharyngeal abscesses. Patients are also at risk for dehydration due to decreased food and water intake.  
• Consultation with appropriate specialists, such as surgeon, an anesthesiologist, and infectious disease clinicians. Under their care, in severe cases, steroids may be used.                                          |

Clinical management of complications and severe forms of mpox (3)

<table>
<thead>
<tr>
<th>Complication</th>
<th>Treatment</th>
</tr>
</thead>
</table>
| Ocular lesions     | • One of the most significant sequelae of mpox is corneal scarring and loss of vision.  
                        • Patients may present with nonspecific ocular symptoms such as conjunctivitis.  
                        • Eye care with ophthalmologist evaluation.  
                        • Ophthalmic antibiotics/antivirals if indicated for co-infection.  
                        • Vitamin A supplementation, especially for malnourished children.  
                        • Good eye care that includes eye lubrication and saline-soaked protective eye pads.  
                        • Avoid steroid ointments (may prolong presence of mpox in ocular tissue).  
                        • Trifluridine eye drops (sometimes used for other orthopoxviruses or herpetic eye infections) may be considered to hasten resolution of symptoms and prevent long-term damage from scarring, where available. |

Clinical management of complications and severe forms of mpox (4)

<table>
<thead>
<tr>
<th>Complication</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>• Manage according to the WHO <em>Clinical Care for Severe Acute Respiratory Infection Toolkit</em>. See also next slide for information specific to bronchopneumonia.</td>
</tr>
<tr>
<td>Acute respiratory distress syndrome (ARDS)</td>
<td>• Oxygen, non-invasive ventilation, mechanical ventilation</td>
</tr>
<tr>
<td></td>
<td>• Manage according to the WHO <em>Clinical Care for Severe Acute Respiratory Infection Toolkit</em>.</td>
</tr>
<tr>
<td>Severe dehydration</td>
<td>• Severe dehydration and hypovolemic shock can be seen in patients with mpox due to intravascular volume loss due to extensive rash and/or gastrointestinal losses due to diarrhea and vomiting accompanied by poor oral intake.</td>
</tr>
<tr>
<td></td>
<td>• Treatment for severe dehydration is resuscitation with intravenous or intraosseous (IV/IO) fluid, given as one or multiple boluses with close monitoring of fluid responsiveness. Adequate IV fluid intake refers to the volume that will correct signs of hypovolemia. See <em>Pocket Book of Hospital Care for Children</em>.</td>
</tr>
</tbody>
</table>

Bronchopneumonia

- Occurs in up to 1 in 10 cases
- Tissue damage can occur throughout the lungs or consolidate in just one area, with or without a bacterial infection

Supportive treatment
- Pulmonary hygiene and physiotherapy
- Supplementary oxygen
- Empirical treatment with antibiotics
- Bronchodilator medications
- Ventilation support
**Clinical management of complications and severe forms of mpox (5)**

<table>
<thead>
<tr>
<th>Complication</th>
<th>Treatment</th>
</tr>
</thead>
</table>
| Sepsis and septic shock       | • Sepsis and septic shock differ from severe dehydration as they result from an immune response to an infection. Management of sepsis requires early identification; management of infection and supportive care, including fluid resuscitation to maintain organ perfusion to reduce and prevent further organ injury; and may also require vasopressors as well as control of infection.  
  • See the WHO *Clinical Care for Severe Acute Respiratory Infection Toolkit* for more information about sepsis.  
| Encephalitis                  | • Consider lumbar puncture for cerebrospinal fluid (CSF) evaluation to evaluate for other treatable conditions.  
  • Monitor and assess airway, breathing, circulation, disability (ABCD), and give emergency treatments.  
  • Monitor neurological status (AVPU).  
  • Control seizures with anti-epileptics.  
  • Give antibiotics/antivirals if indicated for co-infections.  
### Clinical management of complications and severe forms of mpox (6)

<table>
<thead>
<tr>
<th>Complication</th>
<th>Treatment</th>
</tr>
</thead>
</table>
| **Nutritional considerations**         | • Assess nutritional status of all patients. If food intake is limited due to weakness, patient should be assisted with feeding by a health care provider. If patient is unable to tolerate oral nutrition, consider enteral nutrition.  
• Placement of a nasogastric tube by an experienced provider could be considered along with nasogastric feeding. Always ensure proper placement of nasogastric tube before administering feeds to avoid risk of aspiration.  
• Take special care with patients at risk for re-feeding (critically unwell, low BMI, reduced food intake for > 5 days, history of alcohol abuse, or receiving the following drugs: insulin, chemotherapy, antacids, or diuretics) and start enteral feeding slowly with close monitoring.  
• Patients with reduced levels of consciousness are at risk for aspiration and should not be forced to eat. If severe malnutrition is present, refer to WHO published guideline. |


Knowledge check

1. What are the more common complications?
2. What are the less common complications?
3. What does WHO recommend for patients at high risk for complications and those with severe or complicated mpox?
4. What is the triage and clinical assessment to identify high risk and severe cases?
5. What is the clinical management of necrotizing soft tissue infection?
6. What is the clinical management of cervical adenopathy?
7. What is the clinical management of ocular lesions?
8. How does pneumonia present; and what is the supportive treatment?
Module 9: Prevention
Learning objectives

At the end of this module participants will be able to:

• Present the vaccination strategy

• Describe how to offer primary preventive vaccination to eligible clients

• Describe how to offer post-exposure preventive vaccination to eligible clients

• Describe how to offer correct vaccination to special population groups
Vaccination strategy (1)

Vaccination programs should be accompanied by

• A strong **information campaign** to inform vaccinees that:
  – It takes approximately 2 weeks from finalizing a complete series of vaccination (1 or 2 doses depending on product) for immunity to develop
  – The level of protection conferred by vaccination is currently unknown

• Robust **pharmacovigilance**
Vaccination strategy (2)

- Mass vaccination is not required nor recommended for mpox at this time.

- Public health measures: use of personal protective equipment (PPE) for caregivers, good hand hygiene, and isolation and supportive care of case patients for the duration of the infectious period.

- Primary preventive vaccines and post-exposure preventive vaccines are recommended for select groups.

- Broader use of vaccines for persons at risk may be warranted if justified by the evidence.
Primary preventive (pre-exposure) vaccination (PPV)

For individuals at **high-risk of exposure**:

- Individuals (but not limited to) those who self-identify as gay or bisexual, or other men who have sex with men (MSM) or other individuals with multiple sexual partners

- Health workers at high risk of exposure, laboratory personnel working with orthopoxviruses, clinical laboratory personnel performing diagnostic testing for mpox, outbreak response team members (as designated by national public health authorities)
Post-exposure preventive vaccination (PEPV)

- For **contacts** of cases, PEPV is recommended **within four days** of first exposure (and up to 14 days in the absence of symptoms), to prevent onset of disease or mitigate disease severity.

- **Children, pregnant women and immunocompromised** persons may be at risk of developing more severe disease. Therefore, *in case of limited vaccine supply*, these populations, if exposed, should be offered vaccination in **priority**

- Persons who have had a **two-dose** primary preventive (pre-exposure) vaccination and who become exposed (contacts) **should not receive PEPV** but should monitor for any symptoms up to 21 days after the last exposure.

- Persons who have contact with a monkeypox case **after their first dose and before their second dose**, should receive their second dose as scheduled.
The following vaccines are currently available

<table>
<thead>
<tr>
<th>Non-replicating vaccine</th>
<th>Minimally replicating vaccines</th>
<th>Replicating vaccinia-based vaccines</th>
</tr>
</thead>
<tbody>
<tr>
<td>• MVA-BN</td>
<td>• LC16</td>
<td>• ACAM2000</td>
</tr>
</tbody>
</table>
Vaccination for special populations

• For healthy adults, replicating, non-replicating or minimally replicating vaccines are recommended.

• For individuals for whom replicating or minimally replicating vaccine is contraindicated (i.e., pregnant and breastfeeding women; severe immune deficiency; PLHIV with CD4 cell count of <200 cells µl; patients using immunosuppression therapies or atopic dermatitis), the non-replicating should be used.

• For children, where consideration is given to vaccination for PEPV, non-replicating or minimally replicating vaccines should be used.

• Older adults (>50 years), vaccinated against smallpox vaccines in the context of global smallpox eradication (before 1980), and who are eligible for PPV or PEPV, should be vaccinated irrespective of previous smallpox vaccination and/or visible smallpox scar.
Vaccines’ protection

• The level and duration of protection is currently unknown.

• It takes approximately 2 weeks from time of finalizing a complete series (2 doses) of vaccination with non-replicating vaccines for peak immunity to develop.

• For the minimally and non-replicating vaccines peak immunity is expected to occur 4 weeks after vaccination (1 dose).
Smallpox and mpox vaccine options (19 August 2022)

<table>
<thead>
<tr>
<th>Vaccine (Manufacturer)</th>
<th>Licensed for smallpox (country, type, date)</th>
<th>Licensed for monkeypox (country, type, date)</th>
<th>Considerations</th>
<th>Presentation</th>
<th>Injection materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACAM2000 (Emergent BioSolutions) Second generation</td>
<td>Multiple countries - Approved</td>
<td>USA - EIND for PEPV</td>
<td>Single dose: Approved for use in adults aged 18 – 64 years of age.</td>
<td>Freeze-dried Multidose vials</td>
<td>Bifurcated needle</td>
</tr>
</tbody>
</table>

EU: European Union (European Medicines Agency)  
USA: United States of America (Food and Drug Administration)  
Canada: Health Canada  
MA: Market authorization  
EIND: Emergency Investigational New Drug program of the U.S. Food and Drug Administration  
PEPV: Post-exposure preventive vaccination  
SEP: Smallpox eradication program
Vaccination in the case of limited supply

Prioritized for receipt of vaccine following analysis of risks and benefits on a case-by-case basis

• Close contacts of monkeypox cases at risk of developing severe disease, such as
  – children
  – pregnant women
  – immunocompromised persons, including those on immunosuppressive therapy or living with poorly controlled HIV
Knowledge check

1. What are the key recommendations for cases and contacts to prevent transmission?

2. Is mass vaccination recommended?

3. For whom are primary preventive vaccines recommended?

4. For whom are post-exposure preventive vaccines recommended?

5. How are current vaccines for mpox categorized?

6. What are the names of the currently recommended vaccines?

7. What type of vaccines are recommended for healthy adults, PBFW, and children?
Module 10: Special Considerations
Learning objectives

At the end of this module participants will be able to:

- Account for and properly manage people living with HIV who are infected with mpox
- Account for and properly manage pregnant women who are infected with mpox
- Account for and properly manage children who are infected with mpox
Mpxo and key populations

- Anyone can get and spread mpxo (regardless of sexual orientation or gender identity).
- However, current outbreak is primarily among men who identify as gay or bisexual, and other men who have sex with men.
- Current cases have atypical features.
- May be confused with STIs or other conditions (e.g., herpes and syphilis), however the diagnosis of an STI does not exclude mpxo as a concurrent infection may be present, particularly anogenital lesions.
- The key population community must not be stigmatized and must be well educated about how to protect themselves, including ensuring rapid access to vaccination.
Mpxox and HIV (1)

- About half of the people with mpxox whose status is known are HIV positive.
- HIV status is not linked with mpxox severity.
- Among HIV-negative men with mpxox, a majority were on PrEP.
Mpox and HIV (2)

Data from *New England Journal of Medicine*:

- 528 mpox infections across North America, Mexico, Argentina, Europe, Australia, and Israel
- 98% of people with mpox infection were gay or bisexual men
- 41% were PLHIV with median CD4 680 cells per cubic millimeter of blood
- 96% of those were on ART and 95% had a viral load <50 copies/mL
- Three new cases of HIV were identified in people who were diagnosed with mpox
- 57% of the non-PLHIV in this study were on pre-exposure prophylaxis (PrEP)
- No deaths

Mpox and HIV (3)

• Whether PLHIV are at greater risk of acquiring mpox or experiencing more severe cases has not been confirmed
• Non-virally suppressed PLHIV may be at increased risk
• PLHIV with well-controlled HIV and a high CD4 do not have more severe mpox illness
• Mpox in PLHIV may present as an atypical rash
• PLHIV who contract mpox should begin or re-initiate ART
Mpox and HIV (4)

- Most of the commonly used HIV medications are considered safe for people on mpox treatment.
- Persons with and without HIV infection should follow the same guidance to protect themselves from mpox.
- Some people have been concurrently diagnosed with mpox, HIV, and other STIs. Therefore, testing for these infections should be offered when mpox is suspected or diagnosed.
- People taking PrEP for HIV prevention should also continue.
Mpx in women during and after pregnancy

- Pregnant or recently pregnant women with mild or uncomplicated mpx may not require acute care in hospital.

- Those with severe or complicated disease should be admitted to improve maternal and fetal survival.

- Pregnant and recently pregnant women with mpx should have access to woman-centered, respectful, skilled care, including midwifery, obstetric, gynecologic, fetal medicine and neonatal care, mental health and psychosocial support, with readiness to care for maternal and neonatal complications.

- Induction of labor and caesarean section should only be undertaken when medically justified and based on maternal and fetal condition.

- Pregnant and recently pregnant women who recovered from mpx should receive routine antenatal, postpartum, or abortion care, as appropriate.

- Recommendation to stop breastfeeding for a mother with mpx should consider the general physical status of the mother and the severity of disease.
Mpopx in young children

- Newborn infants of mothers with mpopx should be monitored closely for evidence of potential congenital or perinatal exposure or infection.

- Mothers and infants or young children can also be exposed through close contact.

- Children exposed to mpopx should be fully vaccinated for their age according to the routine national immunization schedule and have their vaccinations up to date, when possible.
Knowledge check

1. Are non-virally suppressed PLHIV at increased risk?
2. Can mpox in PLHIV present as an atypical rash?
3. Should PLHIV who contract mpox begin or re-initiate ART?
4. Are most of the HIV medications safe for people on mpox treatment?
5. Should people taking PrEP continue it?
6. Is induced labor or caesarean section recommended for pregnant women with mpox infection?
7. Should a mother with mpox stop breastfeeding?
8. Could newborn infants of mothers with mpox have congenital or perinatal exposure or infection?
9. What should mpox-exposed children receive?
Q&A
Module 11: Infection Prevention and Control (IPC)
Learning objectives

At the end of this module participants will be able to describe how to:

• Comply with infection risk hygiene and cough etiquette
• Implement the steps for injection and medication safety
• Implement cleaning and disinfection measures
• Implement appropriate waste management
• Correctly isolate mpox cases
• Counsel cases and contacts on infection control and prevention measures and home isolation
Standard precaution

- Risk assessment
- Hand hygiene
- Respiratory hygiene and cough etiquette
- Personal protective equipment (PPE)
- Injection and medication safety
- Cleaning and disinfection procedures
- Waste management
Respiratory hygiene and cough etiquette

- Ask patients to cover mouth and nose with a mask, tissue, or elbow when coughing or sneezing.
- Dispose of used tissues and masks in waste container.
- Clean hands after contact with respiratory secretions.
- Wear a medical mask.
- Stay at least 1 meter from the patient.
Personal protective equipment (PPE)

- Disposable gown
- Face shield or goggles
- Disposable mask
- Closed footwear
- Disposable gloves
Injection and medication safety

7 STEPS for safe injection

1. A clean workplace
2. Clean hands and wear gloves
3. Use sterile injection equipment
4. Use each vial once for one patient
5. Properly disinfect skin before injection
6. Ensure sharps disposal
7. Ensure proper waste management

OpenWHO.org
Cleaning and disinfection

Cleaning

Disinfection

Credit: WHO / Tom Plotzak

Retrieved from: 123rf
Waste management
Isolation of patients

To minimize risk of transmission

Why?

With the use of **physical barriers** + keeping a **distance of at least 1 m** at all times

How?

until new layer of healthy skin has formed

How long?
Isolation in a health facility
Infection prevention and control during health care

- Isolation room or space
- Handwashing
- Gown, mask, goggles and gloves
- Cleaning and disinfection
- Waste management
- Safe handling of linens
Five moments of hand hygiene

Before touching patient

After touching patient

Before clean or aseptic procedure

After risk of exposure to body fluids

After touching patient surroundings

OpenWHO.org
# Recommendations for cases and contacts

<table>
<thead>
<tr>
<th>Recommendations</th>
<th>Symptomatic contacts</th>
<th>Asymptomatic contacts</th>
<th>Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regularly practice hand hygiene and respiratory etiquette</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Do not donate blood, cells, tissue, organs, breast milk, or semen</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Continue routine daily activities such as going to work and attending school (i.e., no quarantine is necessary)</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Halt routine daily activities such as going to work and attending school (i.e., quarantine is necessary). Pre-school children: not attend day care, nursery, or other group settings during the contact follow-up period</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Avoid undertaking any travel, including international, until they are determined as no longer constituting a public health risk</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Avoid close direct contacts with animals (for 21 days after the last exposure*)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Abstain from sexual activities (for 21 days after the last exposure*)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Avoid contacts with immunocompromised people, newborn, infants, children, and pregnant women (for 21 days after the last exposure*)</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

*applies to contacts only
<table>
<thead>
<tr>
<th>Limit contact with other household members; sleep in separate room.</th>
<th>Avoid contact with objects and materials that a person with mpox has used.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not touch the rash or scabs of a person with mpox.</td>
<td>Do not share bedding, towels, wash cloths, toothbrushes, razors.</td>
</tr>
<tr>
<td>Avoid kissing, hugging, cuddling, intimate or sexual contacts.</td>
<td>Do not share food, drinks, cups, utensils, dishes.</td>
</tr>
<tr>
<td>Wash your hands often with soap and water or use an alcohol-based hand sanitizer, especially before eating or touching your face and after you use the bathroom.</td>
<td>Avoid visitors at home.</td>
</tr>
<tr>
<td>Avoid close contacts with newborns, infants, young children, pregnant women, those with impaired immuno-system.</td>
<td>Leave the house only if emergency; postpone non-essential medical or dental care.</td>
</tr>
</tbody>
</table>
Knowledge check

1. What are the respiratory hygiene and cough etiquette?
2. What PPE is required?
3. How should a patient be isolated?
4. What are the five moments of hand hygiene?
5. What are the key recommendations for mpox cases and contacts?
6. What are the measures for home isolation?
Module 12: Communication and Literacy
Learning objectives

At the end of this module participants will be able to:

• Refer to the general communication considerations and challenges when offering education and counseling about mpox infection

• Use the appropriate informational material when offering education and counseling about mpox infection
General communication considerations

- Awareness raising among the general population is needed.
- Focus on routes of transmission (close contact, e.g., sex) without emphasizing *who* is most affected.
- Risk communication must be nonstigmatizing (toward affected populations and mpox) and actionable.
- Trusted communicators and channels will be key to acceptance of preventive measures.
- Media engagement will be critical to combating myths and misconceptions and avoiding stigmatization.
Risk communication challenges

• Most media coverage is focused on *WHO* is affected by mpox not *HOW* it is transmitted

• Myths and misinformation are spreading (e.g., mpox linked to COVID-19 vaccination)

• New disease (for most) that is being defined by early media reports and myths and misinformation

• Stigmatization has slowed risk communication response in many countries
Guidelines for reducing stigma and discrimination

Communication to general population

- Emphasize mpox is not a disease linked to sexual orientation.
- Repeat accurate information (over and over) to combat emerging rumors; stay “top of mind” for audiences, especially in social media feeds.
- Stress vaccination is not the only preventive measure – diagnostic testing for contact-tracing and other behavioral changes (e.g., infection prevention and control, limit sexual partners) are also important.
- Train media to provide accurate information and address stigmatizing language.
Key approaches for affected populations

- Work with community representatives to design and adapt messaging and activities with specific audiences.
- Use community-led interventions deployed through trusted networks and platforms.
- Integrate mpox prevention and social and behavior change (SBC) communication into familiar sexual health programs (e.g., HIV prevention, HIV/STI testing, etc.).
- Consider “place-based” interventions (e.g., bars, clubs, saunas, etc.).
- Train providers, contact tracers, and others to help them identify stigmatizing behavior (and avoid it).
Considerations for stakeholders

- Guidance related to messaging for men who have sex with men, other vulnerable populations, and health care providers
- Training and capacity building for health care providers
- Adapt QuickRes for tracking results of demand-creation activities and linkage to services for clients
- Support countries to build teams to conduct case and contact investigations
Considerations for program managers

- Transmissions
- Signs and symptoms
- Key populations’ risk
- Mpox and HIV
- Treatment and vaccine
- Prevention
Considerations for community-based organizations

- What is mpxox
- Who can get mpxox
- How does mpxox spread
- What are the symptoms of mpxox
- How to protect yourself and others
Considerations for providers

- What is mpx
- How mpx spreads
- What are the symptoms of mpx
- Complications
- Differential diagnosis
- When to suspect a case of mpx
- How to educate the community
- What to do when encountering a suspect case
What community members need to know

What sex workers need to know

• Know the symptoms and check yourself regularly; ask sexual partners to do the same.

• Reduce your risk by reducing your number of sexual partners, waiting for a while before having sex with any new partners, or taking a break from sex.

• Have open, nonjudgmental conversations. Swap contact details with new sexual partners and agree to let each other know if you develop symptoms.

• Condoms will prevent some STIs. They may also reduce your risk of exposure to mpxox and could help reduce painful symptoms should you become infected, but they will not prevent you from becoming infected through close physical contact.

• If someone you know is diagnosed with or has suspected mpxox, avoid close contact with them, including sexual contact.

• If you develop symptoms, seek health advice. You will be offered testing. Self-isolate while you wait for a test.

• If someone you know is diagnosed with or has suspected mpxox, avoid close contact with them. Clean and disinfect environments that could have been contaminated with the virus from someone who is infectious.

• Stay informed about mpxox in your area.

• Get vaccinated if it is available to you. If you've had a vaccine, be aware that full protection can take some weeks – avoiding sex during this period is a good idea.

• Combat misinformation by sharing only reliable, evidence-based, and non-stigmatizing information from trustworthy sources.

Source: WHO [Internet]. Public health advice on protecting yourself and others from mpxox (monkeypox); AND Public advice for men who have sex with men on preventing mpxox (monkeypox). Geneva: WHO [updated 2022 Sep 2; cited 2023 Apr 27].
What individuals with mpox need to know

Recovering from monkeypox at home

If you think you might have monkeypox, self-isolate and contact a health worker immediately.

How to take care of yourself if recovering at home:

- Keep hydrated; eat well and get enough sleep. Use medication for pain and fever if needed.
- Take care of your rash:
  - Don't scratch.
  - Clean your hands before and after touching.
  - Keep your rash dry and uncovered.
  - Rinse lesions in your mouth with salt water.
  - Take warm baths with baking soda in water.
  - Use peroxide to manage the discharge of lesions, if needed.
- Take care of your mental health:
  - If feeling sad, grieving, or struggling with anxiety or depression, seek support from your family or loved ones.
  - Exercise if you feel well enough and do so as safely as possible.

How to protect others if you are isolating at home:

- Avoid contact with anyone until all of your lesions have crusted over, fallen off, and a thick layer of skin has formed.
- Ask friends or family to deliver supplies.

If you live with other people:

- Store supplies in a separate room.
- Wash hands frequently with soap and water.
- Avoid physical contact and stigmatisation.
- Wear a mask when in close contact with someone else.
- Avoid shared meals and eating utensils.
- Clean and disinfect frequently touched surfaces and objects with soap and water.
- Open windows.

If you can't avoid being in the same room as someone else:

- Use separate eating utensils.
- Avoid physical contact.
- Wash hands frequently with soap and water.
- Wear protective masks.
- Avoid close contact.

Source: WHO [Internet]. Recovering from monkeypox at home. Geneva: WHO [updated 2022 Sep 2; cited 2023 Apr 27].
Knowledge check

1. What are the communication considerations?
2. What are the risk communication challenges?
3. What are the key principles about communicating with the general population?
4. What are the key communication approaches for affected populations?
Module 13: Surveillance, Monitoring, and Evaluation
Learning objectives

At the end of this module participants will be able to:

• Describe the goal and objectives of surveillance
• List and define the WHO and PEPFAR indicators
• Use the WHO monitoring and evaluation (M&E) tools
• Describe how indicators can be captured on QuickRes
Surveillance

• The overall goal of surveillance, case investigation, and contact tracing is to stop human-to-human transmission and to control the outbreak.

• The key **objectives** of surveillance and case investigation for mpox in the current context are to:
  1. Provide optimal clinical care
  2. Isolate cases to prevent further transmission; identify, manage, and follow-up contacts to recognize early signs of infection
  3. Identify risk groups for infection and for severe disease
  4. Protect frontline providers
  5. Tailor effective control and prevention measures
Probability of successful outbreak control through tracing cases among the contacts

Simulation results of successful outbreak control over time, up to 12 weeks, where cases among the contacts are assumed to be traced with the same success rate.

Probability of unsuccessful outbreak control through tracing cases among the contacts

Simulation results of unsuccessful outbreak control over time, up to 12 weeks, for which contact tracing of contacts occurs at different success rates.

WHO indicators

- Proportion of suspect, probable, and confirmed cases with identified contacts
- Number of contacts reported per suspect, probable, and confirmed case
- Proportion of identified contacts with complete follow-up information
- Proportion of cases coming from a contact tracing list
- Proportion of high- and medium-risk contacts who received post-exposure prophylaxis
Mpx death

• Death resulting from a clinically compatible illness in a probable or confirmed mpx case, unless there is a clear alternative cause of death that cannot be related to mpx infection (e.g., trauma).

• Diagnosis for mpx can also be confirmed after the death has occurred if there is sufficient lesion material to perform a PCR testing.

• There should be no period of complete recovery between the illness and death.
PEPFAR-USAID indicators

- **MPX_RISK_REDUCTION**: Number of risk-reduction interventions implemented to minimize the spread of MPXV.
- **MPX_LAB_SUPPORT**: Number of USAID-supported laboratories able to test for MPXV.
- **MPX_CASE**: Number of MPV cases detected through USAID-supported activities.
- **MPX_FAC_SUPPORT**: Number of facilities receiving USAID support to strengthen infection prevention and control (IPC) practices.
- **MPX_TRAINED**: Number of people trained to prevent, detect, and respond to the MPXV outbreak.
- **MPX_RISK_COMM**: Number of individuals reached with risk communications messaging about MPXV.
<table>
<thead>
<tr>
<th>WHO Indicator</th>
<th>QuickRes (QR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proportion of suspect, probable, and confirmed cases with identified contacts</td>
<td>We can add a disaggregation for records added to QR to have the case screening status as (1) suspect, (2) probable, or (3) confirmed; (however the definitions for this would not be presented in QR, that would be based on separate guidance and SOPs).</td>
</tr>
<tr>
<td>Number of contacts reported per suspect, probable, and confirmed case</td>
<td>The suspect, probable, and confirmed cases recorded on QR are linked to the client referral tool where we can track in a separate database the number of referrals each of those cases made and if “MPX” was selected from the list of conditions on the client referral tool for each of those contacts.</td>
</tr>
<tr>
<td>Proportion of identified contacts with complete follow-up information</td>
<td>For each contact referred on the client referral tool, QR will automatically book an incomplete appt with TBD appt date, time, provider, blank client name, but it will include “referral - MPX” under the services requested on the appt record and the phone number of the contact. At this stage it looks like a pending referral on the system, and then someone on the program side (contact investigator) should call the phone number, go into QR, and add the client name, other demographic info, and can then assign the record to a specific provider with date and time. When the record is saved, it will appear as an appt with a specific provider who can call the client and take them through the MPX screening and note the results on their same file as (0) not-suspect, (1) suspect, (2) probable, or (3) confirmed. This screening may also be done via an in-person appt (the provider/contact tracer SOPs would determine how that should be done).</td>
</tr>
<tr>
<td>Proportion of cases coming from a contact tracing list</td>
<td>As soon as the appt for the contact (which was auto-booked using the above-described method) has their MPX status changed to (2) probable or (3) confirmed, then we can track the number of cases that sourced as a contact.</td>
</tr>
<tr>
<td>Proportion of high- and medium-risk contacts who received post-exposure prophylaxis</td>
<td>At the contact stage, QR itself would not capture the risk of the contact/transmission. Right now, we only capture “MPX” from a list of services when the original case makes that referral and responds to the question: “If you potentially exposed this person to an infection, select the screening services we should recommend to them.” That said, if the client referral tool is managed by a program staff or health worker, they can use an SOP to ensure they only ever enter medium- and high-risk contacts on the client referral tool. Then, as those referrals are made, and appts booked for the contact, then on the contact’s appt, we can track the provision of post-exposure prophylaxis.</td>
</tr>
<tr>
<td>Monkeypox death</td>
<td>All MPX cases appear on QR as an appt where the MPX clinic action button is set to status: (2) probable, or (3) confirmed, then we can add that record to a new case management cohort called MPX. That means a case manager can be assigned to follow up with the client over time until they can close the case as recovered or died (or other status). However, there is no indication of the cause of death – only to mean that they died while on MPX case management and before they recovered, and the case is closed and does not require any additional follow-up.</td>
</tr>
<tr>
<td>PEPFAR-USAID Indicator</td>
<td>QuickRes</td>
</tr>
<tr>
<td>------------------------</td>
<td>----------</td>
</tr>
<tr>
<td>MPX_RISK_REDUCTION</td>
<td>QuickRes is not well suited to capture these kinds of # of activities type of indicators.</td>
</tr>
<tr>
<td>MPX_LAB_SUPPORT</td>
<td>It is possible to capture this. We would add all the USAID-supported labs to QuickRes, assign those labs an org unit that specifies if they are USAID or not USAID-supported. Then we can add a service offering for those labs on QuickRes that says MPX testing, we could make this unique from mpox screening as a service.</td>
</tr>
<tr>
<td>MPX_CASE</td>
<td>This can be captured on QuickRes, it is addressed above.</td>
</tr>
<tr>
<td>MPX_FAC_SUPPORT</td>
<td>QuickRes is not well suited to capture these kinds of # of activities type of indicators.</td>
</tr>
<tr>
<td>MPX_TRAINED</td>
<td>QuickRes is not well suited to capture these kinds of # of activities type of indicators.</td>
</tr>
<tr>
<td>MPX_RISK_COMM</td>
<td>Virtual communication platforms themselves can be used to track the number of “profiles” exposed to mpox risk communication messages, maybe not perfectly representing individuals. For instance, reach on Facebook ads or other social media platforms. Also, it is quite challenging or impossible to deduplicate reach between platforms so you could present disaggregated results by platform with an asterisk that the totals between each platform are likely to overlap slightly. QuickRes itself may be able to be used for tracking reach of individual risk communication; if, for instance, your risk communication is provided by a booked appt on QuickRes for a virtual or in-person consult on mpox with program staff, outreach worker, case manager, or provider.</td>
</tr>
</tbody>
</table>
Go.Data platform: In-depth case investigation form

- Global Outbreak Alert and Response Network (GOARN) Go.data software is designed to facilitate rapid data entry, offer better visualization of chains of transmission, and runs in stand-alone and connected modes, enabling more flexible ways of working and improved data sharing.

- It allows for case and contact data collection and visualization of disease transmission that can help responders choose the right interventions to stop a disease from spreading.

- Available from: Go.Data | GOARN (who.int)
Contacts listing form

Contacts monitoring form

Example from South Africa

Case report form (WHO)

• Probable and confirmed cases of mpox should be reported as early as possible to WHO through national IHR focal points (NFPs) under Article 6 of the International Health Regulations (IHR 2005).

• The WHO Global Clinical Platform for Mpox (Monkeypox)
Monkeypox Case Investigation Form (CIF) and Case Reporting Form (CRF)

- WHO has updated the monkeypox case investigation form (CIF) and case reporting form (CRF) to include the latest information on symptomatology and epidemiological parameters, and to align with the recommendations of the latest Monkeypox Emergency Committee meeting.

- The CIF has been designed to conduct in-depth epidemiological investigation of suspected, probable, and confirmed cases of mpox. It allows collection of information prospectively or retrospectively for both cases and their contacts.

- The full form is meant to serve as a tool for in-country use, and the data are not required to be reported to WHO.

Source: WHO. *Mpox (monkeypox) case investigation form (CIF) and minimum dataset case reporting form (CRF)*. Geneva: WHO; 2023.
**Line list and case investigation form (WHO)**

<table>
<thead>
<tr>
<th>Reporting County or State:</th>
<th>Date of Initial Report:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case ID (IDSR / Epid No):</td>
<td>Unique identifier assigned to each case-patient</td>
</tr>
<tr>
<td>Case name or initials:</td>
<td></td>
</tr>
<tr>
<td>Age in years or months under age 5 years; <strong>Sex:</strong> Male, Female, not known</td>
<td></td>
</tr>
<tr>
<td>Symptom onset: date mm/dd/yy; symptom type</td>
<td></td>
</tr>
<tr>
<td>Rash onset: Date mm/dd/yy; location of rash</td>
<td></td>
</tr>
<tr>
<td>Current status: Ill / recovered, died</td>
<td></td>
</tr>
<tr>
<td>Location: Address, village, county / district, hospital</td>
<td></td>
</tr>
<tr>
<td>Case category: Confirmed, probable, suspect</td>
<td></td>
</tr>
<tr>
<td>Epi Links: Known exposures, affiliations or connections to other cases</td>
<td></td>
</tr>
<tr>
<td>Underlying conditions: Immunodeficiency, HIV status, malnutrition, medications</td>
<td></td>
</tr>
</tbody>
</table>
Knowledge check

1. What are the objectives of surveillance?
2. What are the WHO indicators?
3. What are the USAID indicators?
4. What indicators can QuickRes capture?
5. What case categories should be reported to WHO?
Q&A
Module 14: EpiC Response
Learning objectives

At the end of this module participants will be able to:

• Describe the EpiC project scope and response to mpox
Scope of the response under EpiC

- Risk communication and community engagement for men who have sex with men and other vulnerable populations and health care providers
- Training and capacity building for health care providers, including community-based teams
- Support for the adaptation of QuickRes for tracking results of demand-creation activities and linkage to services for clients
- Support to build teams to conduct case and contact investigations
- Support related to diagnostics and laboratory biosafety
How EpiC is responding to mpox outbreak

- Engaged by USAID to lead efforts across six countries: Benin, DR, Ghana, Guatemala, Jamaica, Morocco (MENA)
- Engagement of key populations community across several countries
- Development of fact sheet on mpox (English, French, Portuguese, Spanish)
- Webinars and technical meetings (internal and global)
- Engagement and collaboration with USAID Missions, ministries of health, implementing partners, etc.
Rapid and sustained community mobilization

- Developing prevention messages
- Sharing and amplifying scientifically correct information in a timely fashion
- Collaborating with all actors from public health to the private sector
- Promoting the vaccine and where and how to receive it
Stay updated on the evolving WHO recommendations

- Third meeting of the International Health Regulations (2005) (IHR) Emergency Committee regarding the multi-country outbreak of monkeypox (who.int)
Resources

• Mpox (monkeypox) outbreak 2022 - Global (who.int)
• Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022 (who.int)
• Mpox health topics page (who.int)
• Mpox Content Collection (thelancet.com)
• Mpox | CDC
• Monkeypox | Johns Hopkins Medicine
EpiC is a global cooperative agreement dedicated to achieving and maintaining HIV epidemic control. It is led by FHI 360 with core partners Right to Care, Palladium, and Population Services International (PSI).