Mpox Training for Clinical Providers

June 2023

USAID
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EpiC
Meeting Targets and Maintaining Epidemic Control

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

This resource is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the EpiC project and do not necessarily reflect the views of USAID or the United States Government. EpiC is a global cooperative agreement (7200AA19CA00002) led by FHI 360 with core partners Right to Care, Palladium International, and Population Services International (PSI).

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).
- Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021.
- 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

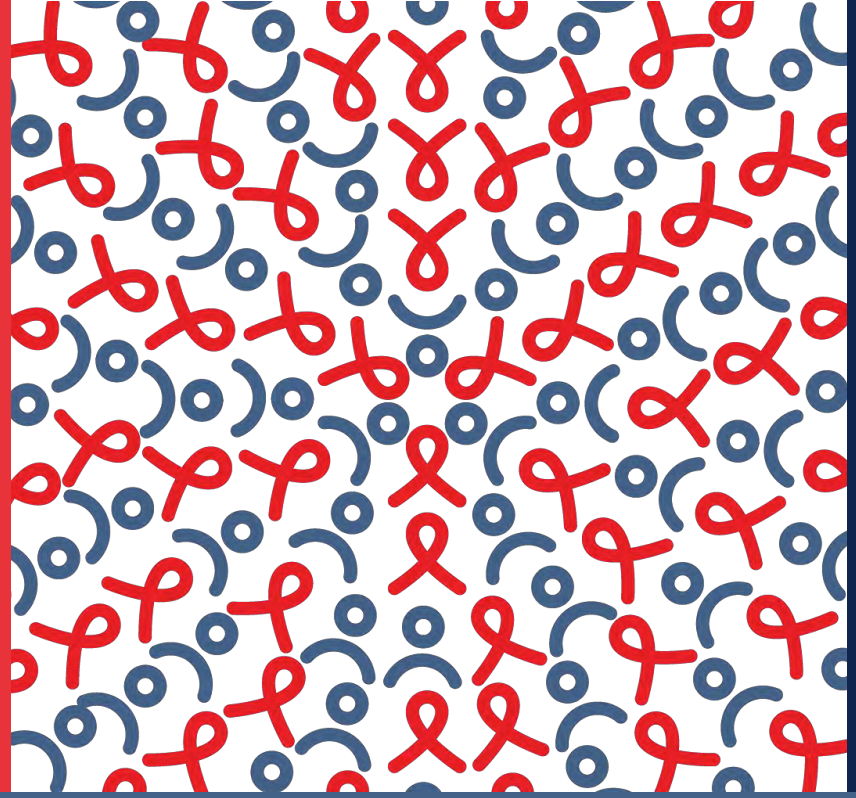
Participants who master the learning objectives of the training will demonstrate an understanding of the background, epidemiology, mode of transmission, diagnosis, treatment, and prevention of mpox.

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

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



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

Mpox, background and history (1)

- Monkeypox 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)

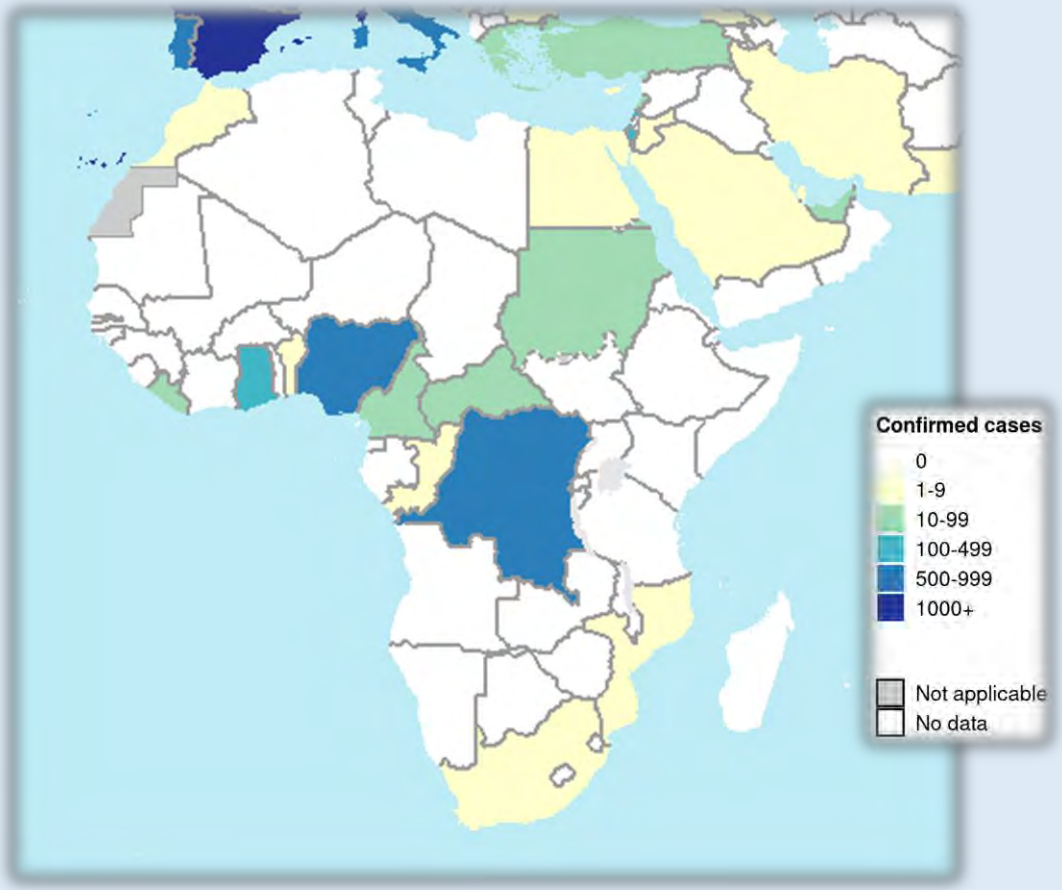
1958	• Identified in laboratory monkeys in Denmark
1970	• Identified in humans in Demographic Republic of Congo • Endemic in mammals in central and west Africa; cases occurring in humans with varying outbreaks
1996	• Outbreak in DRC related to human-to-human transmission
2003	• Outbreak in United States linked to prairie dogs and a rat from Ghana
2017-19	• Outbreak in Nigeria

Mpox outbreak

- Beginning May 13, 2022, a high proportion of mpox cases were reported from countries **without previously documented mpox 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.**

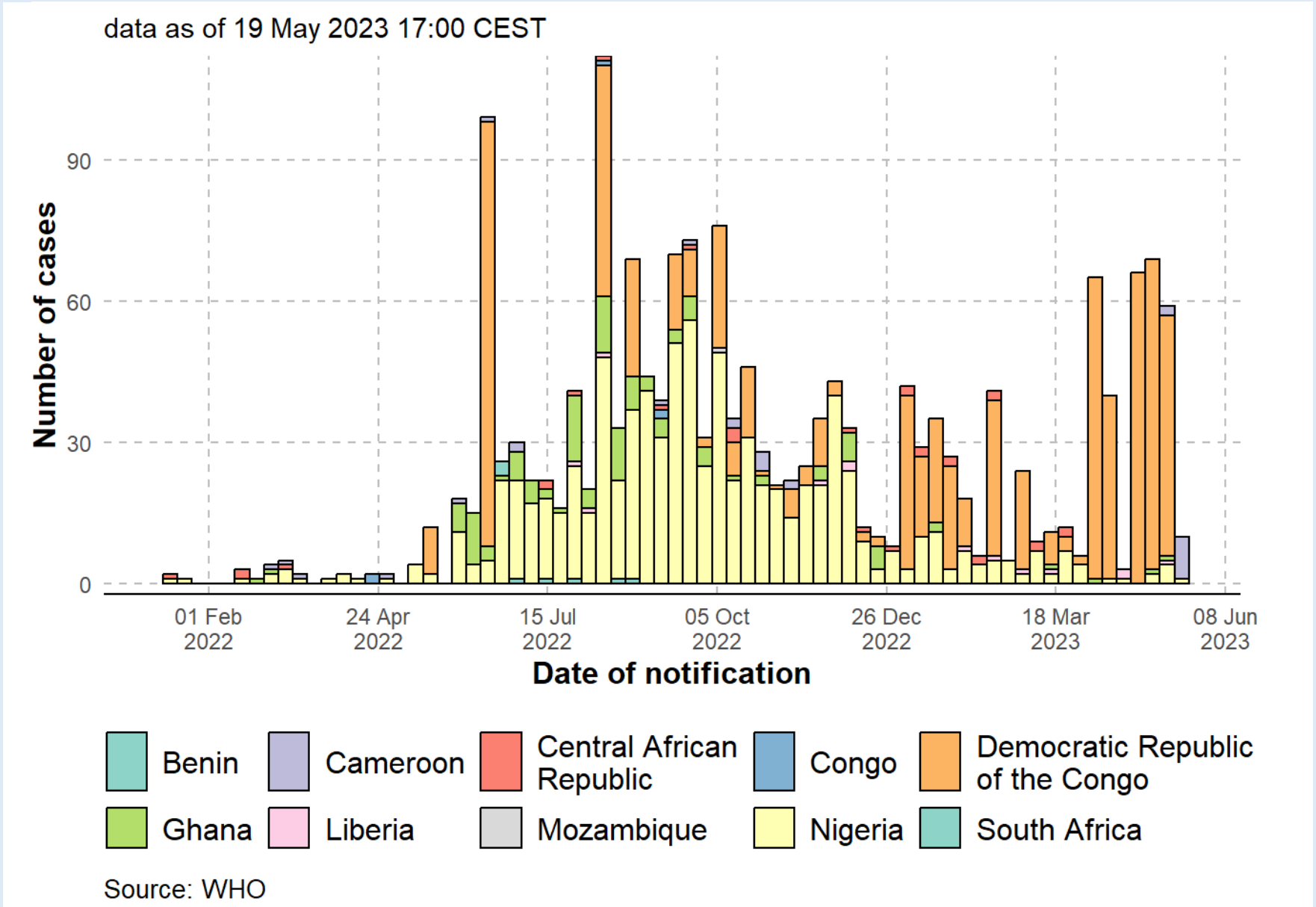
Mpox is endemic in central and west Africa

	Cumulative confirmed cases, 01Jan22–05Jun23
Benin	3
Cameroon	29
Central African Republic	30
Congo	5
Democratic Republic of Congo	739
Ghana	127
Liberia	13
Nigeria	842
Sudan	19



WHO [Internet]. Map of confirmed cases of mpox from Jan 2022, as of 05 Jun 23. Geneva: WHO; c2023 [updated 2023 Jun 05; cited 2023 Jun 08]. Available from: 2022-23 Mpox (Monkeypox) Outbreak: Global Trends (shinyapps.io).

Epidemic curve for Africa



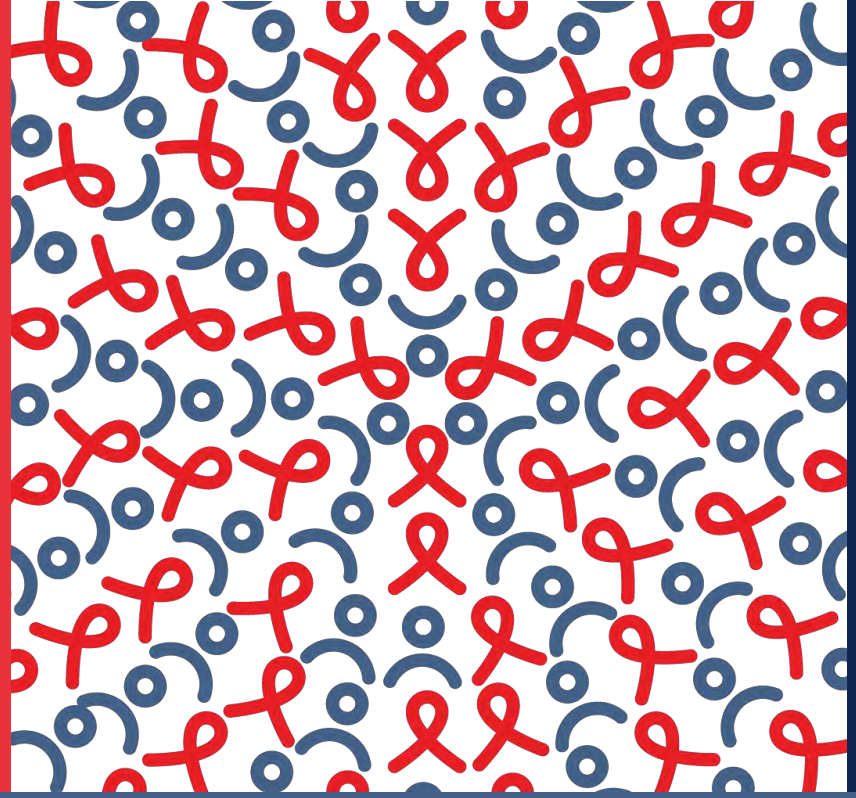
WHO [Internet]. Africa in focus: epidemic curve. Geneva: WHO; c2023 [updated 2023 May 19; cited 2023 Jun 08]. Available from: 2022-23 Mpox (Monkeypox) Outbreak: Global Trends (shinyapps.io)

Genetic clades of mpox virus

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

	West African clade 1	**Central African clade 2**
Countries which reported cases		
Infectiousness	Limited	Up to 7 generations
Case fatality ratio	Up to 6%	Up to 11%

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.

Source: WHO [Internet]. 2022-23 mpox (monkeypox) outbreak: global trends. Geneva: WHO [updated 2023 Jun 05; cited 2023 Jun 08]. Available from: 2022-23 Mpox (Monkeypox) Outbreak: Global Trends (shinyapps.io)

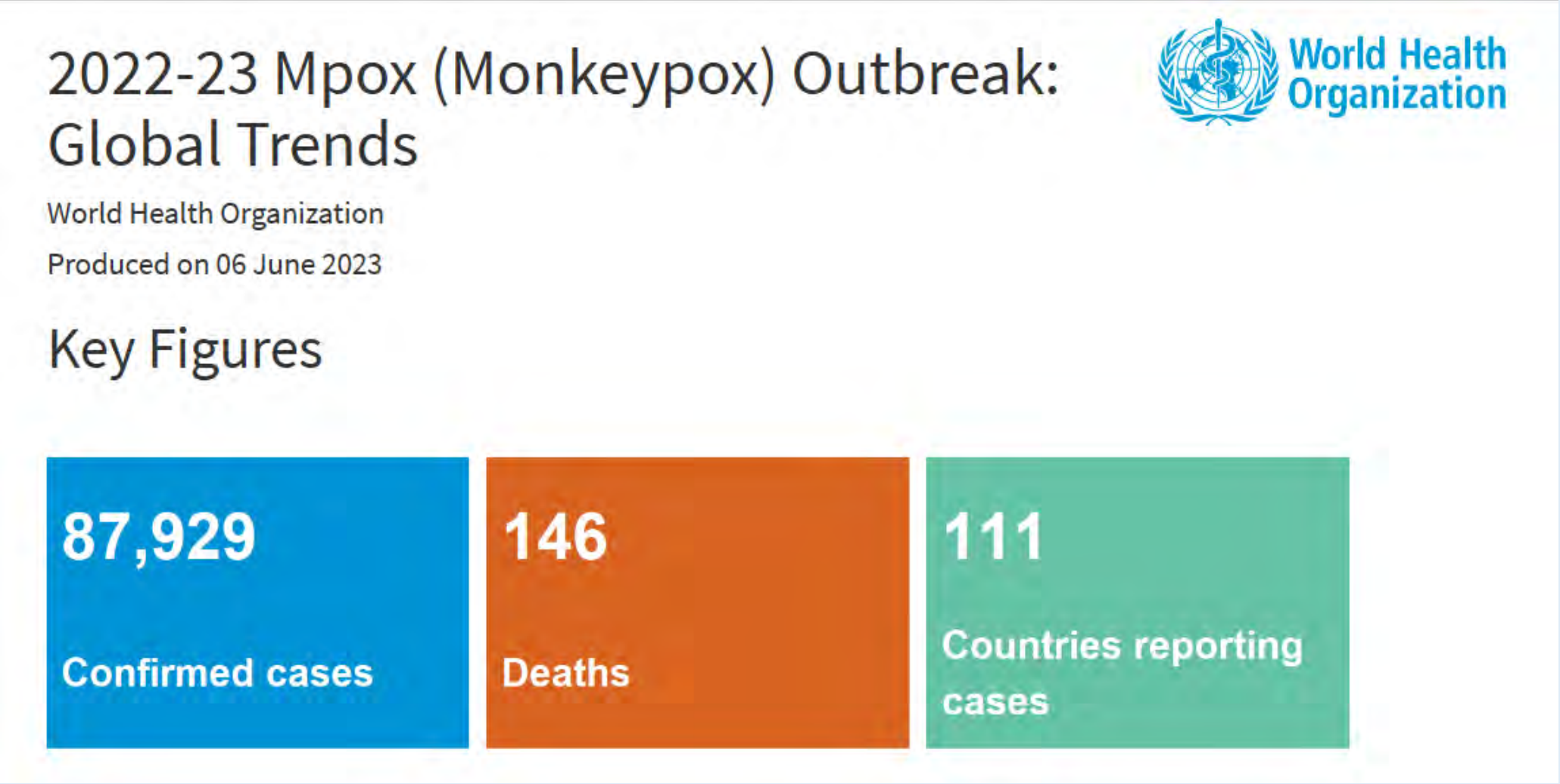
Overview (2)

- 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 transitionary period towards a long-term mpox control strategy.

Risk	Region
High	—
Moderate	Europe Americas Africa Eastern Mediterranean
Low	Southeast Asia Western Pacific

Source: WHO [Internet]. 2022-23 mpox (monkeypox) outbreak: global trends. Geneva: WHO [updated 2023 Jun 05; cited 2023 Jun 08]. Available from: 2022-23 Mpox (Monkeypox) Outbreak: Global Trends (shinyapps.io)

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



Source: WHO [Internet]. 2022-23 mpox (monkeypox) outbreak: global trends. Geneva: WHO [updated 2023 Jun 06; cited 2023 Jun 08]. Available from Mpox (Monkeypox) Outbreak: Global Trends (shinyapps.io).

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:

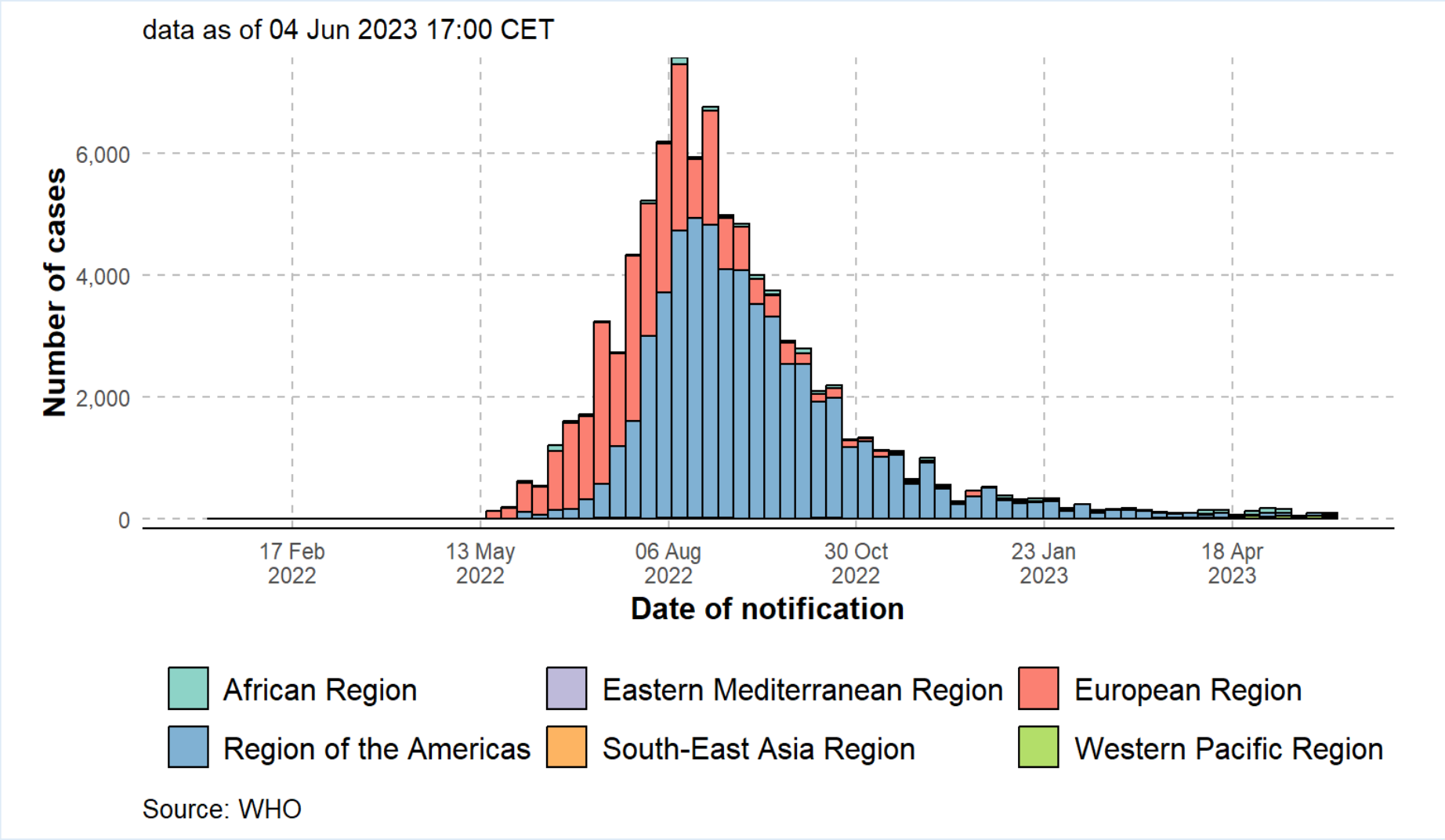
- On average, at the global level, 117 cases have been observed weekly.
- The most affected region was the Region of the Americas, where 602 cases and 31 deaths have been reported.
- This is followed by the Western Pacific Region (368 cases, 0 deaths), and the African Region (341 cases, 2 deaths).

Countries	Mpox cases
USA	30,243
Brazil	10,948
Spain	7,556
France	4,146
Colombia	4,090
Mexico	4,020
Peru	3,800
United Kingdom	3,753
Germany	3,691
Canada	1,496

83.9% of global cases

Source: WHO [Internet}. 2022-23 mpox (monkeypox) outbreak: global trends. Geneva: WHO [updated 2023 Jun 04; cited 2023 Jun 08]. Available from: 2022-23 Mpox (Monkeypox) Outbreak: Global Trends (shinyapps.io).

Global cases epidemic curve

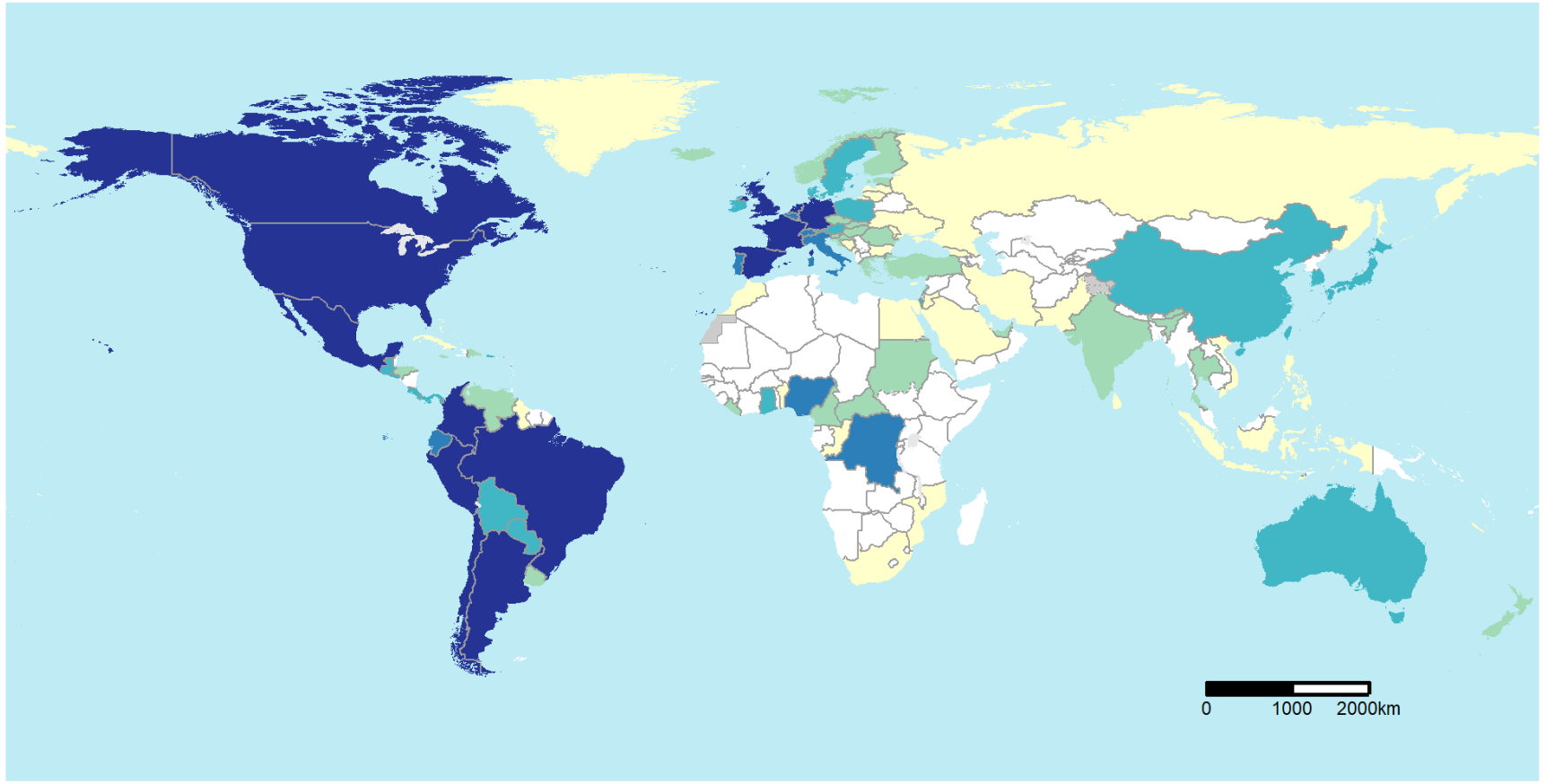


Source: WHO [Internet]. Global cases: epidemic curve. Geneva: WHO; c2023 [updated 2023 Jun 04; cited 2023 Jun 08]. Available from: 2022-23 Mpox (Monkeypox) Outbreak: Global Trends (shinyapps.io).

Confirmed cases of mpox

from 1 Jan 2022, as of 05 Jun 23

World Health Organization



The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of WHO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.
Dotted and dashed lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: WHO Health Emergencies Programme

Source: 2022-23 Mpox (Monkeypox) Outbreak: Global Trends (shinyapps.io).

Case profile as of June 2023

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

**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.*

Source: WHO [Internet]. 2022-23 mpox (monkeypox) outbreak: global trends. Geneva: WHO [updated 2023 Jun 04; cited 2023 Jun 08]. Available from: 2022-23 Monkeypox Outbreak: Global Trends (shinyapps.io).

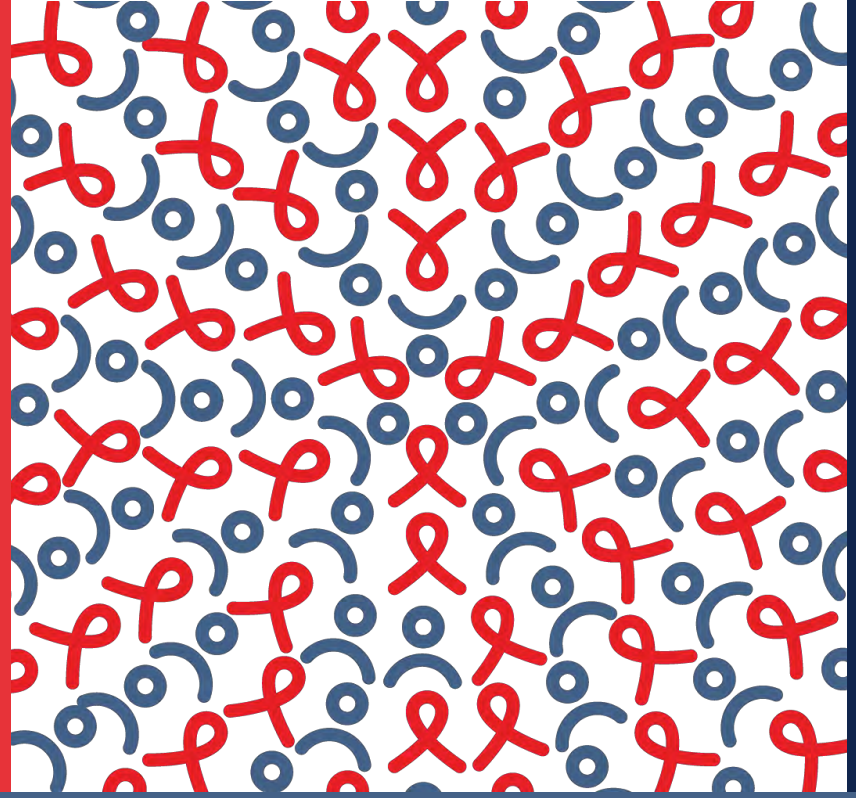
Country context

- 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?

Q&A



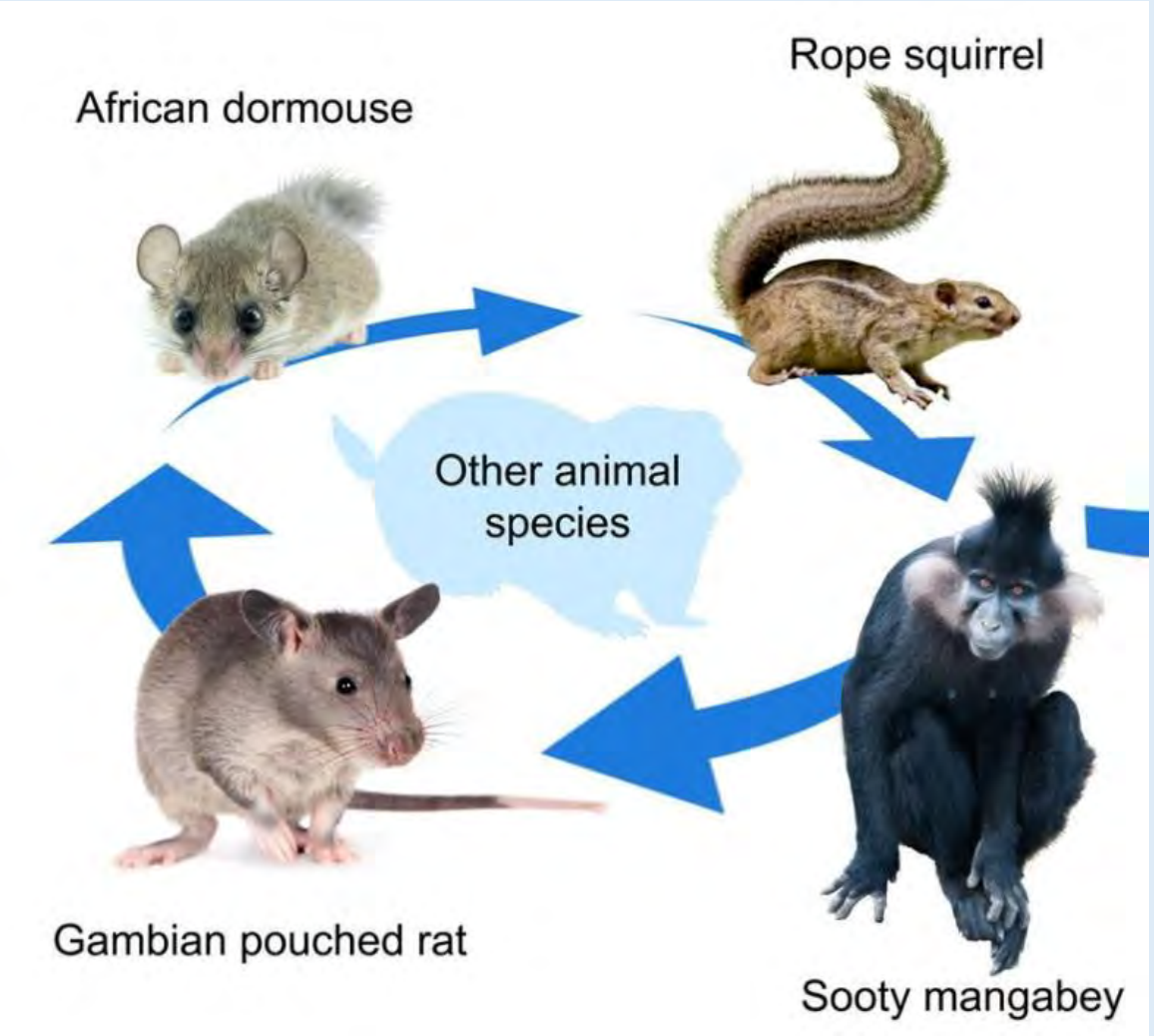
Module 3: Modes of Transmission

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

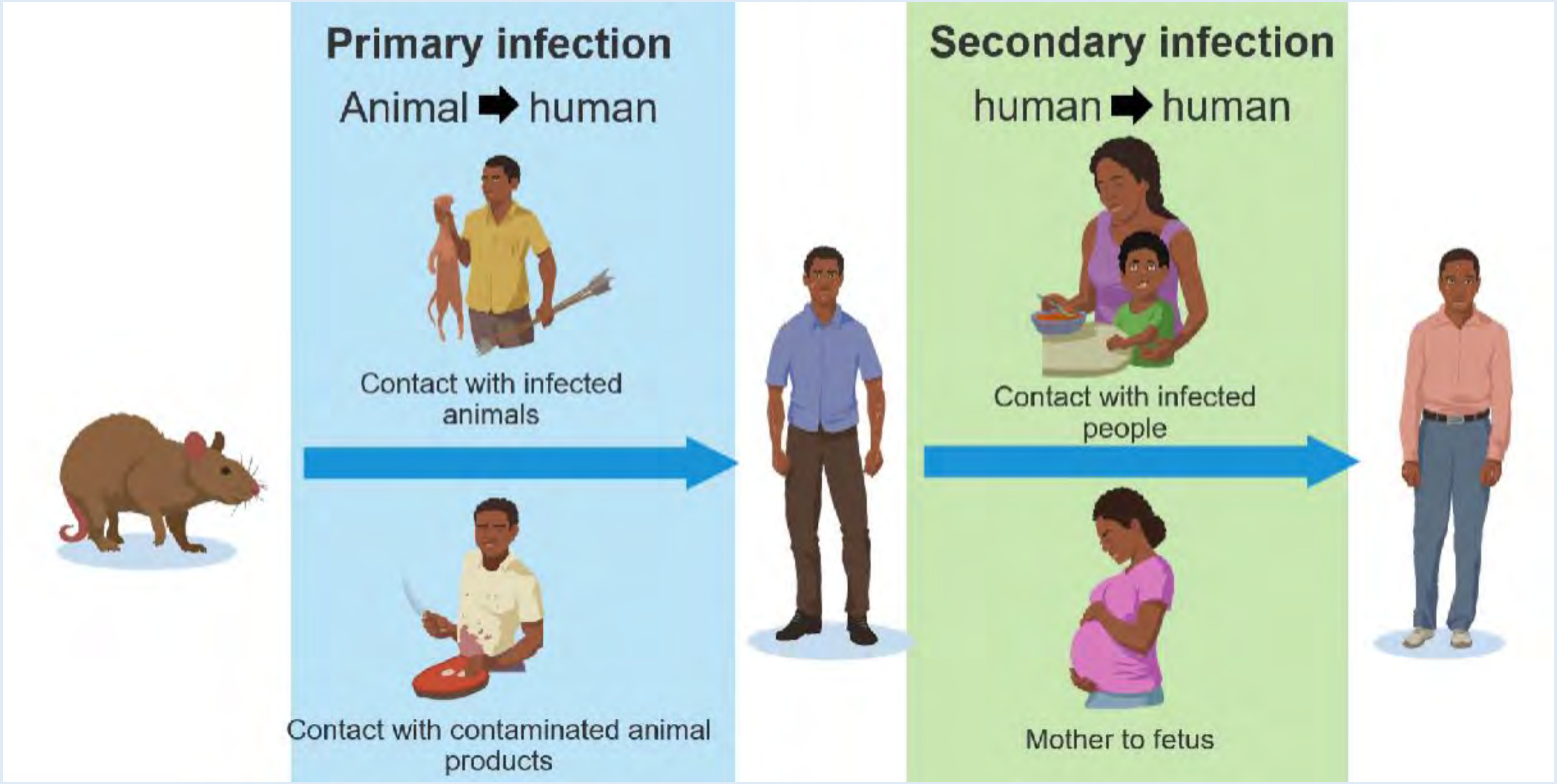
Animals associated with mpox



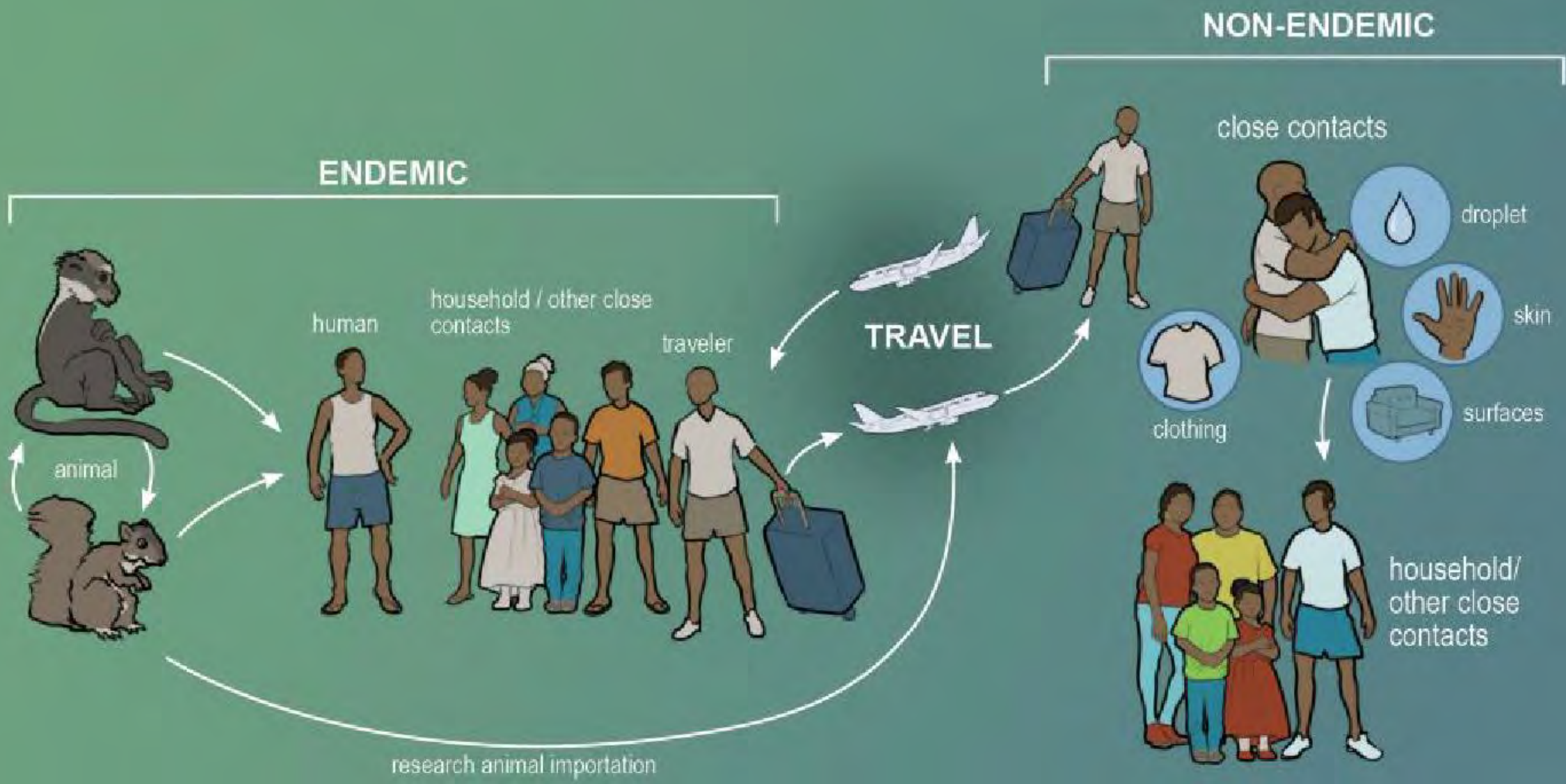
- MPXV is named due to its initial detection in monkeys.
- MPXV can primarily be found in rodents, however the reservoir is undetermined.

Source: OpenWHO [Internet]. Mpox: Epidemiology, preparedness and response for African outbreak contexts. Geneva: WHO; 2021.

Primary and secondary infection



Source: OpenWHO [Internet]. Mpox: Epidemiology, preparedness and response for African outbreak contexts. Geneva: WHO; 2021.



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

Environmental and social factors

Deforestation

Civil unrest and poverty

Climate change

Cessation of smallpox vaccination

Source: OpenWHO [Internet]. Mpox: Epidemiology, preparedness and response for African outbreak contexts. Geneva: WHO; 2021.

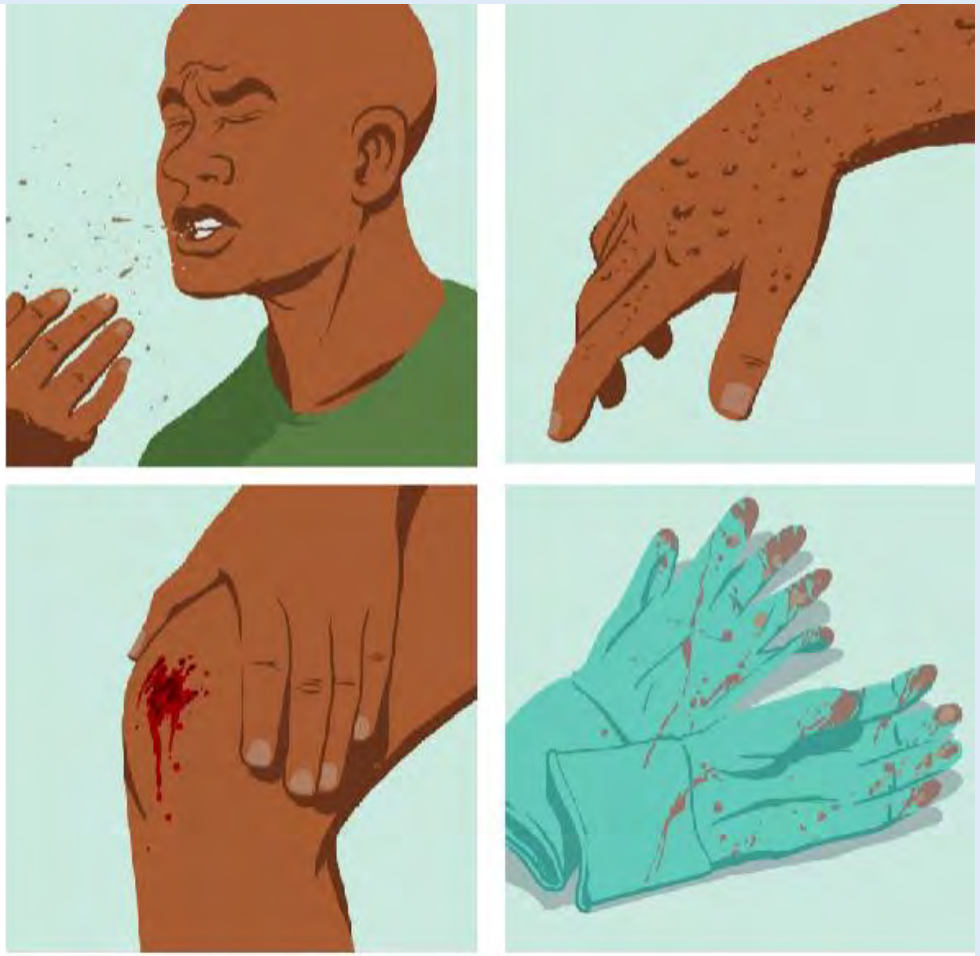
Transmission

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)



Source: OpenWHO [Internet]. Mpox: Epidemiology, preparedness and response for African outbreak contexts. Geneva: WHO; 2021.

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.

Source: Centers for Disease Control and Prevention [Internet]. Mpox: clinician FAQs. Atlanta: CDC [updated 2023 Feb 2; cited 2023 Apr 27]. Available from: https://www.cdc.gov/poxvirus/mpox/clinicians/faq.html.

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

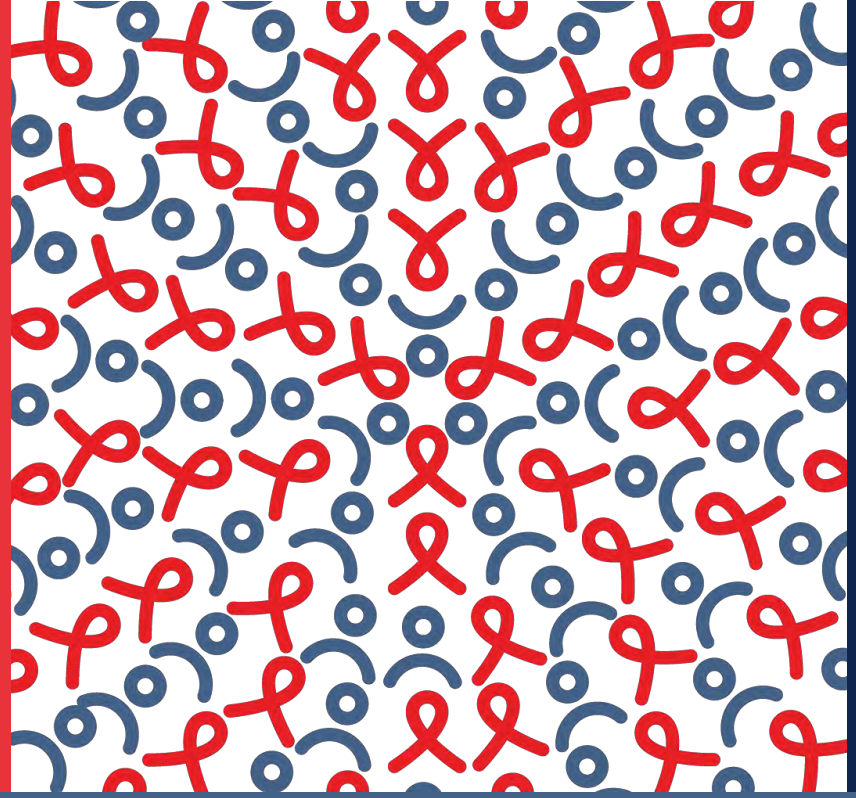
- No studies have found a clear link between mpox and water in pools, bathtubs, hot tubs, or splash pads; so, sharing waters carries low to no risk.
- The mpox virus is killed in water at the specific chlorine levels recommended for disinfection in recreational water, but not all public water sites may 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.

Source: Centers for Disease Control and Prevention [Internet]. Mpox: clinician FAQs. Atlanta: CDC [updated 2023 Feb 2; cited 2023 Apr 27]. Available from: https://www.cdc.gov/poxvirus/mpox/clinicians/faq.html.

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.

Source: OpenWHO [Internet]. Mpox: Epidemiology, preparedness and response for African outbreak contexts. Geneva: WHO; 2021.

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 ration: 10% Congo basin clade 2

- 57 patients hospitalized with mpox
- 82% had HIV infection
- 9% of whom were receiving antiretroviral therapy (ART) before mpox diagnosis

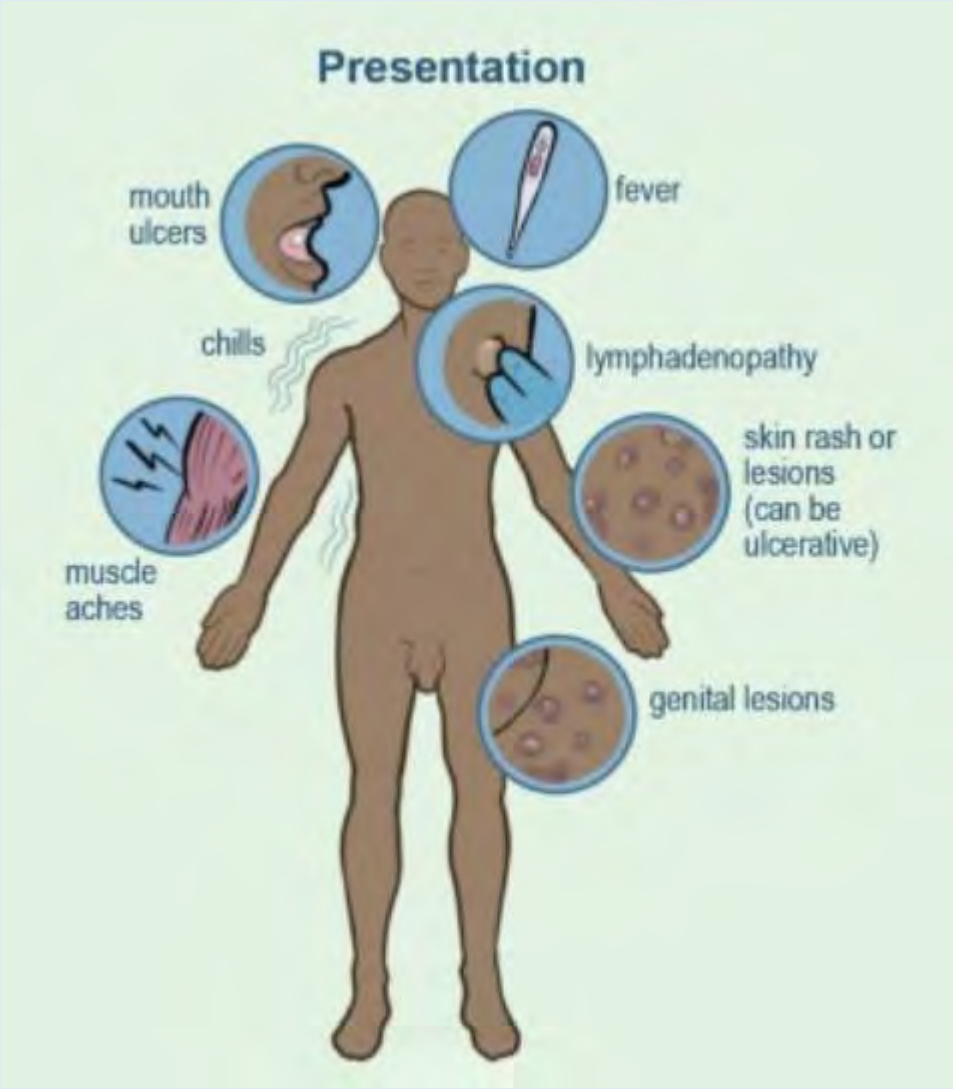
Source: Miller MJ, Cash-Goldwasser S, Marx GE, et al. Severe monkeypox in hospitalized patients—United States, Aug 10–Oct 10, 2022. CDC Morbidity and Mortality Weekly Report 2022;71:1412–17.

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.

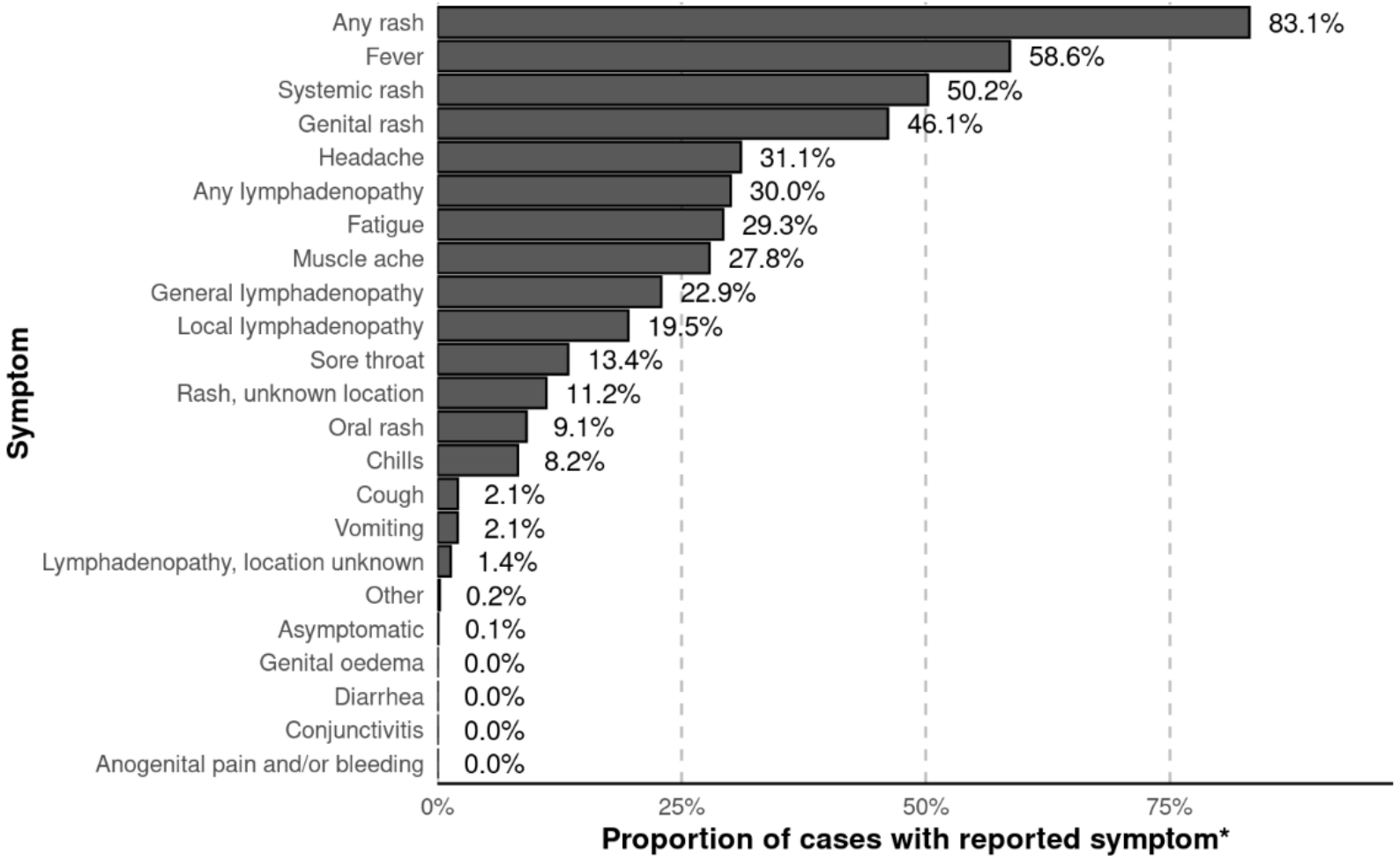
Signs and symptoms

- 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.



Source: OpenWHO [Internet]. Mpox: Epidemiology, preparedness and response for African outbreak contexts. Geneva: WHO; 2021.

Proportion of cases with reported symptoms



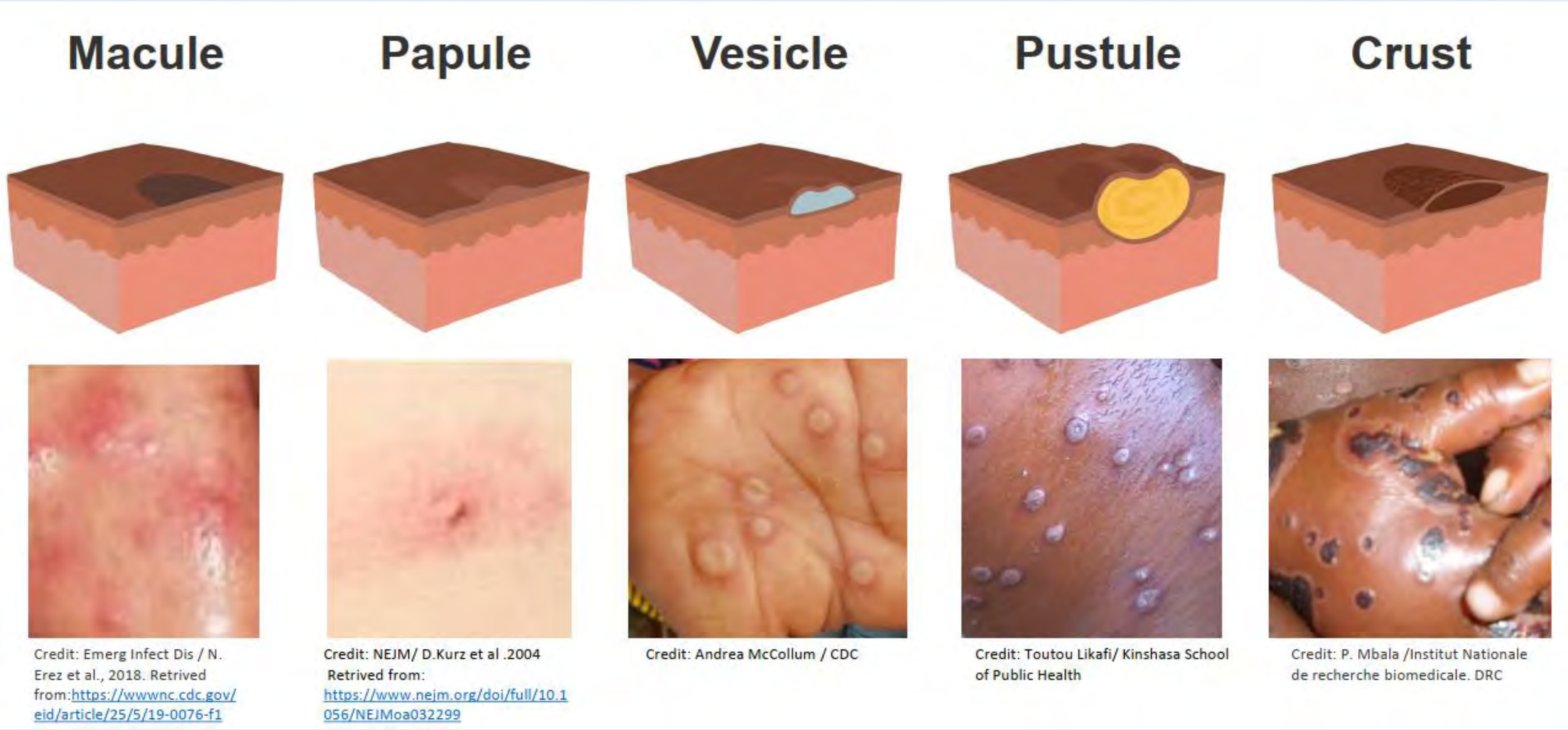
Graph refers to:

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



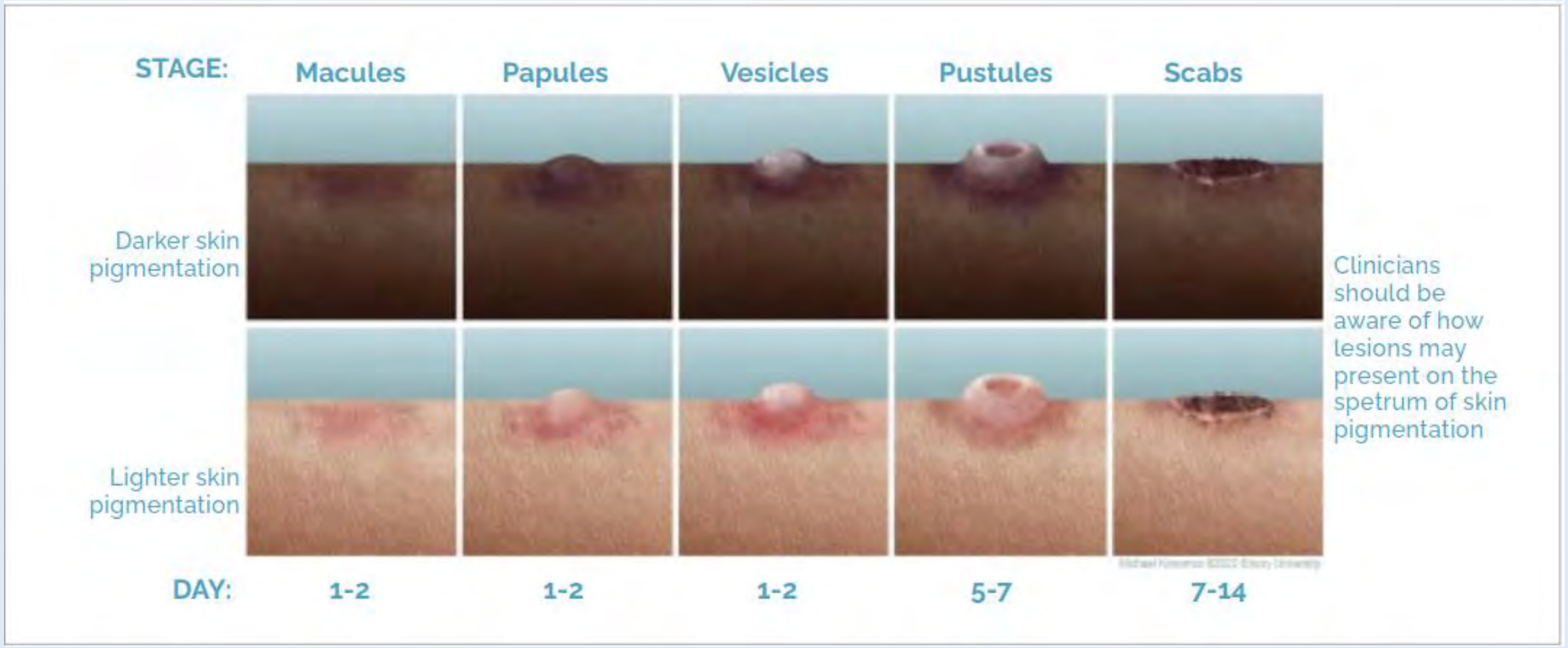
Credit: Emerg Infect Dis / N. Erez et al., 2018. Retrived from:https://wwwnc.cdc.gov/eid/article/25/5/19-0076-f1

Credit: NEJM/ D.Kurz et al .2004 Retrived from: https://www.nejm.org/doi/full/10.1056/NEJMoa032299

Credit: Andrea McCollum / CDC

Credit: Toutou Likafi/ Kinshasa School of Public Health

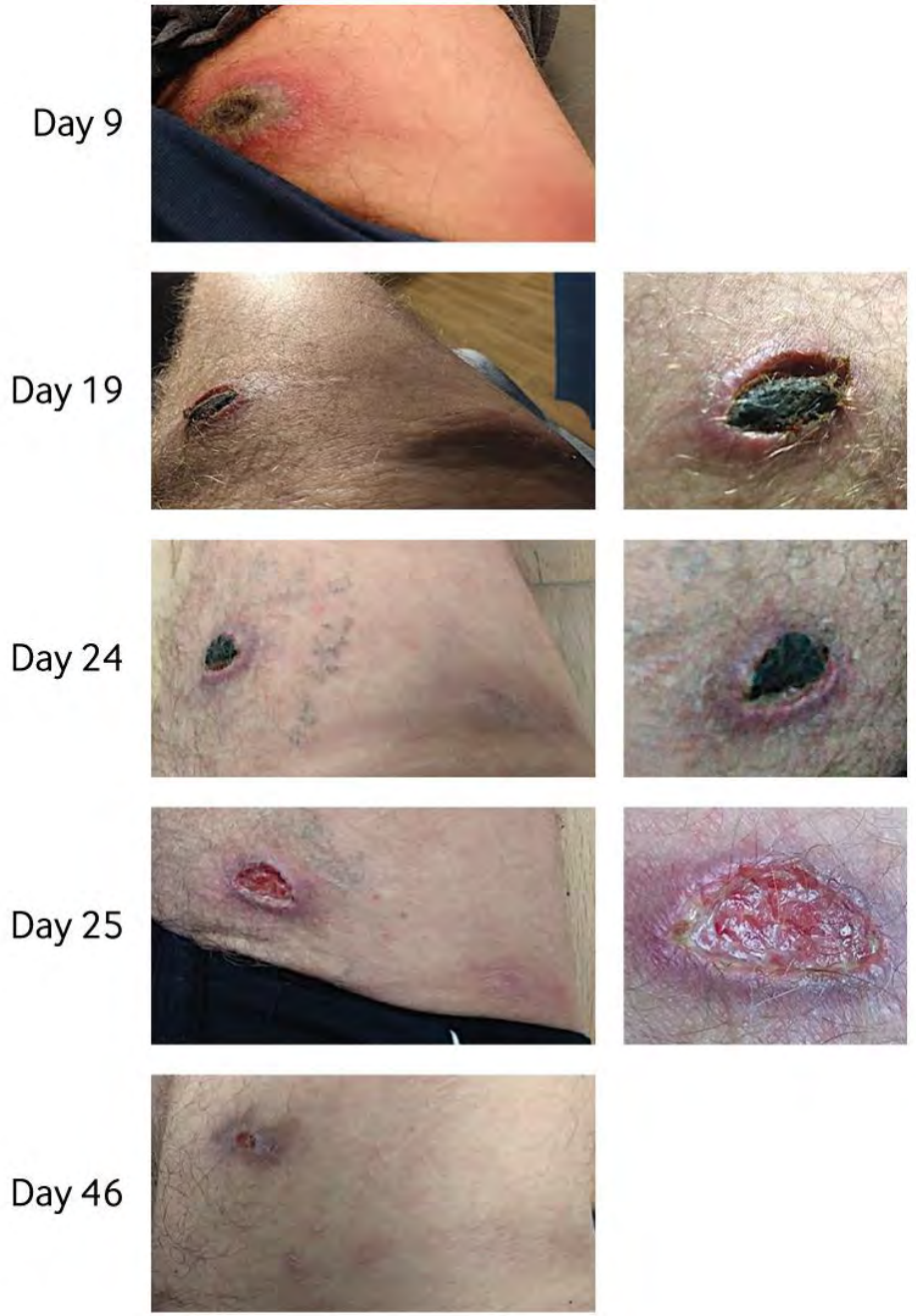
Credit: P. Mbala /Institut Nationale de recherche biomedicale. DRC



Source: Titanji BK, Tegomoh B, Nematollahi S, et al. Monkeypox: a contemporary review for healthcare professionals. Open Forum Infec Dis. 2022;9(7):10.1093/ofid/ofac310.

Evolution of lesions over time

Development of **solitary lesion** on right upper inner thigh, tracking laterally to outer thigh

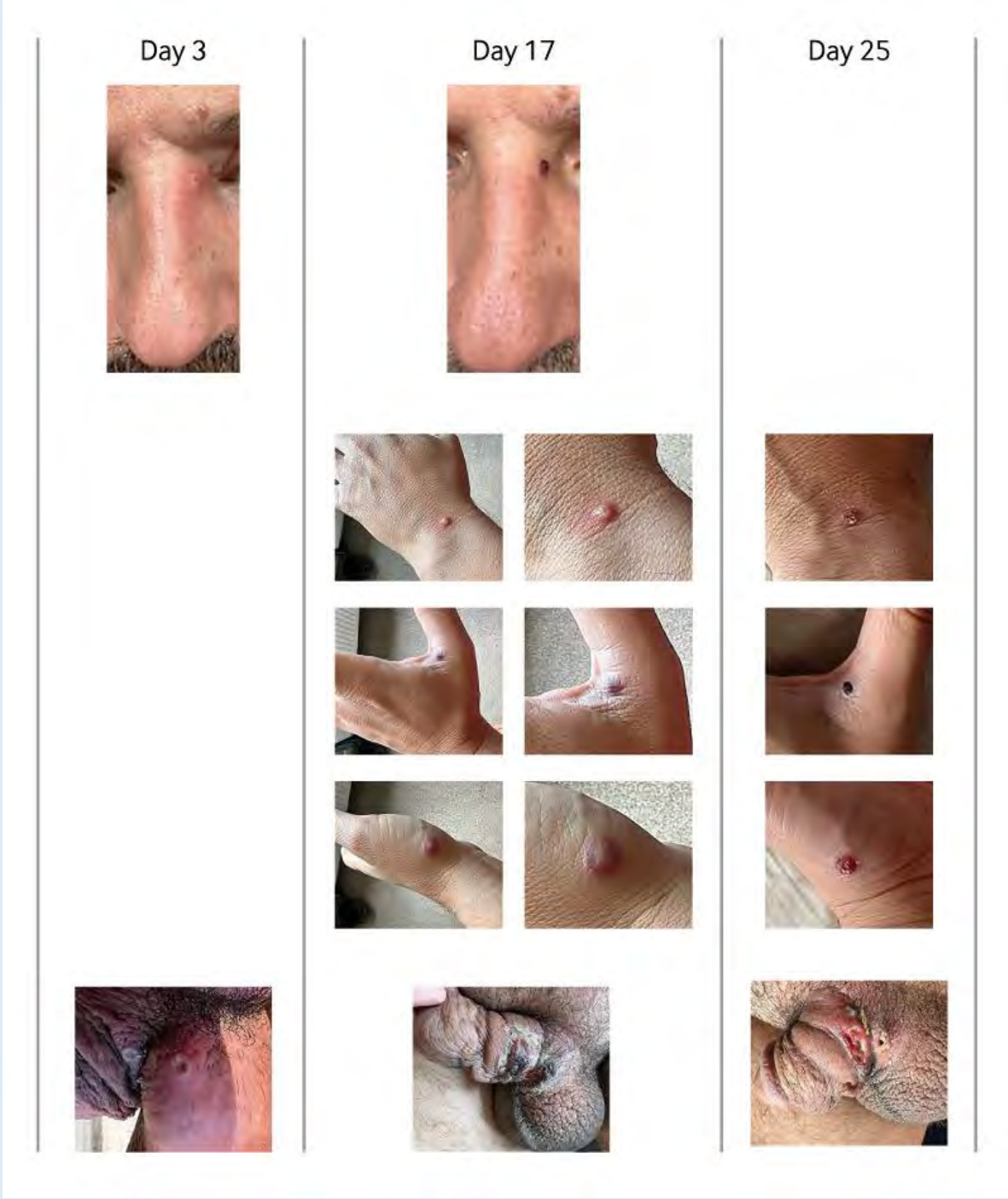


- 53-year-old man
- HIV positive
- Viral load <200 copies/mL
- On ART
- Single skin lesion on the thigh
- Initially this was a small papule on the medial right thigh but developed into a painful mass with surrounding erythema

Source: Patel A, et al. Clinical features and novel presentations of human monkeypox in a central London centre during the 2022 outbreak: descriptive case series. BMJ. 2022;378:e072410.

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

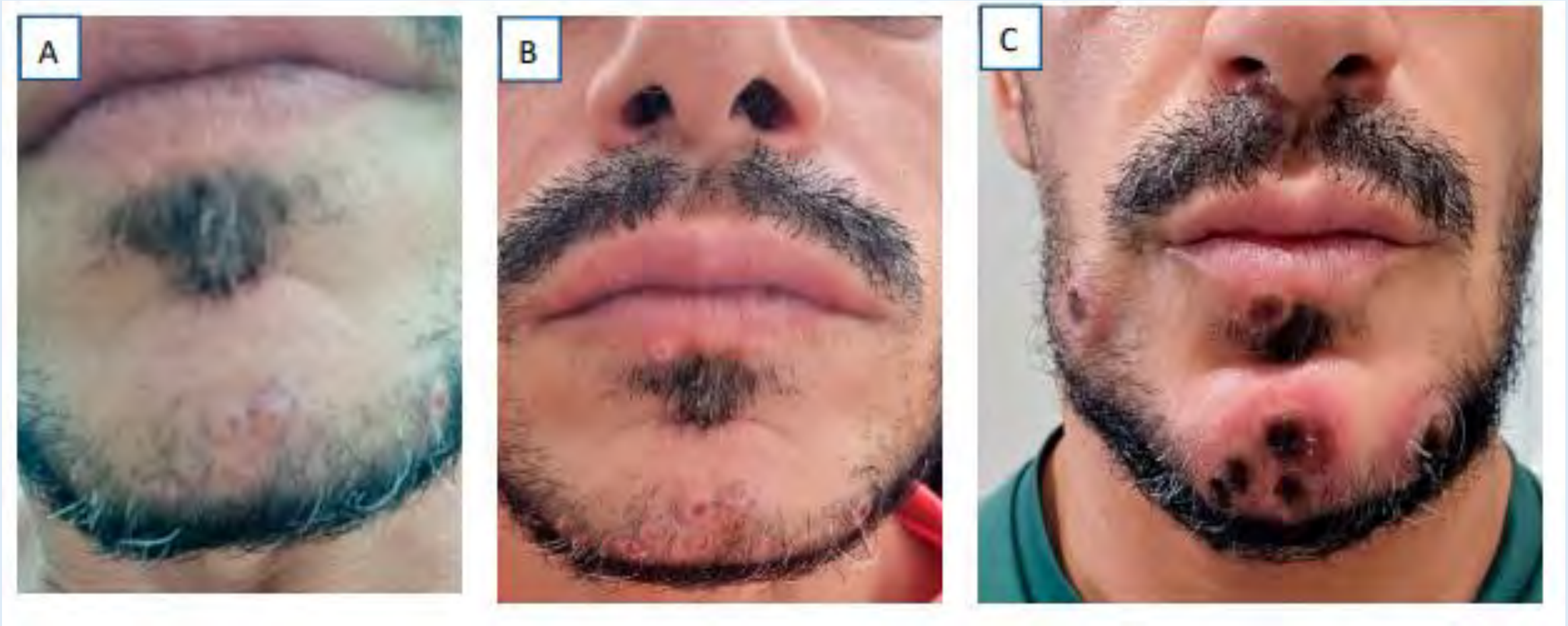
On day 17 there were fresh pustular lesions on the hand, a partly scabbed lesion on the face, and fully scabbed lesions on the penis.



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

Source: Patel A, et al. Clinical features and novel presentations of human monkeypox in a central London centre during the 2022 outbreak: descriptive case series. BMJ. 2022;378:e072410.

Synchronous evolution of the lesions



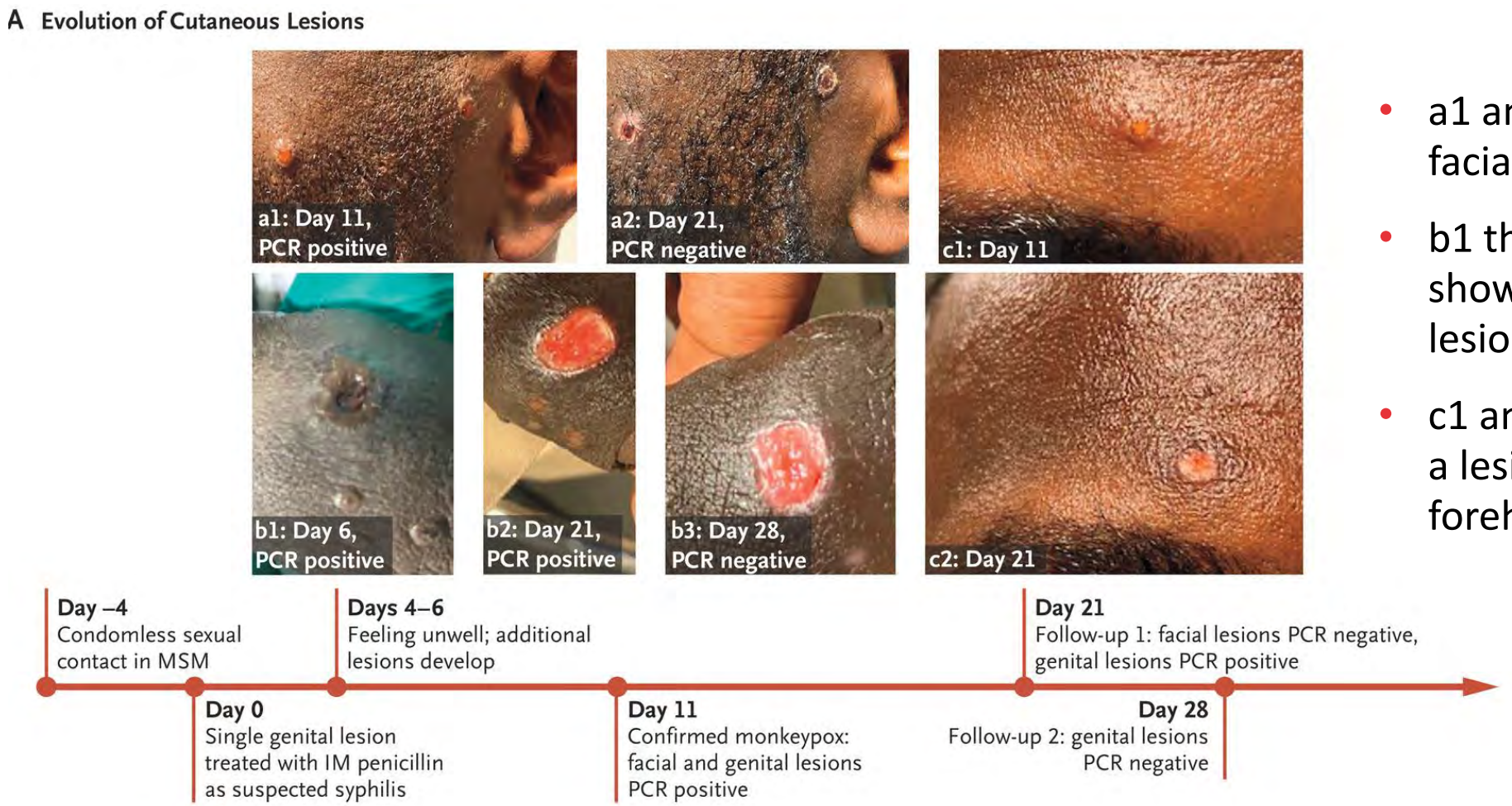
(A) Day 1

(B) Day 3

(C) Day 7

Source: Betancort-Plata C, et al. Monkeypox and HIV in the Canary Islands: a different pattern in a mobile population. Trop Med Infect Dis. 2022;7(10):10.3390/tropicalmed7100318.

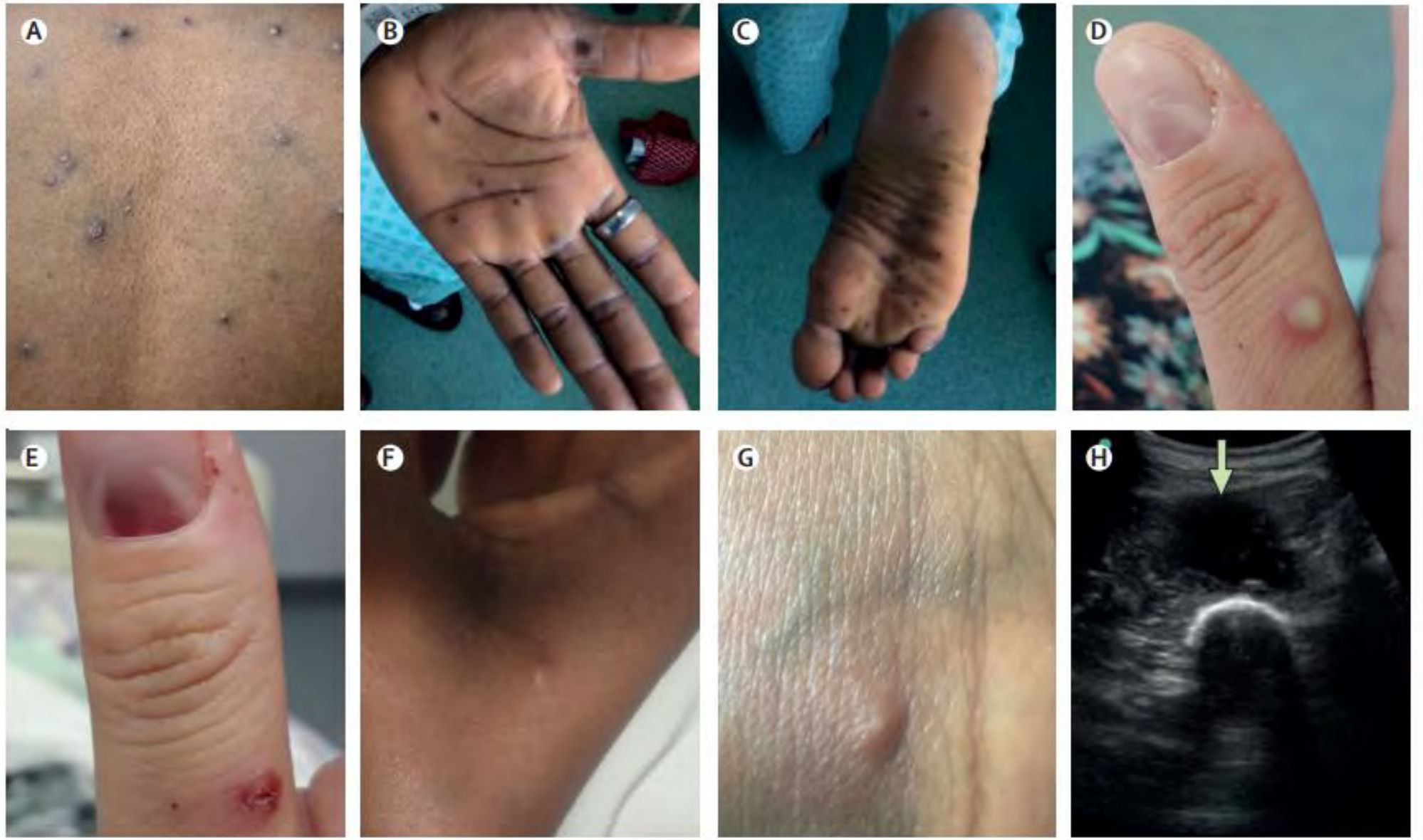
Evolution of cutaneous lesions in a person with mpox



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

Source: Thornhill JP. Monkeypox virus infection in humans across 16 countries — April–June 2022. N Engl J Med. 2022;387:679-91.

Skin and soft tissue lesions



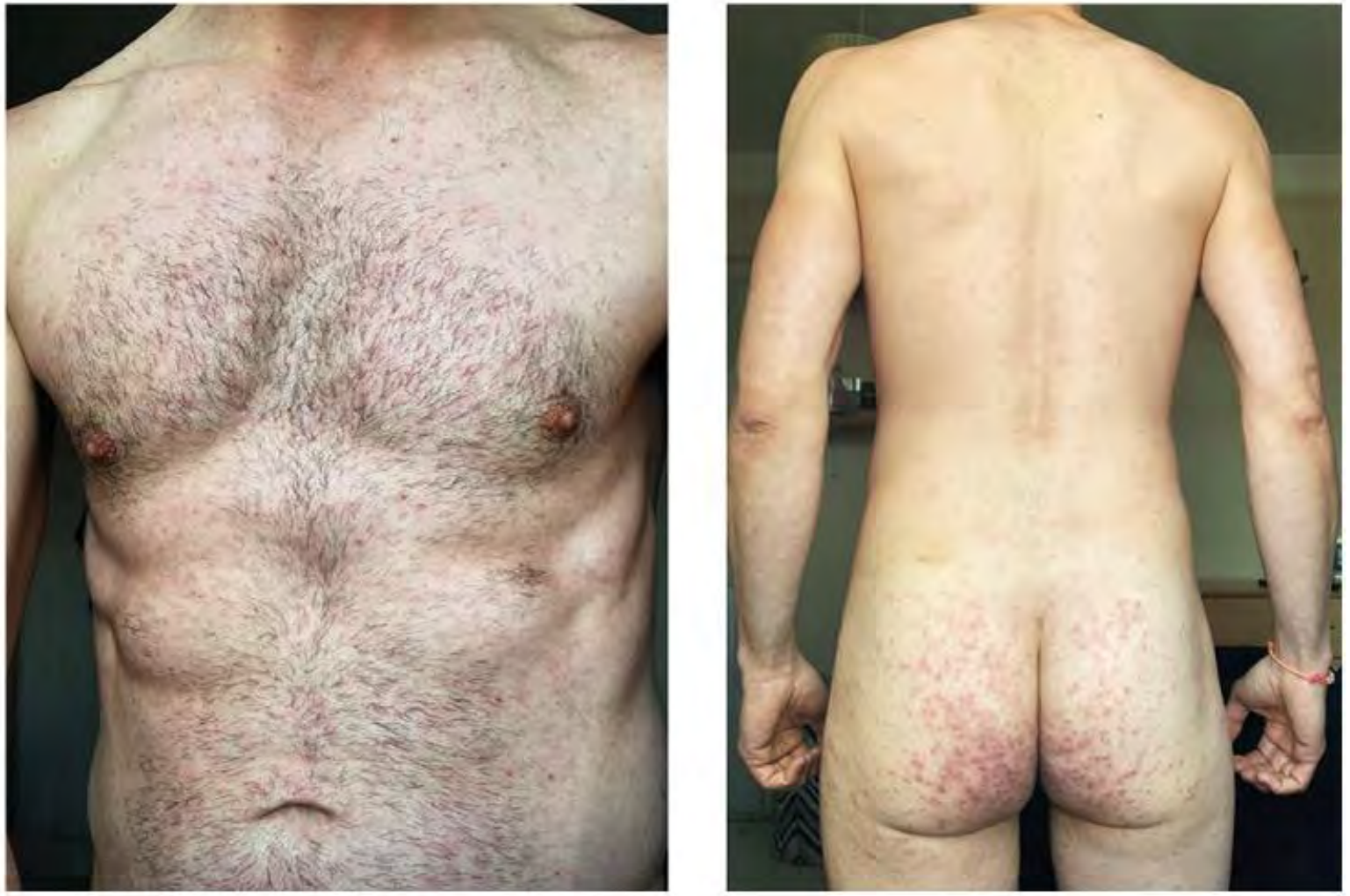
Skin and soft tissue features included:

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

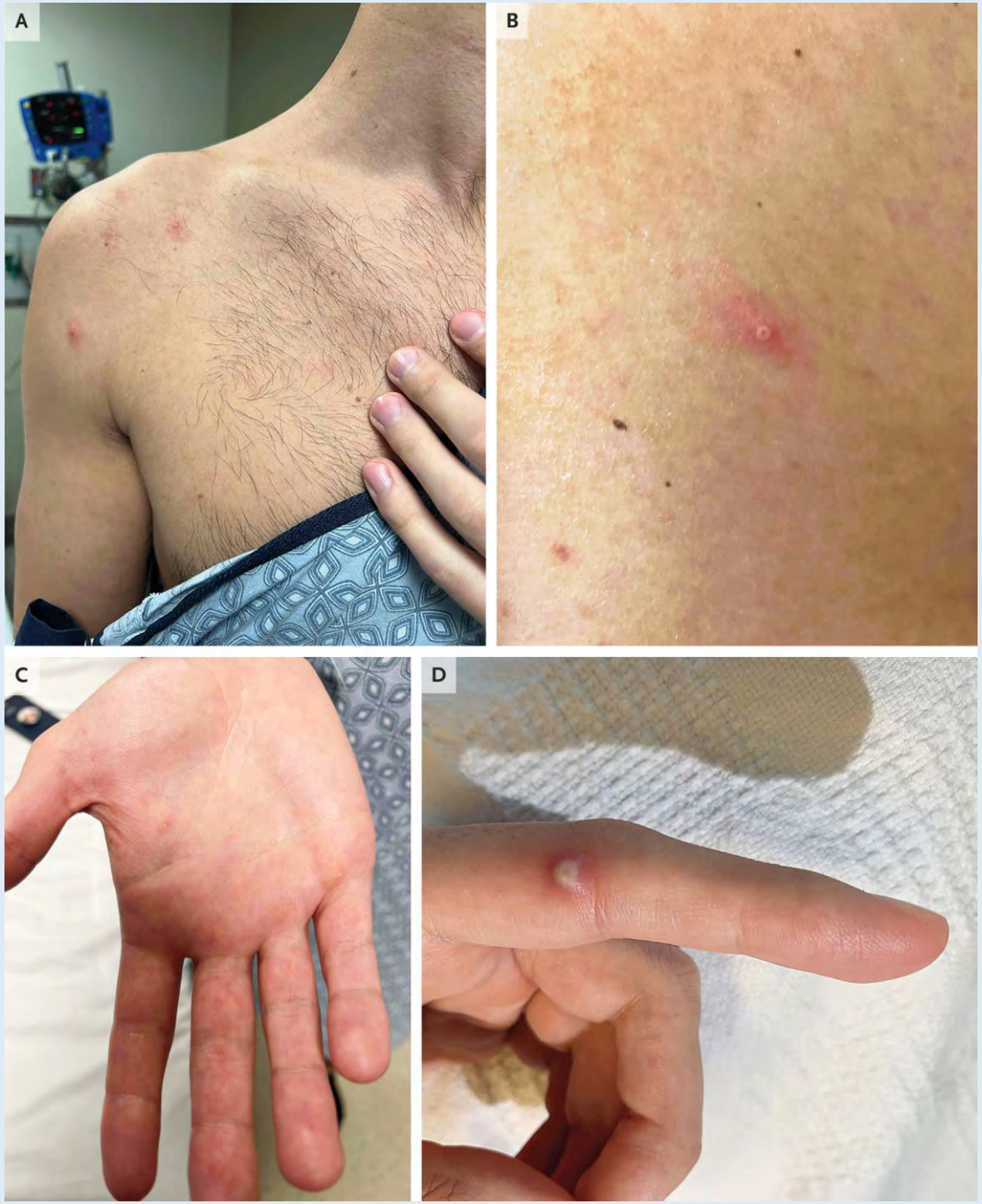
Source: Adler H, et al. Clinical features and management of human monkeypox: a retrospective observational study in the UK. Lancet Infect Dis. 2022:22(8):1153-61.

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

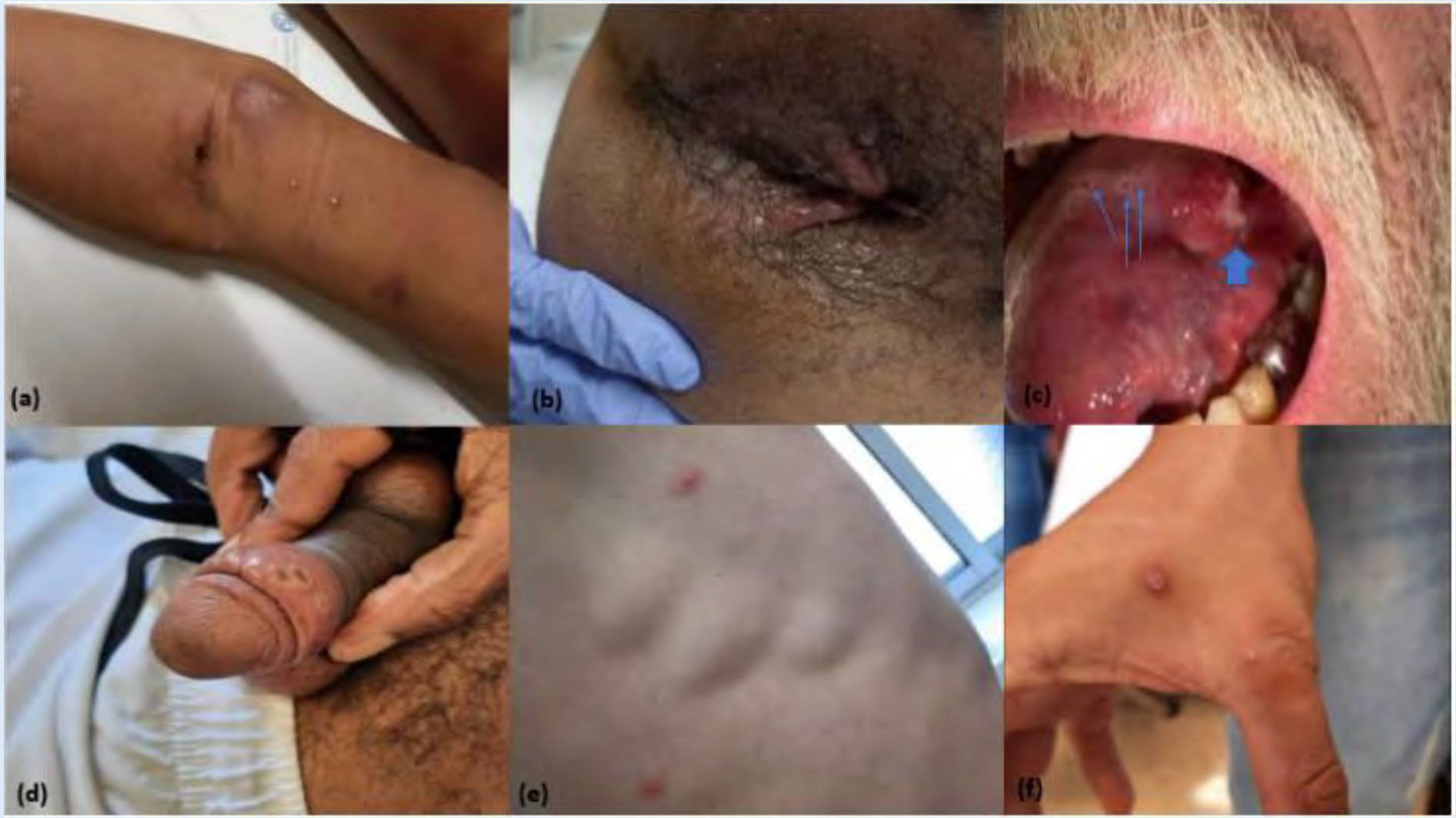


Source: Patel A, et al. Clinical features and novel presentations of human monkeypox in a central London centre during the 2022 outbreak: descriptive case series. BMJ. 2022;378:e072410.



- 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.

Source: Basgoz N. Case 24-2022: a 31-year-old man with perianal and penile ulcers, rectal pain, and rash. N Engl J Med. 2022:387:547-56.



a. Upper limb pustules and cicatrized lesion in veno-punction 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

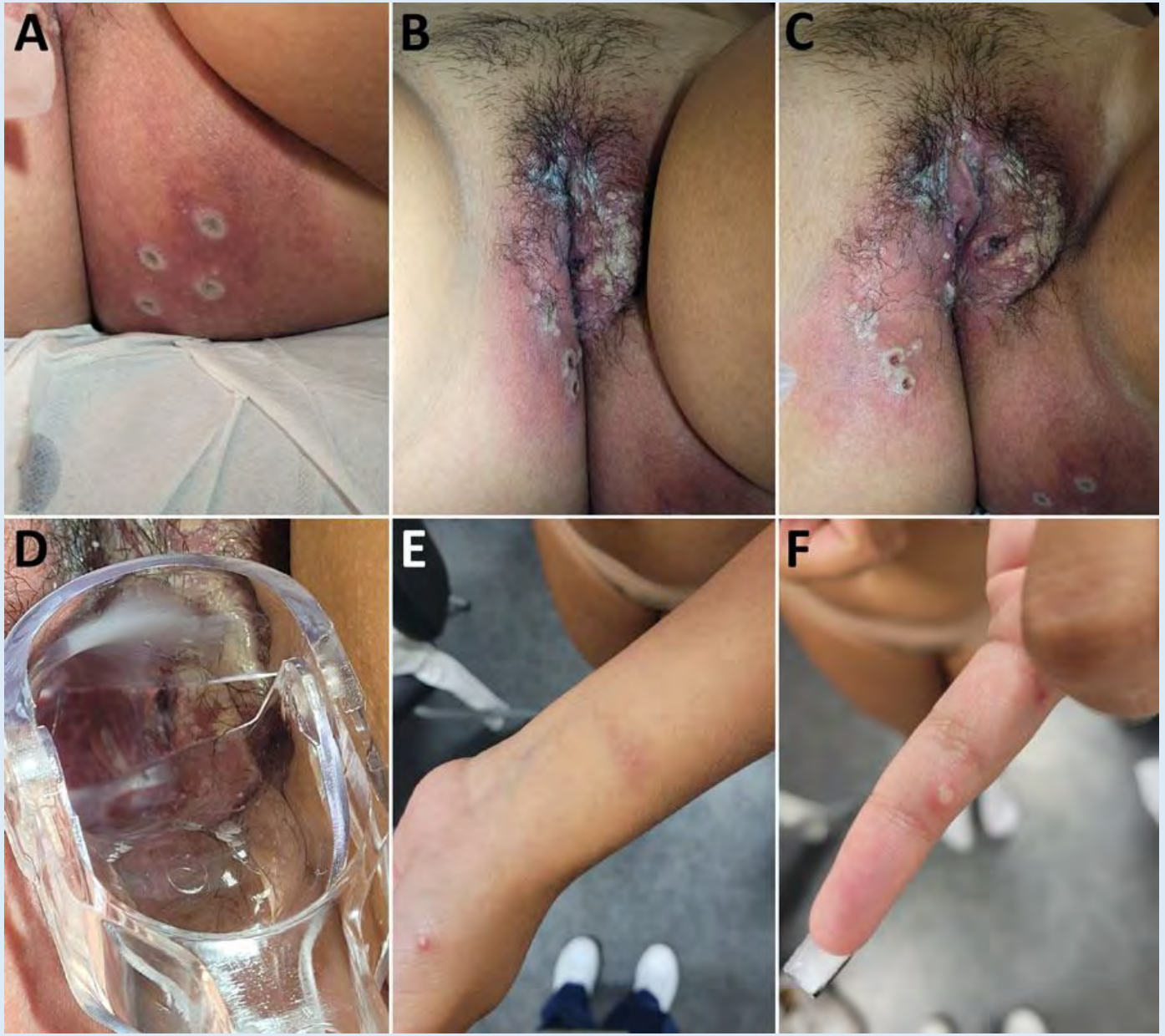
Source: Caria J, et al. Clinical and epidemiological features of hospitalized and ambulatory patients with human monkeypox infection: a retrospective observational study in Portugal. Infect Dis Rep. 2022;14(6):810–23.

Mpox in women

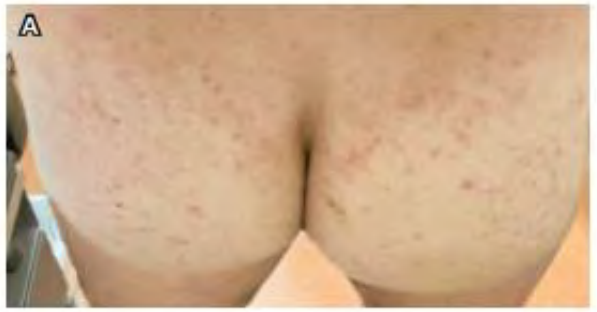
Young woman with MPXV infection after sexual intercourse, pustules in:

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

France, September 2022

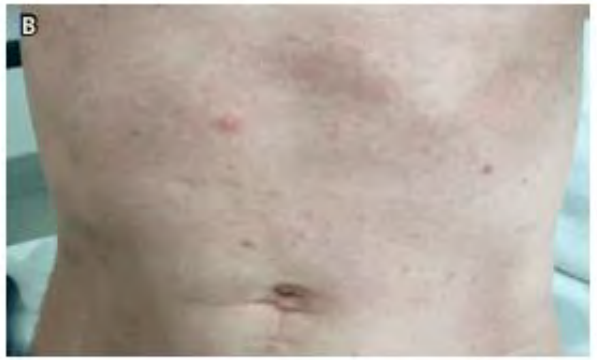


Source: Vallée A, Chatelain A, Carbonnel M, et al. Monkeypox virus infection in 18-year-old woman after sexual intercourse, France, September 2022. Emerg Infect Dis. 2023;29(1)219–22.

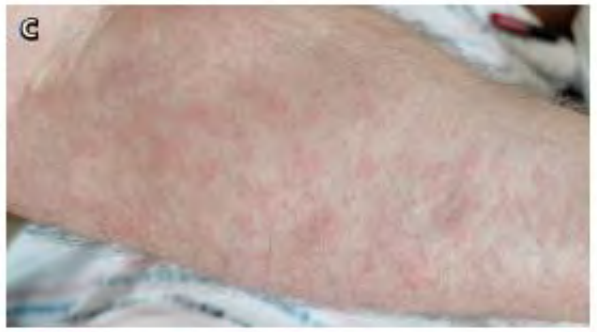


Morbilliform rash on

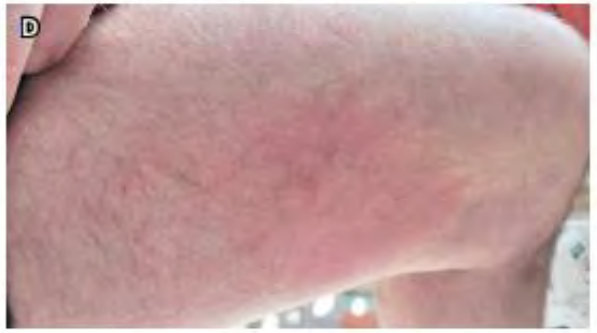
Buttocks (A)



Lower trunk (B)



Forearm (C)

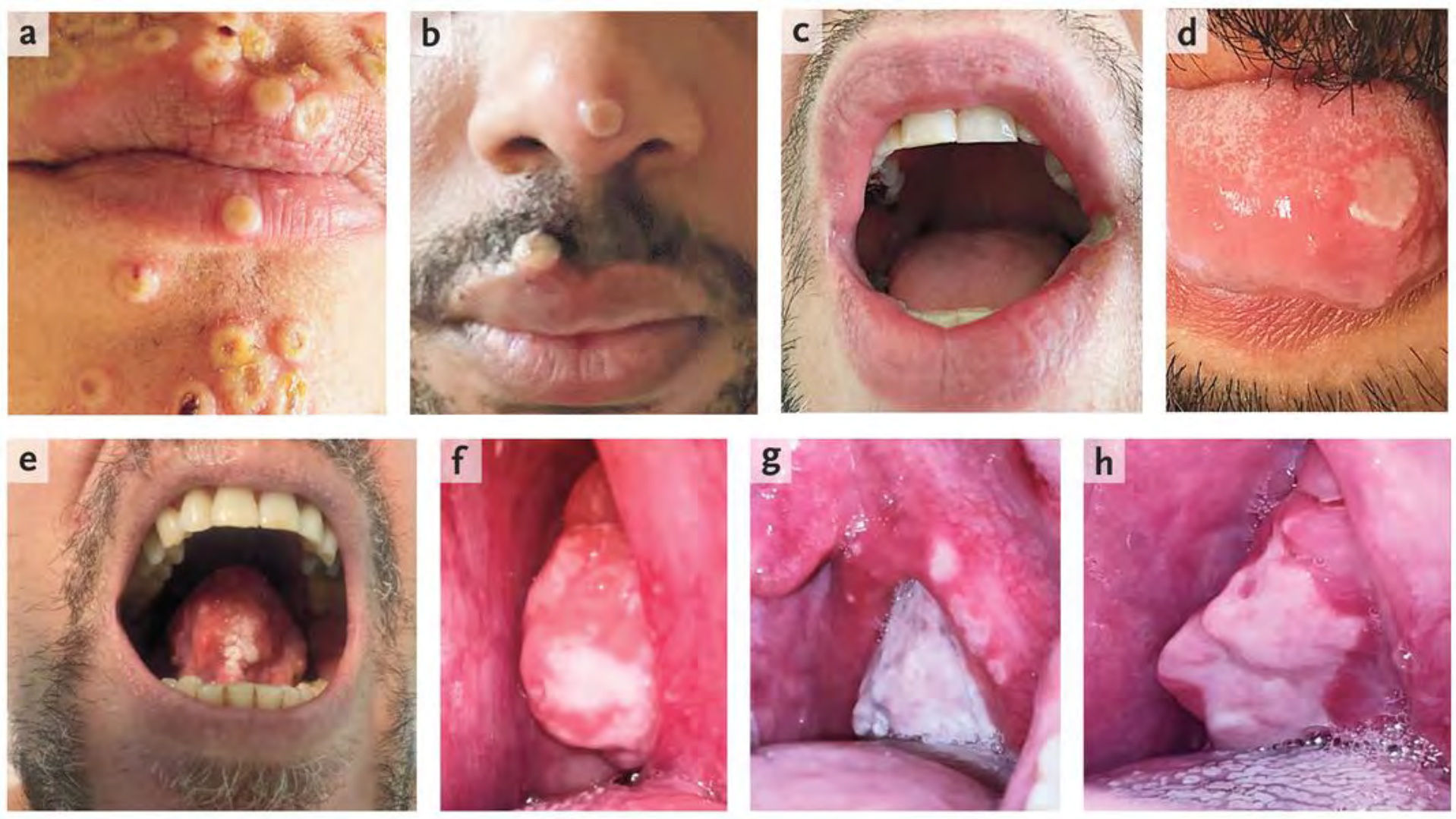


Morbilliform rash on thigh with area of confluent rash (D)

Source: Torres HM, et al. Approaching monkeypox: a guide for clinicians. Top Antivir Med. 2022;30(4):575–81.

Oral lesions

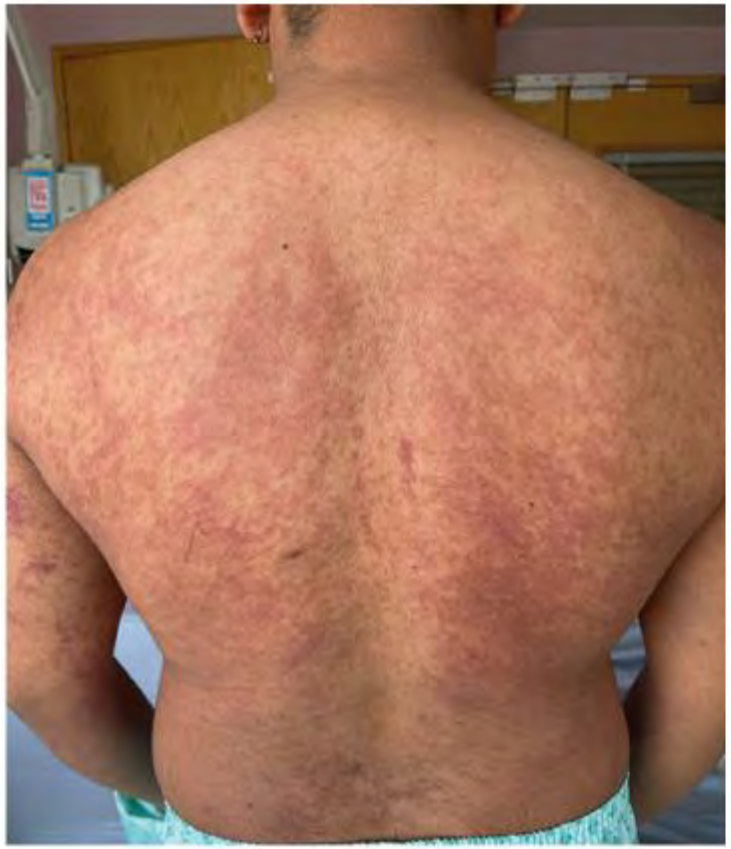
Oral and perioral lesions

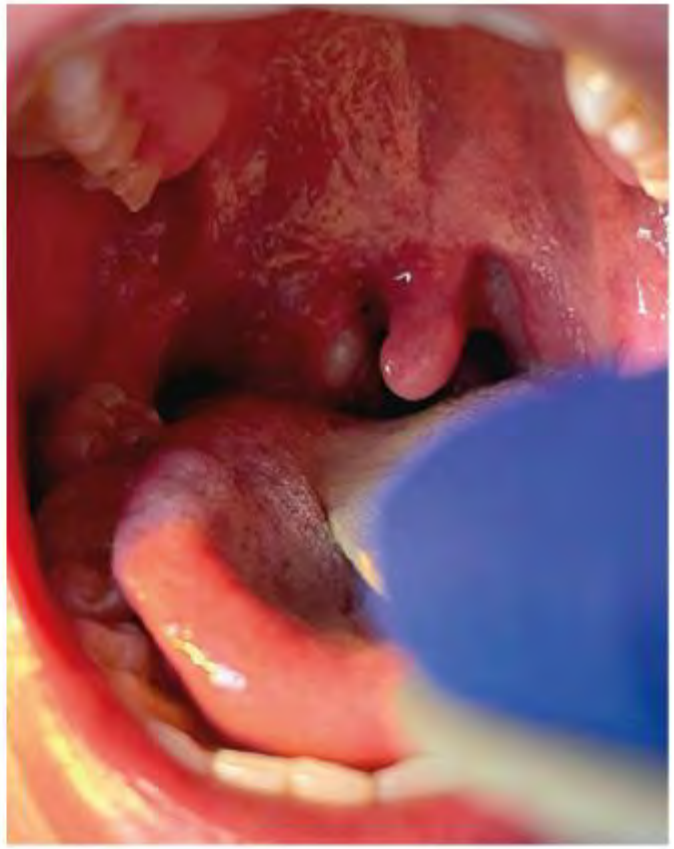


- **a:** perioral umbilicated lesions
- **b:** perioral vesicular lesion on day 8, PCR positive
- **c:** ulcer on the left corner of the mouth on day 7, PCR positive
- **d:** tongue ulcer
- **e:** tongue lesion on day 5, PCR positive
- **f, g, h:** pharyngeal lesions on day 0, 3, and 21, respectively,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

Source: Thornhill JP, et al. Monkeypox virus infection in humans across 16 countries—April–June 2022. N Engl J Med. 2022;387:679–91.

(Left) Symmetrical erythematous maculopapular rash on back and upper arms, with areas of confluent erythema



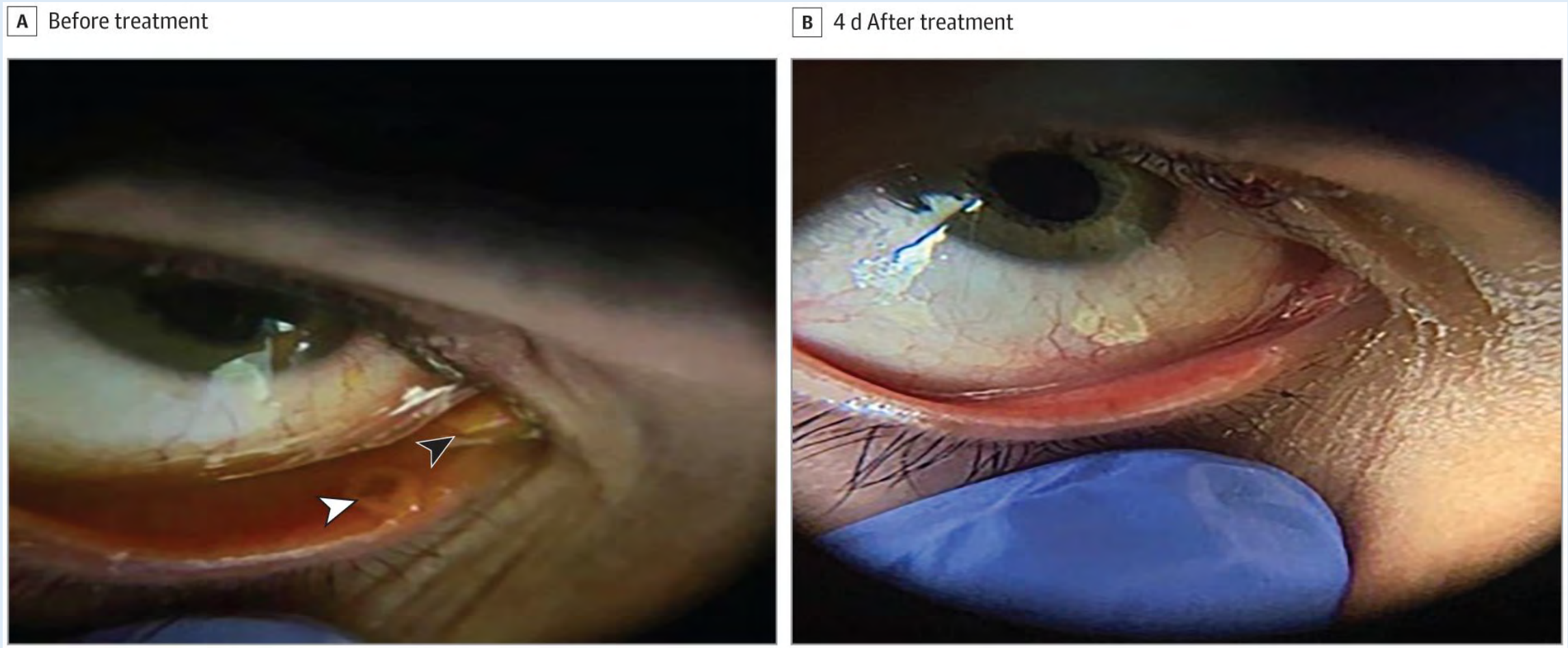


(Right) Right tonsillar enlargement with an overlying pustular lesion and yellow-green exudate with slight deviation of the uvula

- 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

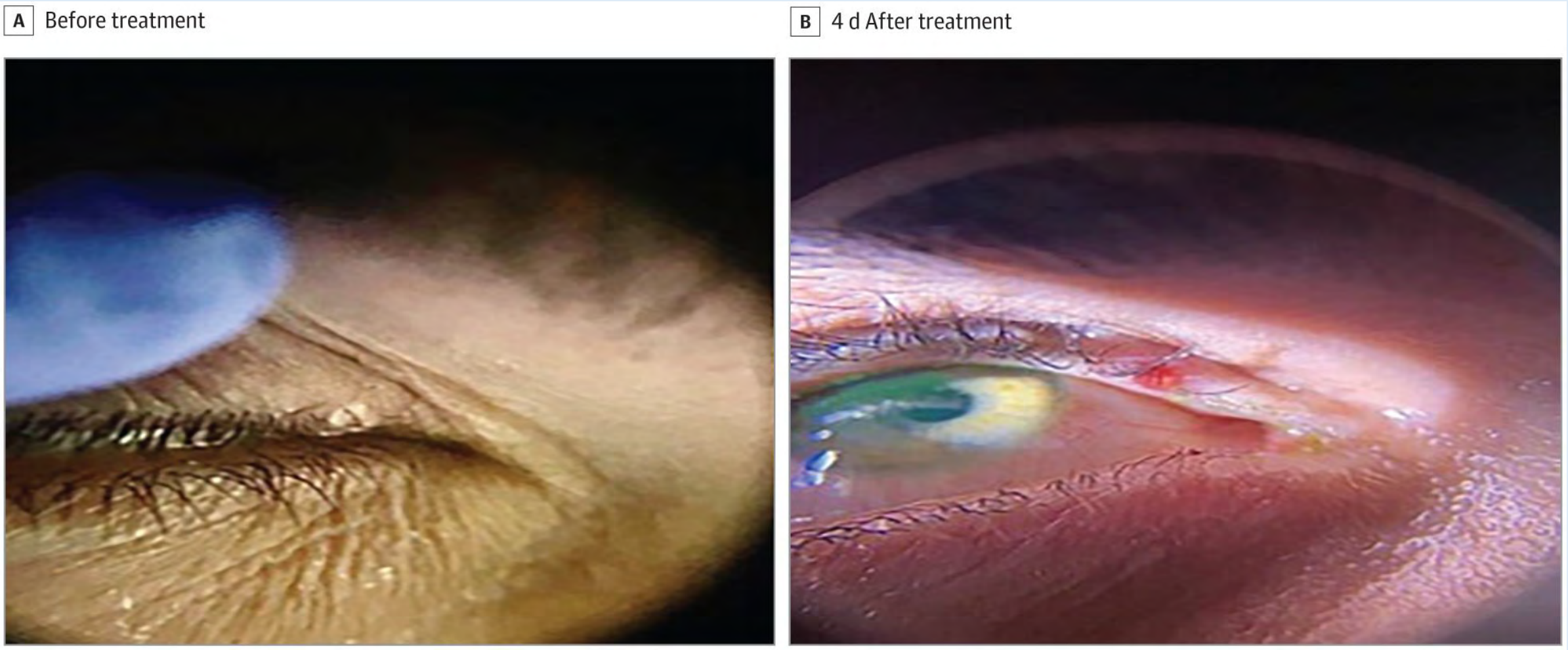
Source: Patel A, et al. Clinical features and novel presentations of human monkeypox in a central London centre during the 2022 outbreak: descriptive case series. BMJ. 2022;378:e072410.

Ocular lesions



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

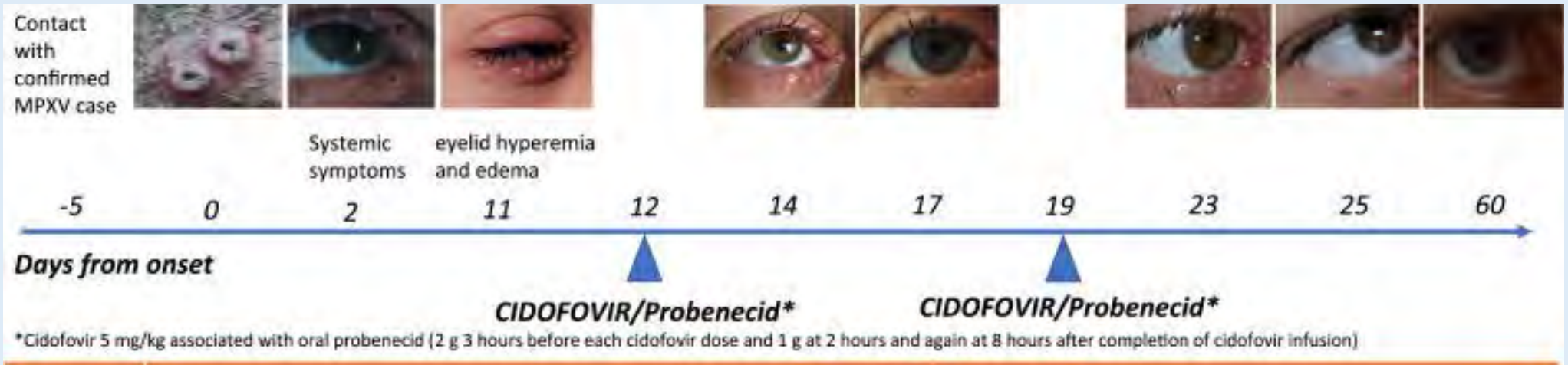
Source: Ravneet SR, et al. Ocular pox lesions in a male patient with monkeypox treated with tecovirimat, JAMA Ophthalmol. 2022;140(12):1244-46.



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

Source: Ravneet SR, et al. Ocular pox lesions in a male patient with monkeypox treated with tecovirimat, JAMA Ophthalmol. 2022;140(12):1244-46.

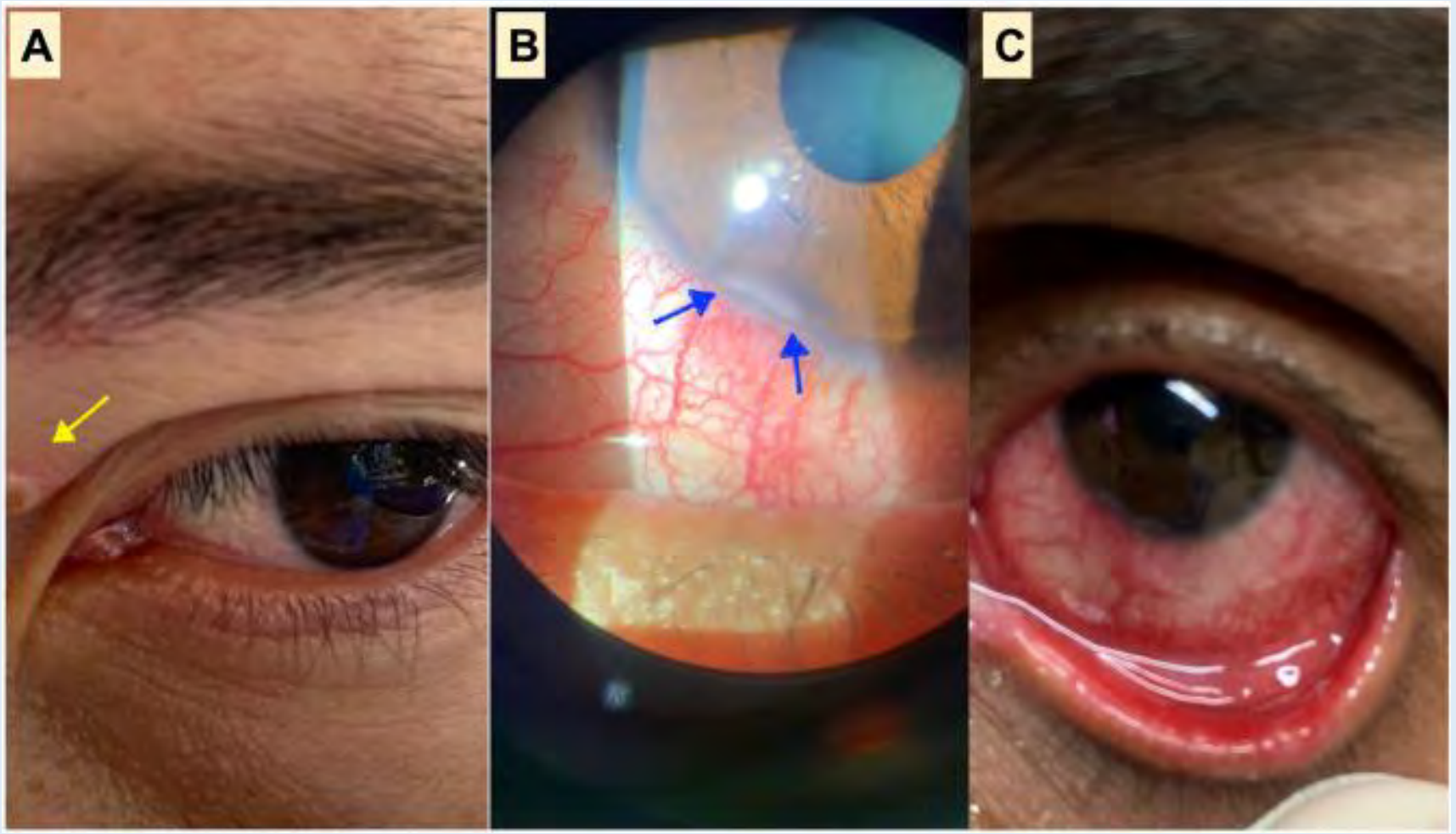
Timeline of clinical evolution and PCR positivity in biological samples collected



*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)

Sample	Quantification cycle (Cq) of specific MPXV RT-PCR									
Skin lesion	18,69	25,20	30,12	19,02	22,61					
Oropharingeal swab	NEG	35,49	36,22	32,25	30,02	NEG			NEG	
Eyelid swab		32,96		21,45	28,41			36,11		
Conjiunctival swab				18,99				36,01	NEG	
Serum		37,81	35,65	34,93	NEG	NEG				
Urine		NEG	NEG	35,62	NEG	NEG				
Sputum		26,01	29,05	31,79		NEG				

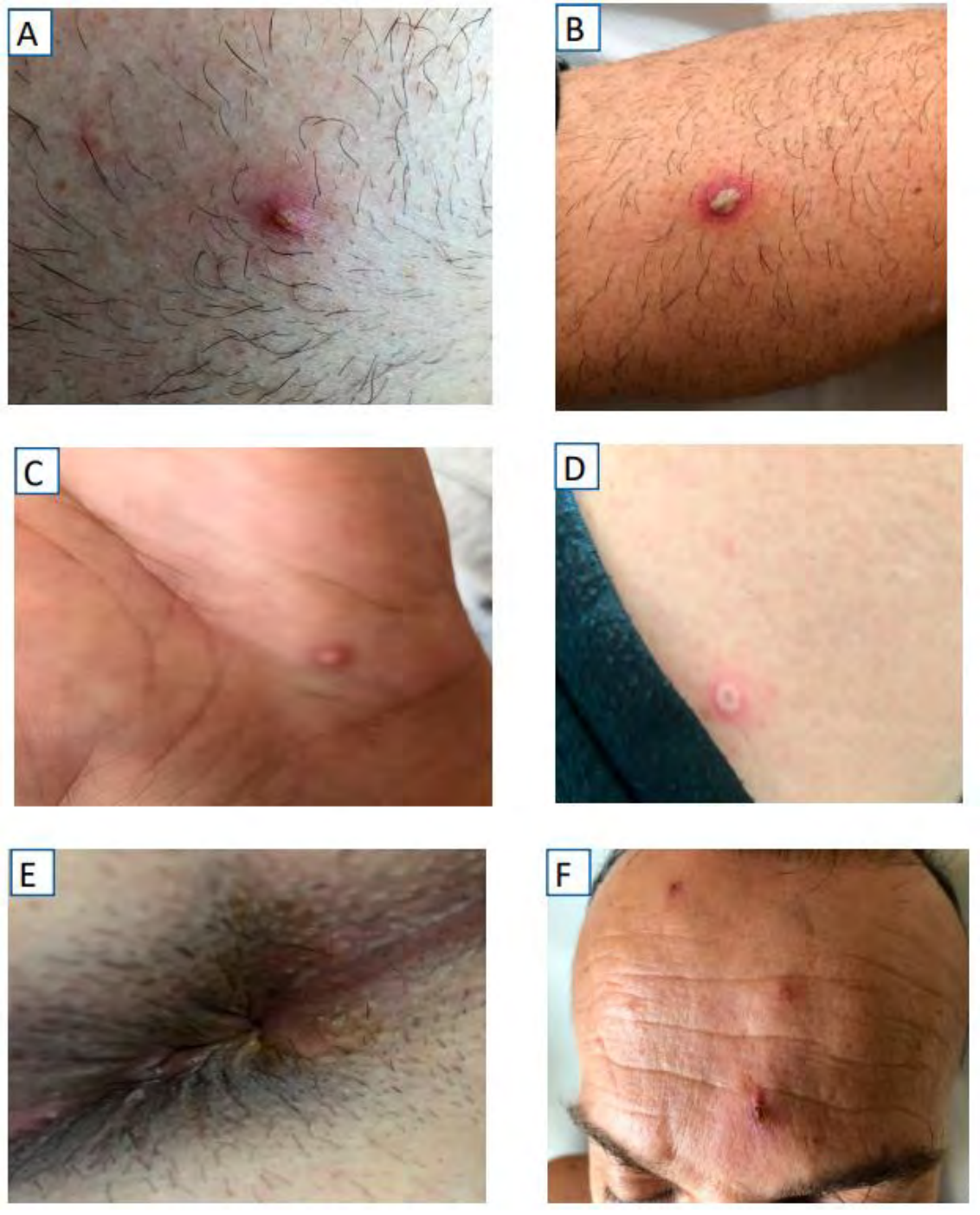
Source: Mazzotta V, et al. Ocular involvement in monkeypox: description of an unusual presentation during the current outbreak. J Infect. 2022;85(5):573-607.



Source: Ng FYC, et al. Monkeypox and ocular implications in humans. Ocul Surf. 2023;27:13–15.

- **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)

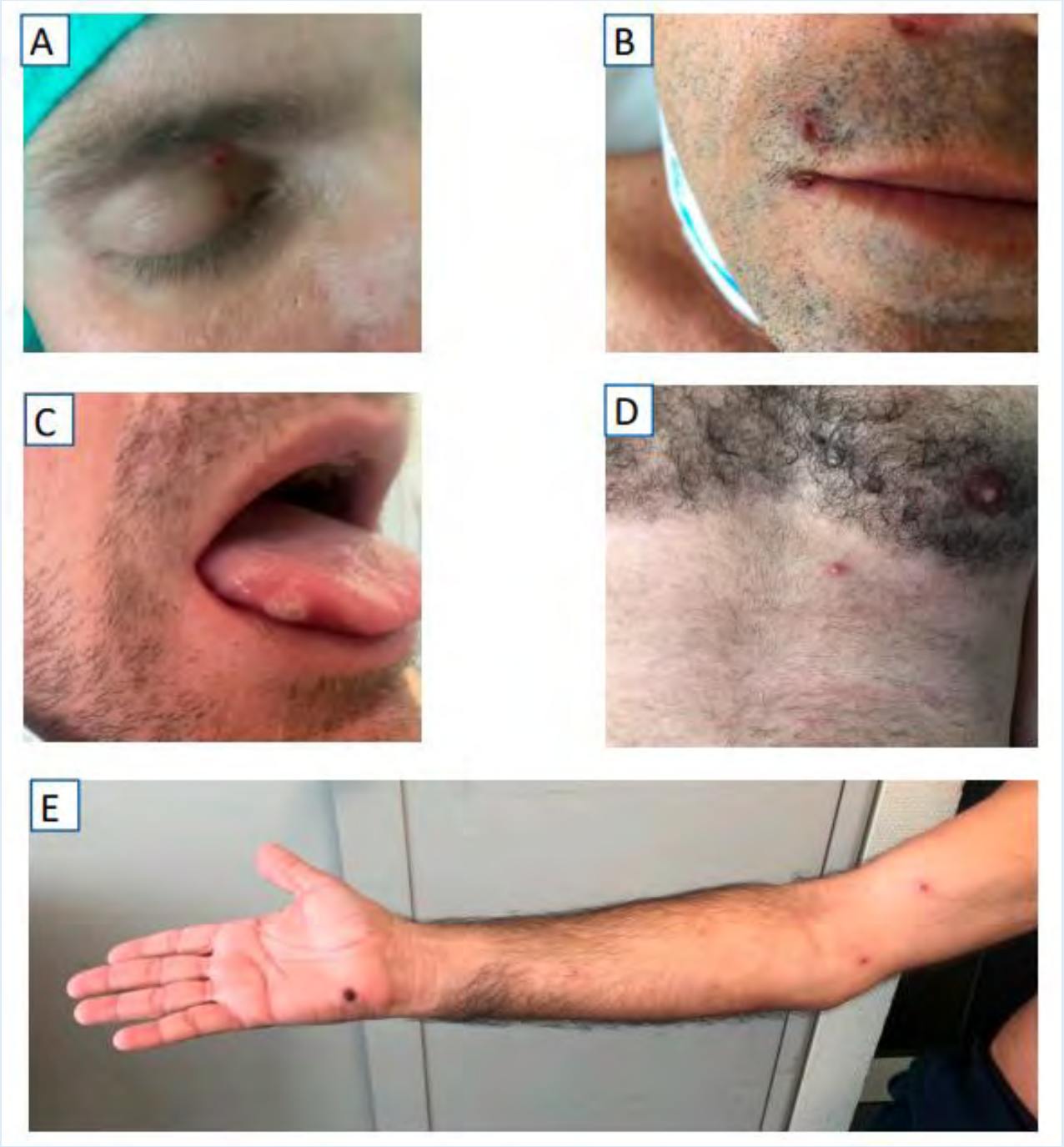
C. Papulo-pustule (white center, hand)

D. Papulo-pustule (black center, neck)

E. Chancriform ulcer (anus)

F. Atrophic scar (forehead)

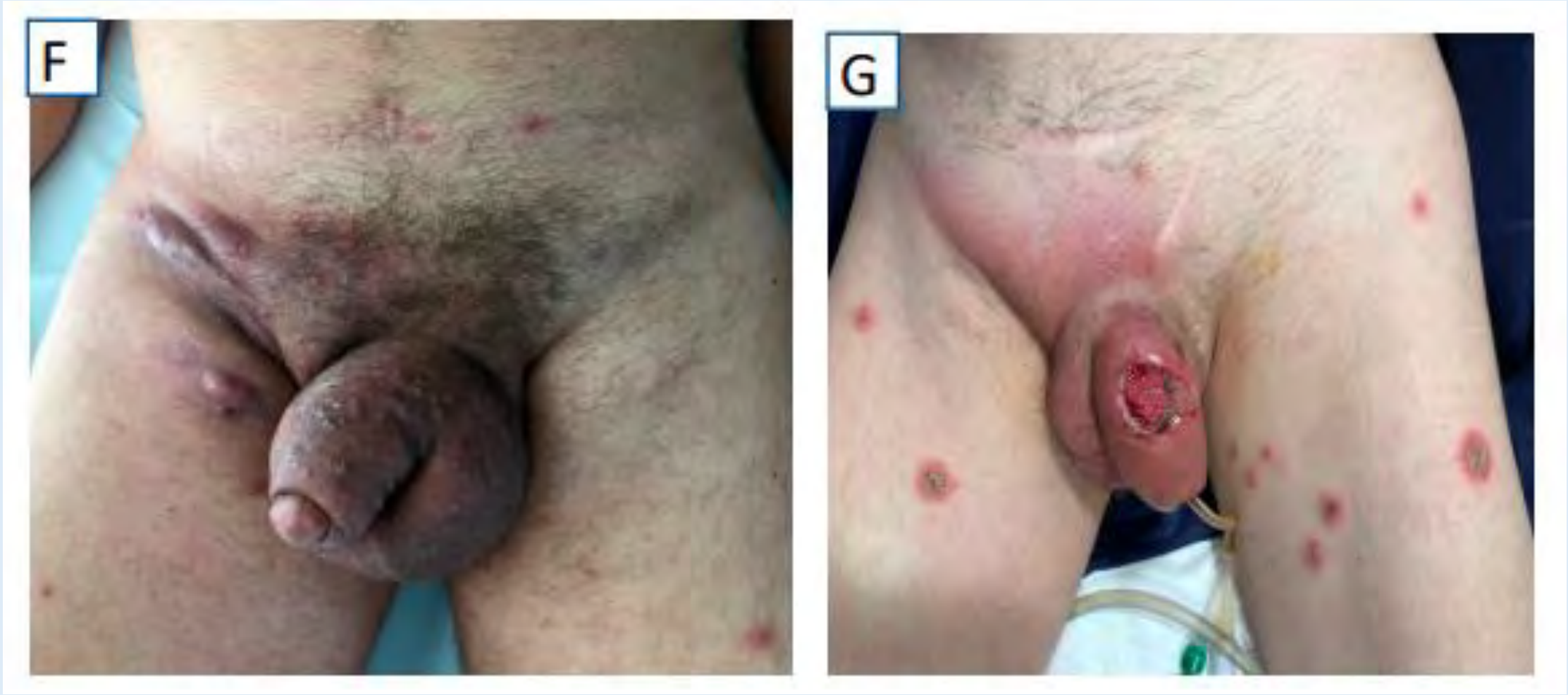
Source: Betancort-Plata C, et al. Monkeypox and HIV in the Canary Islands: a different pattern in a mobile population. Trop Med Infect Dis. 2022;7(10):10.3390/tropicalmed7100318.



Topographical distribution of lesions:

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

Source: Betancort-Plata C, et al. Monkeypox and HIV in the Canary Islands: a different pattern in a mobile population. Trop Med Infect Dis. 2022;7(10):10.3390/tropicalmed7100318.

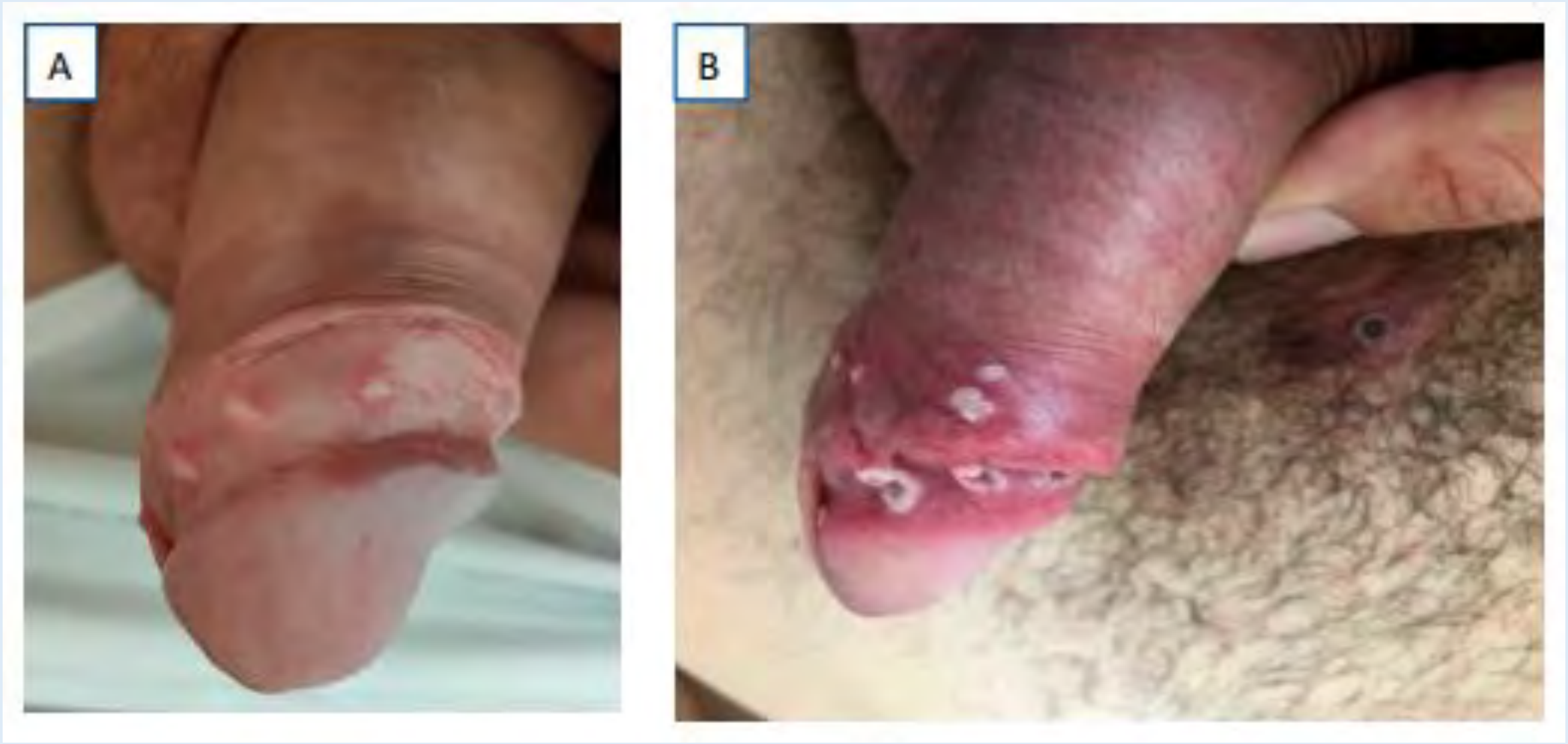


Topographical distribution of lesions *(continued):*

(F) Abdomen, genital area, and thighs

(G) Abdomen, genital area, and thighs

Source: Betancort-Plata C, et al. Monkeypox and HIV in the Canary Islands: a different pattern in a mobile population. Trop Med Infect Dis. 2022;7(10):10.3390/tropicalmed7100318.



(A) Day 4

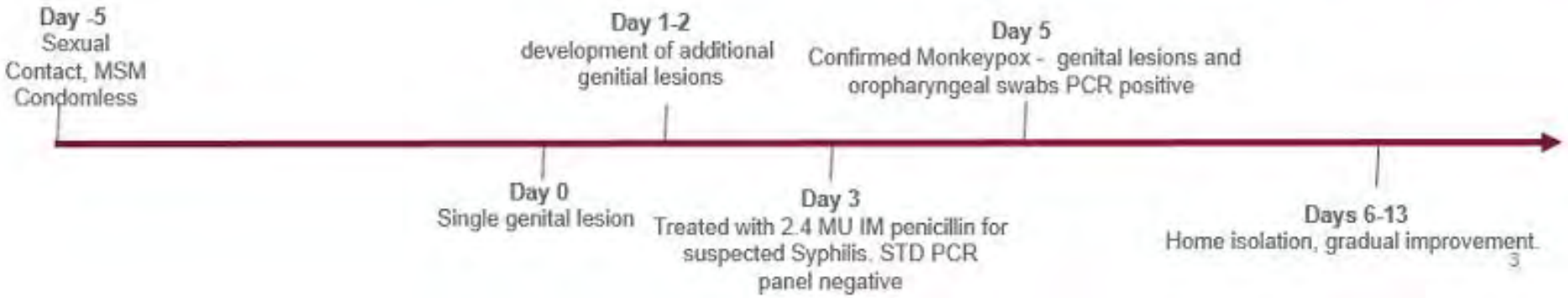
(B) Day 8

Source: Betancort-Plata C, et al. Monkeypox and HIV in the Canary Islands: a different pattern in a mobile population. Trop Med Infect Dis. 2022;7(10):10.3390/tropicalmed7100318.

Penile lesions

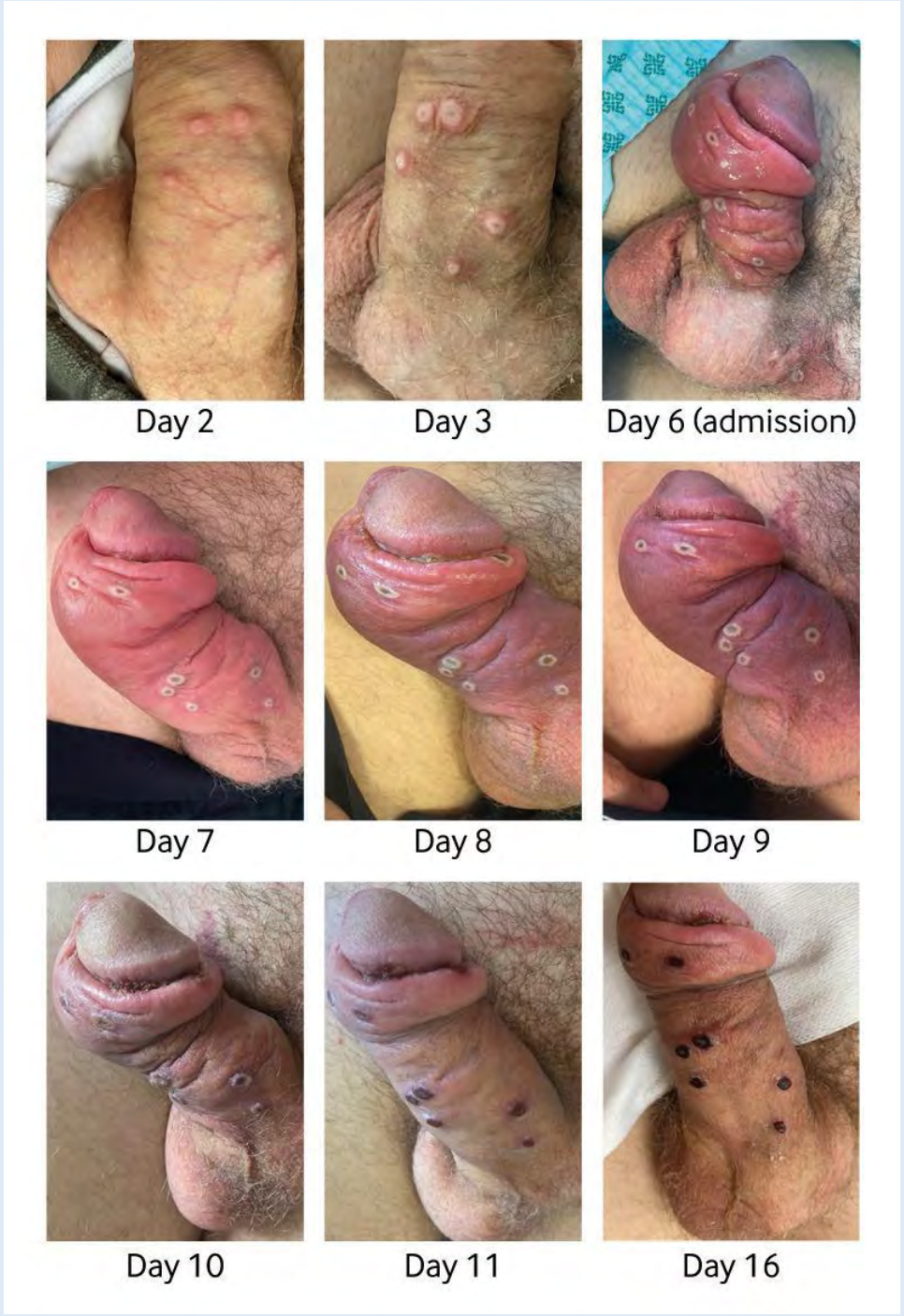
Clinical evolution of penile lesions

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.



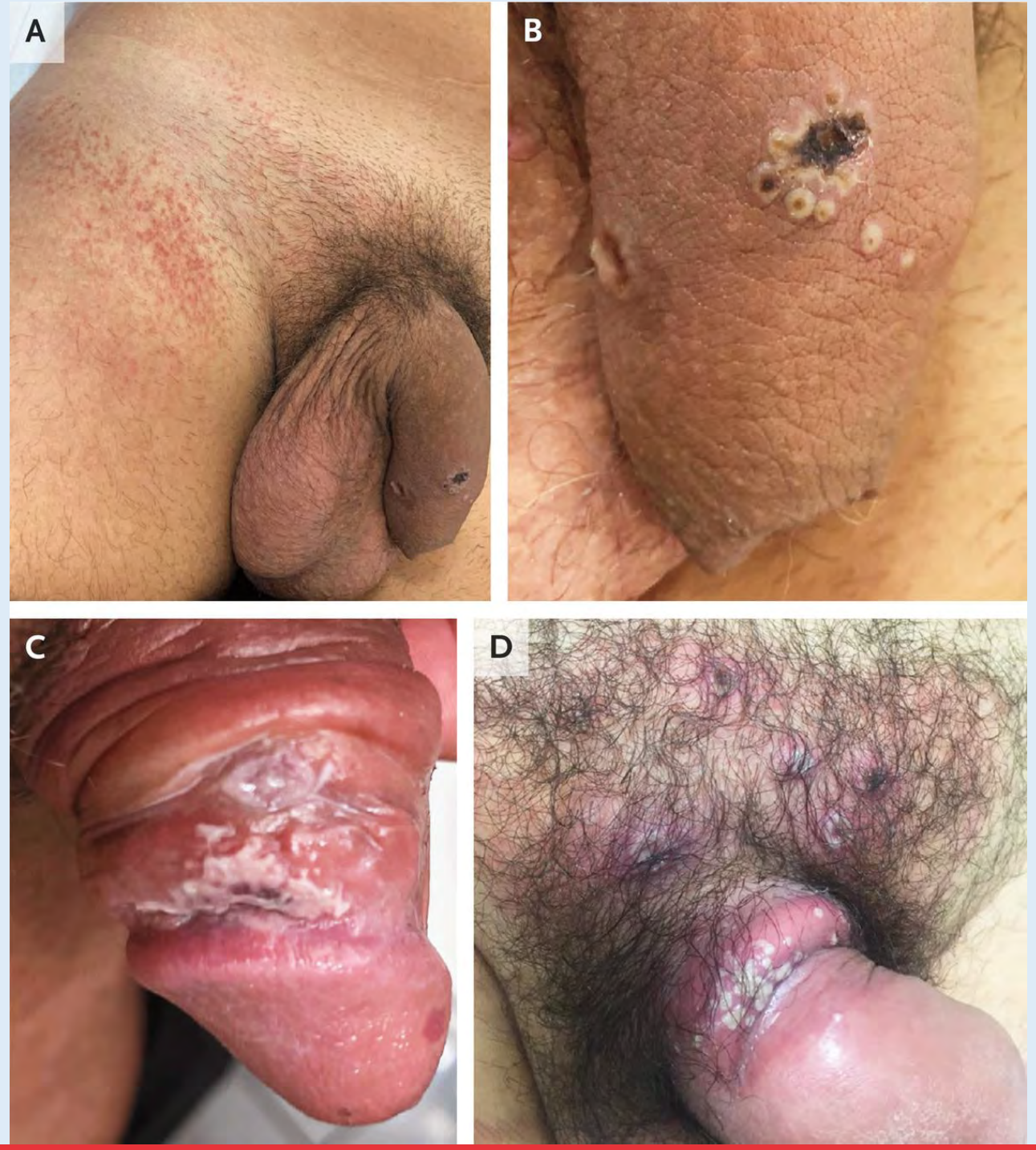
Photos courtesy of New Eng J Med:Thornhill JP, et al. NEJM, 2022.

Progression of penile lesions and penile oedema



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

Source: Patel A, et al. Clinical features and novel presentations of human monkeypox in a central London centre during the 2022 outbreak: descriptive case series. BMJ. 2022;378:e072410.



- 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).

Source: Patrocinio-Jesus R, et al. Monkeypox genital lesions. New Eng J Med. 2022;387:66.

Progression of penile confluent lesions

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

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

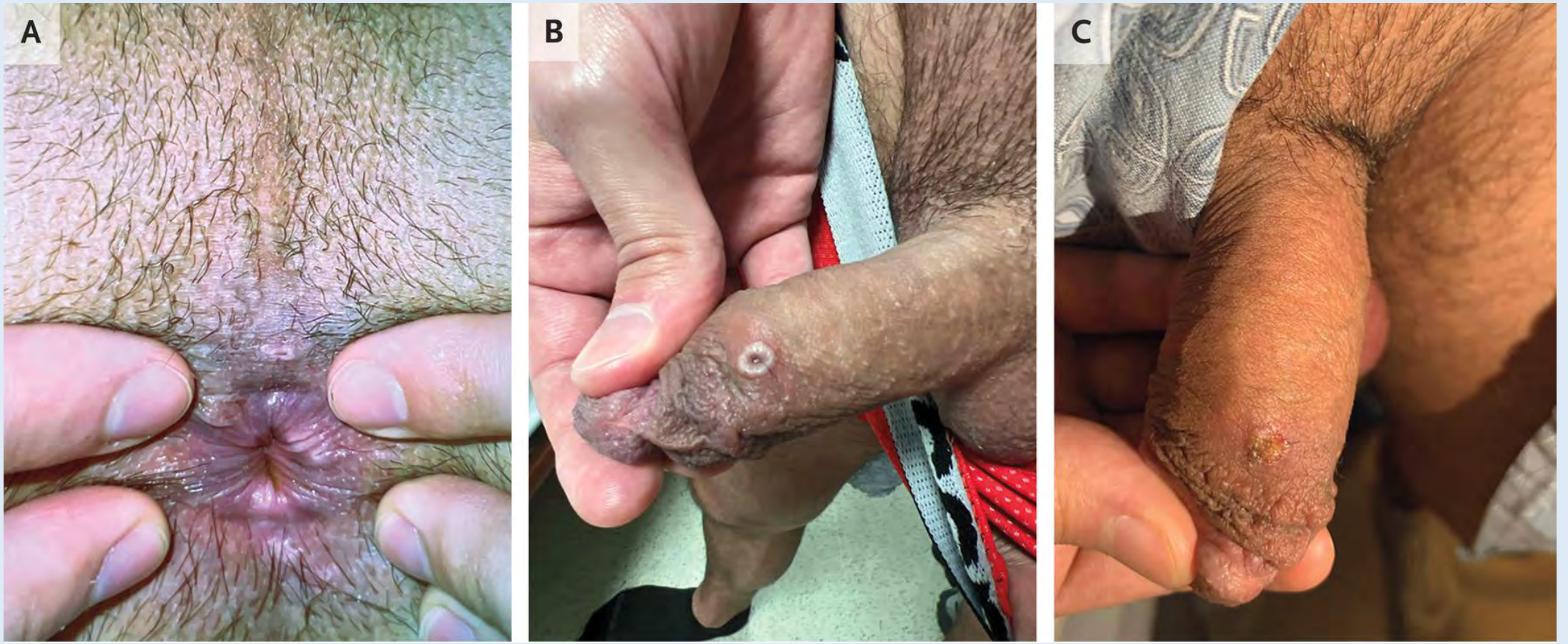
Source: Patel A, et al. Clinical features and novel presentations of human monkeypox in a central London centre during the 2022 outbreak: descriptive case series. BMJ. 2022;378:e072410.

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

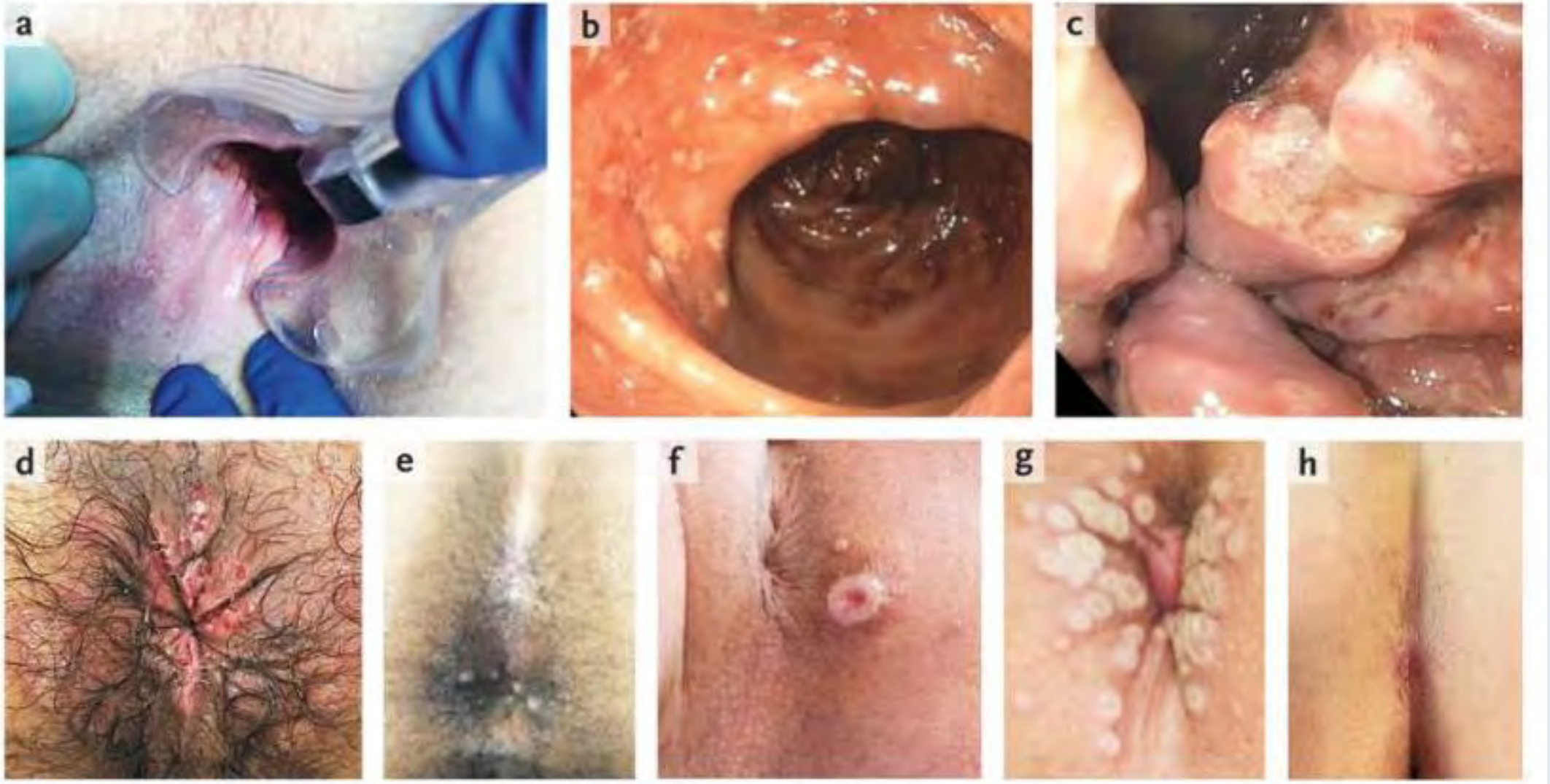
Source: Patel A, et al. Clinical features and novel presentations of human monkeypox in a central London centre during the 2022 outbreak: descriptive case series. BMJ. 2022;378:e072410.

Perianal, anal, and rectal lesions



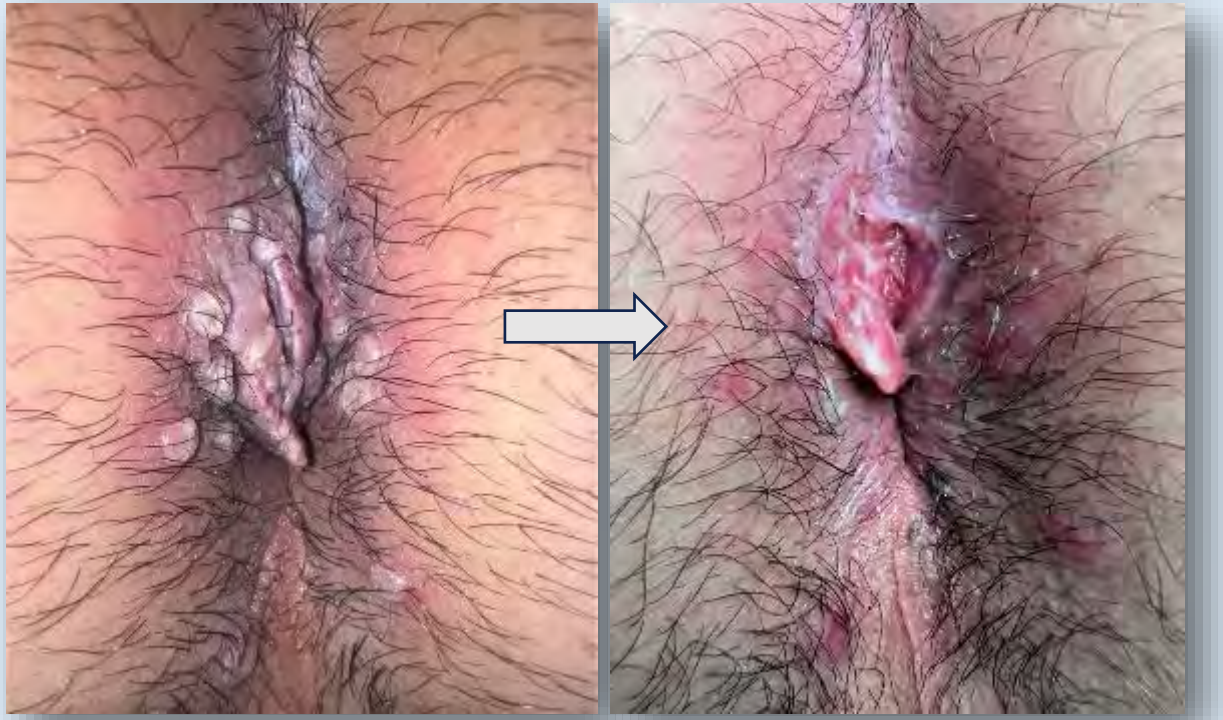
- **A:** a tender perianal ulcer, measuring less than 1 cm in diameter, with raised, firm margins.
- **B:** an ulcer on the dorsum of the penile shaft, measuring 7 mm in diameter that is similar in appearance to the perianal ulcer.
- **C:** the ulcer has heaped margins around a central dry base.
  In all panels, the patient's hands are shown.

Source: Basgoz N, et al. Case 24-2022: a 31-year-old man with perianal and penile ulcers, rectal pain, and rash. N Engl J Med. 2022:387:547–56.



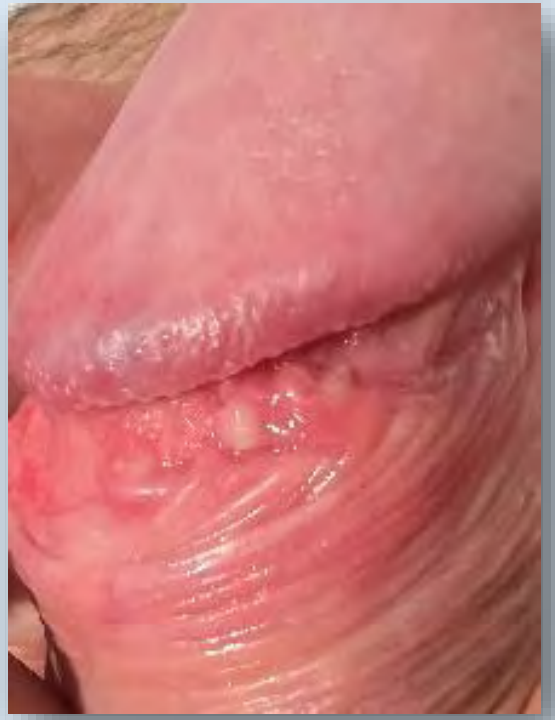
Source: Thornhill JP. Monkeypox virus infection in humans across 16 countries — April–June 2022. N Engl J Med. 2022;387:679-91.

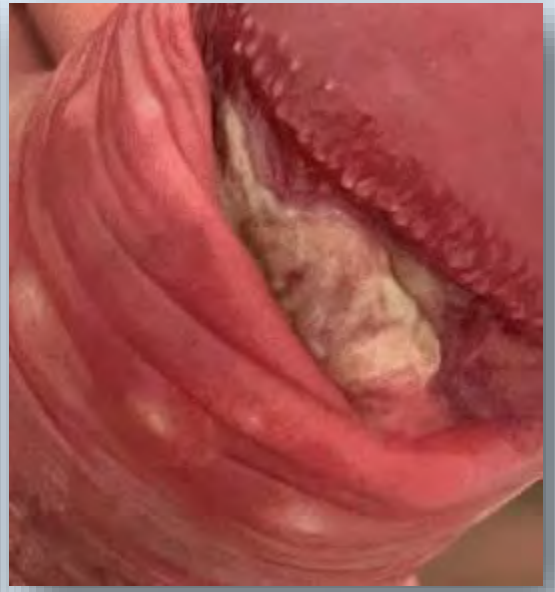
- **a:** anal and perianal lesions on day 6, PCR positive
- **b and c:** rectal and anal lesions in a single person, PCR positive
- **d:** perianal ulcers, PCR positive
- **e:** anal lesions
- **f:** umbilicated perianal lesion on day 3, PCR positive
- **g:** umbilicated perianal lesions on day 3, PCR positive
- **h:** perianal ulcer on day 2, PCR positive

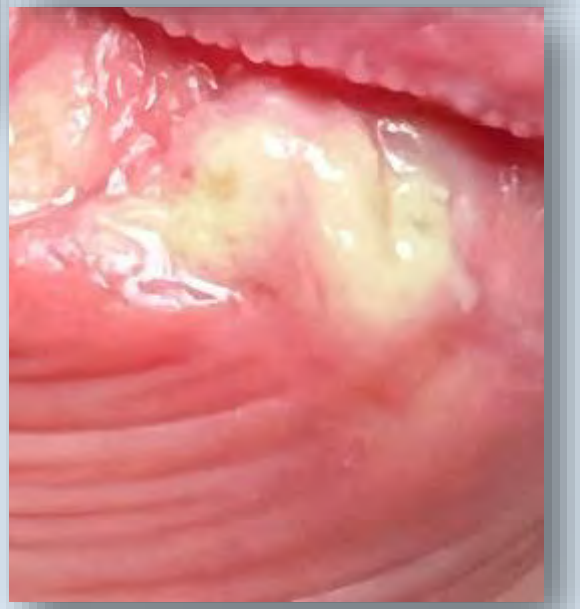


Perianal pustules evolving into large ulcerative lesion (8 days)

- 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.







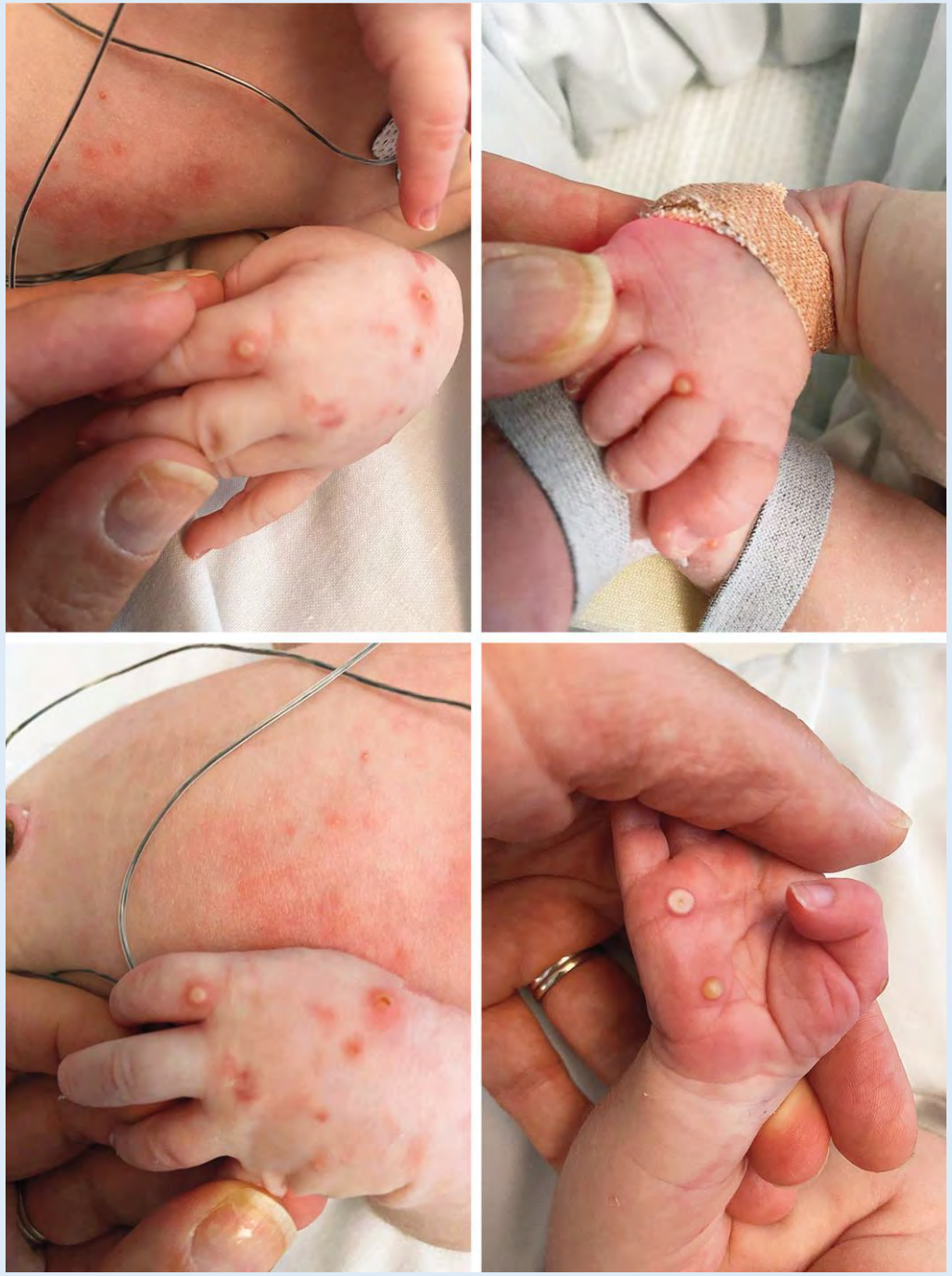
Penile lesions coalescing into large ulceration (8 days)

Source: Girometti N, et al. Demographic and clinical characteristics of confirmed human monkeypox virus cases in individuals attending a sexual health centre in London, UK: an observational analysis. Lancet Infect Dis. 2022;22(8):1321-28.

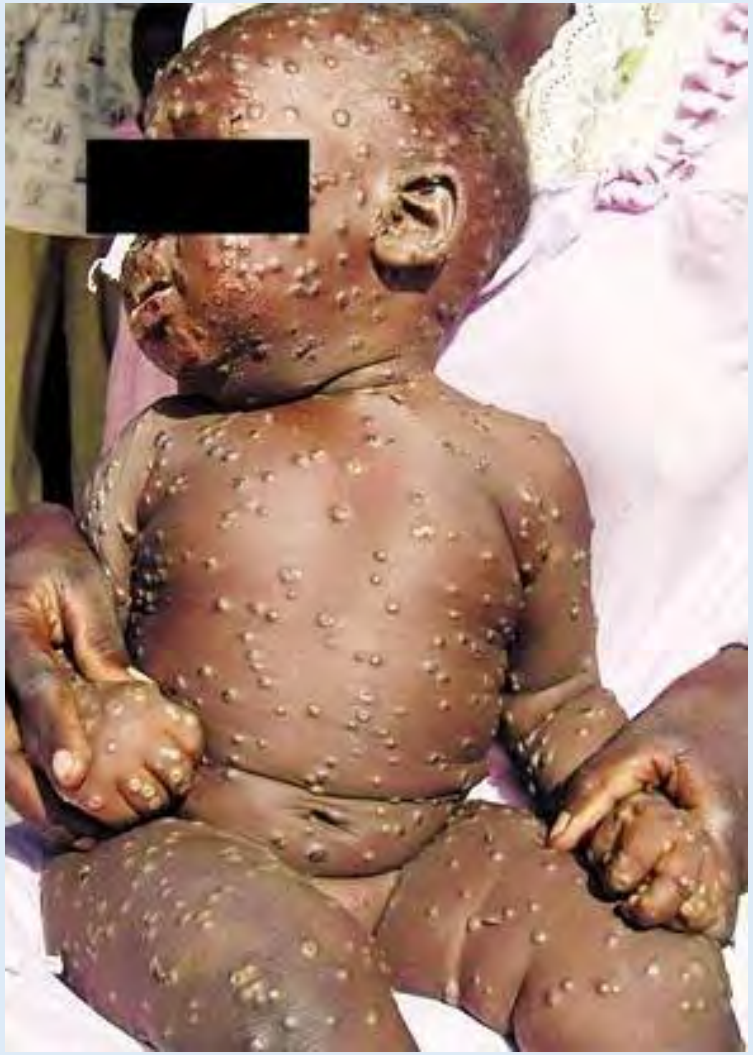
Lesions in children

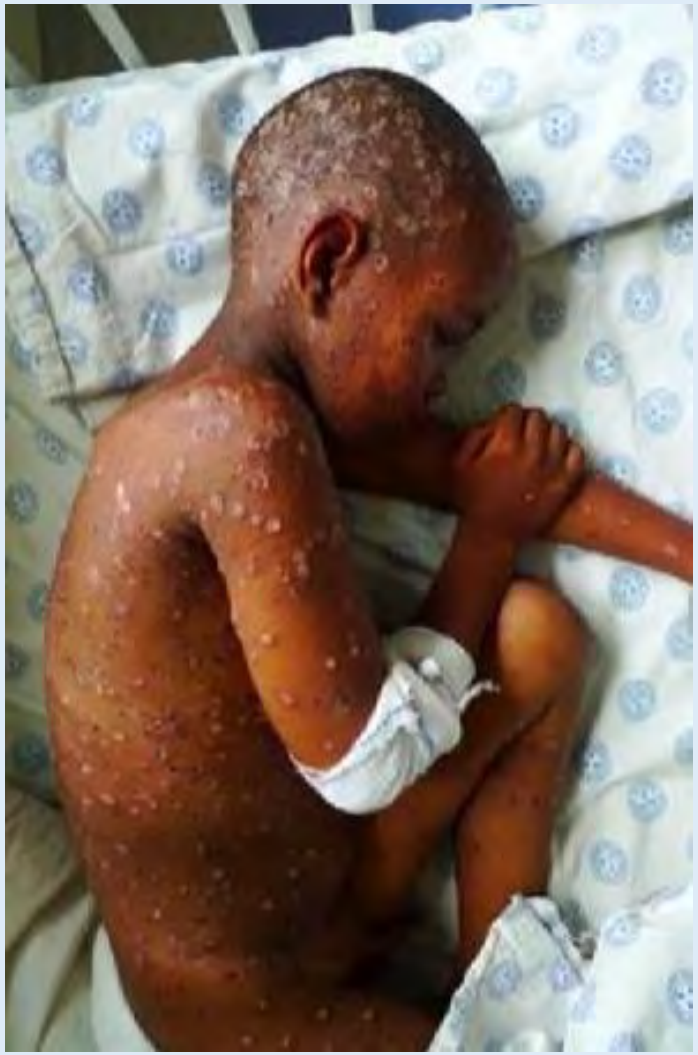
Skin lesion in newborn infant

- 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

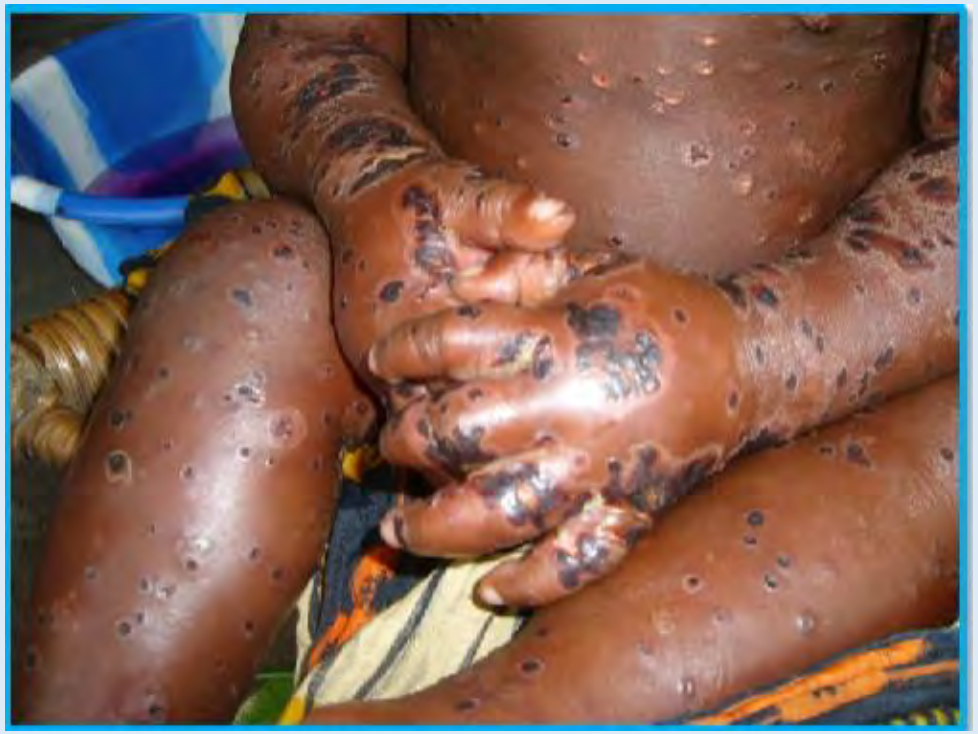


Source: Ramnarayan P, et al. Neonatal monkeypox virus infection: letter to editor. N Engl J Med. 2022;3817:1618–20.

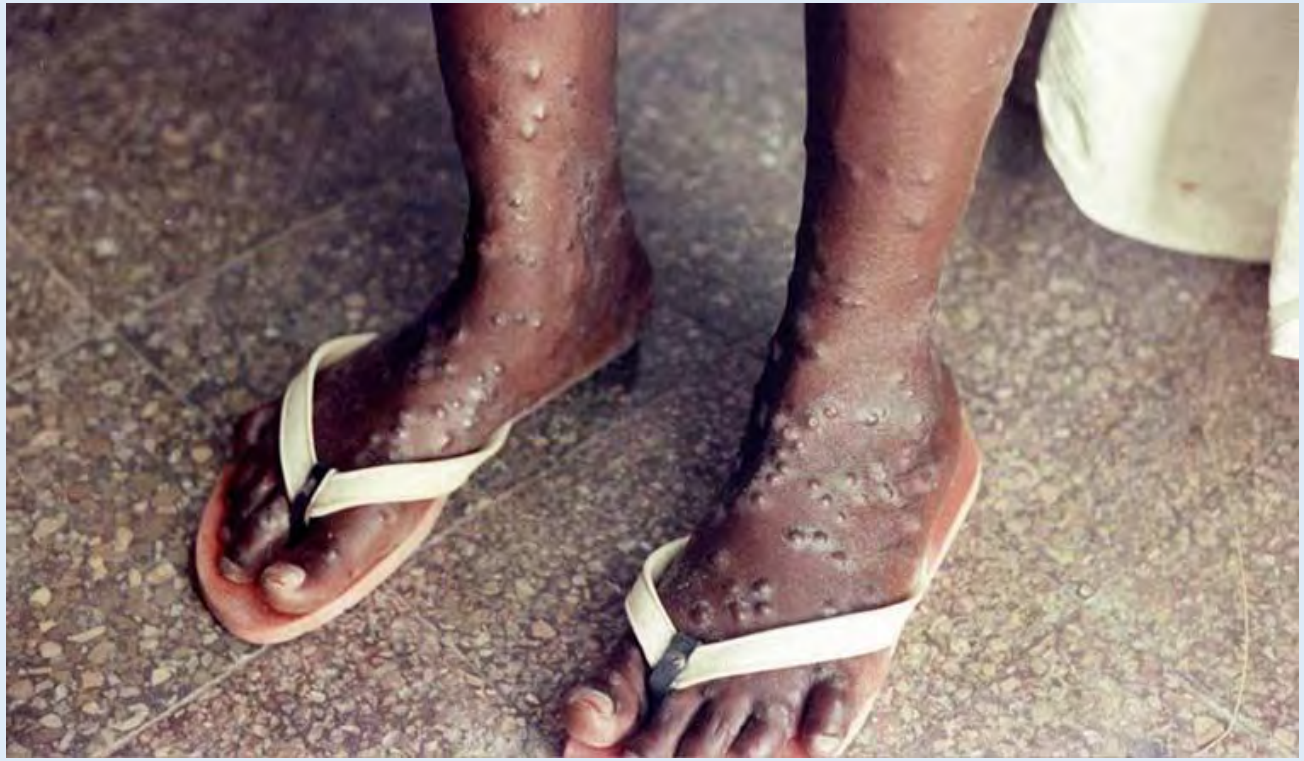




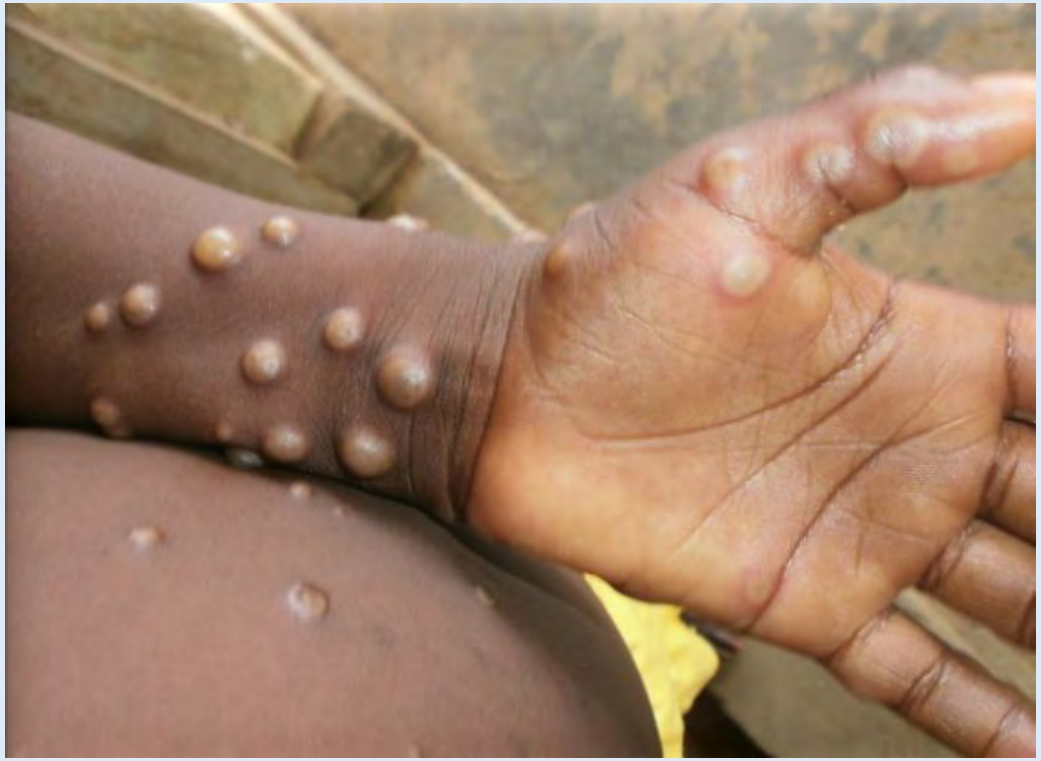
Source: Damon IK, et al. Discovery of monkeypox in Sudan: letter to editor. N Engl J Med. 2006;355:9862-63.



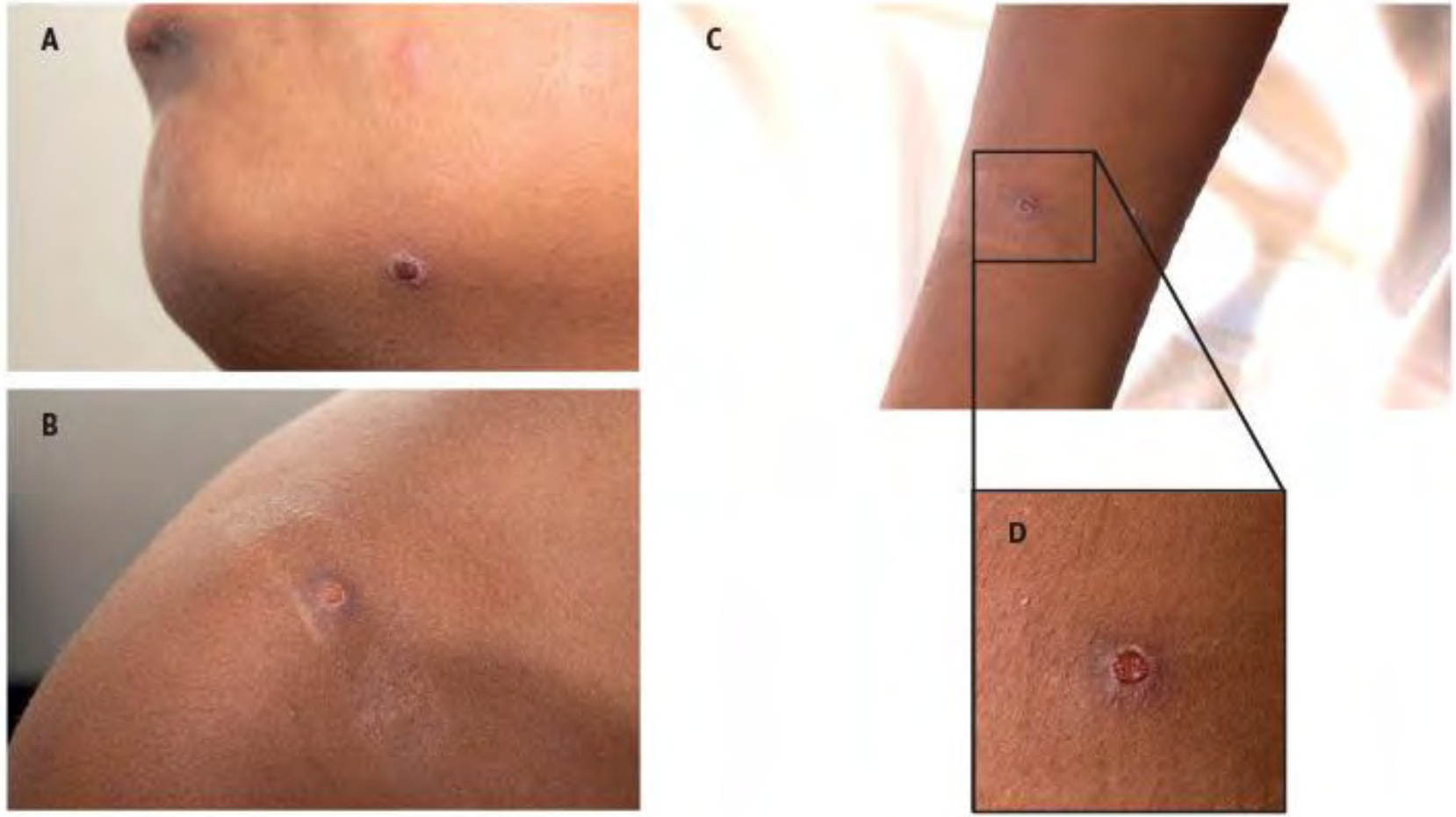
Source: WHO. Pocket book of hospital care for children: 2nd edition. Geneva: WHO; 2013. Available from: https://www.who.int/publications/i/item/978-92-4-154837-3.



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.

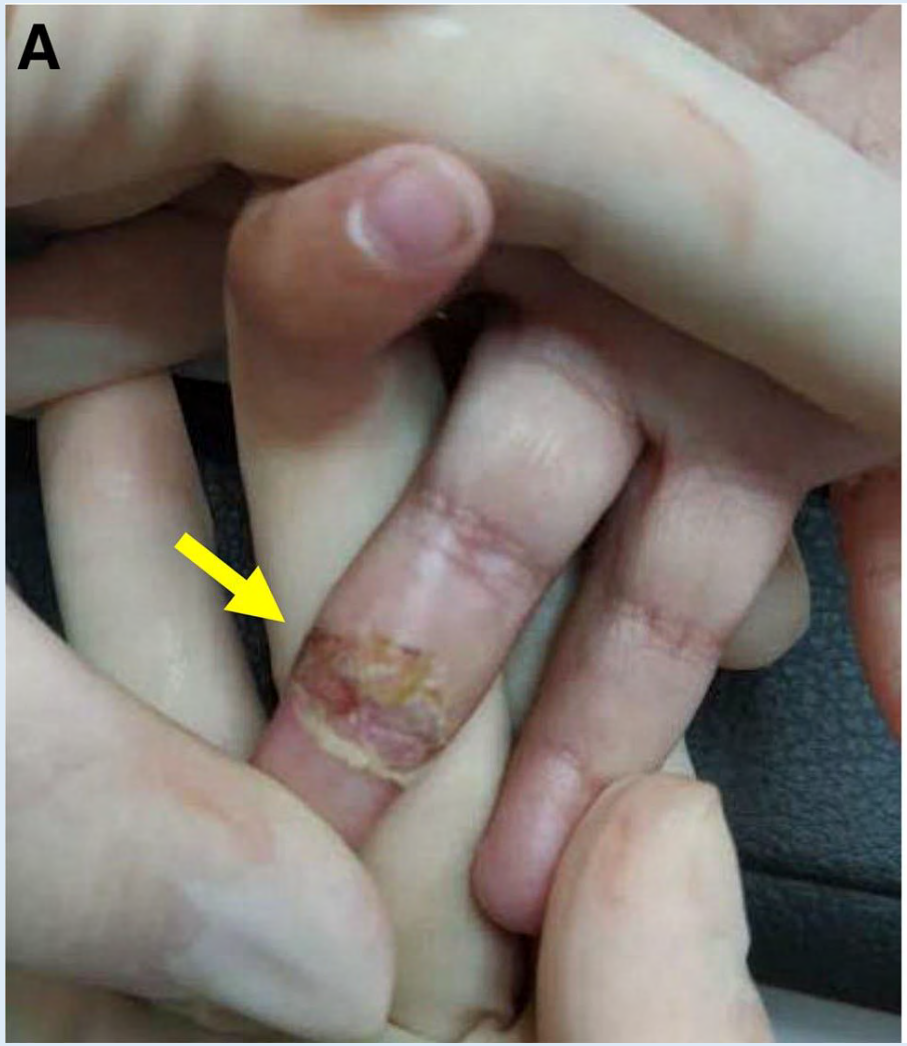


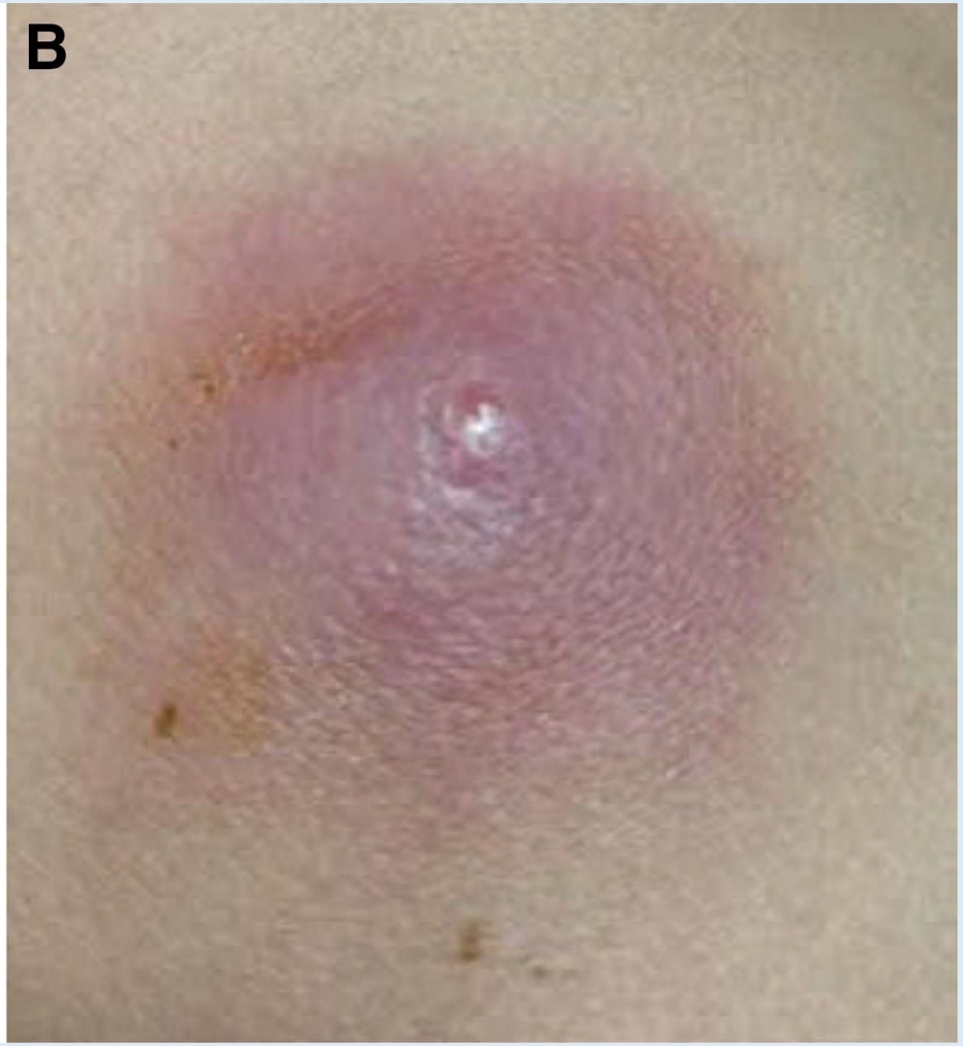
- **A:** two solitary lesions on the left lower jaw and cheek
- **B:** right shoulder
- **C:** right forearm
- **D:** forearm zoomed in

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

- 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

Source: van Furth AMT, et al.Paediatric monkeypox patient with unknown source of infection, the Netherlands, June 2022. Euro Surveill. 2022;27(29):2200552.





- 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

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.

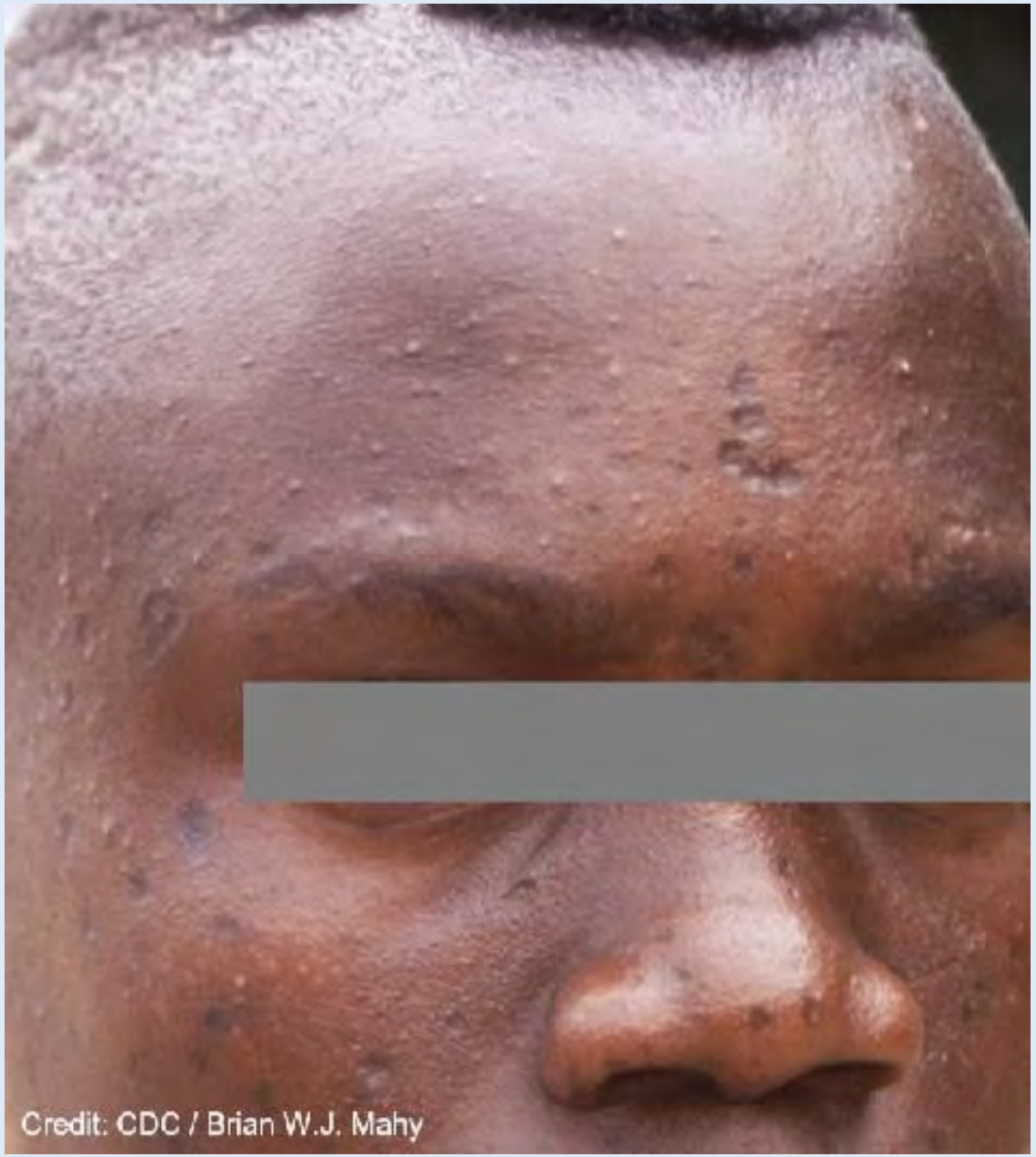
Source: Fuente SM, et al. A call for attention: pediatric monkeypox case in a context of changing epidemiology: letter to editor. Pediatr Infect Dis J. 2022;41(12):548-49.

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.



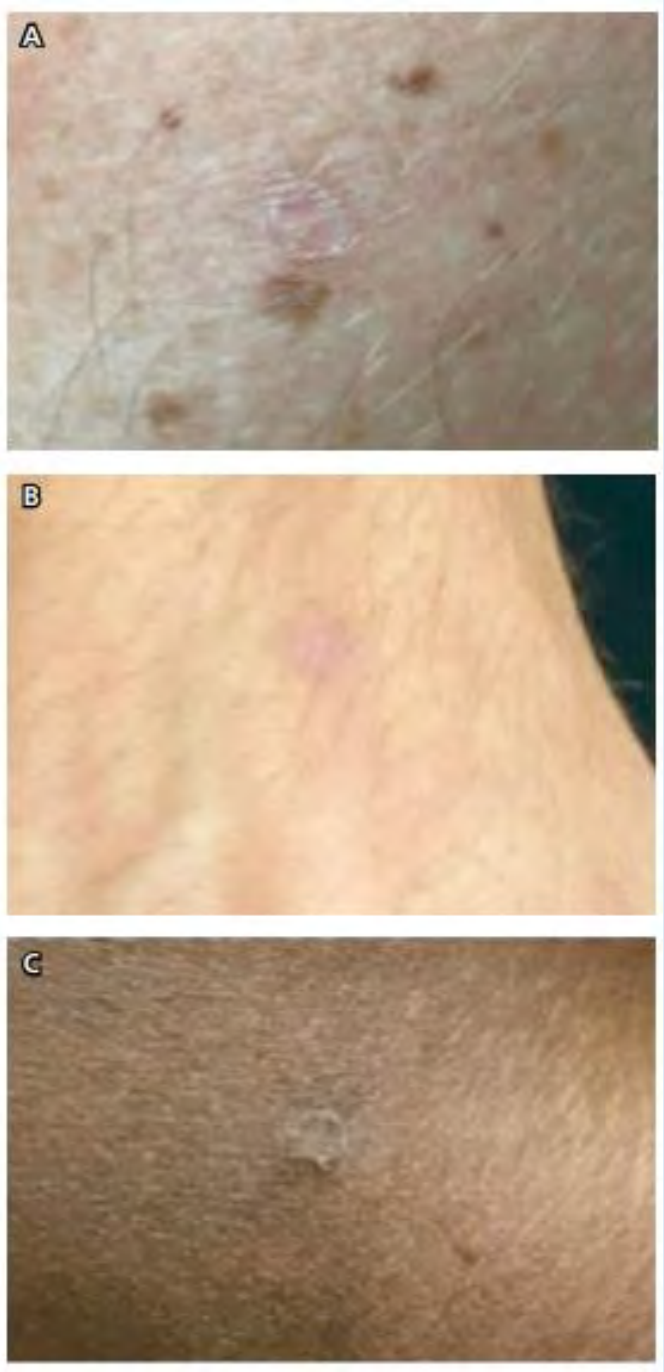
Scabbed lesions

- **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

Source: Torres HM, et al. Approaching monkeypox: a guide for clinicians. Top Antivir Med. 2022;30(4):575–81.

Resolution of lesions

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



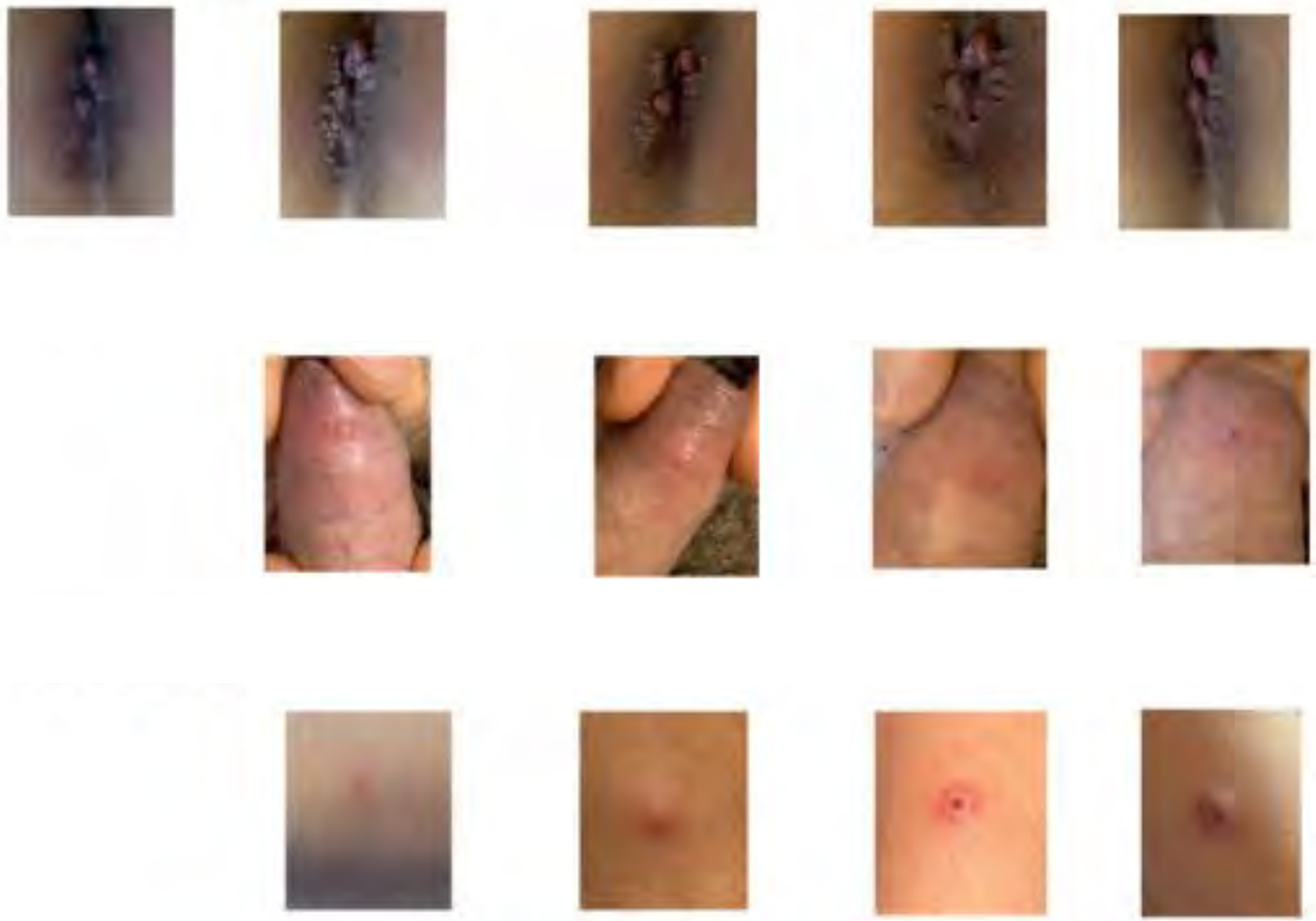
Source: Torres HM, et al. Approaching monkeypox: a guide for clinicians. Top Antivir Med. 2022;30(4):575–81.

Long term consequences

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

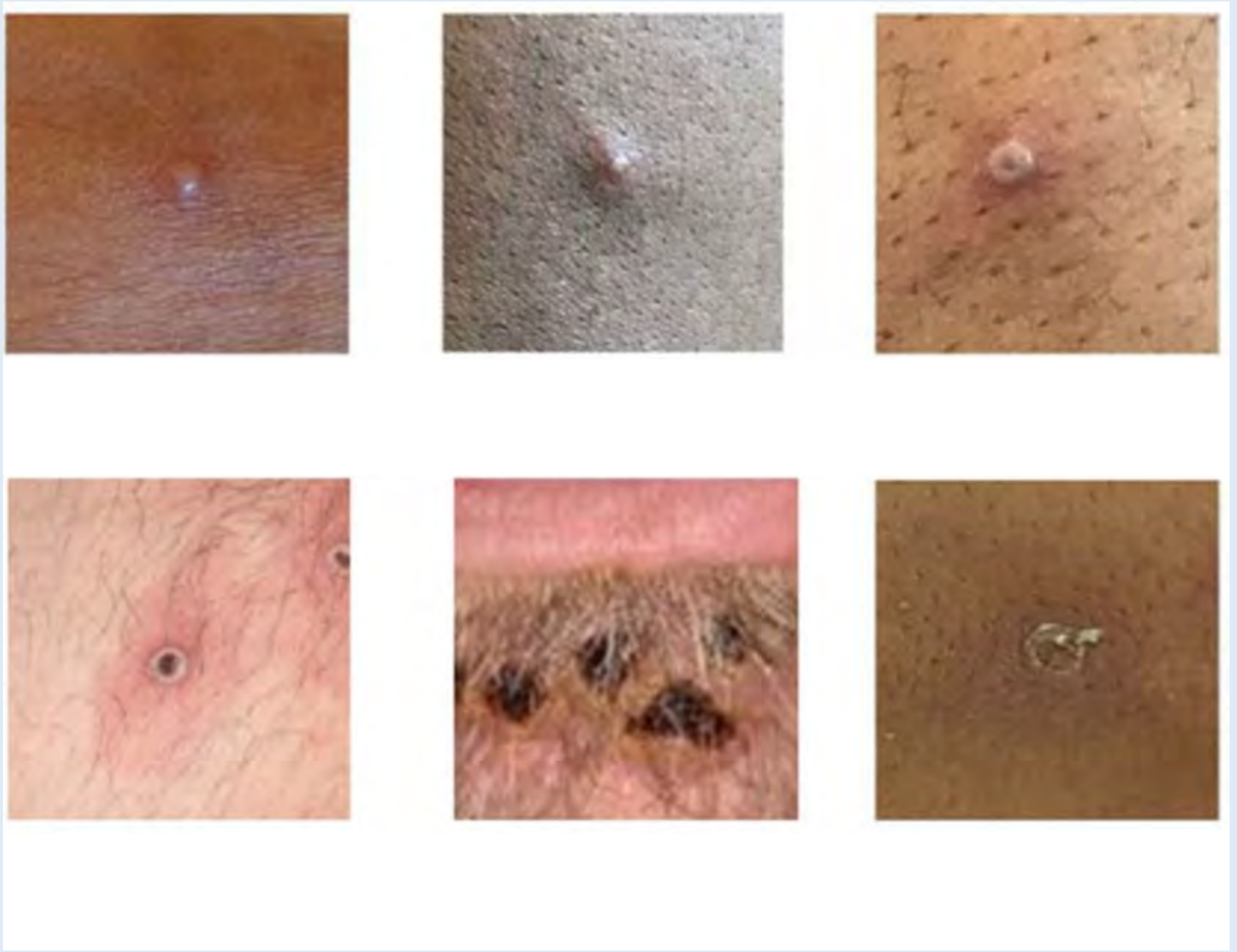
Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021

Practicum: Describe the lesions

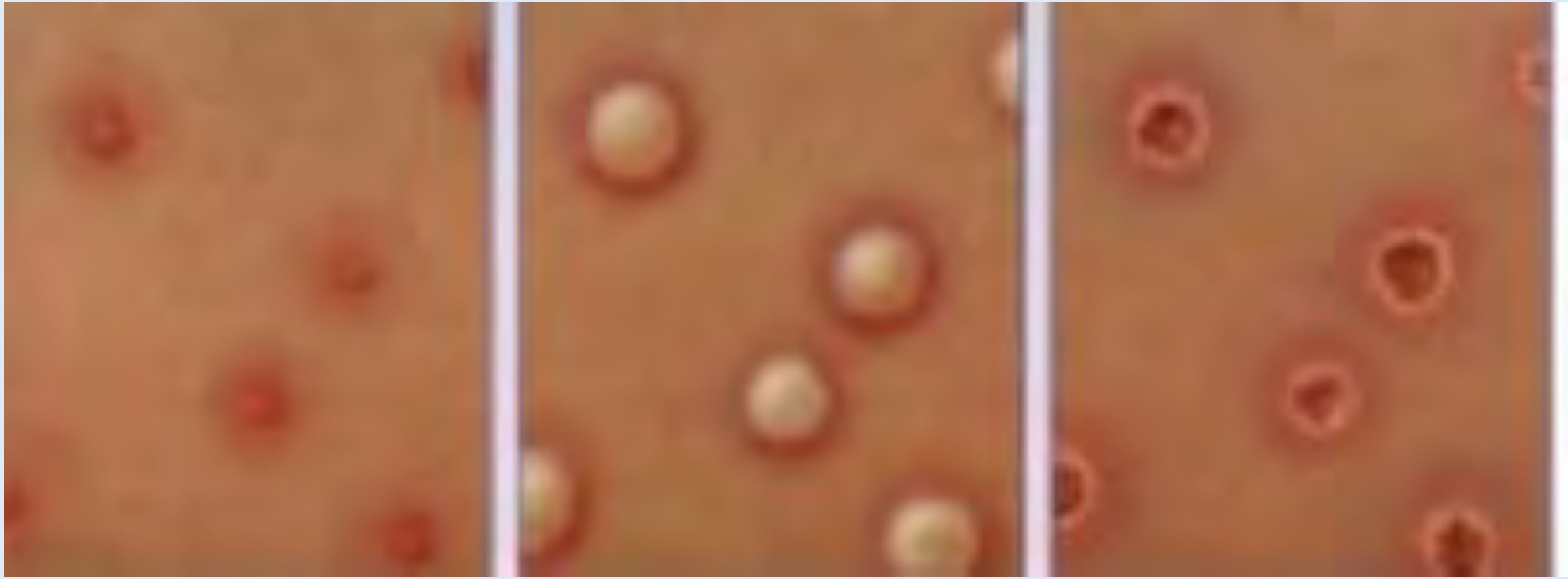


- Lesions appeared 1–3 days after systemic symptoms, clustered (anal area 1A) or isolated (skin or penis 1B-1C).
- They typically began as raised, itchy papules secreting serous, with a central umbilication; over days, the central umbilication widened until the lesion opened and the scab formed about 2 weeks after symptom onset.

Source: Antinori A, et al. Epidemiological, clinical and virological characteristics of four cases of monkeypox support transmission through sexual contact, Italy, May 2022. Euro Surveill. 2022;27(22):2200421.



Source: Gov.UK [Internet]. Mpox (monkeypox): background information. London: UK [updated 2022 Aug 9, cited 2023 Apr 27].

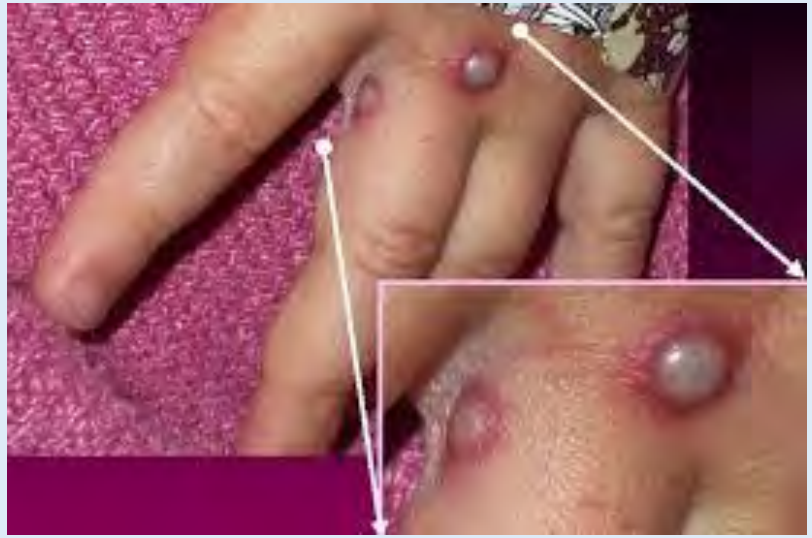


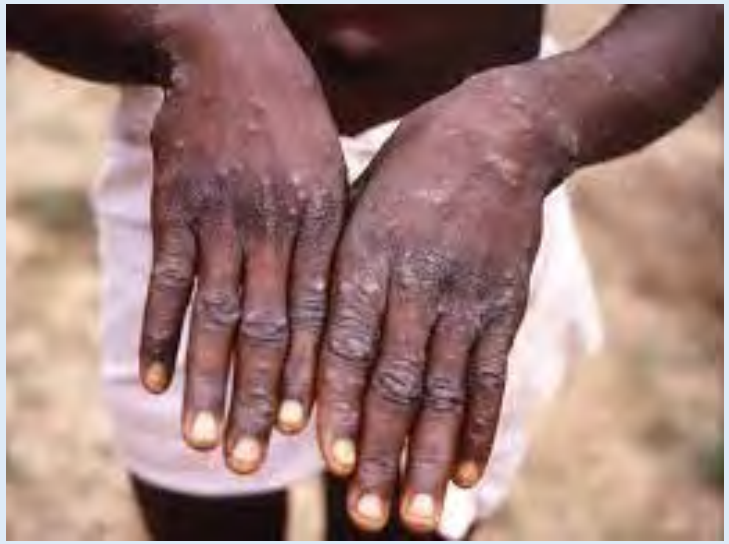
Flat red bumps

Firm fluid-filled raised bumps

Scabs that heal over many weeks

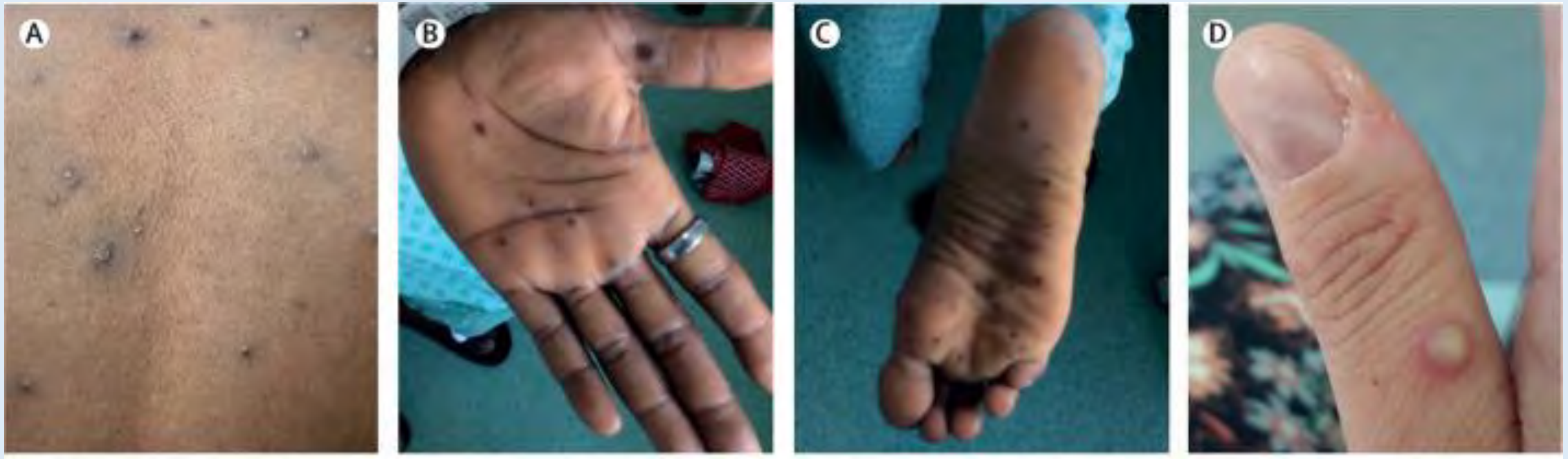
Source: Gov.UK [Internet]. Mpox (monkeypox): background information. London: UK [updated 2022 Aug 9, cited 2023 Apr 27].





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

Source: Yvan J.F. Hutin et al. Outbreak of Human Monkeypox, Democratic Republic of Congo, 1996–1997. Emerging Infectious Diseases, Vol. 7, No. 3, May–June 2001.

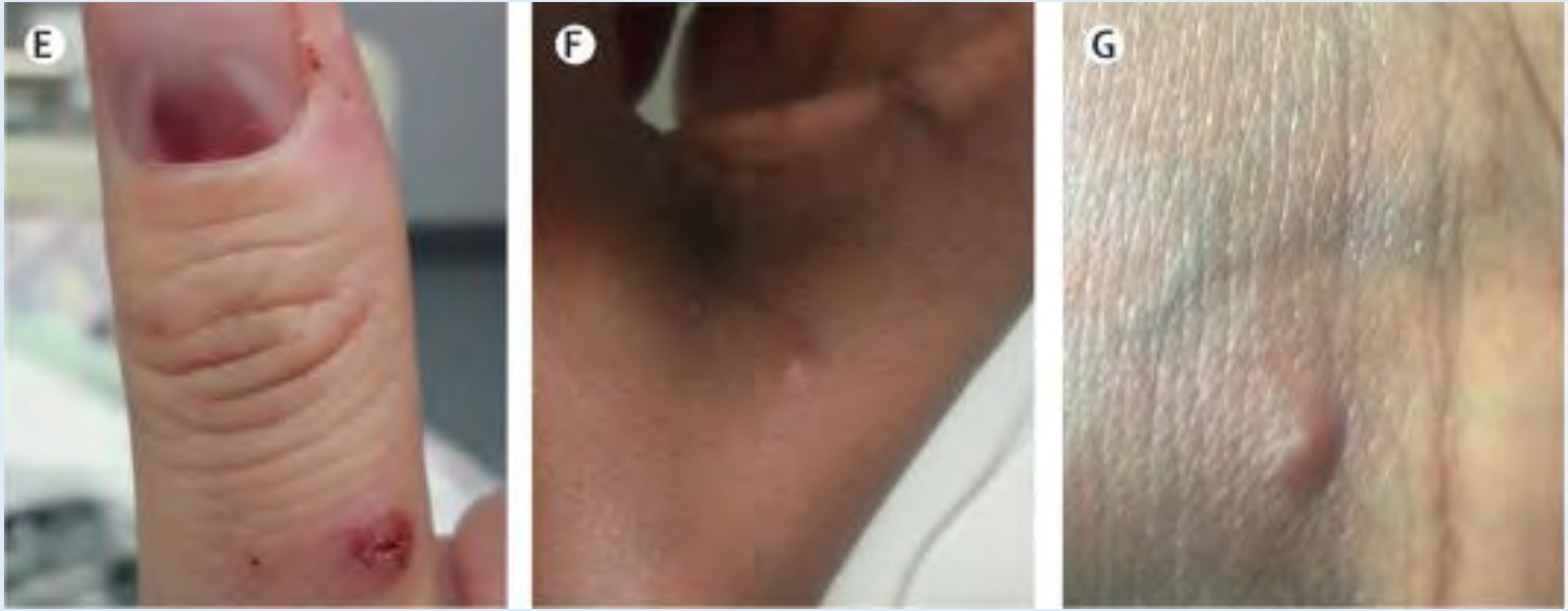


Vesicular or pustular lesions

Macular lesions involving the palms and soles

Sub-ungual lesion and vesicular lesion

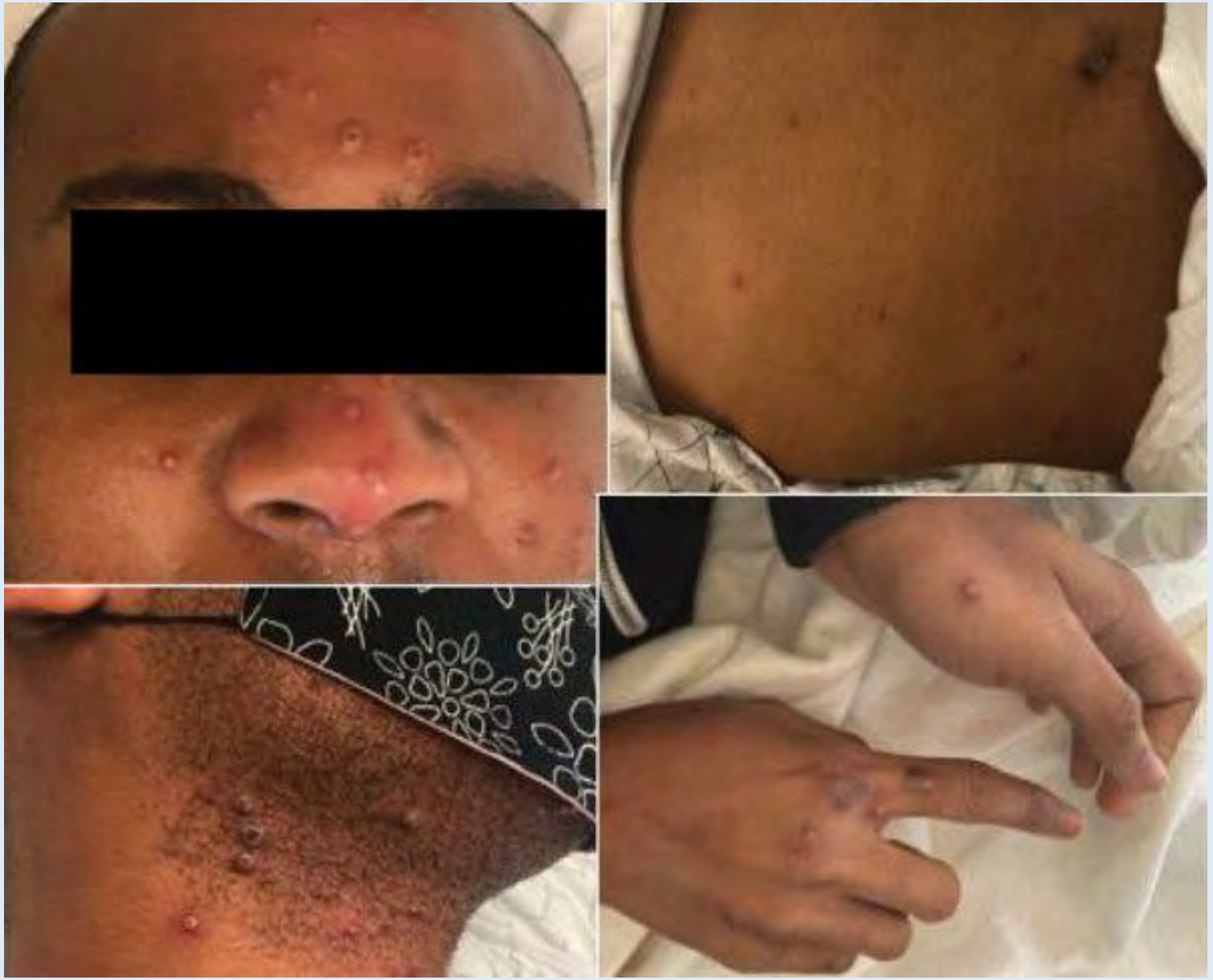
Source: Adler H, et al. Clinical features and management of human monkeypox: a retrospective observational study in the UK. Lancet Infect Dis. 2022:22(8):1153-62.



Sub-ungual lesion

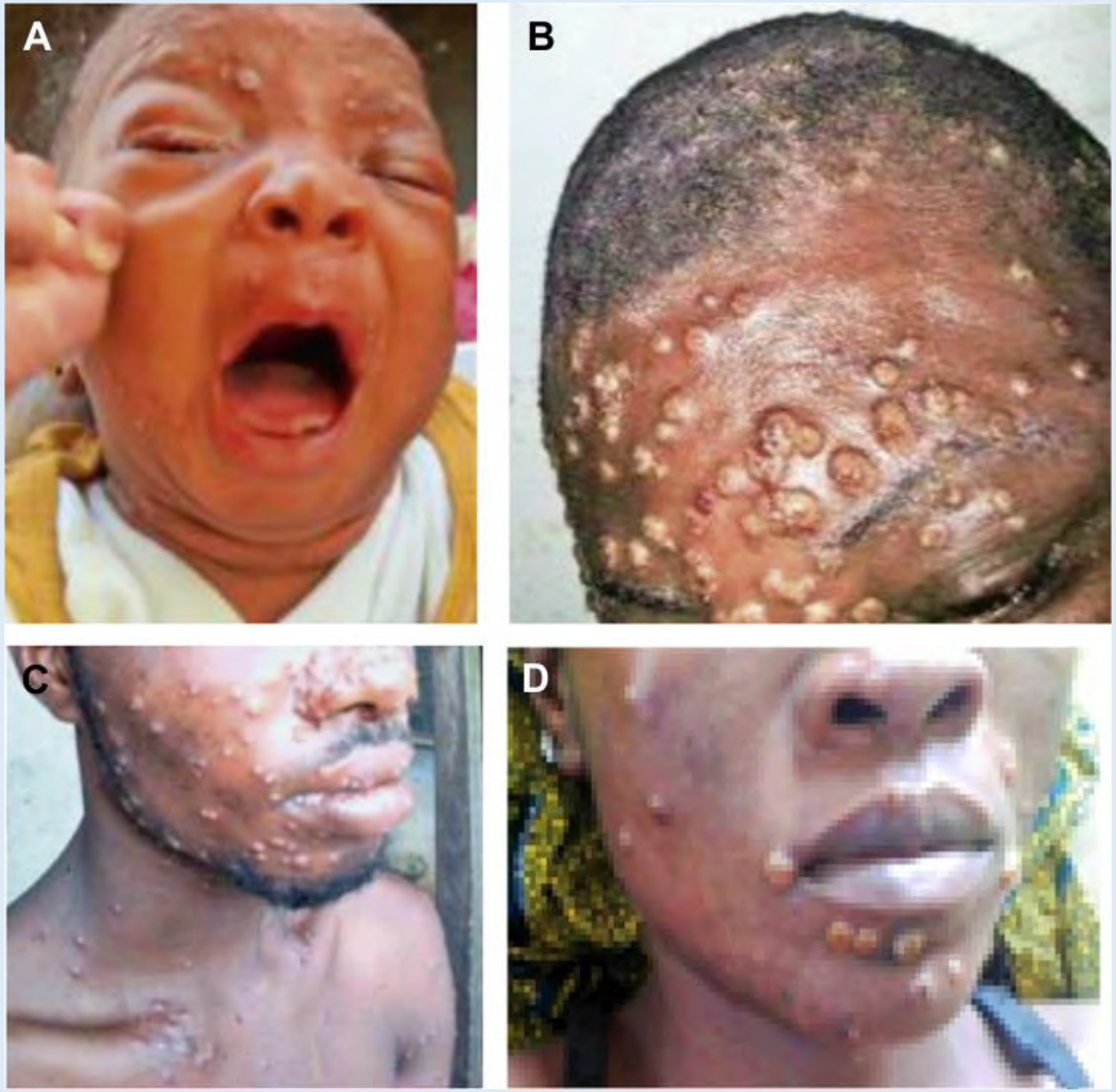
More subtle papules and smaller vesicles

Source: Adler H, et al. Clinical features and management of human monkeypox: a retrospective observational study in the UK. Lancet Infect Dis. 2022:22(8):1153-62.



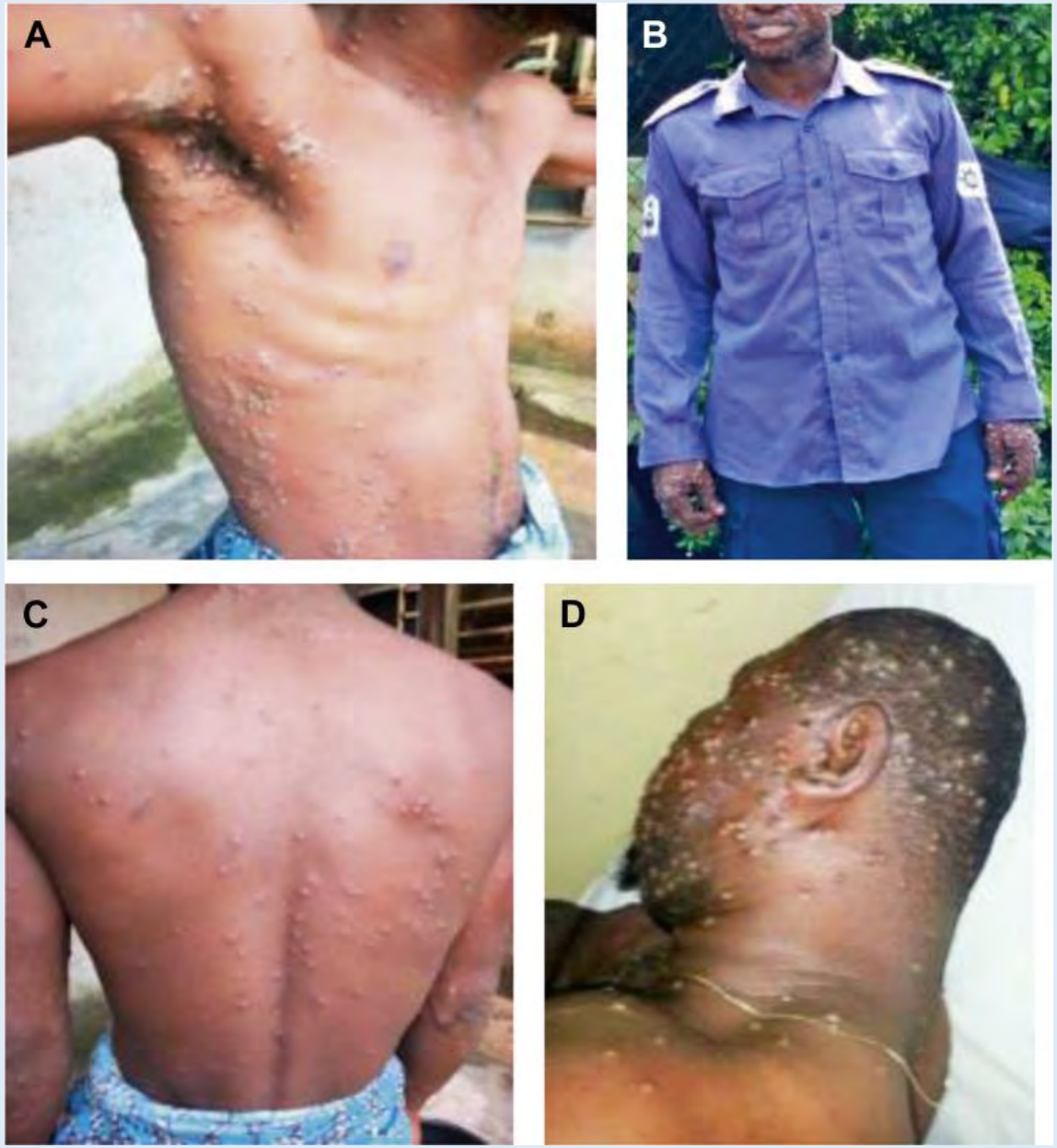
Numerous pustules on erythematous base with some central umbilication and acrofacial propensity

Source: Costello V, et al. Imported monkeypox from international traveler, Maryland, USA, 2021. Emerg Infect Dis. 2022;28(5):1002-05.



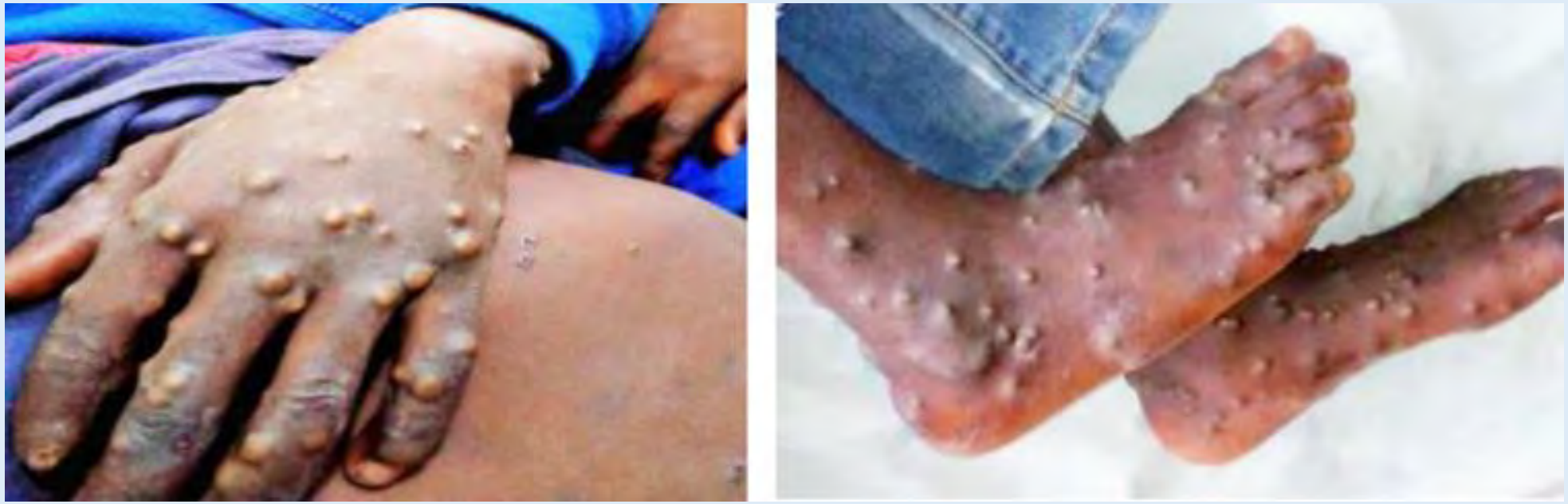
Maculo-papular-vesicular-pustular mpox skin lesions of varying sizes on the face

Credit: Courtesy of Nigeria Centre for Disease Control, Abuja, Nigeria, appearing in Petersen E, et al. Human monkeypox: epidemiologic and clinical characteristics, diagnosis, and prevention, in Infect Dis Clin North Am. 2019;33(4):1027-43.



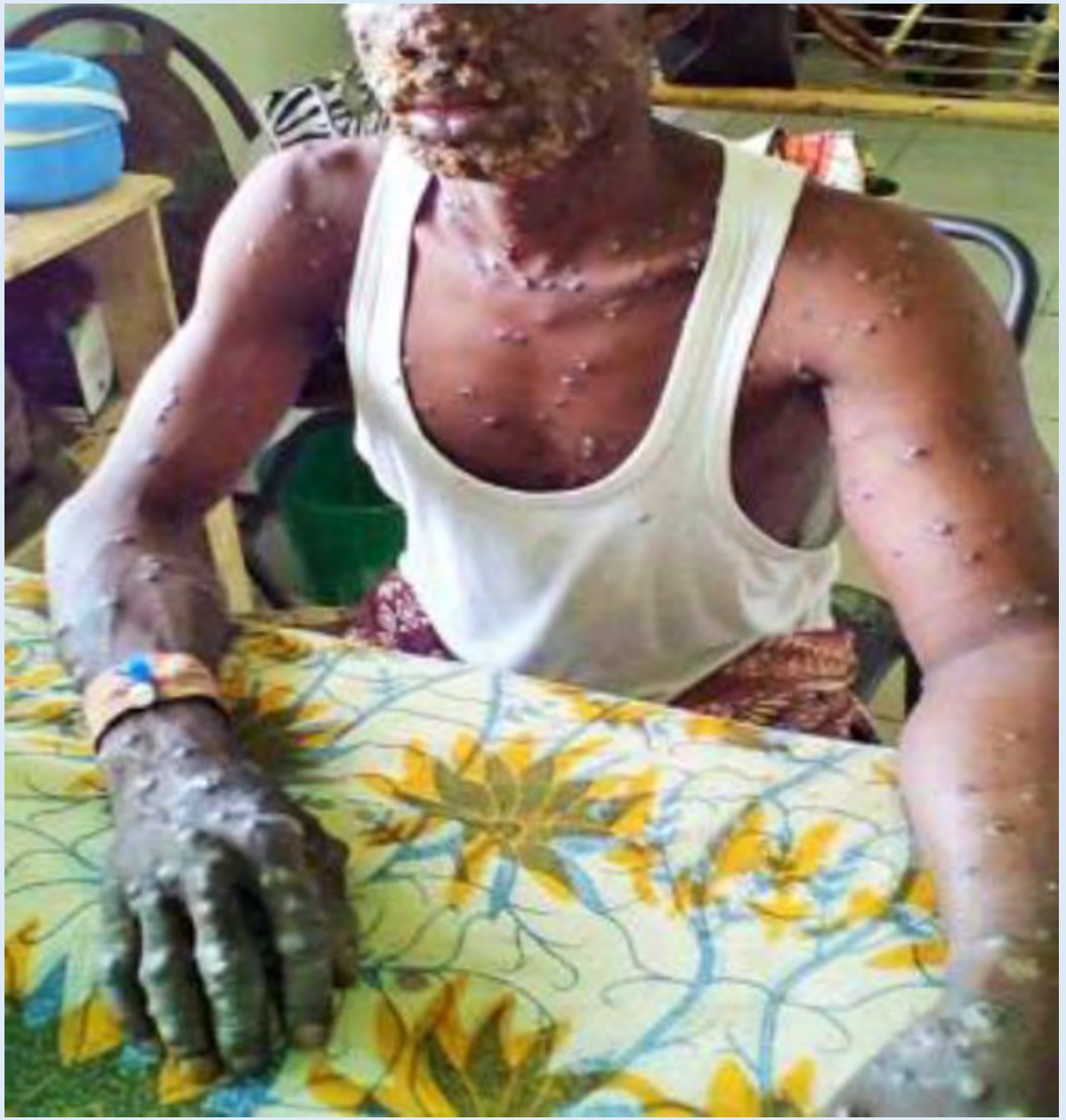
Papular-vesicular-pustular mpox skin lesions of varying sizes across the body

Credit: Courtesy of Nigeria Centre for Disease Control, Abuja, Nigeria, appearing in Petersen E, et al. Human monkeypox: epidemiologic and clinical characteristics, diagnosis, and prevention, in Infect Dis Clin North Am. 2019;33(4):1027-43.



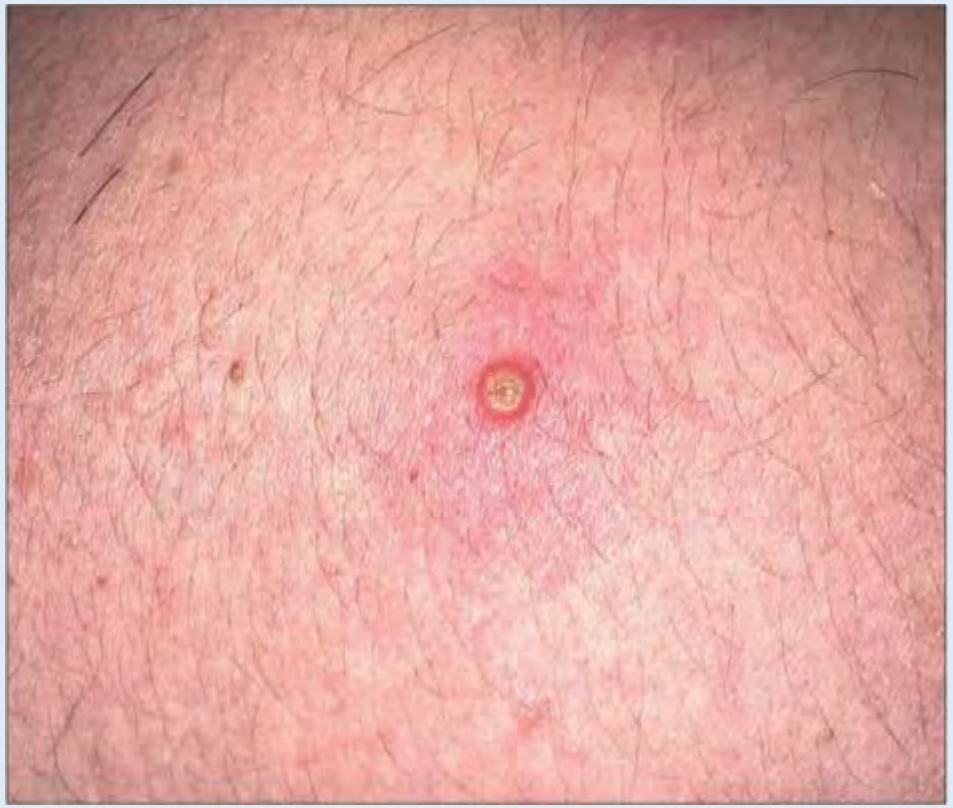
Papular-pustular mpox skin lesions on the hands, legs, and feet

Credit: Courtesy of Nigeria Centre for Disease Control, Abuja, Nigeria, appearing in Petersen E, et al. Human monkeypox: epidemiologic and clinical characteristics, diagnosis, and prevention, in Infect Dis Clin North Am. 2019;33(4):1027-43.

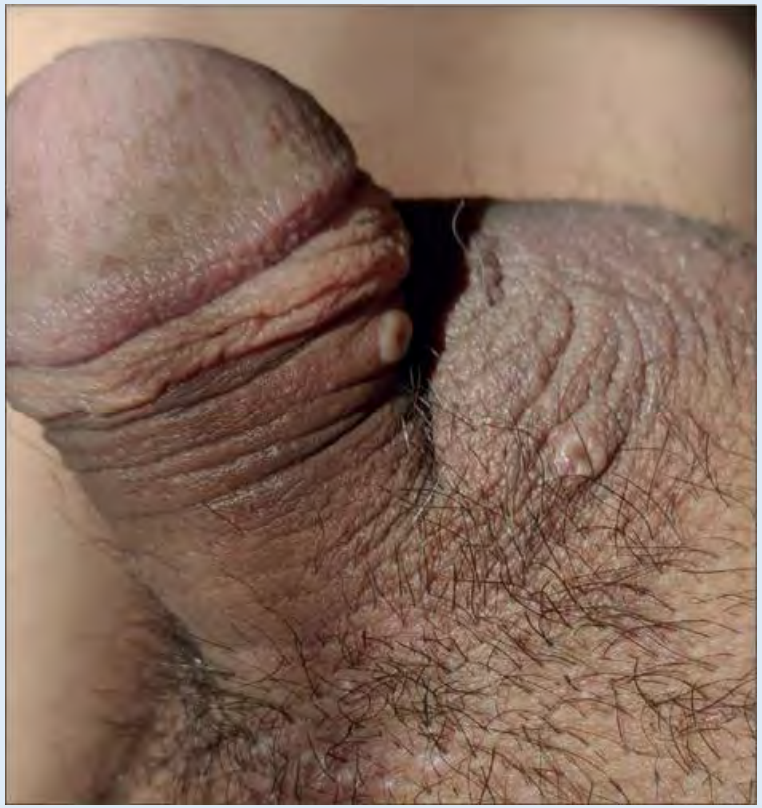


Extensive papulo-pustular mpox rashes with crust and scar formation

Credit: Courtesy of Nigeria Centre for Disease Control, Abuja, Nigeria, appearing in Petersen E, et al. Human monkeypox: epidemiologic and clinical characteristics, diagnosis, and prevention, in Infect Dis Clin North Am. 2019;33(4):1027-43.



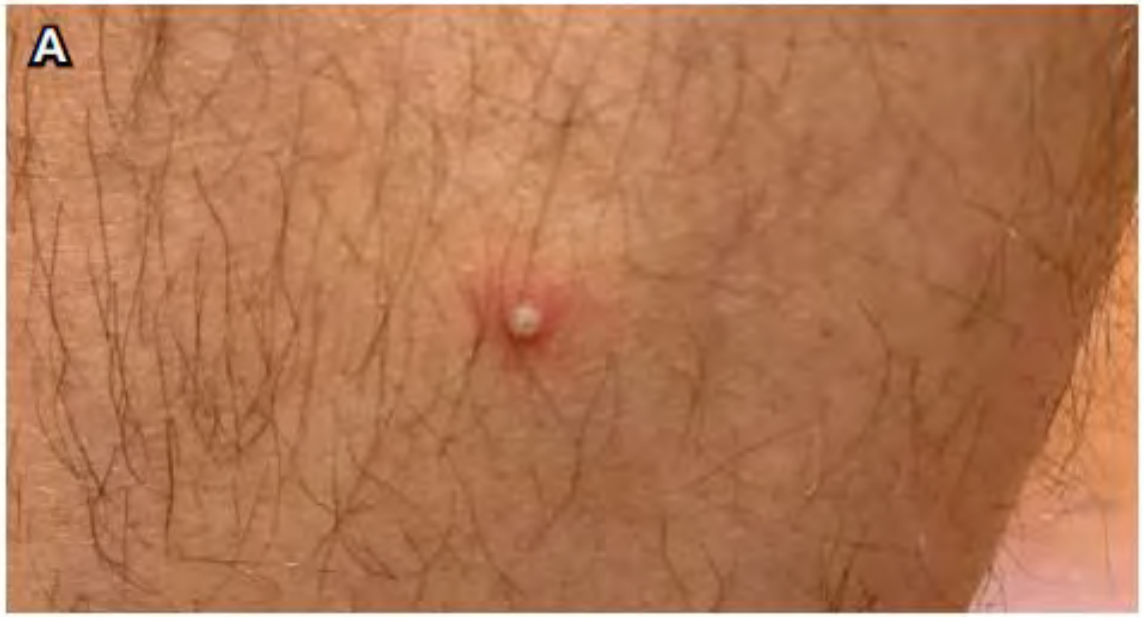
Single umbilicated pustular lesion on leg

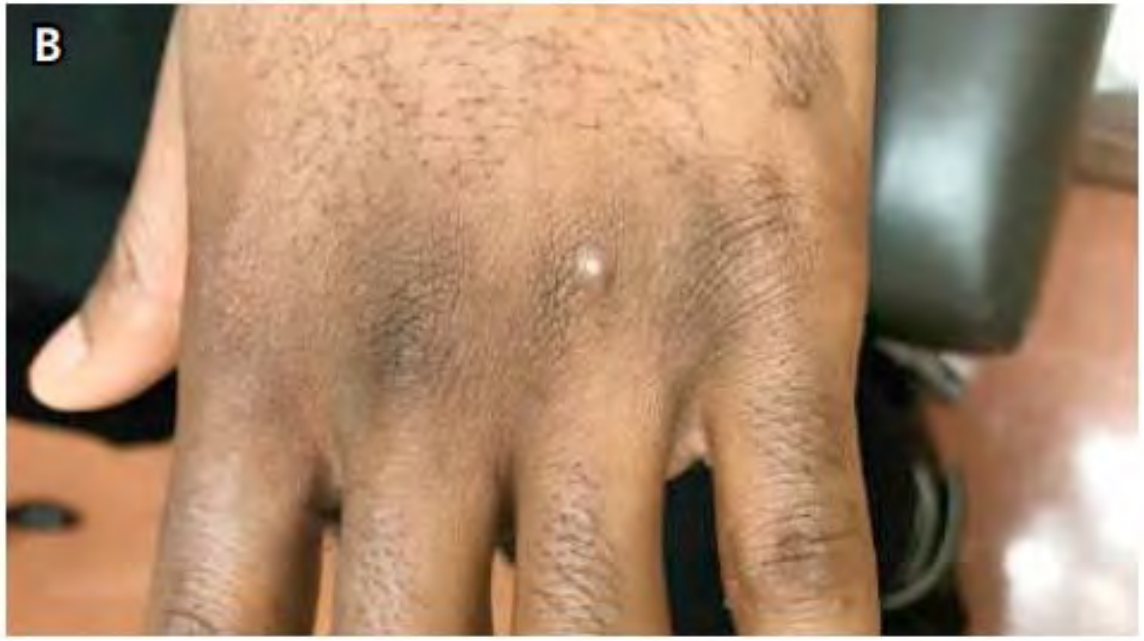


Multiple umbilicated pustular lesions

Source: Girometti N, et al. Demographic and clinical characteristics of confirmed human monkeypox virus cases in individuals attending a sexual health centre in London, UK: an observational analysis. Lancet Infect Dis. 2022;22(8):1321–28.

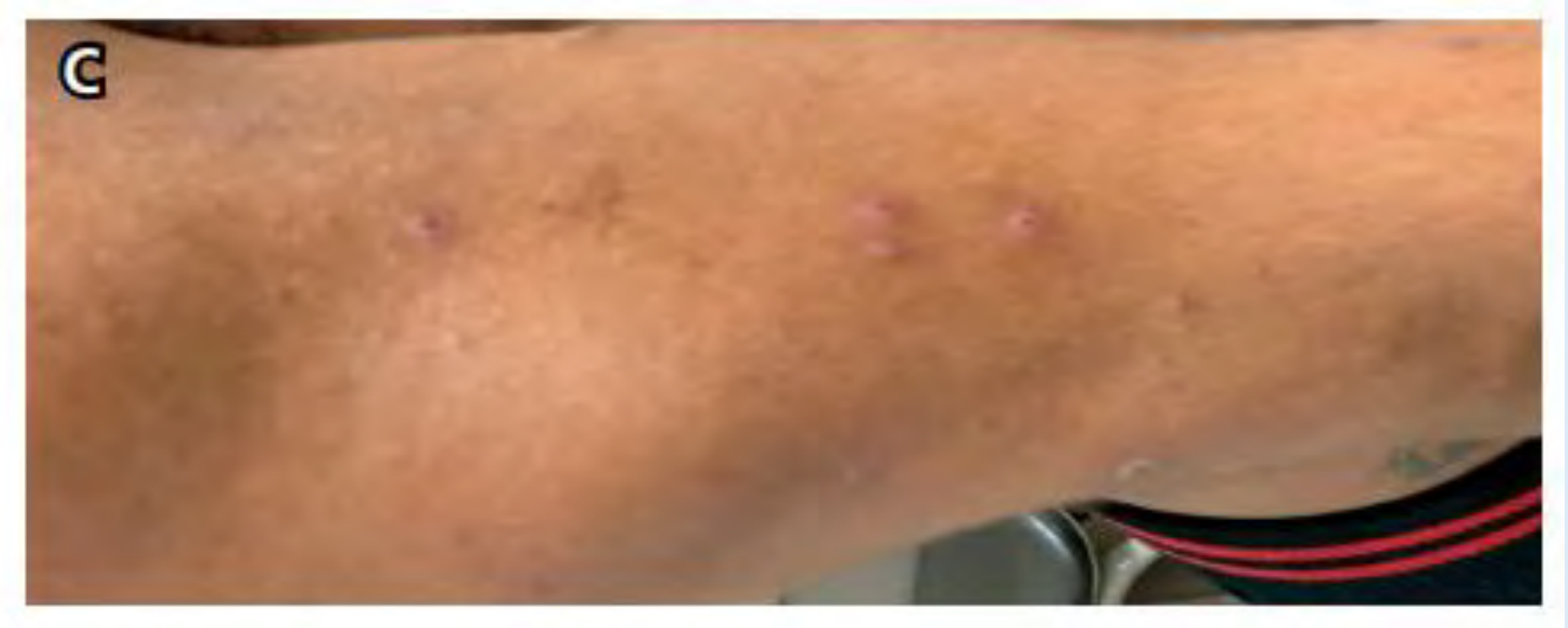
- MSM
- Majority were unaware of contact with known mpox case, reported inconsistent condom use in the 3 weeks before symptom onset and at least one new sexual partner during the same period
- None reported travel to sub-Saharan Africa
- Majority presented with at least one skin lesion on the genital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





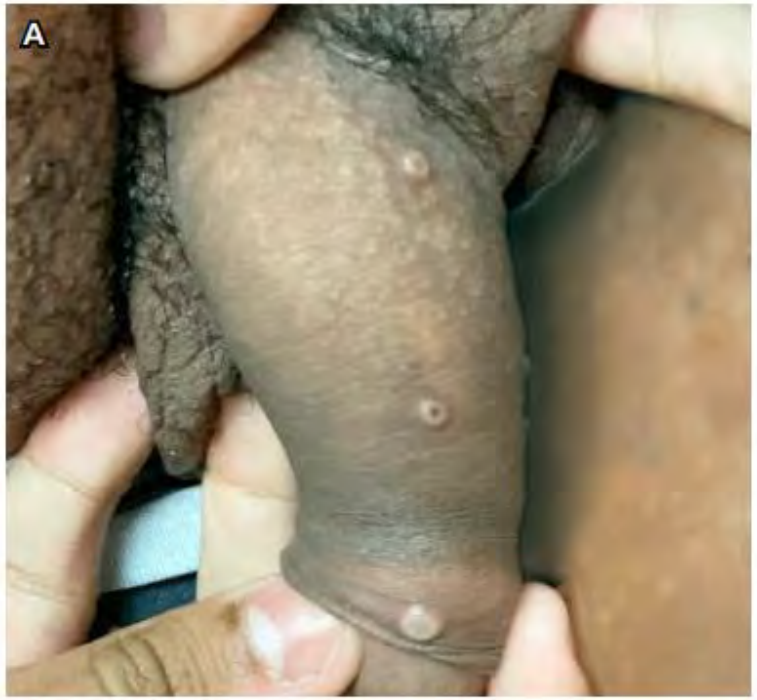
A and B: Pustule-like lesions on a limb and dorsal hand

Source: Torres HM, et al. Approaching monkeypox: a guide for clinicians. Top Antivir Med. 2022;30(4):575–81.

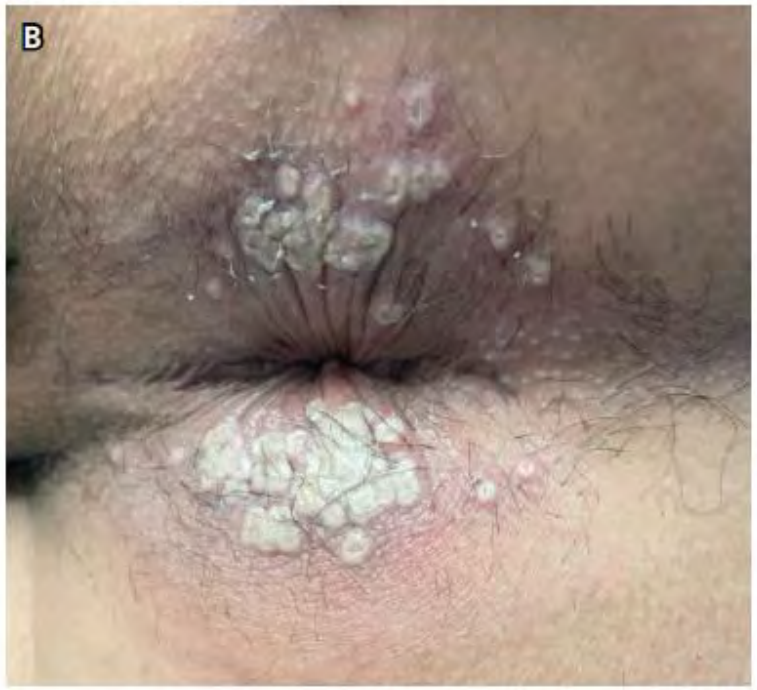


C: Cluster of papules, some with umbilication

Source: Torres HM, et al. Approaching monkeypox: a guide for clinicians. Top Antivir Med. 2022;30(4):575–81.

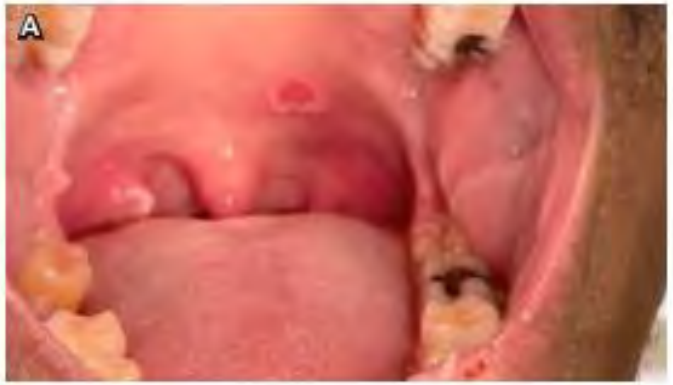


A: Umbilicated lesion on penis.



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

Source: Torres HM, et al. Approaching monkeypox: a guide for clinicians. Top Antivir Med. 2022;30(4):575–81.



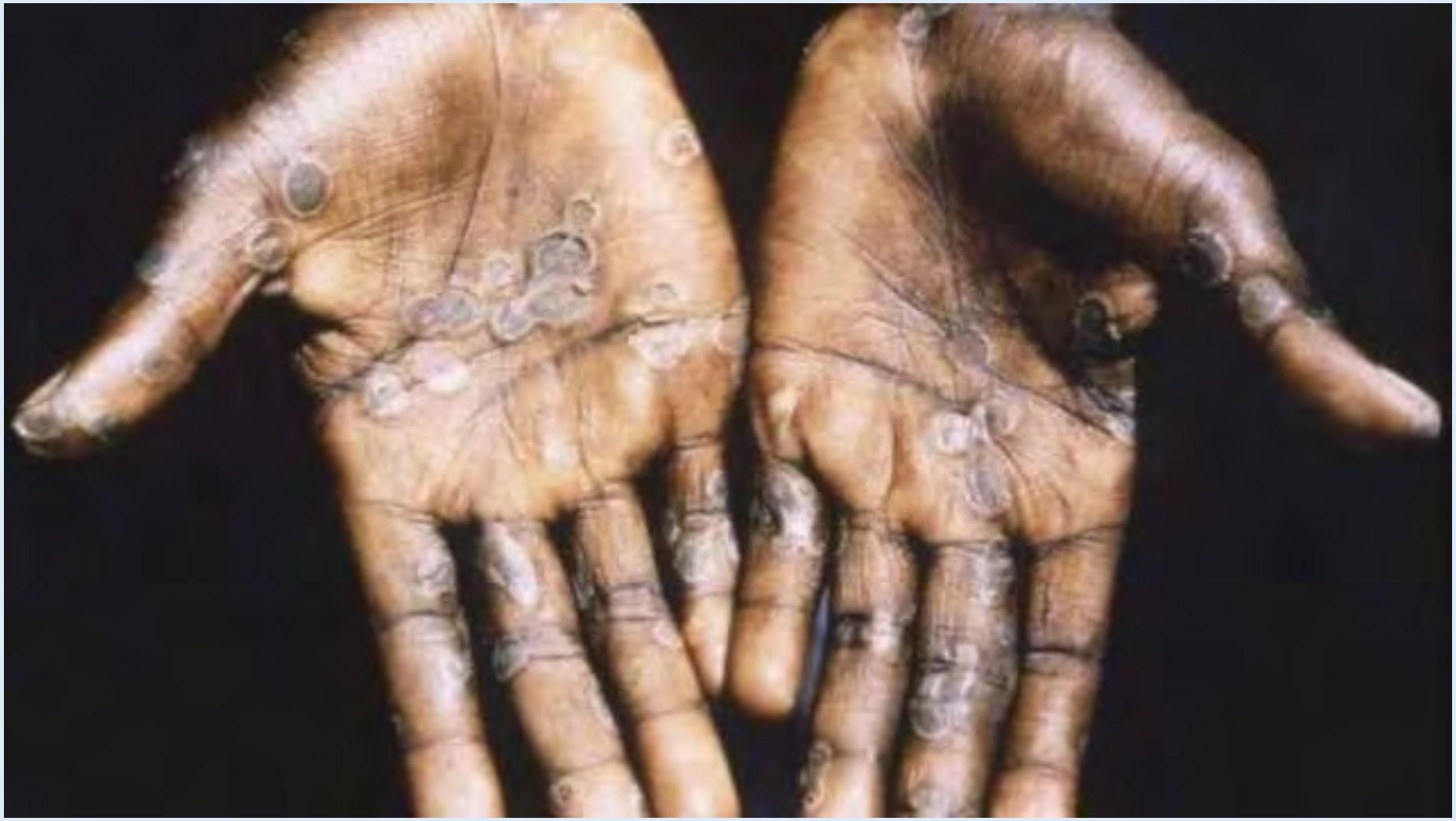
A: Ulcerations on palate and tonsil

B: Ulceration on penis

C: Ulcerations on penis and pubis

Source: Torres HM, et al. Approaching monkeypox: a guide for clinicians. Top Antivir Med. 2022;30(4):575–81.

Additional atlas of images

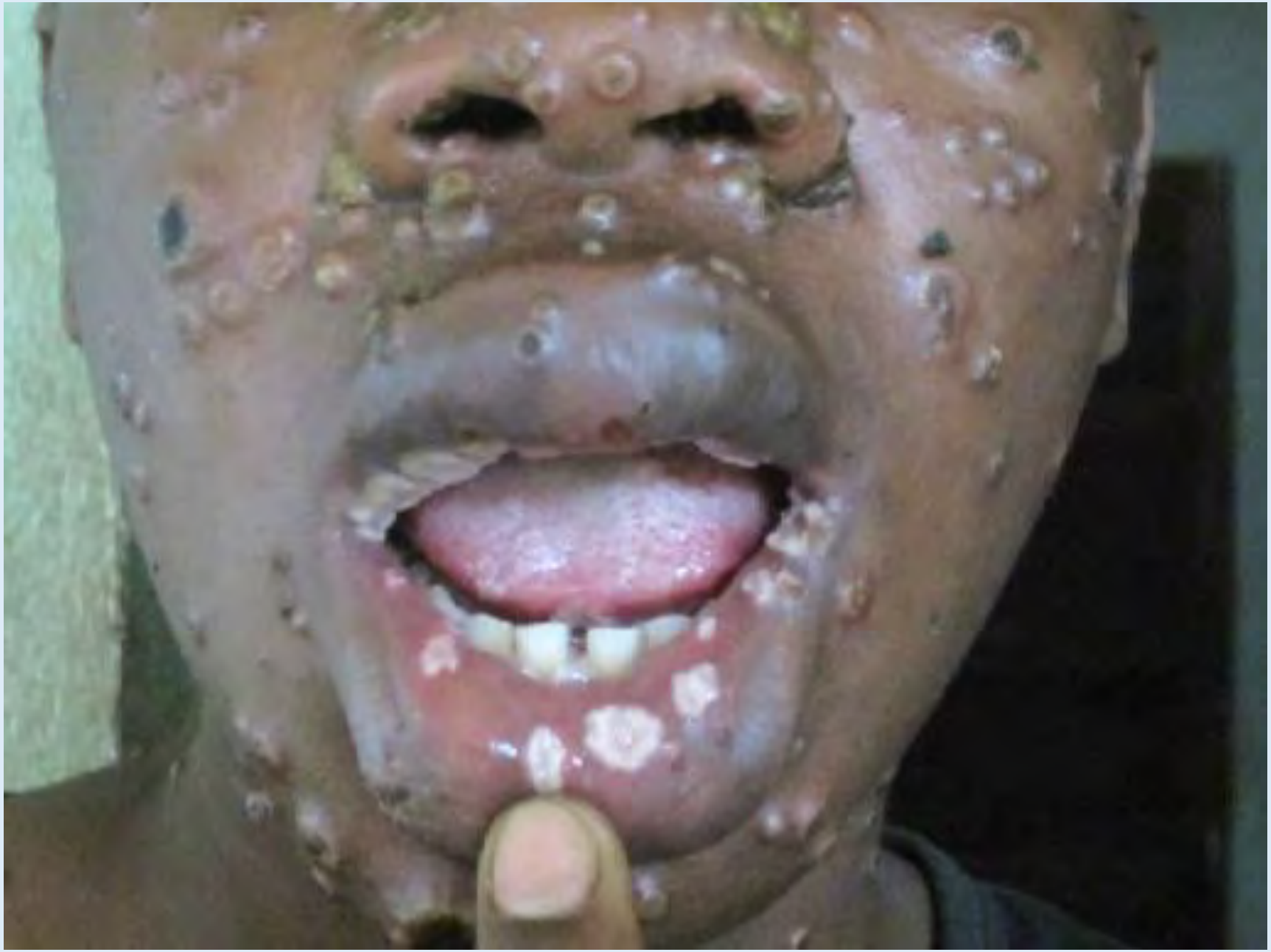


The palms of a monkeypox patient from Lodja, Democratic Republic of the Congo.

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



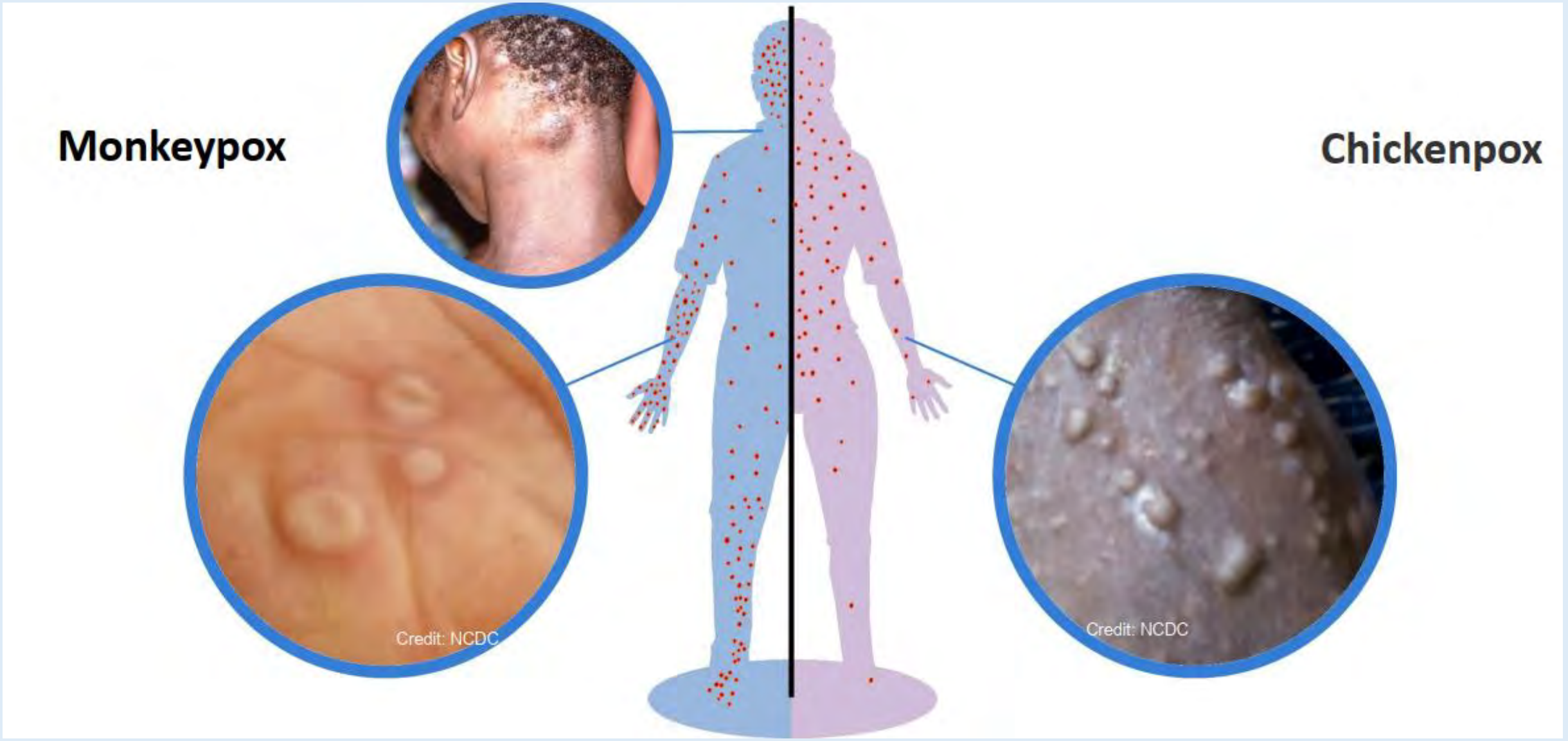
Source: WHO training Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021

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

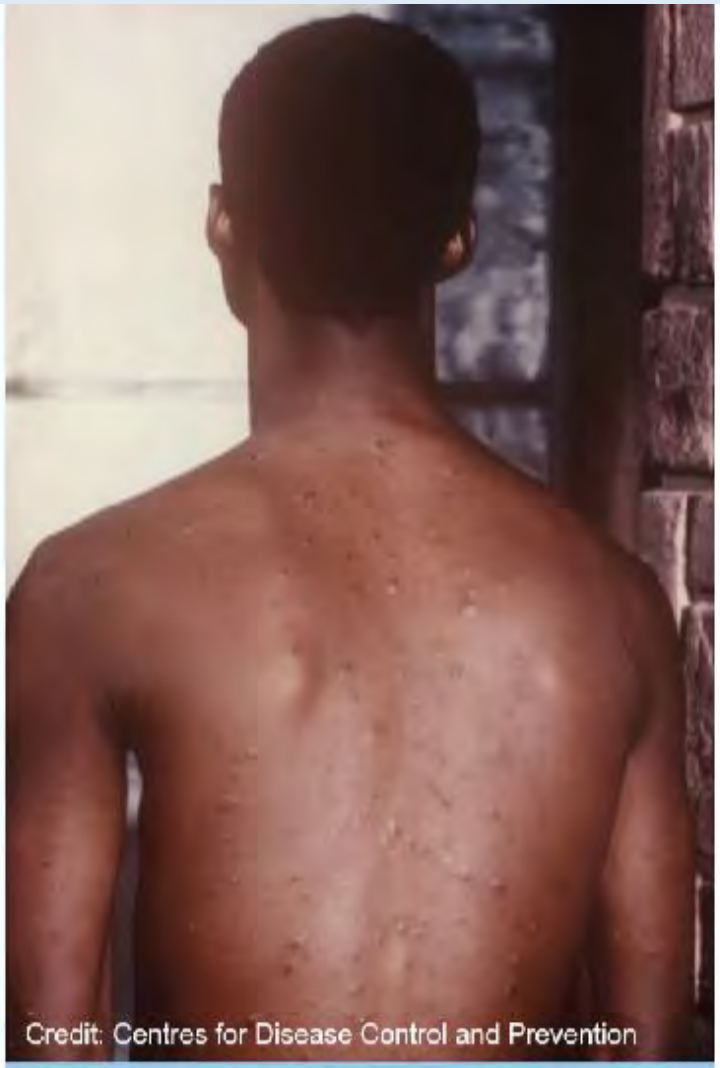
Symptoms	Monkeypox	Chickenpox	Measles
Fever	1-3 days before rash	1-2 days before rash	3-5 days before rash
Rash appearance	Lesions often in one stage of development	Lesions often in multiple stages of development	Lesions often in multiple stages of development
Rash development	Slow	Rapid	Rapid
Rash distribution	More dense on face; present on palms and soles	More dense on trunk; Absent on palms and sole	Starts on face and spreads, sometimes reaching hands and feet
Lymphadenopathy	Present	Absent	Occasional
Death	Up to 10%	Rare	Varies widely

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

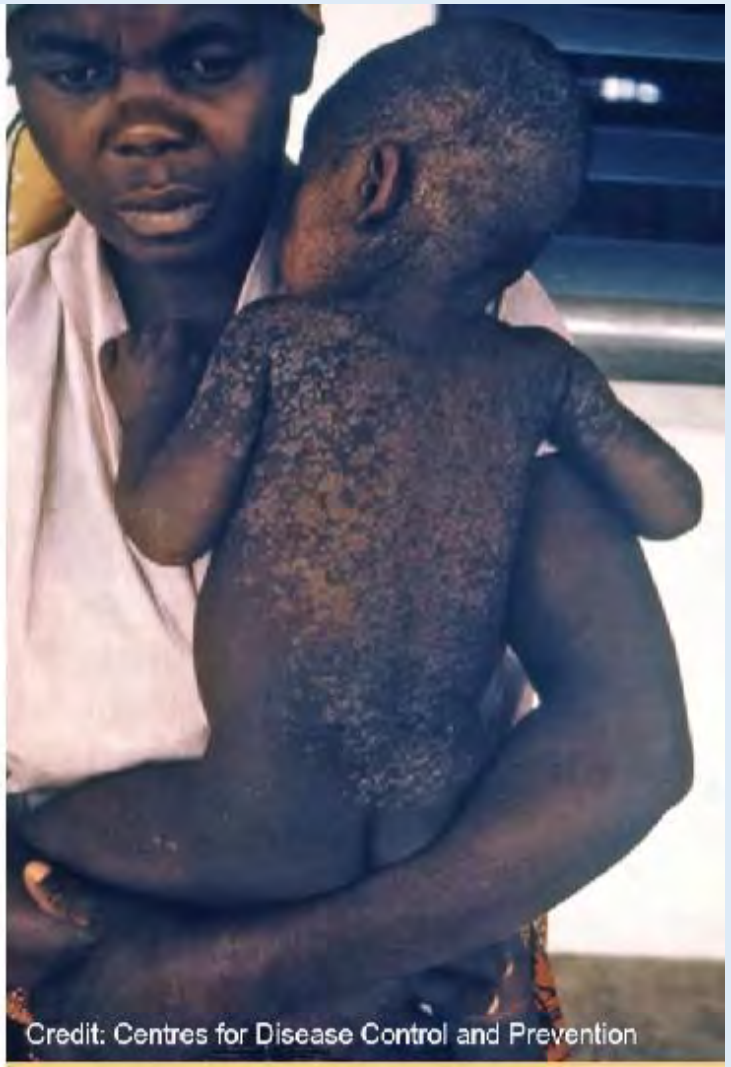


Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021

Monkeypox



Chickenpox



Measles

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

Skin care (1)

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.

Source: American Academy of Dermatology Association. Monkeypox: caring for the skin. Rosemont (IL): AADA; 2022.

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.

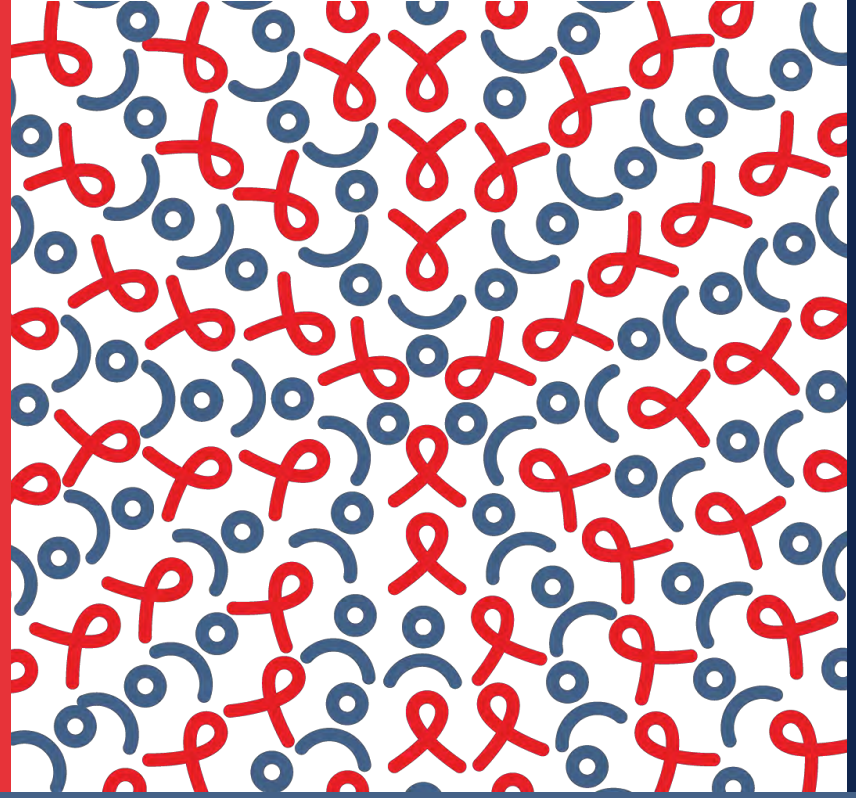
To help soothe skin,
baths may be taken.
Alternatively, sitz baths and warm or
cool compresses may help in soothing
lesions in the anogenital region.

Source: American Academy of Dermatology Association. Monkeypox: caring for the skin. Rosemont (IL): AADA; 2022.

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



Module 5: Diagnosis

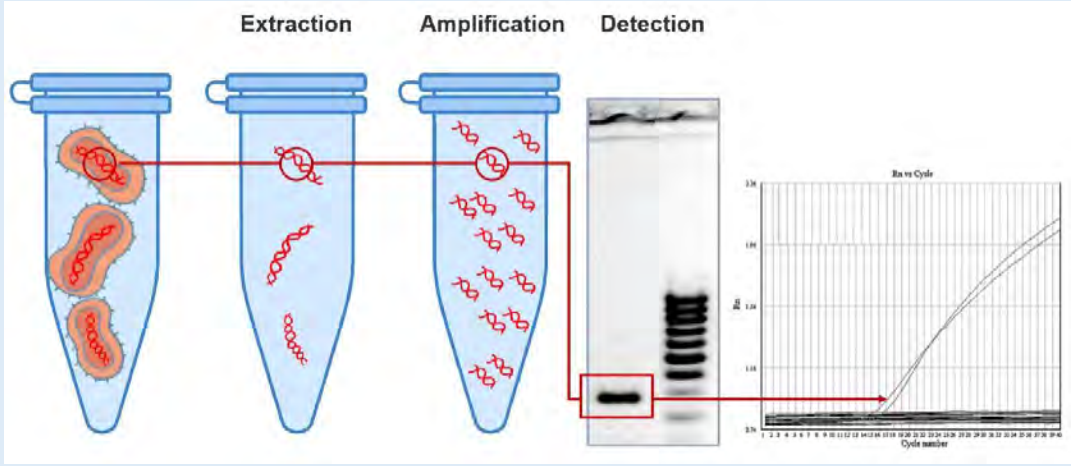
Learning objectives

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

Diagnostic test

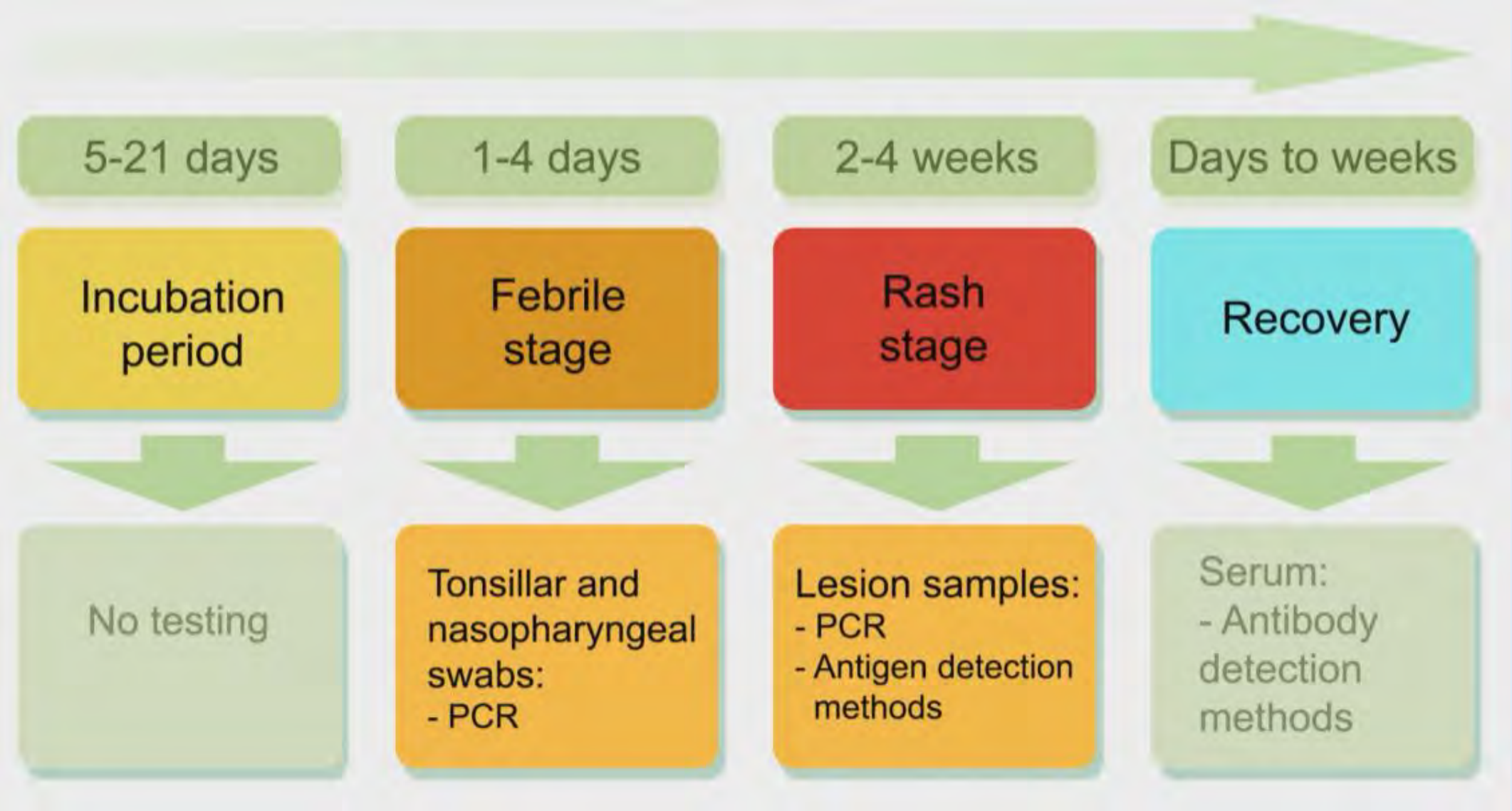
- Any individual that meets the suspected case definition of mpox should be offered testing in appropriately equipped laboratories by staff trained in the relevant technical and safety procedures.



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

- 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

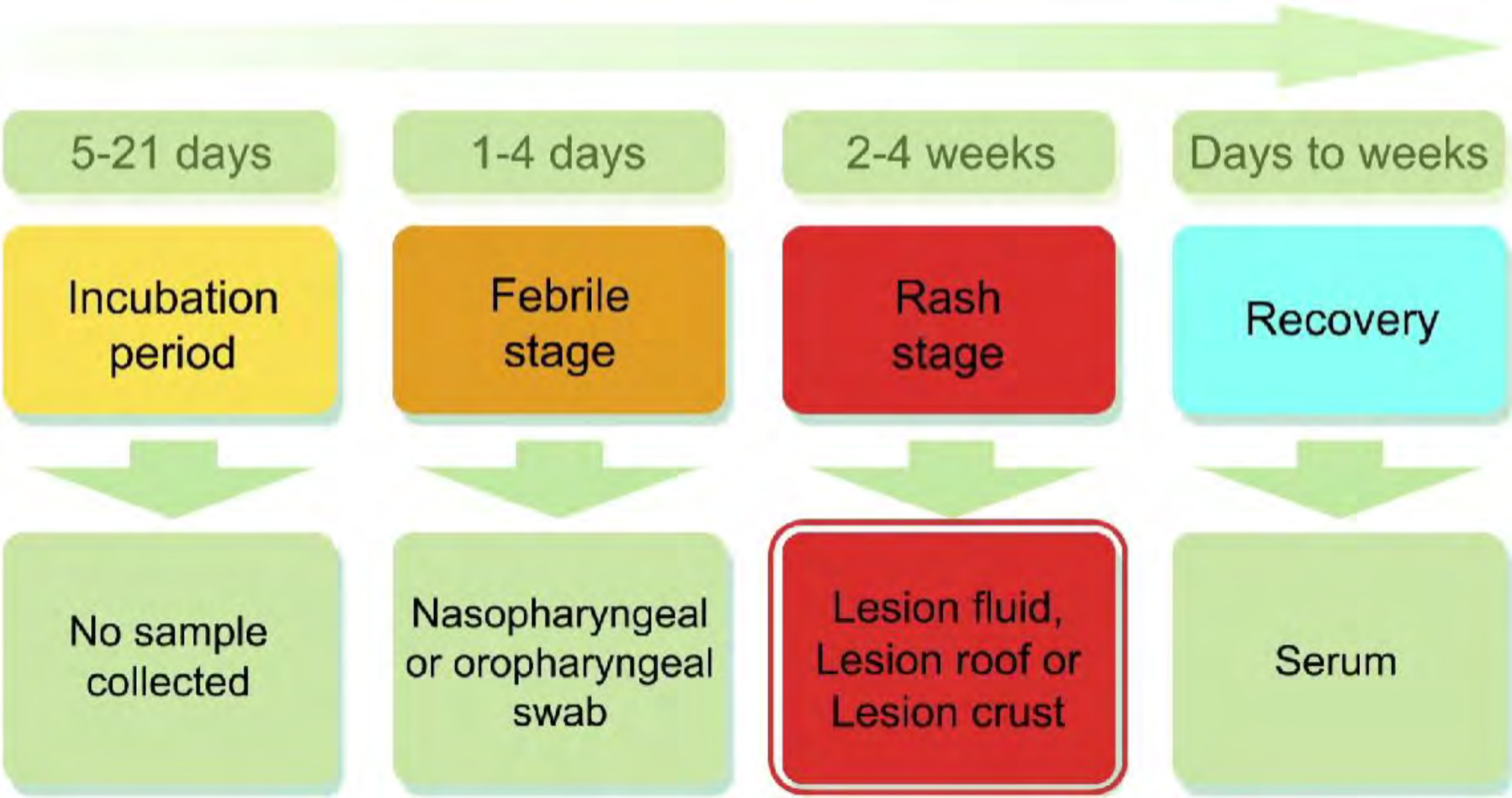


Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021

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

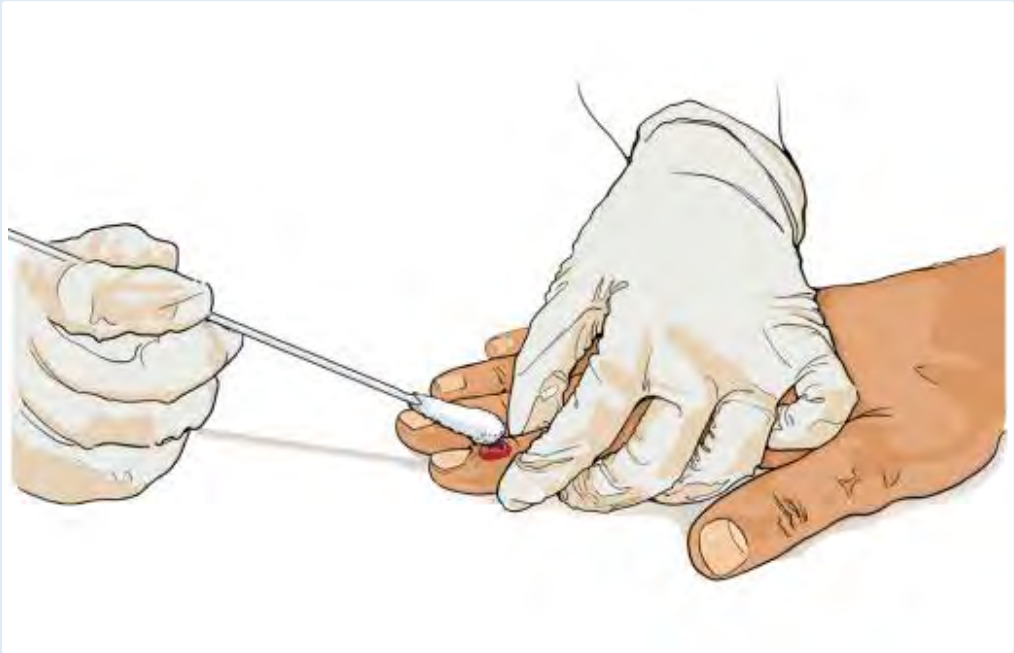
Which specimen to collect and when



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

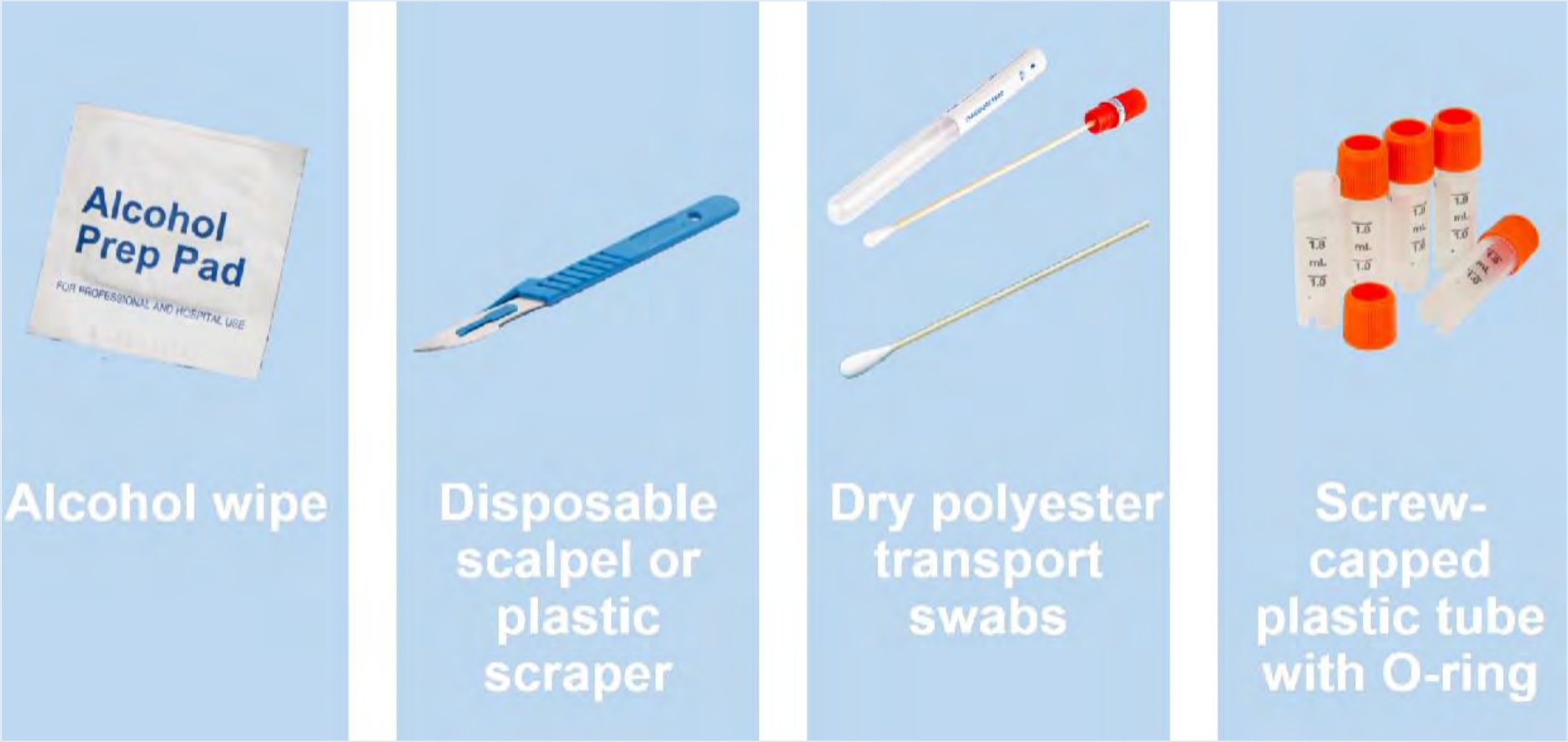


Source: Mpox: Epidemiology, preparedness and response for African outbreak contexts. OpenWHO, 2021

Specimen to be collected (2)

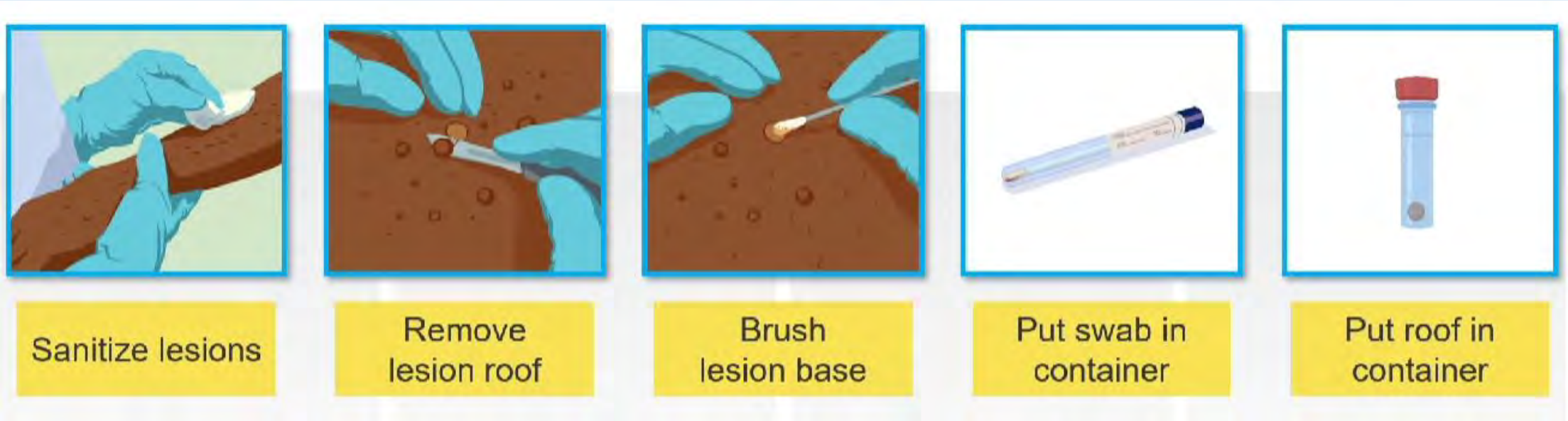
- Collection of additional specimen types **for research purposes** can be considered.
  - Urine, semen, rectal, and/or genital swab
  - EDTA blood
- Collection of a lesion biopsy during the macular stage should be considered only if clinically indicated
- **Antibody detection** from plasma or serum should not be used alone for diagnosis of mpox
- Recent vaccination may interfere with serological testing

Lesion roofs and fluid - consumables



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

Lesion roofs and fluid - procedures



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

Lesions crusts - consumables

Alcohol wipe

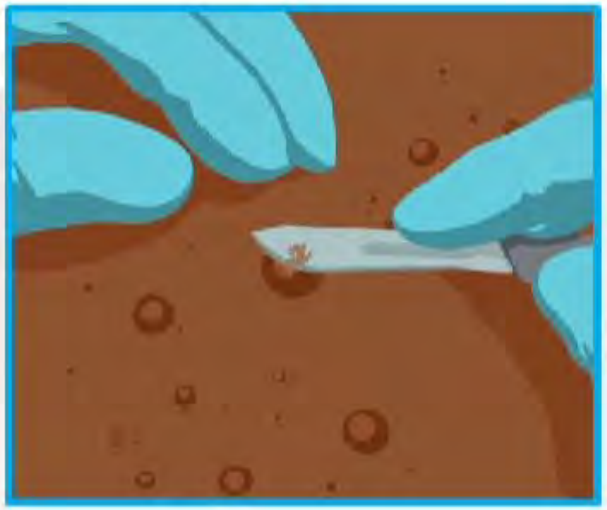
Sterile scalpel, lancet, plastic scraper, curette or needle

Screw-capped plastic tube with O-ring

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

Lesion crusts - procedures

Sanitize lesions



Remove crusts

Put crust in container

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

Serum - consumables

Alcohol wipe

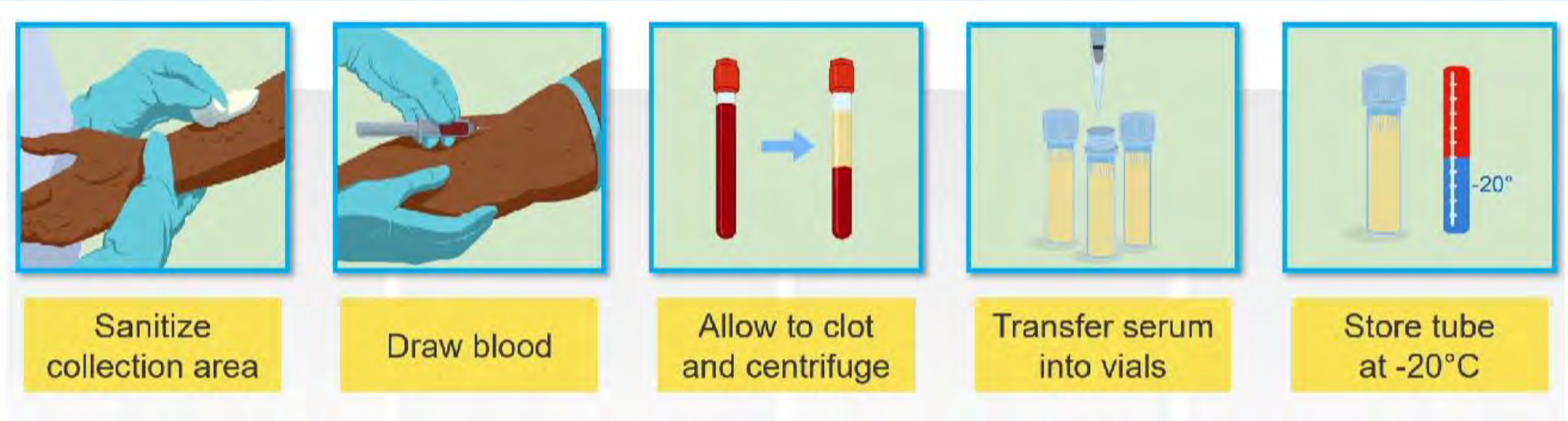
Sterile Syringe and needle

Serum separator tubes

Screw-capped plastic tube with O-ring

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

Serum - procedures



Source: Mpox: 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

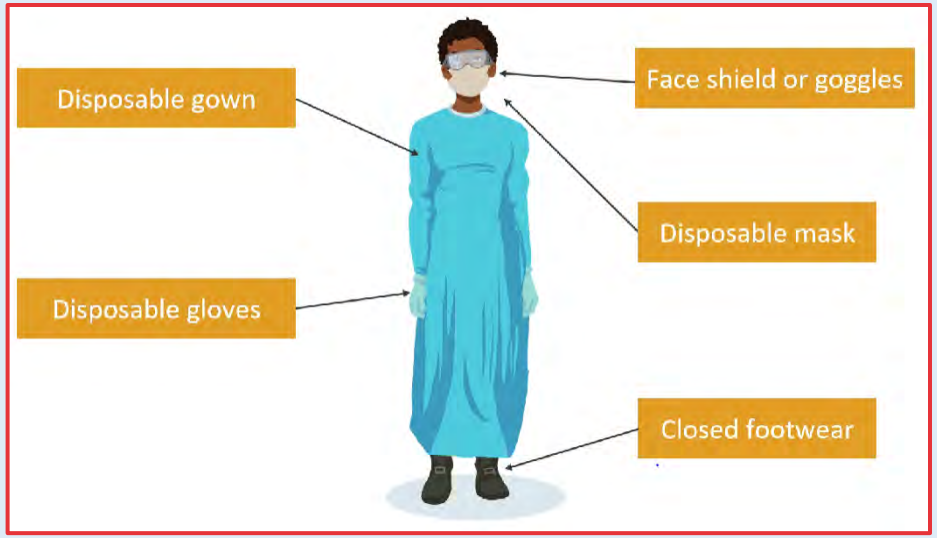
Brush tissue

Put swab in container

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

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

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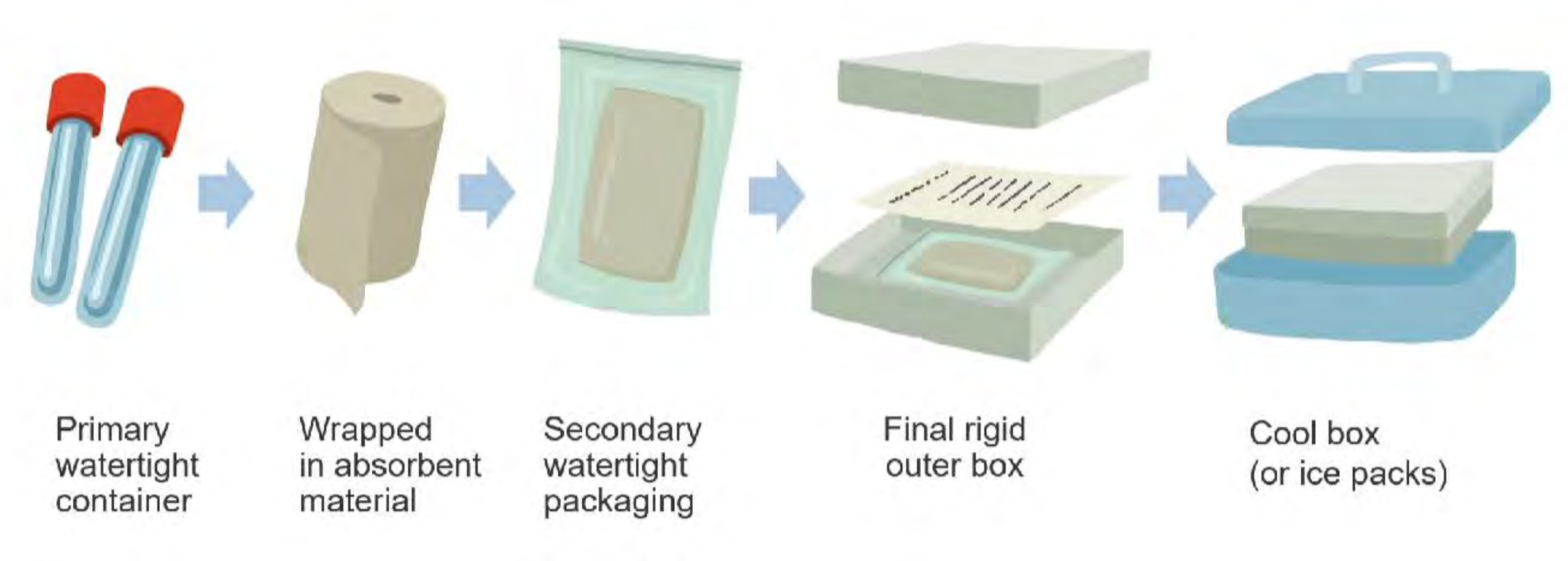
WHO reference number: WHO/MPX/Laboratory/20 .

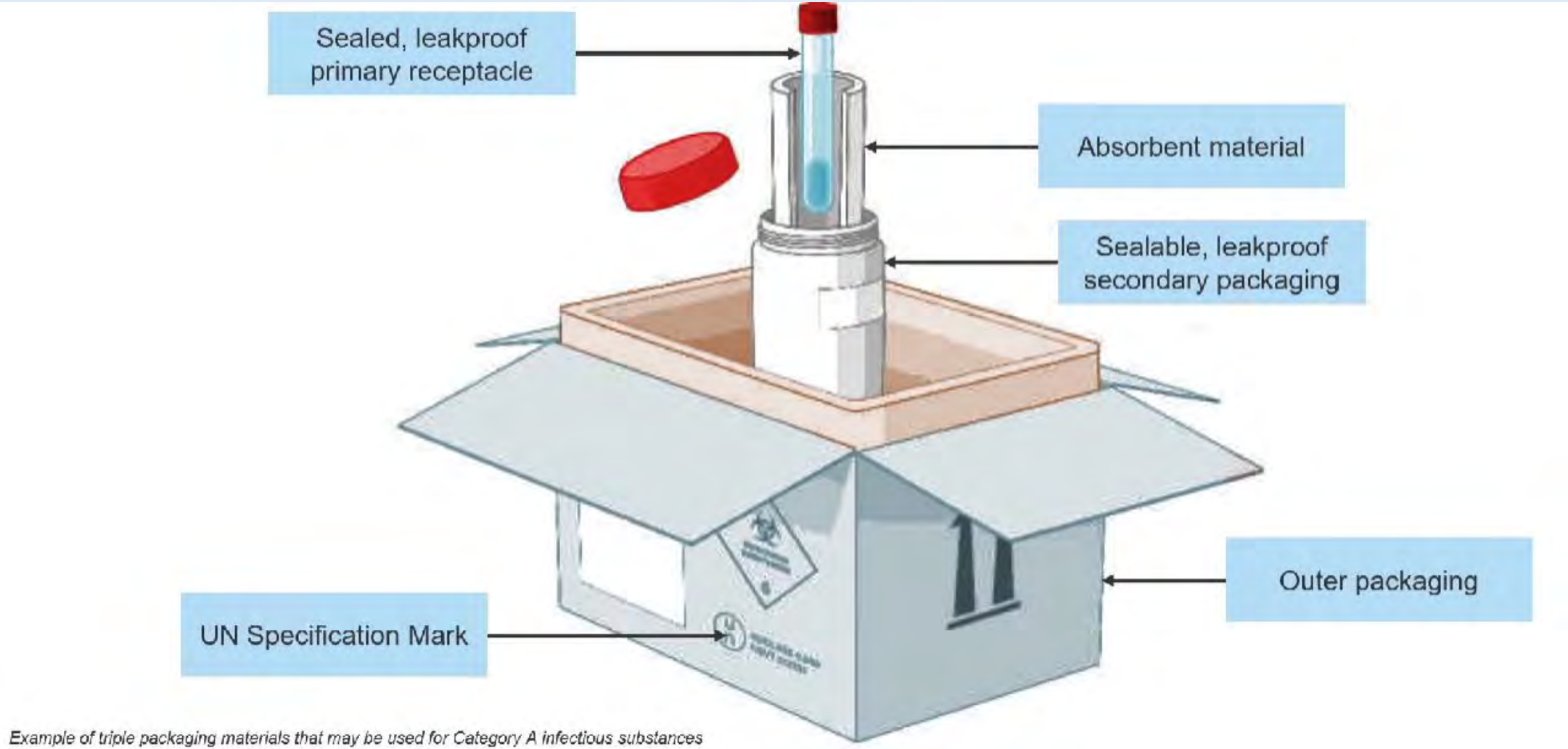
Packaging and shipment of clinical specimens

- 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



Triple packaging for mpox specimen



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

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.

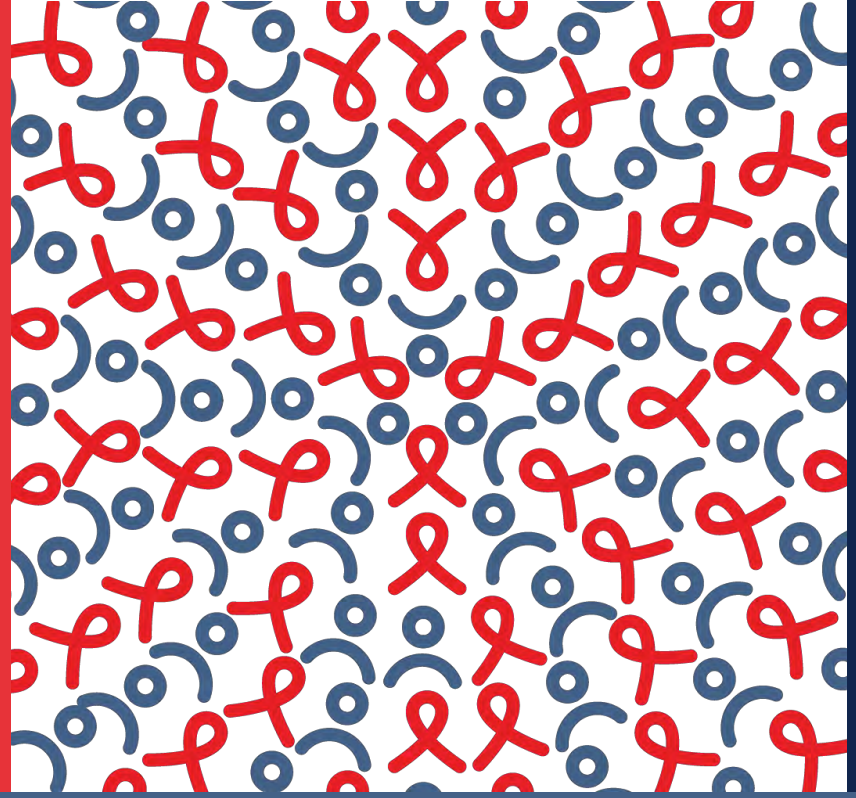
Interpretation of laboratory results (2)

- 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?

Q&A



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

Suspect case

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

OR

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.

AND

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

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

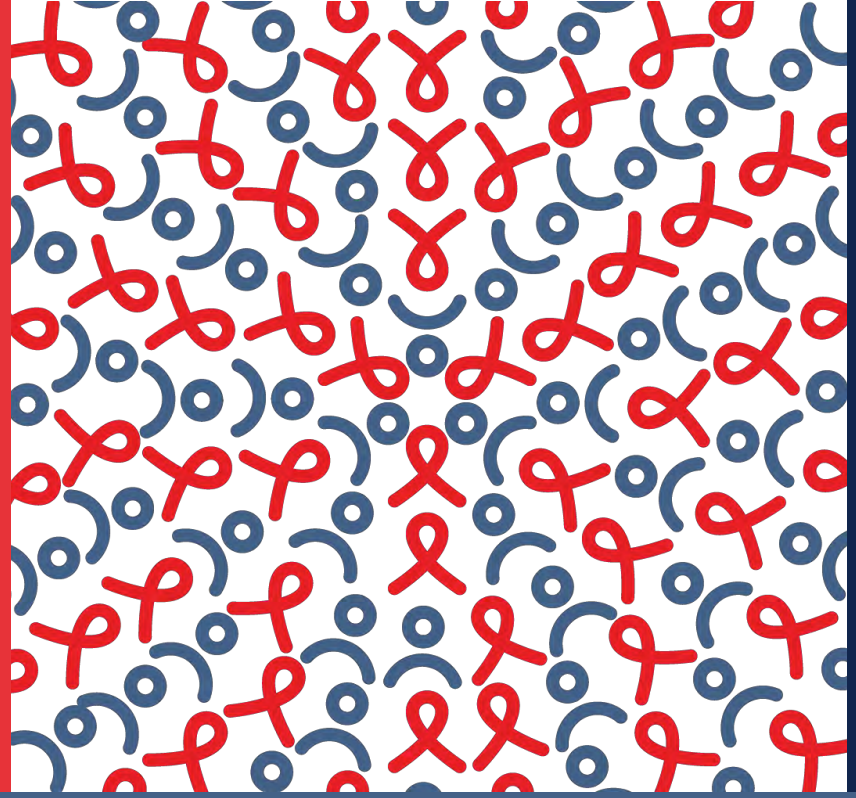
What is the case category?

- 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

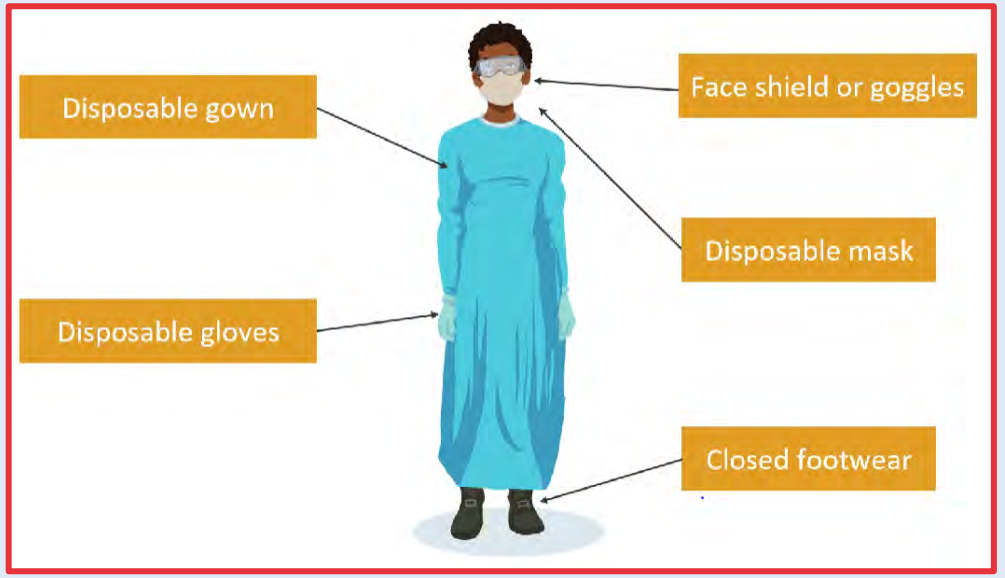
Learning objectives

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



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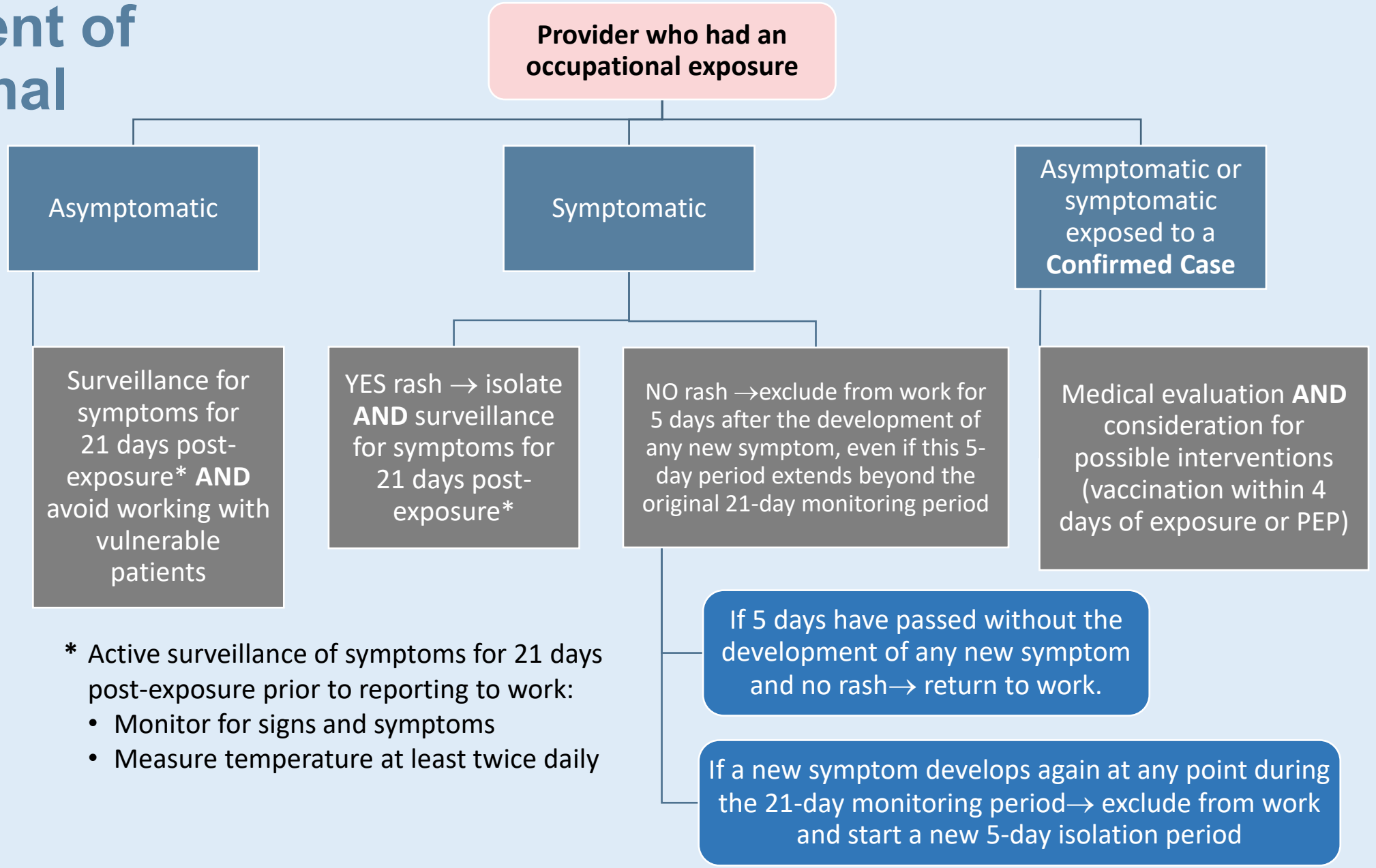
Who could be occupationally exposed?

- 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



* 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

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?

Q&A

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

- Direct skin-to-skin physical contact (such as touching, hugging, kissing, intimate, or sexual)
- Contact with contaminated materials such as clothing or bedding, including material dislodged from bedding or surfaces during handling of laundry or cleaning of contaminated rooms
- Prolonged face-to-face respiratory exposure in close proximity
- Respiratory exposure (possible inhalation) or eye mucosal exposure to lesion material (e.g., scabs/crusts) from an infected person

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.*

Exposure risk	Description of exposure
High	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
Medium	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
Low, minimal	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

Source: WHO [Internet]. Vaccines and immunization for monkeypox: Interim guidance, 16 November 2022. Geneva: WHO; 2022.

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**.

Appendix 3: Contact Listing Form

s/ no	Sur-name	Other names	Sex (M/F)	Age (yrs)	Rela-tion to case	Date of last contact with case	Type of contact (1,2 or 3)	Head of house-hold	Ad-dress	Town	LGA	Phone num-ber	Occupation

Source: Mpox: 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 →
- Use attendance lists, passenger manifests, etc., to further identify contacts.

- 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

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.**

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
  - NO rash develops → continue isolation; clinical and temperature monitoring for the remainder of the 21 days
    - NO rash develops within the remainder of the 21 days → 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
  - Yes, rash develops → continue isolation, PCR on skin, mucosa swab, and refer to flow chart 3
- PCR pos → CONFIRMED CASE

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

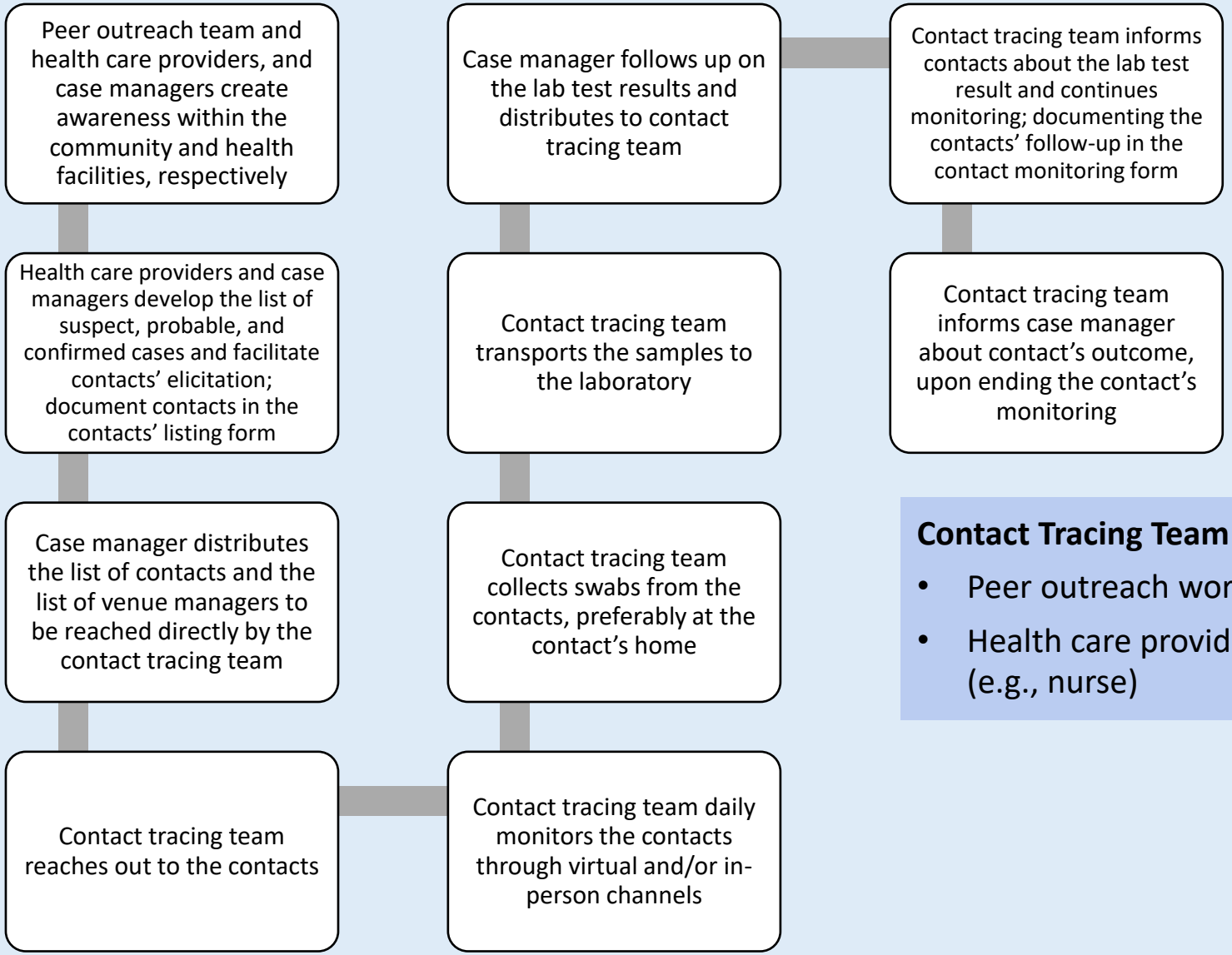
- PCR neg → Continue isolation; clinical and temperature monitoring for the next 5 days
  - Repeat PCR on skin, mucosa swab?
    - PCR neg → close the case after 21 days from last exposure and classify as PROBABLE CASE MPOX
    - PCR pos → CONFIRMED CASE
- PCR pos → CONFIRMED CASE

Signs and symptoms: Headache, fever, chills, sore throat, malaise, fatigue, rash, lymphadenopathy

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



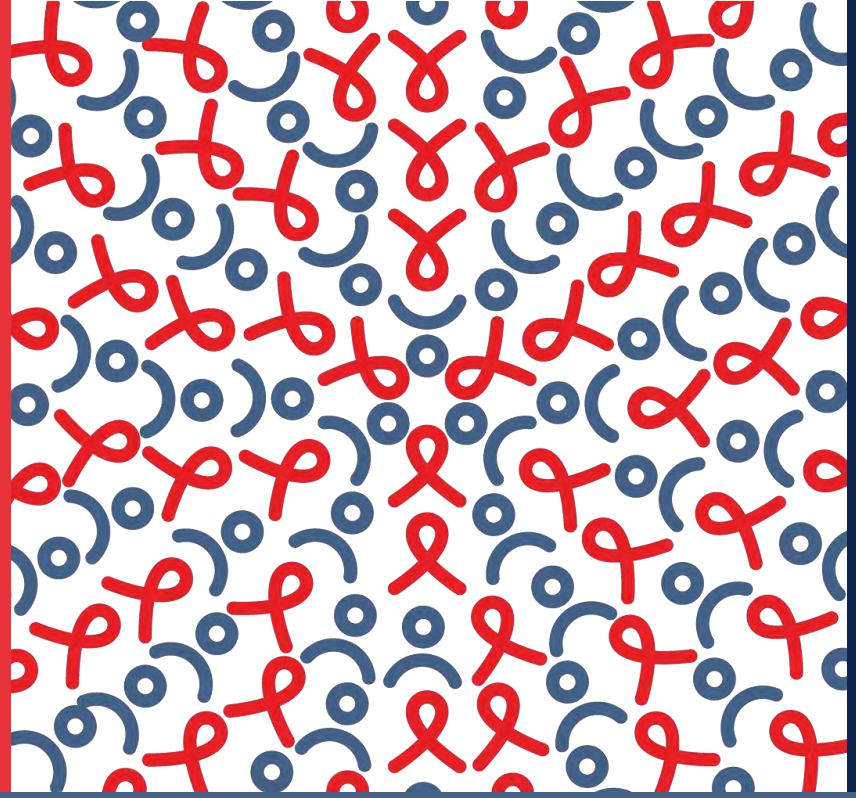
Contact Tracing Team includes:

- 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.

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO;2022.

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.

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO;2022.

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

Antibiotic	Dose
Cloxacillin (flucloxacillin)	500 mg orally every 8 hours
Cefalexin	500 mg orally every 8 hours
Amoxicillin-clavulanic acid	500–125 mg orally every 8 hours
If concern for community acquired MRSA consider following treatment:	
Clindamycin	600 mg orally every 8 hours
Trimethoprim-sulfamethoxazole	800–160 mg orally every 12 hours
Doxycycline	100 mg orally every 12 hours
Note: **In the case of penicillin or beta-lactam allergy:** use clindamycin or trimethoprim-sulfamethoxazole.	

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO;2022.

Children

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

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.

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO;2022.

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.

Sources: Mucker EM, et al. Efficacy of tecovirimat (ST-246) in nonhuman primates infected with variola virus (smallpox). Antimicrob Agents Chemother. 2013;57(12):6426-53; Grosenbach DW, et al. Oral tecovirimat for the treatment of smallpox. New Engl J Med. 2018;379:44-53; Rice AD, et al. Efficacy of CMX001 as a post exposure antiviral in New Zealand white rabbits infected with rabbitpox virus: a model for orthopoxvirus infections of humans. Viruses. 2011;3(1):47-62;

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)

	Tecovirimat	Brincidofovir	Cidofovir
Treatment dose, route, duration (adults) *(65,66,71,73,76)*	**Dose** Oral 600mg PO every 12 hours Intravenous* 3 kg to < 35 kg: 6 mg/kg every 12 hours 35 kg to < 120 kg: 200 mg every 12 hours > 120 kg: 300 mg every 12 hours *Must be administered over 6 hours **Duration** 14 days	**Dose** Oral < 10 kg: 6 mg/kg 10–48 kg: 4 mg/kg > 48 kg: 200 mg (20 mL) **Duration** Once weekly for 2 doses, on days 1 and 8	**Dose** Intravenous 5 mg/kg IV once weekly Must be given with oral probenecid: 2 grams 3 hours prior to each dose and 1 gram at 2 and 8 hours after completion of the infusion Must be given with at least 1 L of 0.9% normal saline over a 1–2 hour period before each infusion **Duration** Once weekly × 2 weeks, then once every other week (based on treatment for CMV retinitis)

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance. 10 June 2022. Geneva: WHO; 2022.

Antiviral products (3)

	Tecovirimat	Brincidofovir	Cidofovir
Treatment dose, route, duration (paediatrics) *(65,66,71,73,76)*	**Dose** Oral 13–25 kg: 200 mg every 12 hours 25–40 kg: 400 mg every 12 hours > 40 kg: 600 mg every 12 hours Intravenous* 3–35 kg: 6 mg/kg every 12 hours 35–120 kg: 200 mg every 12 hours > 120 kg: 300 mg every 12 hours *Must be given over 6 hours **Duration** 14 days	**Dose** Oral < 10 kg: 6 mg/kg 10–48 kg: 4 mg/kg > 48 kg: 200 mg (20 mL) **Duration** Once weekly for 2 doses, on days 1 and 8	**Dose** Intravenous 5 mg/kg IV once weekly Must be given with oral probenecid: 2 grams 3 hours prior to each dose and 1 gram at 2 and 8 hours after completion of the infusion Must be given with at least 1 L of 0.9% normal saline over a 1–2 hour period prior to each infusion. **Duration** Once weekly × 2 weeks, then once every other week (based on treatment for CMV retinitis)

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO; 2022.

Antiviral products (4)

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

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO;2022.

Antiviral products (5)

	Tecovirimat	Brincidofovir	Cidofovir
Use in pregnancy	No data from the use in pregnant women *(65,66)*	Not recommended 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)*	Pregnancy class C No adequate well controlled studies in pregnant women *(76)*
Use in breastfeeding	Unknown whether medicine or metabolites are excreted in human milk *(65,66,70)*	In studies with lactating rates, brincidofovir was detected in milk but not plasma of nursing pups *(73)*	Unknown *(76)*
PEP dose, route, duration (adult)	No data	No data	No data
Mechanism of action	Inhibits activity of the orthopoxvirus VP37 protein and inhibits viral envelope formation *(65,69,70,72)*	Inhibits polymerase mediated synthesis of DNA *(73)*	Inhibits DNA polymerase *(79,80)*
Licensed for smallpox	European Medicines Agency (2022)*(65)* US Food and Drug Administration (2021)*(66)* Health Canada (2021)*(67)*	US FDA (2021) *(73)* EMA (2016)	US CDC (EA-IND)
Licensed for monkeypox	European Medicines Agency (2022) *(65,70)* US CDC (EA-IND protocol)	US CDC (EA-IND protocol)	US CDC (EA-IND)

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO; 2022.

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?

Q&A

Module 8.2: Complications and Severe Mpox

Learning objectives

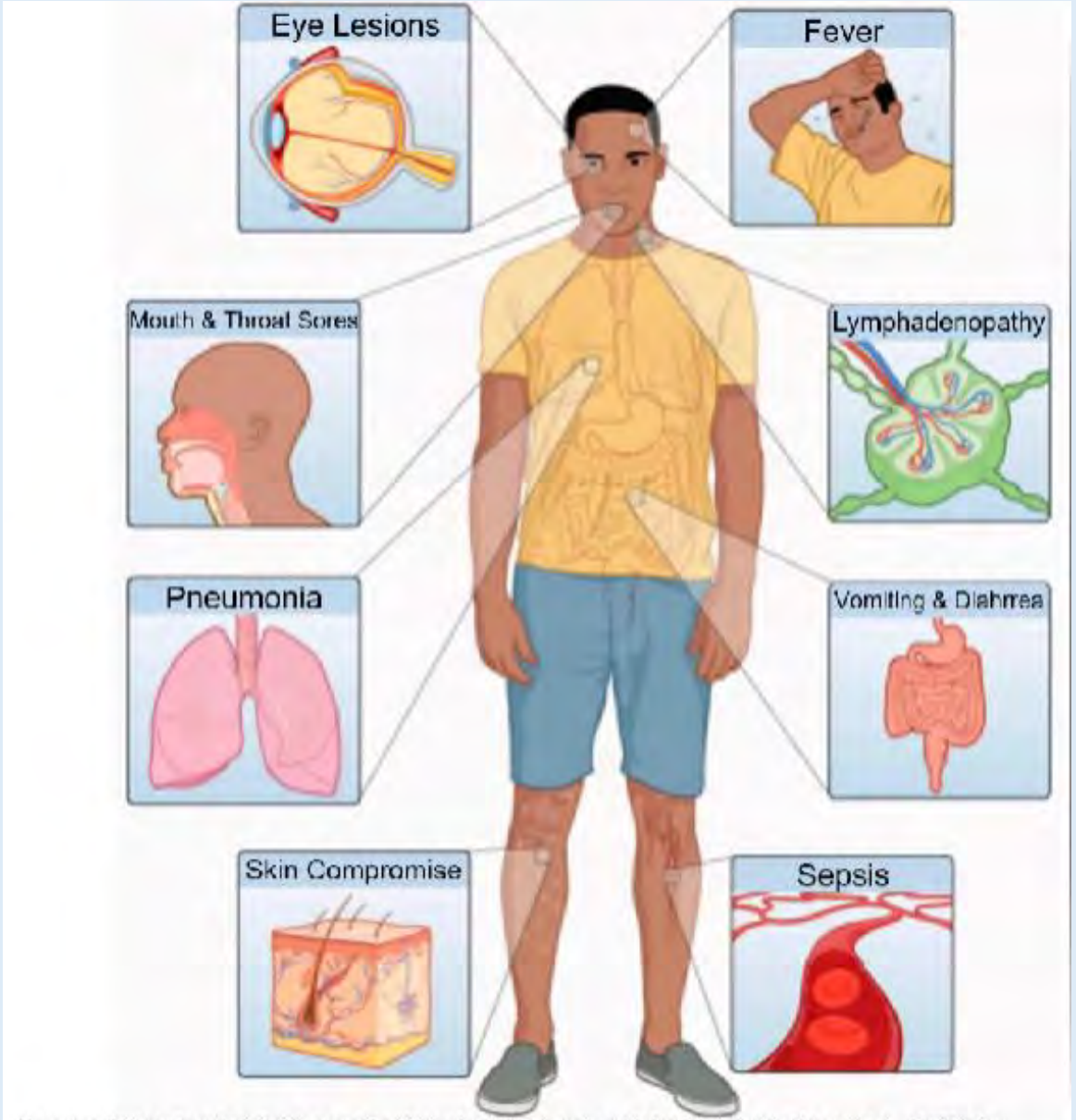
At the end of this module participants will be able to:

- 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%)



Source: Improving the Care and Treatment of Monkeypox Patients in Low-Resource , Settings: Applying Evidence from Contemporary Biomedical and Smallpox Biodefense Research

Danger signs

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

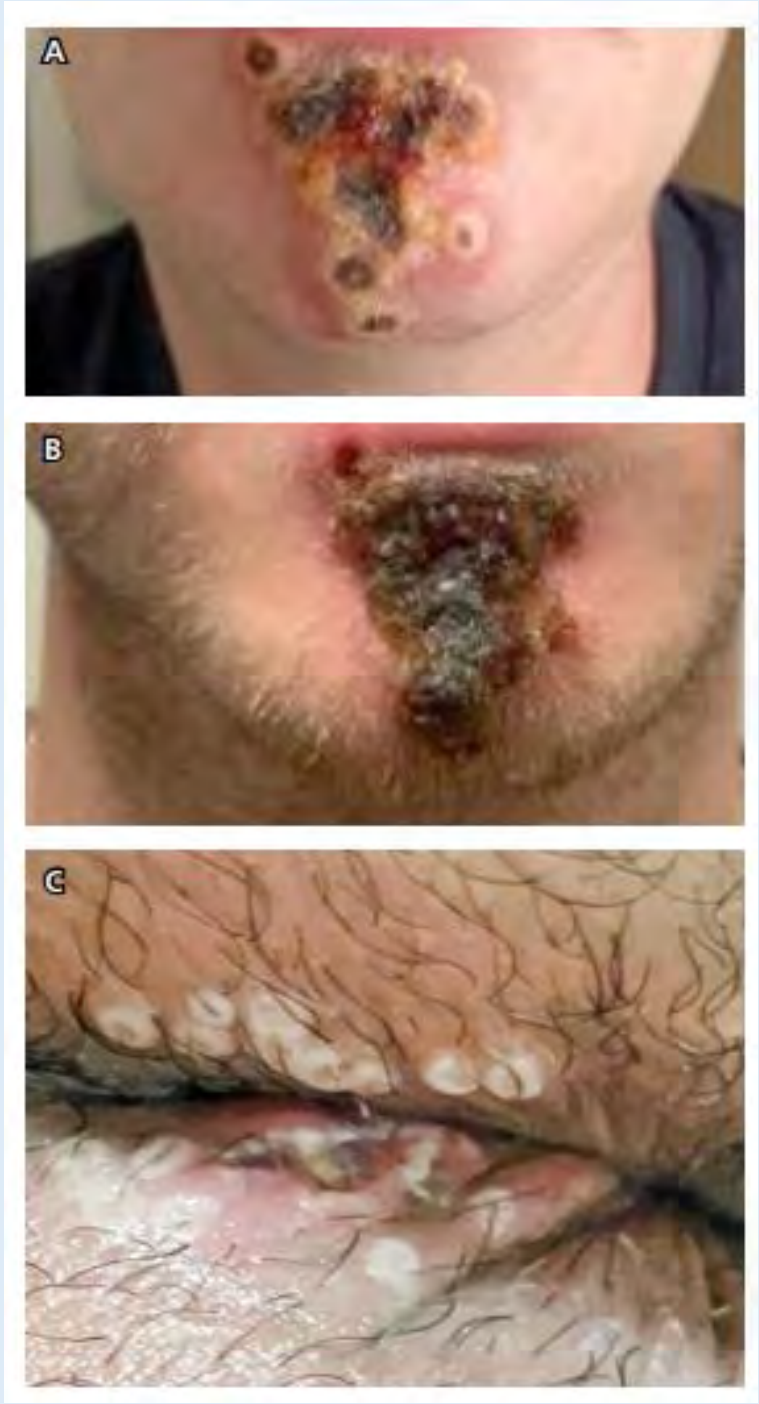
More common complications

- 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



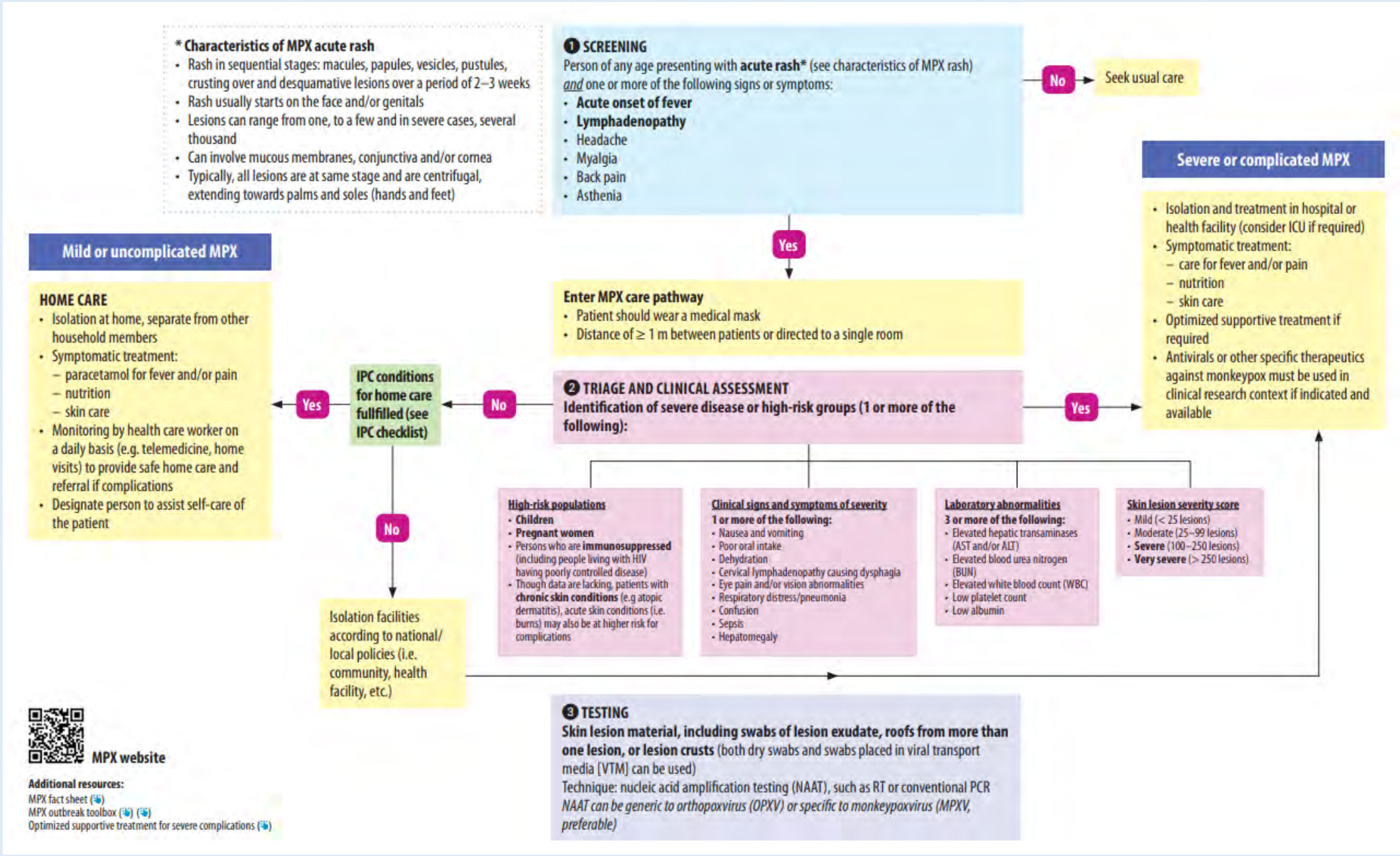
Complications of mpox

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

Vital signs and pain assessment	• 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) • Pain scale
General condition	• Is the patient able to eat and drink without support? • Is the patient able to sit and walk independently? • Has the patient had recent weight loss since onset of symptoms?
Rash characterization	• Stage of rash: macules, papules, vesicles, pustules, crusted over, exfoliation • Location of the rash (face, arms, torso, genitals, legs, mucosa) • Number of lesions *(28,94)*: – Mild (< 25 skin lesions) – Moderate (25–99 skin lesions) – Severe (100–250 skin lesions) – Very severe (> 250 skin lesions) • If exfoliation present: % body affected (> 10% is concerning)
Presence of bacterial secondary infection	• Cellulitis, abscess, pyomyositis, necrotizing soft tissue infection
Neurologic status	• AVPU, seizures, coma
Volume status	• Presence of dehydration: mild, moderate, or severe (see Table 9.2 for more details)
Signs of perfusion	• Pulse rate, strength, capillary refill • Urine output (> 0.5 mL/kg/hr = good in adults; 1.0 mL/kg/hr in children) • Mottling of skin
Respiratory system	• Respiratory rate, SpO_2, signs of respiratory distress
Nutritional assessment	• Change in appetite, weight loss, body weight, height, calculation of BMI, MUAC in children • Signs of malnutrition – use standardized tool (e.g. Malnutrition Universal Screening Tool)
Laboratory tests	• Na, K, HCO_3, BUN, creatinine, AST, ALT, glucose, white blood count, Hg, platelet, PT/INR, Cl, calcium, albumin

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO; 2022.

Classification of dehydration

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

Source: This table is modified from WHO. Optimized supportive care for Ebola virus disease: clinical management standard operating procedures. Geneva: WHO; 2019, p. 6.

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

Complication	Treatment
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.

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO; 2022.

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

Complication	Treatment
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.

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO; 2022.

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

Complication	Treatment
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.

Source: WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO; 2022.

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

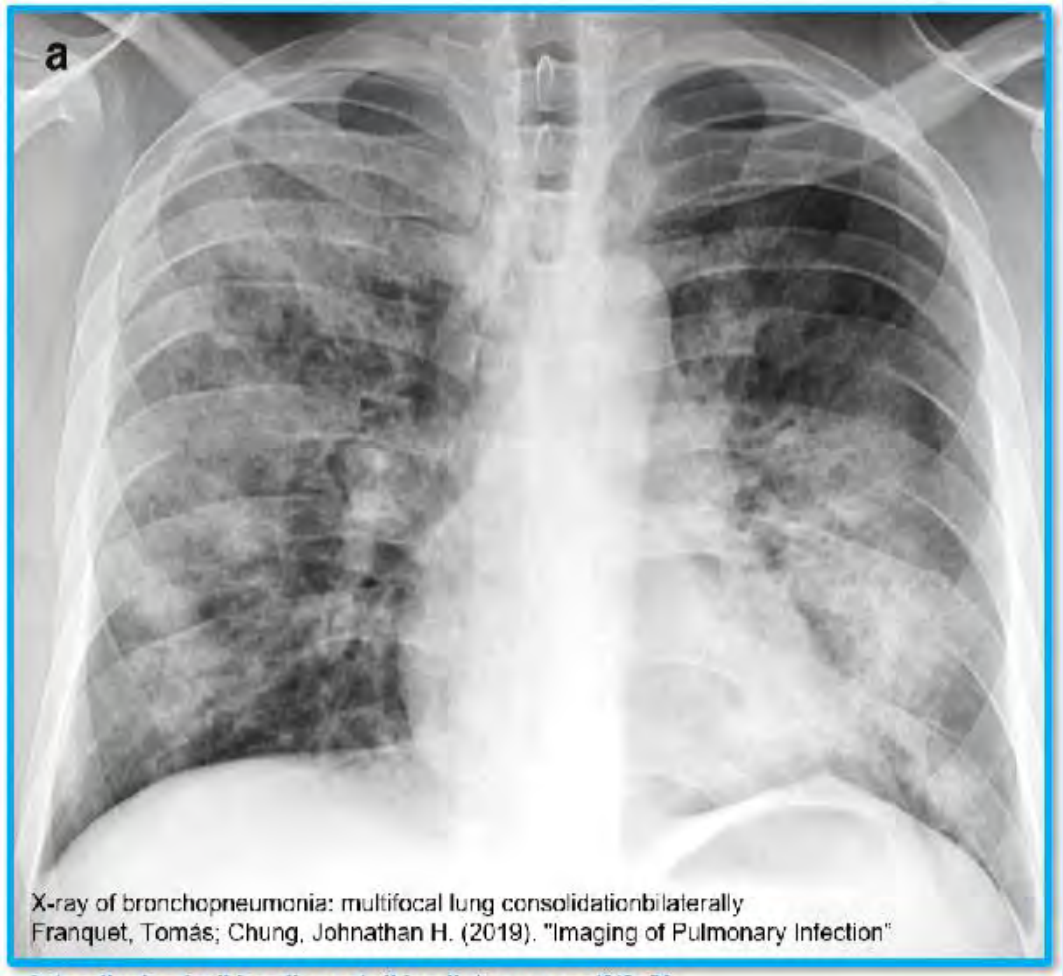
Complication	Treatment
Pneumonia	• Manage according to the WHO *Clinical Care for Severe Acute Respiratory Infection Toolkit*. *See also next slide for information specific to bronchopneumonia.*
Acute respiratory distress syndrome (ARDS)	• Oxygen, non-invasive ventilation, mechanical ventilation • Manage according to the WHO *Clinical Care for Severe Acute Respiratory Infection Toolkit*.
Severe dehydration	• 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. • 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 *Pocket Book of Hospital Care for Children.*

WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO.

WHO. Clinical care of severe acute respiratory infections toolkit [COVID-19 adaptation update 2022]. Geneva: WHO; 2022.

WHO. Pocket book of hospital care for children: 2nd edition. Geneva: WHO; 2013. https://www.who.int/publications/i/item/978-92-4-154837-3.

Bronchopneumonia



X-ray of bronchopneumonia: multifocal lung consolidationbilaterally
Franquet, Tomás; Chung, Johnathan H. (2019). "Imaging of Pulmonary Infection"

https://upload.wikimedia.org/wikipedia/commons/6/6e/X-ray_of_bronchopneumonia.png

- 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)

Complication	Treatment
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. (WHO. Clinical care of severe acute respiratory infection toolkit [COVID-19 adaptation update 2022]. Geneva: WHO; 2022.)
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. (WHO. The WHO essential medicines list antibiotic book: improving antibiotic AWaReness. Geneva: WHO; 2021.)

Clinical management of complications and severe forms of mpox (6)

Complication	Treatment
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.

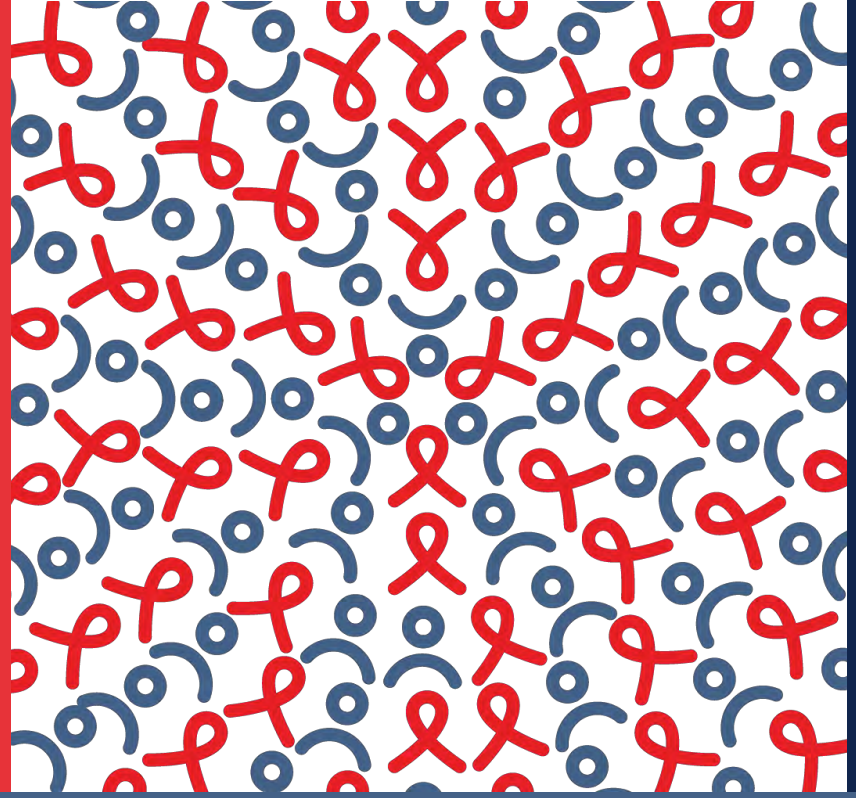
WHO. Clinical management and infection prevention and control for monkeypox: Interim rapid response guidance, 10 June 2022. Geneva: WHO; 2022.

WHO. Updates on the management of severe acute malnutrition in infants and children (guideline). Geneva: WHO; 2013.

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?

Q&A



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.

Choice of vaccine

The following vaccines are currently available

Non-replicating vaccine	Minimally replicating vaccines	Replicating vaccinia-based vaccines
• MVA-BN	• LC16	• ACAM2000

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)

	Vaccine (Manufacturer)	Licensed for smallpox (country, type, date)	Licensed for monkeypox (country, type, date)	Considerations	Presentation	Injection materials
Non-replicating vaccine	**MVA-BN (Bavarian Nordic)** Third generation	EU (Imvanex): has been authorised under exceptional circumstances (2013) Canada (Imvamune): Full MA (2013) USA (Jynneos): Full MA (2019)	USA (Jynneos): Full MA (2019) Canada (Imvamune):Full MA (2019) EU (Imvanex): has been authorized under exceptional circumstances (2022)	Two doses four weeks apart. Liquid-frozen formulation, approved for use in the general adult population. The USA has granted emergency authorization for use in individuals 18 years and below (August 2022).	Liquid frozen or lyophilized (freeze-dried) Single dose vials (Multidose vials possible)	Needle and syringe (sub-cutaneous administration)
Minimally replicating vaccine	**LC16 (KM Biologics)** Third generation	Japan - Full MA (1975)	Japan: MA (August 2022)	Single dose. Approved for use in infants and children (all ages) as well as adults	Freeze-dried Multidose vials	Bifurcated needle
Replicating vaccinia-based vaccine	**ACAM2000 (Emergent BioSolutions)** Second generation	Multiple countries - Approved	USA - EIND for PEPV	Single dose. Approved for use in adults aged 18 – 64 years of age.	Freeze-dried Multidose vials	Bifurcated needle

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

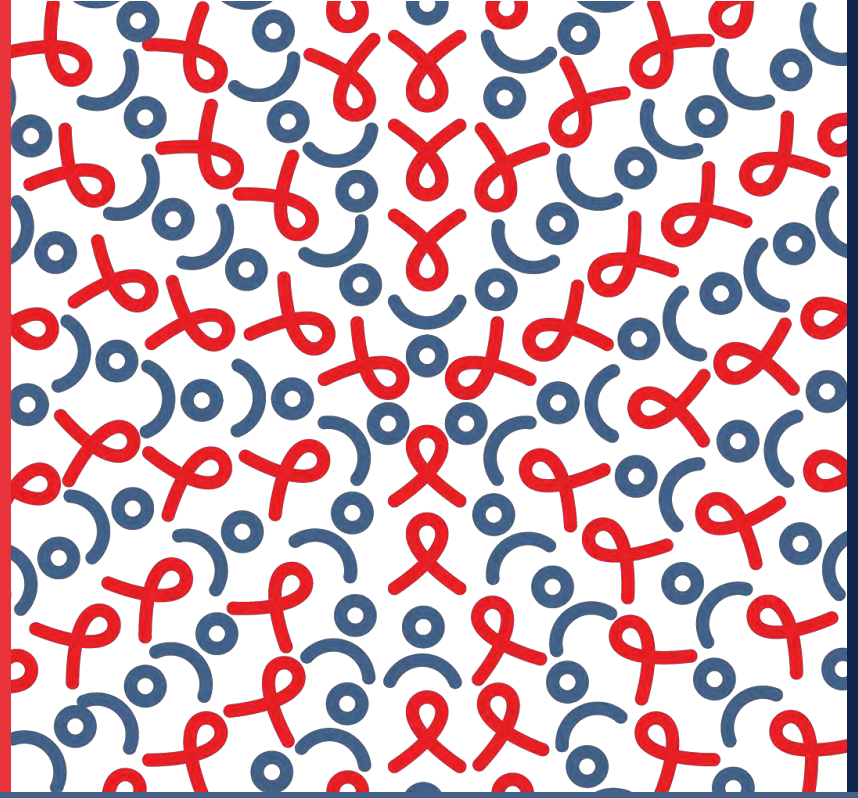
Prioritized for receipt of vaccine following analysis of risks and benefits on a case-by-case basis

- 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?

Q&A



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

Mpox and key populations

- Anyone can get and spread mpox (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 mpox 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.

Mpox and HIV (1)

- About half of the people with mpox whose status is known are HIV positive.
- HIV status is not linked with mpox severity.
- Among HIV-negative men with mpox, 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

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Monkeypox Virus Infection in Humans across 16 Countries — April–June 2022

J.P. Thornhill, S. Barkati, S. Walmsley, J. Rockstroh, A. Antinori, L.B. Harrison, R. Palich, A. Nori, I. Reeves, M.S. Habibi, V. Apea, C. Boesecke, L. Vandekerckhove, M. Yakubovsky, E. Sendagorta, J.L. Blanco, E. Florence, D. Moschese, F.M. Maltez, A. Goorhuis, V. Pourcher, P. Migaud, S. Noe, C. Pintado, F. Maggi, A.-B.E. Hansen, C. Hoffmann, J.I. Lezama, C. Mussini, A.M. Cattelan, K. Makofane, D. Tan, S. Nozza, J. Nemeth, M.B. Klein, and C.M. Orkin, for the SHARE-net Clinical Group*

ABSTRACT

BACKGROUND

Before April 2022, monkeypox virus infection in humans was seldom reported outside African regions where it is endemic. Currently, cases are occurring worldwide. Transmission, risk factors, clinical presentation, and outcomes of infection are poorly defined.

METHODS

We formed an international collaborative group of clinicians who contributed to an international case series to describe the presentation, clinical course, and outcomes of polymerase-chain-reaction–confirmed monkeypox virus infections.

RESULTS

We report 528 infections diagnosed between April 27 and June 24, 2022, at 43 sites in 16 countries. Overall, 98% of the persons with infection were gay or bisexual men, 75% were White, and 41% had human immunodeficiency virus infection; the median age was 38 years. Transmission was suspected to have occurred through sexual activity in 95% of the persons with infection. In this case series, 95% of the persons presented with a rash (with 64% having <10 lesions), 73% had anogenital lesions, and 41% had mucosal lesions (with 54 having a single genital lesion). Common systemic features preceding the rash included fever (62%), lethargy (41%), myalgia (31%), and headache (27%); lymphadenopathy was also common (reported in 56%). Concomitant sexually transmitted infections were reported in 109 of 377 persons (29%) who were tested. Among the 23 persons with a clear exposure history, the median incubation period was 7 days (range, 3 to 20). Monkeypox virus DNA was detected in 29 of the 32 persons in whom seminal fluid was analyzed. Antiviral treatment was given to 5% of the persons overall, and 70 (13%) were hospitalized; the reasons for hospitalization were pain management, mostly for severe anorectal pain (21 persons); soft-tissue superinfection (18); pharyngitis limiting oral intake (5); eye lesions (2); acute kidney injury (2); myocarditis (2); and infection-control purposes (13). No deaths were reported.

CONCLUSIONS

In this case series, monkeypox manifested with a variety of dermatologic and systemic clinical findings. The simultaneous identification of cases outside areas where monkeypox has traditionally been endemic highlights the need for rapid identification and diagnosis of cases to contain further community spread.

The authors' full names, academic degrees, and affiliations are listed in the Appendix. Prof. Orkin can be contacted at c.m.orkin@qmul.ac.uk, or at the SHARE Collaborative, Centre for Immunobiology, Blizard Institute, Queen Mary University of London, 4 Newark St., London E1 2AT, United Kingdom.

*The investigators in the SHARE-net clinical group are listed in the Supplementary Appendix, available at NEJM.org.

Drs. Thornhill, Barkati, Klein, and Orkin contributed equally to this article.

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DOI: 10.1056/NEJMoa2207323

Thornhill JP, et al. Monkeypox virus infection in humans across 16 countries—April–June 2022. N Engl J Med. 2022;387:679-91. doi: 10.1056/NEJMoa2207323.

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.

Mpox in women during and after pregnancy

- Pregnant or recently pregnant women with mild or uncomplicated mpox 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 mpox 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 mpox should receive routine antenatal, postpartum, or abortion care, as appropriate.
- Recommendation to stop breastfeeding for a mother with mpox should consider the general physical status of the mother and the severity of disease.

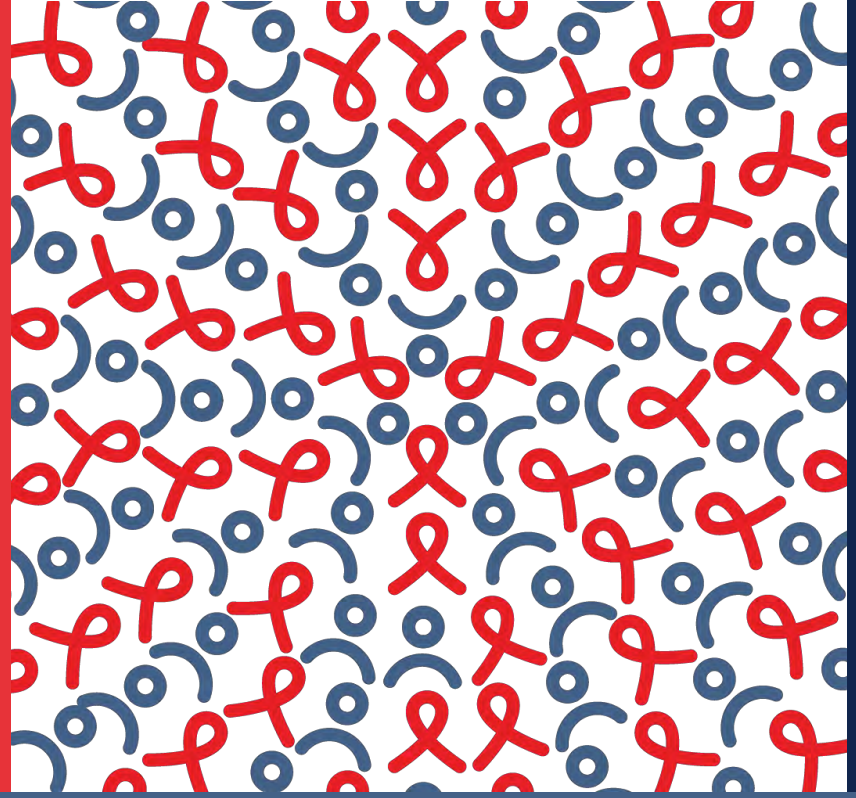
Mpox in young children

- Newborn infants of mothers with mpox 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 mpox 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

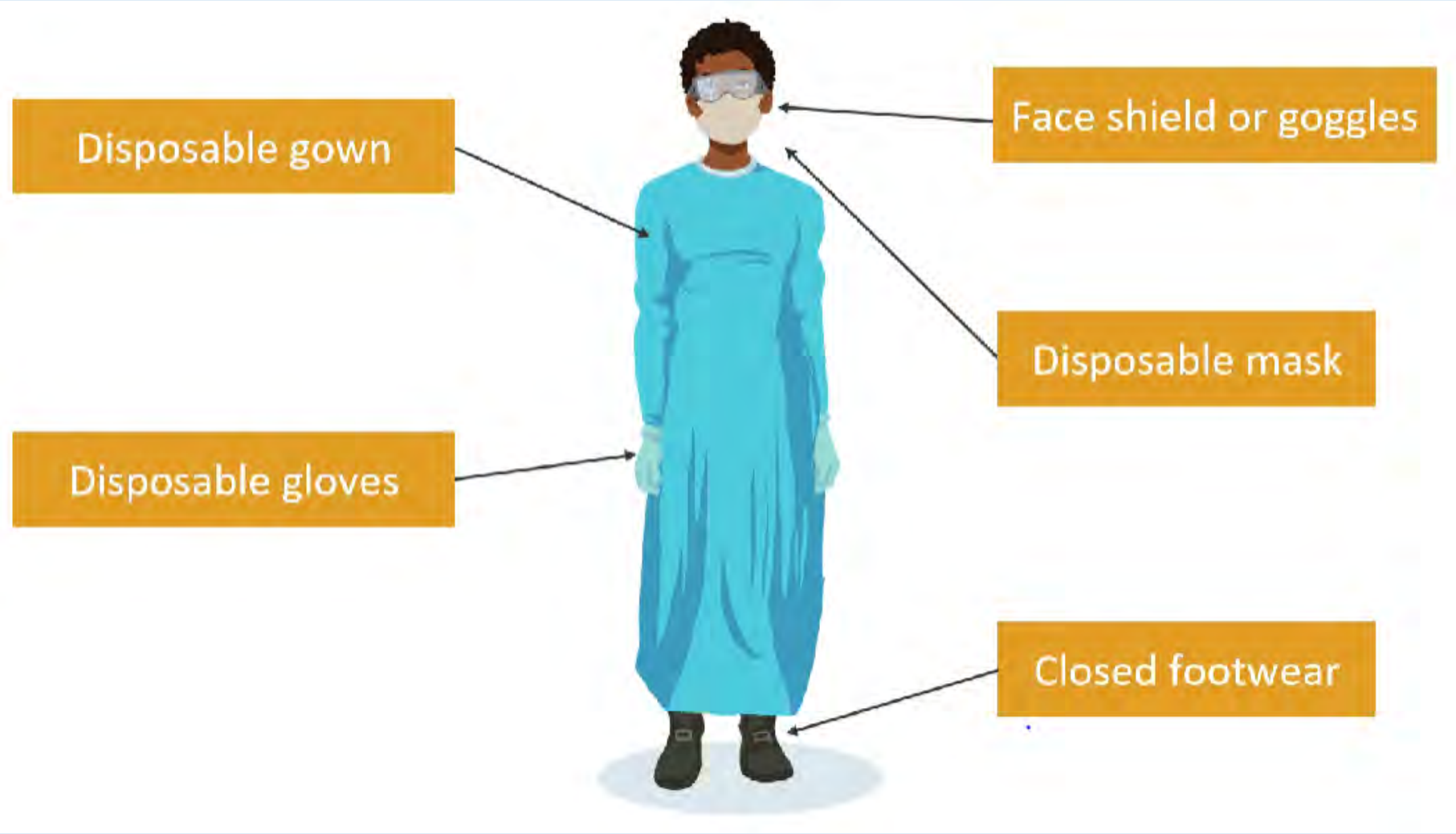
Standard precaution

- 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)



Injection and medication safety

7 STEPS for safe injection

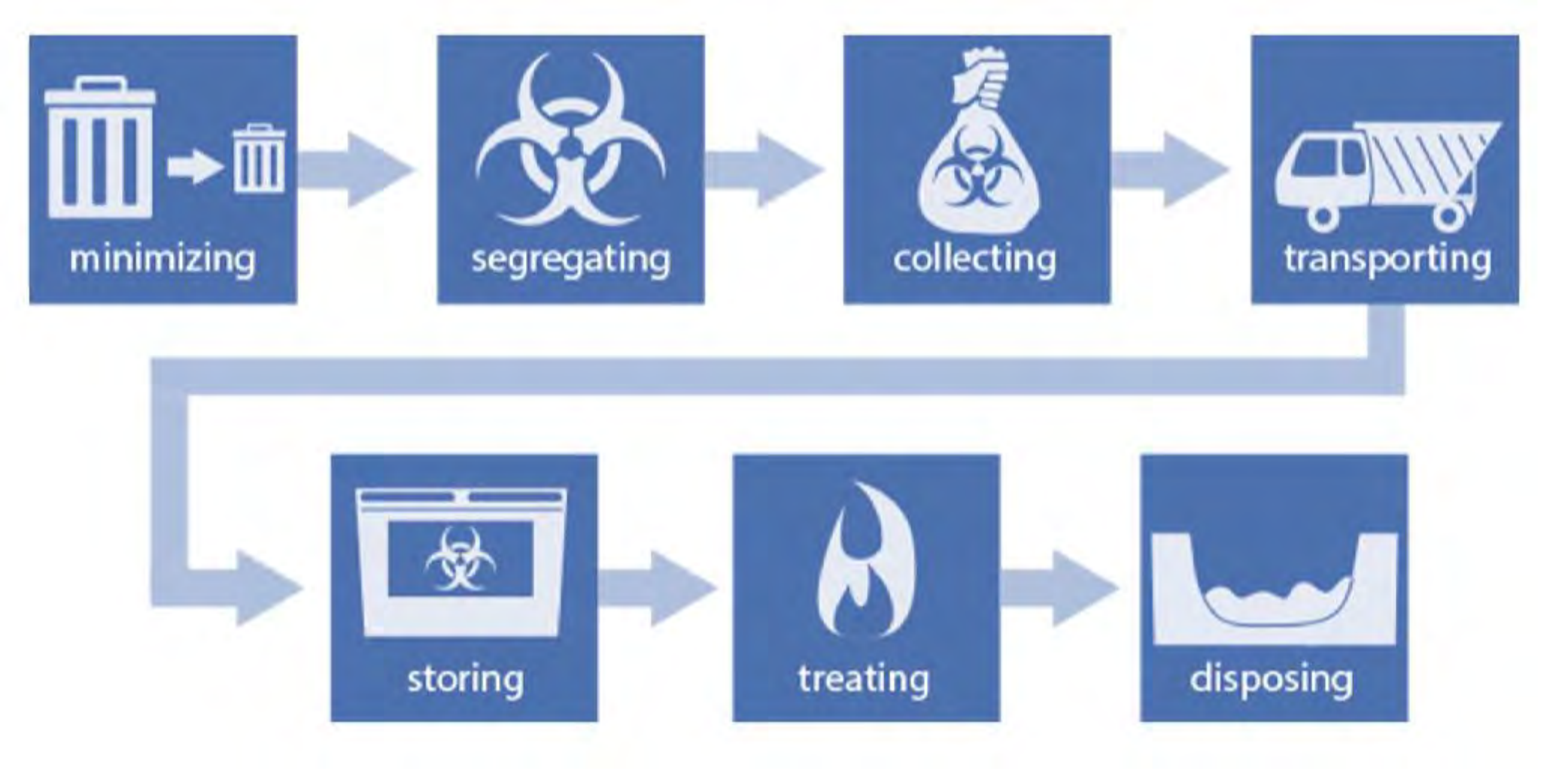
1. A clean workplace
2. Clean hands and wear gloves
3. Use sterile injection equipment
4. Use each vial once for one patient
5. Properly disinfect skin before injection
6. Ensure sharps disposal
7. Ensure proper waste management

Cleaning and disinfection

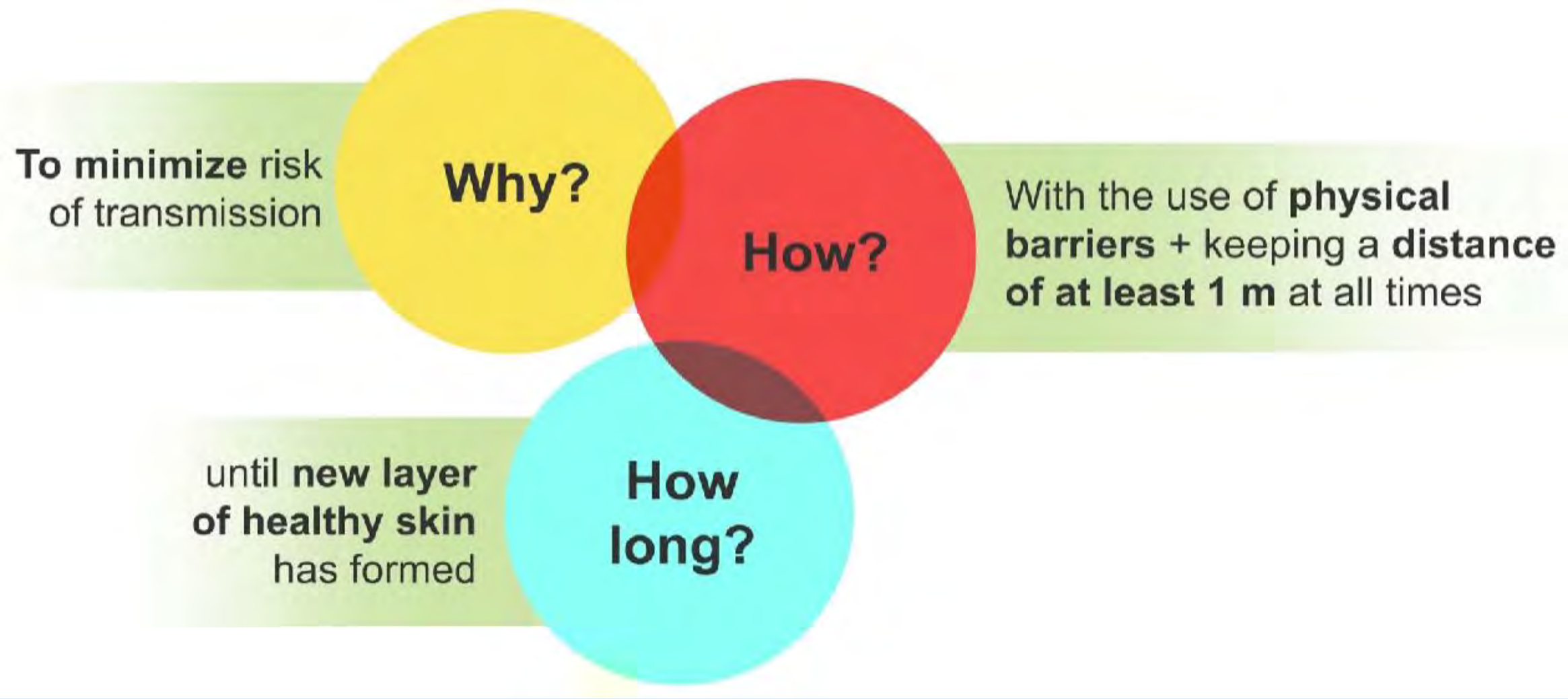
Cleaning

Disinfection

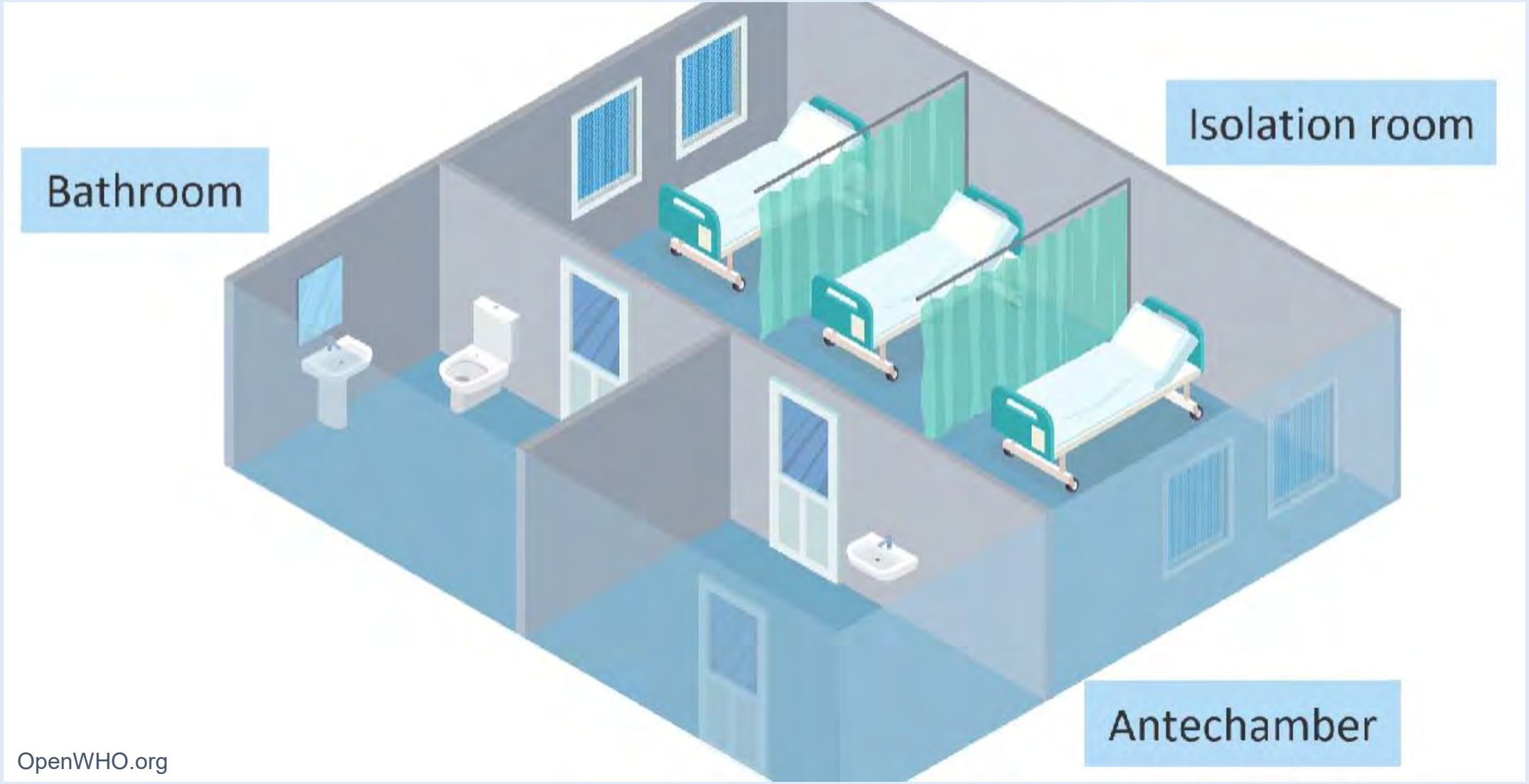
Waste management



Isolation of patients



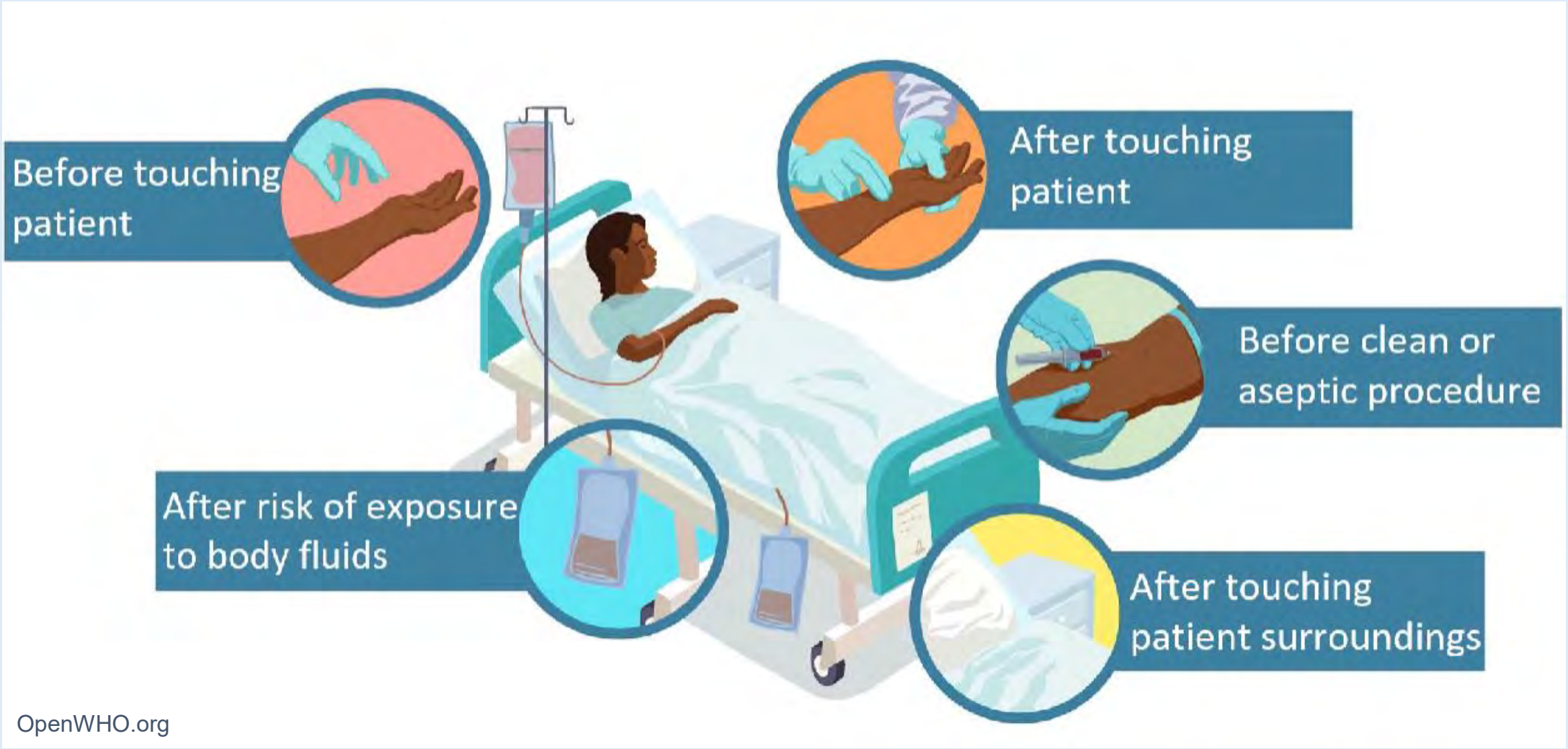
Isolation in a health facility



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



OpenWHO.org

Recommendations for cases and contacts

Recommendations	Symptomatic contacts	Asymptomatic contacts	Cases
Regularly practice hand hygiene and respiratory etiquette	X	X	X
Do not donate blood, cells, tissue, organs, breast milk, or semen	X	X	X
Continue routine daily activities such as going to work and attending school (i.e., no quarantine is necessary)		X	
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	X		X
Avoid undertaking any travel, including international, until they are determined as no longer constituting a public health risk	X	X	X
Avoid close direct contacts with animals (for 21 days after the last exposure*)	X	X	X
Abstain from sexual activities (for 21 days after the last exposure*)	X	X	X
Avoid contacts with immunocompromised people, newborn, infants, children, and pregnant women (for 21 days after the last exposure*)	X	X	X

*applies to contacts only

Home Isolation

Limit contact with other household members; sleep in separate room.

Do not touch the rash or scabs of a person with mpox.

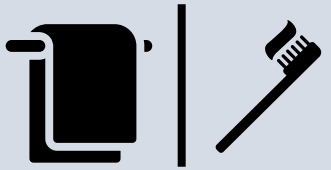
Avoid kissing, hugging, cuddling, intimate or sexual contacts.

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.

Avoid close contacts with newborns, infants, young children, pregnant women, those with impaired immuno-system.

Avoid contact with objects and materials that a person with mpox has used.

Do not share bedding, towels, wash cloths, toothbrushes, razors.



Do not share food, drinks, cups, utensils, dishes.

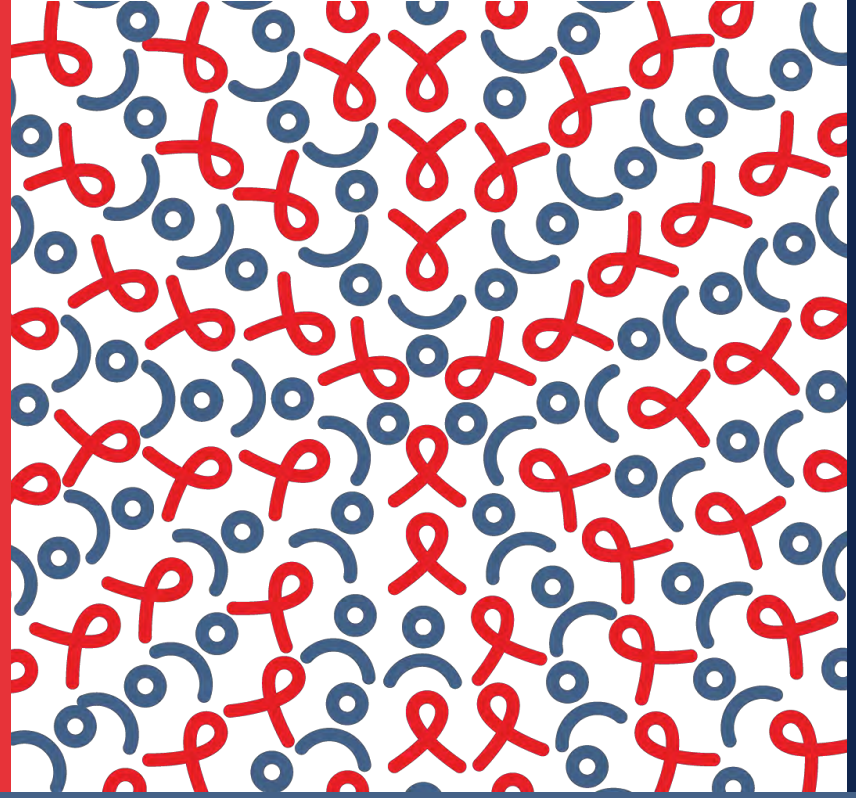
Avoid visitors at home.

Leave the house only if emergency; postpone non-essential medical or dental care.

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?

Q&A



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

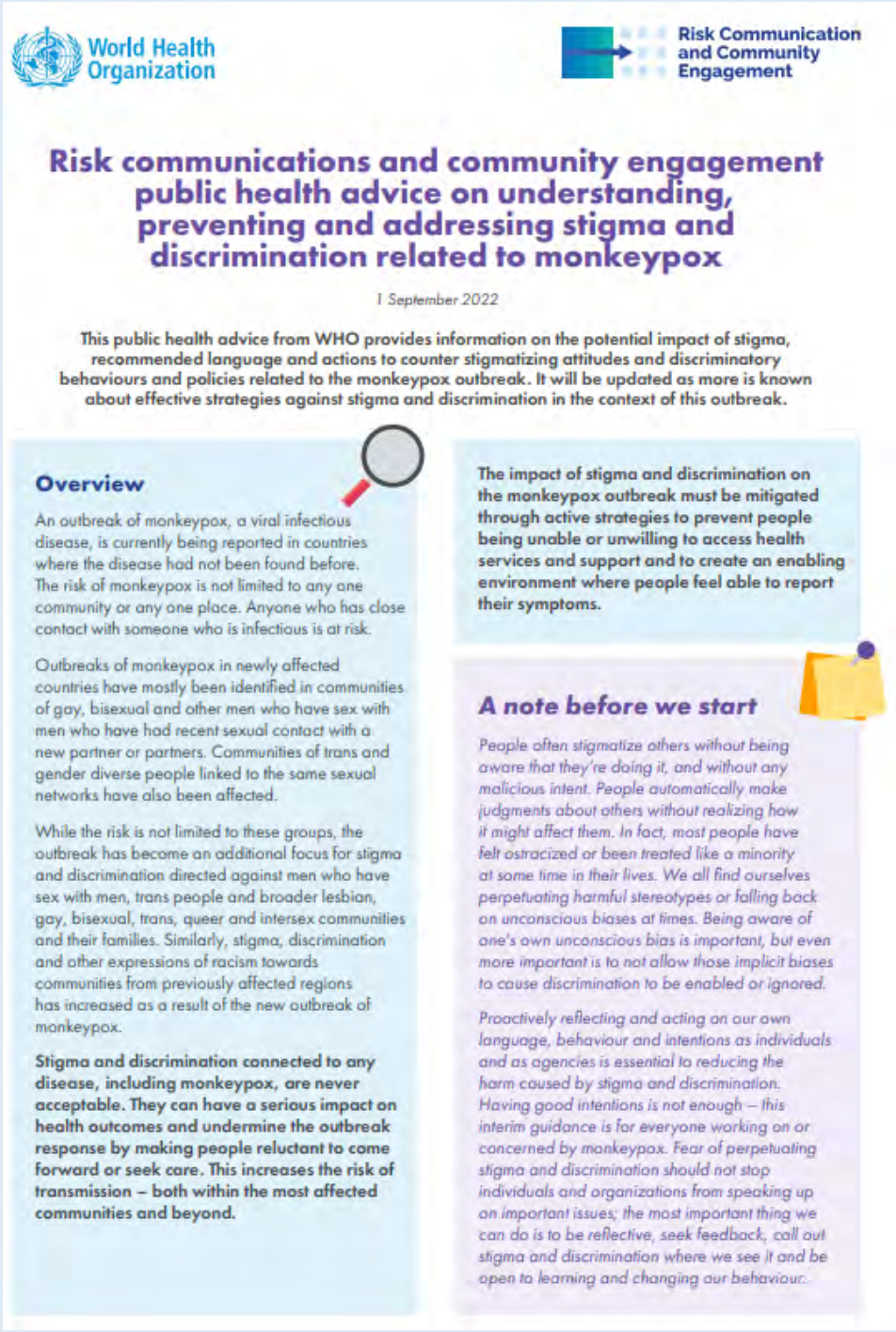
General communication considerations

- 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



World Health Organization

Risk Communication and Community Engagement

Risk communications and community engagement public health advice on understanding, preventing and addressing stigma and discrimination related to monkeypox

1 September 2022

This public health advice from WHO provides information on the potential impact of stigma, recommended language and actions to counter stigmatizing attitudes and discriminatory behaviours and policies related to the monkeypox outbreak. It will be updated as more is known about effective strategies against stigma and discrimination in the context of this outbreak.

Overview

An outbreak of monkeypox, a viral infectious disease, is currently being reported in countries where the disease had not been found before. The risk of monkeypox is not limited to any one community or any one place. Anyone who has close contact with someone who is infectious is at risk.

Outbreaks of monkeypox in newly affected countries have mostly been identified in communities of gay, bisexual and other men who have sex with men who have had recent sexual contact with a new partner or partners. Communities of trans and gender diverse people linked to the same sexual networks have also been affected.

While the risk is not limited to these groups, the outbreak has become an additional focus for stigma and discrimination directed against men who have sex with men, trans people and broader lesbian, gay, bisexual, trans, queer and intersex communities and their families. Similarly, stigma, discrimination and other expressions of racism towards communities from previously affected regions has increased as a result of the new outbreak of monkeypox.

Stigma and discrimination connected to any disease, including monkeypox, are never acceptable. They can have a serious impact on health outcomes and undermine the outbreak response by making people reluctant to come forward or seek care. This increases the risk of transmission – both within the most affected communities and beyond.

The impact of stigma and discrimination on the monkeypox outbreak must be mitigated through active strategies to prevent people being unable or unwilling to access health services and support and to create an enabling environment where people feel able to report their symptoms.

A note before we start

People often stigmatize others without being aware that they're doing it, and without any malicious intent. People automatically make judgments about others without realizing how it might affect them. In fact, most people have felt ostracized or been treated like a minority at some time in their lives. We all find ourselves perpetuating harmful stereotypes or falling back on unconscious biases at times. Being aware of one's own unconscious bias is important, but even more important is to not allow those implicit biases to cause discrimination to be enabled or ignored.

Proactively reflecting and acting on our own language, behaviour and intentions as individuals and as agencies is essential to reducing the harm caused by stigma and discrimination. Having good intentions is not enough – this interim guidance is for everyone working on or concerned by monkeypox. Fear of perpetuating stigma and discrimination should not stop individuals and organizations from speaking up on important issues; the most important thing we can do is to be reflective, seek feedback, call out stigma and discrimination where we see it and be open to learning and changing our behaviour.

Source: WHO. Risk communication and community engagement public health advice on understanding, preventing and addressing stigma and discrimination related to monkeypox. Geneva: WHO; 2022.

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

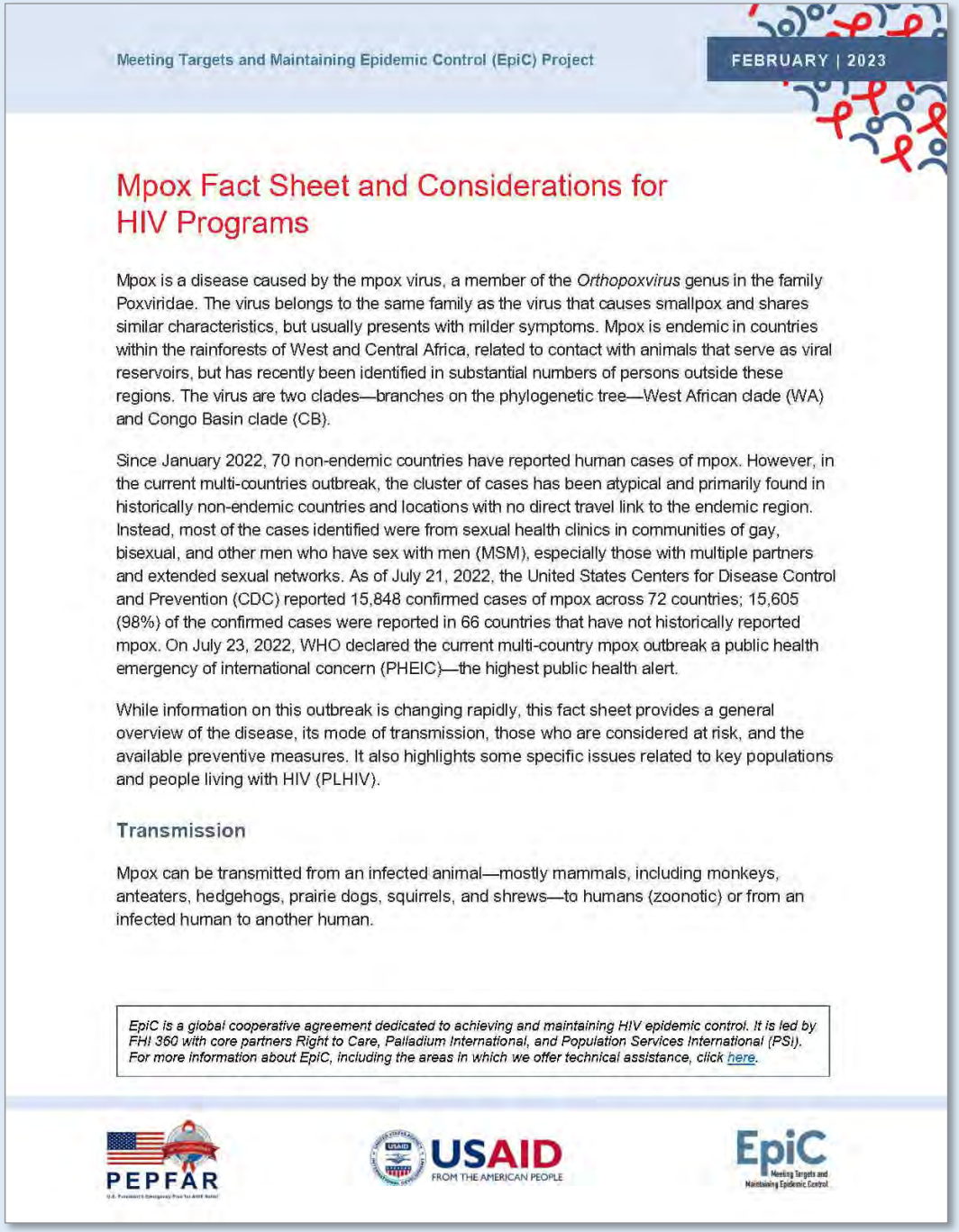
- Work with community representatives to design and adapt messaging and activities with specific audiences.
- Use community-led interventions deployed through trusted networks and platforms.
- Integrate mpox prevention and social and behavior change (SBC) communication into familiar sexual health programs (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



Meeting Targets and Maintaining Epidemic Control (EpiC) Project

FEBRUARY | 2023

Mpox Fact Sheet and Considerations for HIV Programs

Mpox is a disease caused by the mpox virus, a member of the *Orthopoxvirus* genus in the family Poxviridae. The virus belongs to the same family as the virus that causes smallpox and shares similar characteristics, but usually presents with milder symptoms. Mpox is endemic in countries within the rainforests of West and Central Africa, related to contact with animals that serve as viral reservoirs, but has recently been identified in substantial numbers of persons outside these regions. The virus are two clades—branches on the phylogenetic tree—West African clade (WA) and Congo Basin clade (CB).

Since January 2022, 70 non-endemic countries have reported human cases of mpox. However, in the current multi-countries outbreak, the cluster of cases has been atypical and primarily found in historically non-endemic countries and locations with no direct travel link to the endemic region. Instead, most of the cases identified were from sexual health clinics in communities of gay, bisexual, and other men who have sex with men (MSM), especially those with multiple partners and extended sexual networks. As of July 21, 2022, the United States Centers for Disease Control and Prevention (CDC) reported 15,848 confirmed cases of mpox across 72 countries; 15,605 (98%) of the confirmed cases were reported in 66 countries that have not historically reported mpox. On July 23, 2022, WHO declared the current multi-country mpox outbreak a public health emergency of international concern (PHEIC)—the highest public health alert.

While information on this outbreak is changing rapidly, this fact sheet provides a general overview of the disease, its mode of transmission, those who are considered at risk, and the available preventive measures. It also highlights some specific issues related to key populations and people living with HIV (PLHIV).

Transmission

Mpox can be transmitted from an infected animal—mostly mammals, including monkeys, anteaters, hedgehogs, prairie dogs, squirrels, and shrews—to humans (zoonotic) or from an infected human to another human.

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 International, and Population Services International (PSI). For more information about EpiC, including the areas in which we offer technical assistance, click here.

PEPFAR

USAID FROM THE AMERICAN PEOPLE

EpiC Meeting Targets and Maintaining Epidemic Control

Considerations for community-based organizations

- What is mpox
- Who can get mpox
- How does mpox spread
- What are the symptoms of mpox
- How to protect yourself and others

Considerations for providers

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

What community members need to know

03/08/2022

World Health Organization

MONKEYPOX: WHAT YOU NEED TO KNOW

An outbreak of monkeypox is occurring in many countries:

- WHO has declared a public health emergency of international concern.
- Monkeypox is preventable. Most people recover fully, but some people can get seriously ill.
- Symptoms can be uncomfortable and painful.
- While monkeypox can affect anyone, most cases in this outbreak are among men who have sex with men
- What we know about the outbreak is changing fast – we are learning more every day

Symptoms of monkeypox often include:

- Rash on face, hands, feet, body, perianal area or genitals
- Rash in mouth, throat, eyes, vagina and anus
- Fever
- Swollen lymph nodes
- Headaches
- Muscle and back aches
- Low energy
- Painful swelling inside your rectum (proctitis)
- Pain or difficulty when urinating

You can catch monkeypox through close contact with someone who has symptoms including:

- Skin-to-skin (e.g., touching, anal and vaginal sex)
- Face-to-face (e.g., talking, singing, breathing)
- Mouth-to-skin (e.g., oral sex)
- Mouth-to-mouth (e.g., kissing)
- From contaminated bedding, towels, clothing, surfaces or objects

Protect yourself from monkeypox:

- If someone you know is diagnosed with or has suspected monkeypox, avoid close contact with them
- Know the symptoms and check yourself regularly
- If you have symptoms, seek health advice and self-isolate while you wait to get tested
- Get vaccinated if it is available to you
- Follow advice to reduce the risk of infection if you live with someone who has monkeypox

Monkeypox can spread through sex :

- People who have sex with multiple or new partners are most at risk
- Check yourself regularly for symptoms and ask partners to do the same
- If monkeypox is impacting your community, you can 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, non-judgmental conversations. Swap contact details with 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 monkeypox, but they will not prevent you becoming infected through close physical contact

If you think you have monkeypox:

- Get advice from a health worker
- Get tested
- Isolate at home if your health worker recommends you do so
- Take care of your rash, physical and mental health
- Protect others by avoiding close contact with them
- If you are sharing a house with others while isolating, stay in separate rooms, frequently clean hands, clean/disinfect objects and surfaces often and open windows
- Avoid contact with your pets

Stigmatising people because of a disease is never ok.

Anyone can get or pass on monkeypox.
Together, we can end this outbreak.

Source: WHO. Monkeypox: what you need to know. Geneva: WHO; 2022.

What sex workers need to know

World Health Organization

Risk Communication and Community Engagement

Public health advice for sex workers on monkeypox

30 September 2022

Overview

An outbreak of monkeypox, a viral infectious disease, is currently being reported in countries where the disease had not been found before. The risk of monkeypox is not limited to any one community or any one place. Anyone who has close contact with someone who is infectious is at risk.

Outbreaks of monkeypox in newly affected countries have mostly been identified in communities of gay, bisexual and other men who have sex with men who have had recent sexual contact with a new partner or partners. Communities of trans and gender diverse people linked to the same sexual networks have also been affected.

We know that this outbreak is concerning, especially for people who are unwell, their partners, families and communities, and for people whose work require close contact with others, including sex workers. Many sex workers will struggle financially if they are unable to work either by avoiding close contact with clients who have monkeypox or while isolating because they have suspected or confirmed monkeypox. This issue is likely to be particularly acute where these is no social protection or financial support available from their governments in their setting.

Some sex worker-led organizations established mutual aid schemes during the COVID-19 pandemic. Similar schemes may be possible in your country if organizations are beginning to develop emergency response funds for emerging health crises that prevent sex workers from earning an income. Identifying, establishing and raising awareness about these schemes is essential to create an environment in which sex workers can protect themselves and others from transmission.

How to use this document

This document includes public health advice for sex workers of all genders on protecting themselves and others against monkeypox. It is intended for use by sex workers, sex worker-led organisations, community leaders, advocates, health service providers (especially those in sexual health service delivery) and organisations working to promote the health of sex workers.

The information in this document can be used as a basis for formal and informal community conversations, information sessions, or producing community information, to inform sex workers on how to protect themselves and others. **The information included here can and should be adapted to the local context and sex work setting depending on the needs of the community.**

THE SHORT READ

Key points about monkeypox

Monkeypox is caused by a virus. Symptoms can include a rash, fever or body aches, among others.

Monkeypox can spread through touching, kissing, and oral, vaginal and anal sex.

To protect yourself and others:

- Know the symptoms and check yourself regularly
- Have open conversations with close contacts where it is safe to do so
- Avoid close contact with someone who has it
- Seek health advice and get tested if you have been exposed or have symptoms
- Isolate if you have monkeypox, whenever possible
- Get vaccinated if it is available to you

Having or being exposed to monkeypox is nothing to be ashamed of.

Anyone can get monkeypox.

Let's take care of each other and get rid of monkeypox together.

Source: WHO. Public health advice for sex workers on monkeypox. Geneva: WHO; 2022.

- 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 mpox 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 mpox, 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 mpox, 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 mpox 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 mpox (monkeypox); AND Public advice for men who have sex with men on preventing mpox (monkeypox). Geneva: WHO [updated 2022 Sep 2; cited 2023 Apr 27].

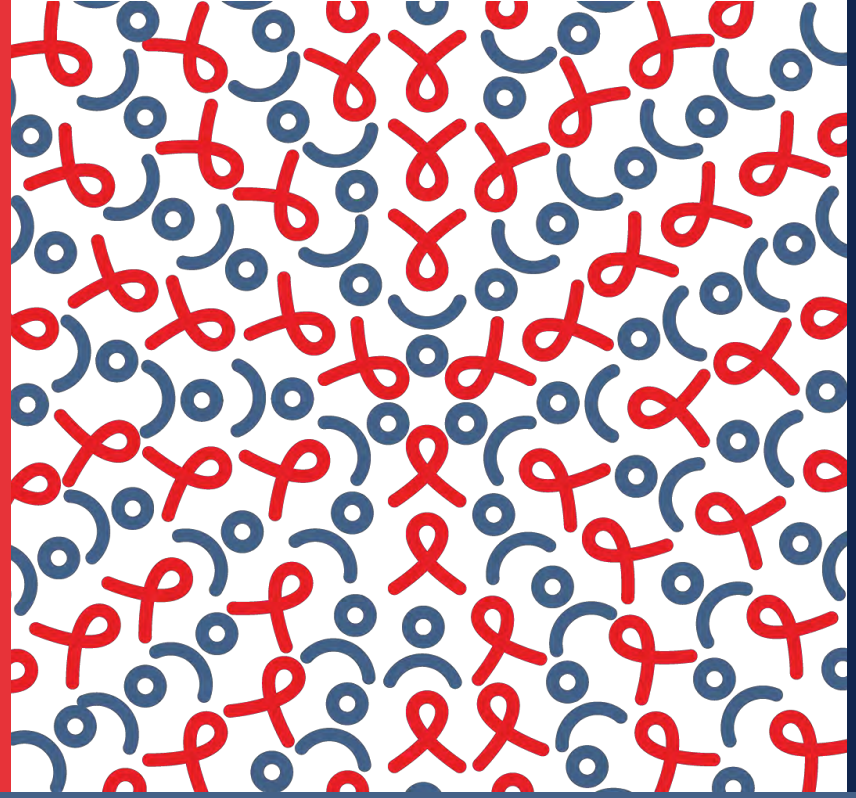
What individuals with mpox need to know

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?

Q&A



Module 13: Surveillance, Monitoring, and Evaluation

Learning objectives

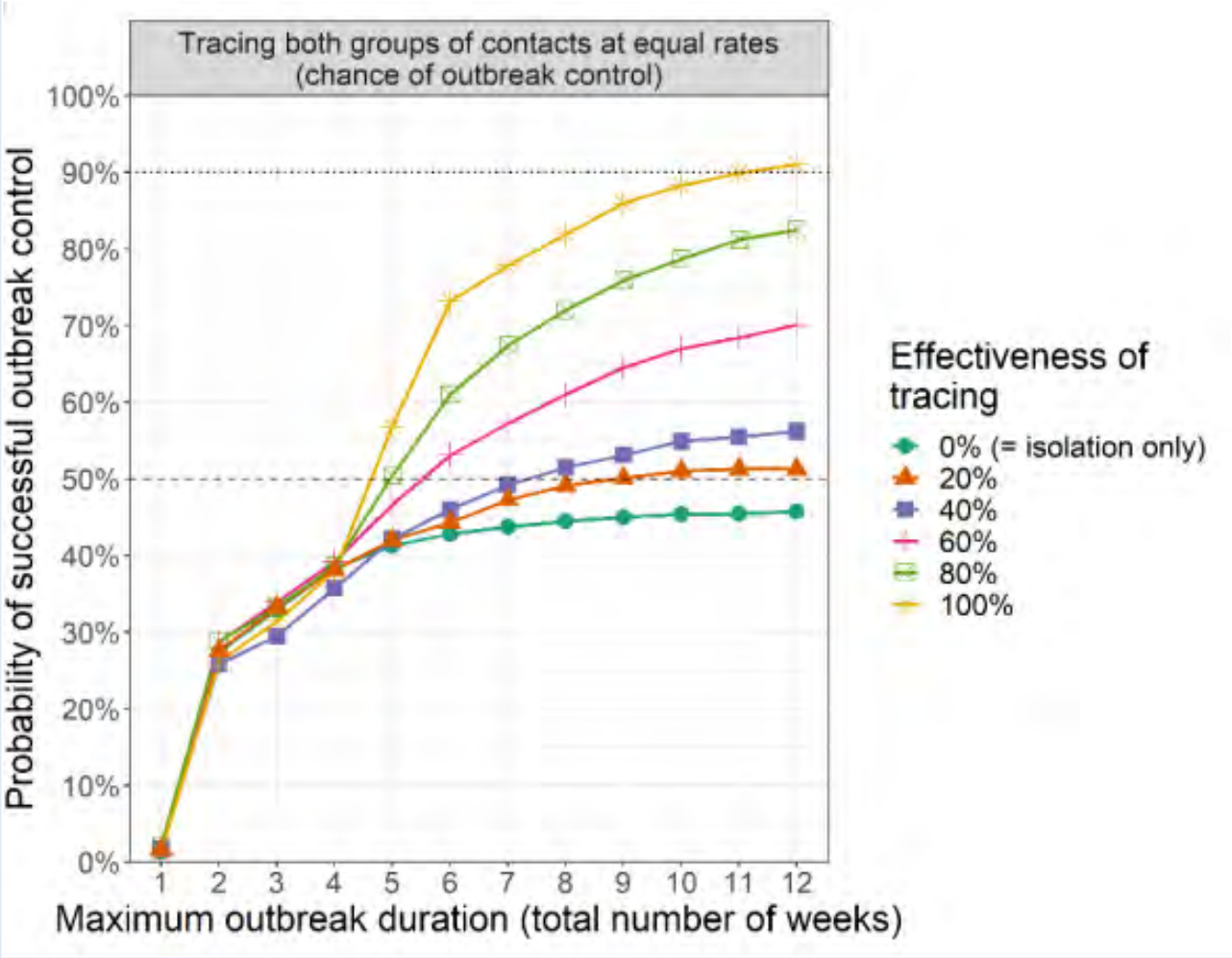
At the end of this module participants will be able to:

- 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

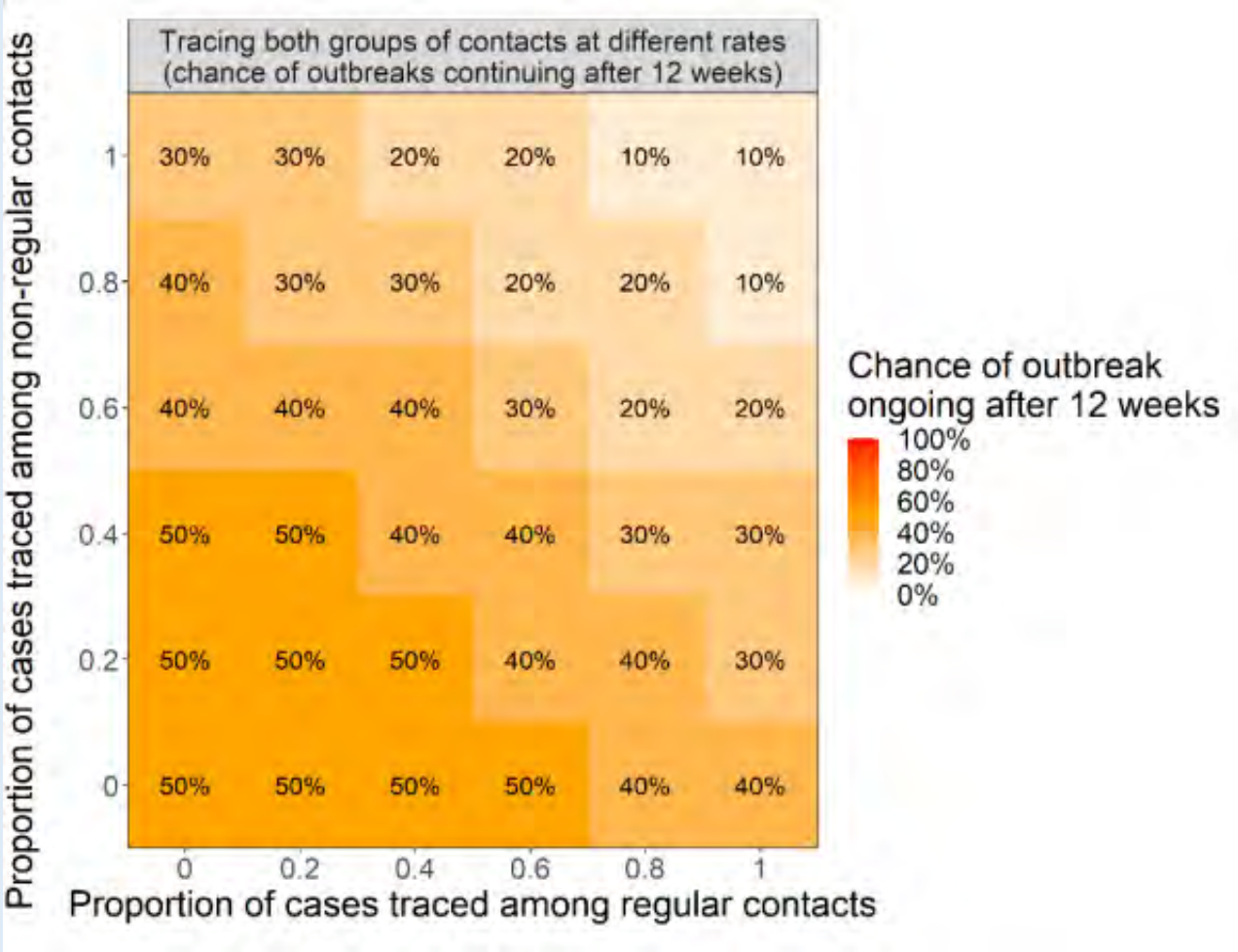
Probability of successful outbreak control through tracing cases among the contacts



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

Source: European Centre for Disease Prevention and Control (ECDC). Considerations for contact tracing during the monkeypox outbreak in Europe 28 June 2022. Stockholm: ECDC; 2022, p. 5.

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

Source: European Centre for Disease Prevention and Control (ECDC). Considerations for contact tracing during the monkeypox outbreak in Europe 28 June 2022. Stockholm: ECDC; 2022, p. 5.

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

Mpox death

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

WHO Indicator	QuickRes (QR)
Proportion of suspect, probable, and confirmed cases with identified contacts	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).
Number of contacts reported per suspect, probable, and confirmed case	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.
Proportion of identified contacts with complete follow-up information	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).
Proportion of cases coming from a contact tracing list	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.
Proportion of high- and medium-risk contacts who received post-exposure prophylaxis	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.
Monkeypox death	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.

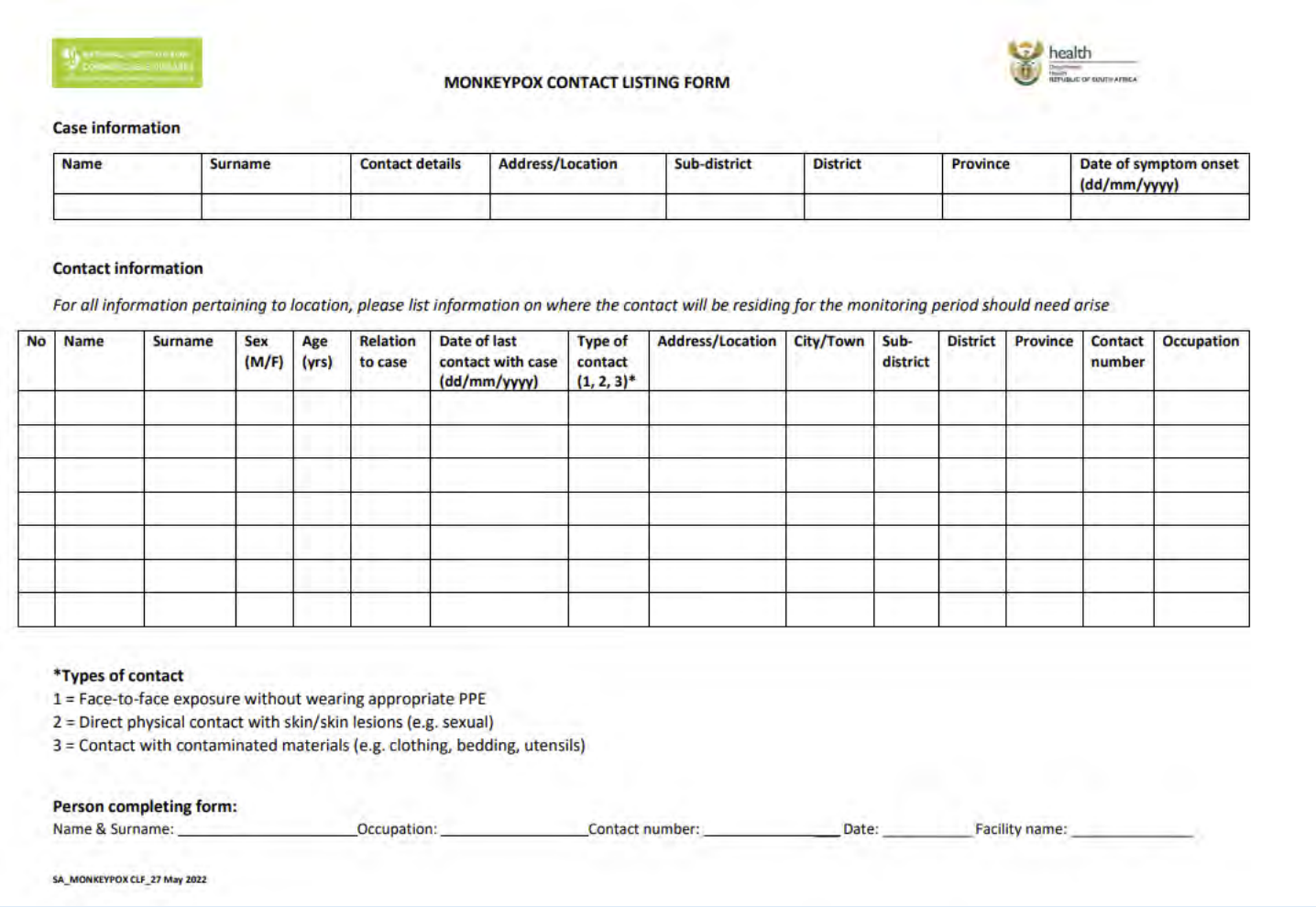
PEPFAR-USAID Indicator	QuickRes
MPX_RISK_REDUCTION	QuickRes is not well suited to capture these kinds of # of activities type of indicators.
MPX _LAB_SUPPORT	It is possible to capture this. We would add all the USAID-supported labs to QuickRes, assign those labs an org unit that specifies if they are 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.
MPX_CASE	This can be captured on QuickRes, it is addressed above.
MPX _FAC_SUPPORT	QuickRes is not well suited to capture these kinds of # of activities type of indicators.
MPX _TRAINED	QuickRes is not well suited to capture these kinds of # of activities type of indicators.
MPX _RISK_COMM	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.

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

Example from South Africa



MONKEYPOX CONTACT LISTING FORM

Case information

Name	Surname	Contact details	Address/Location	Sub-district	District	Province	Date of symptom onset (dd/mm/yyyy)

Contact information

For all information pertaining to location, please list information on where the contact will be residing for the monitoring period should need arise

No	Name	Surname	Sex (M/F)	Age (yrs)	Relation to case	Date of last contact with case (dd/mm/yyyy)	Type of contact (1, 2, 3)*	Address/Location	City/Town	Sub-district	District	Province	Contact number	Occupation

***Types of contact**

1 = Face-to-face exposure without wearing appropriate PPE
2 = Direct physical contact with skin/skin lesions (e.g. sexual)
3 = Contact with contaminated materials (e.g. clothing, bedding, utensils)

Person completing form:

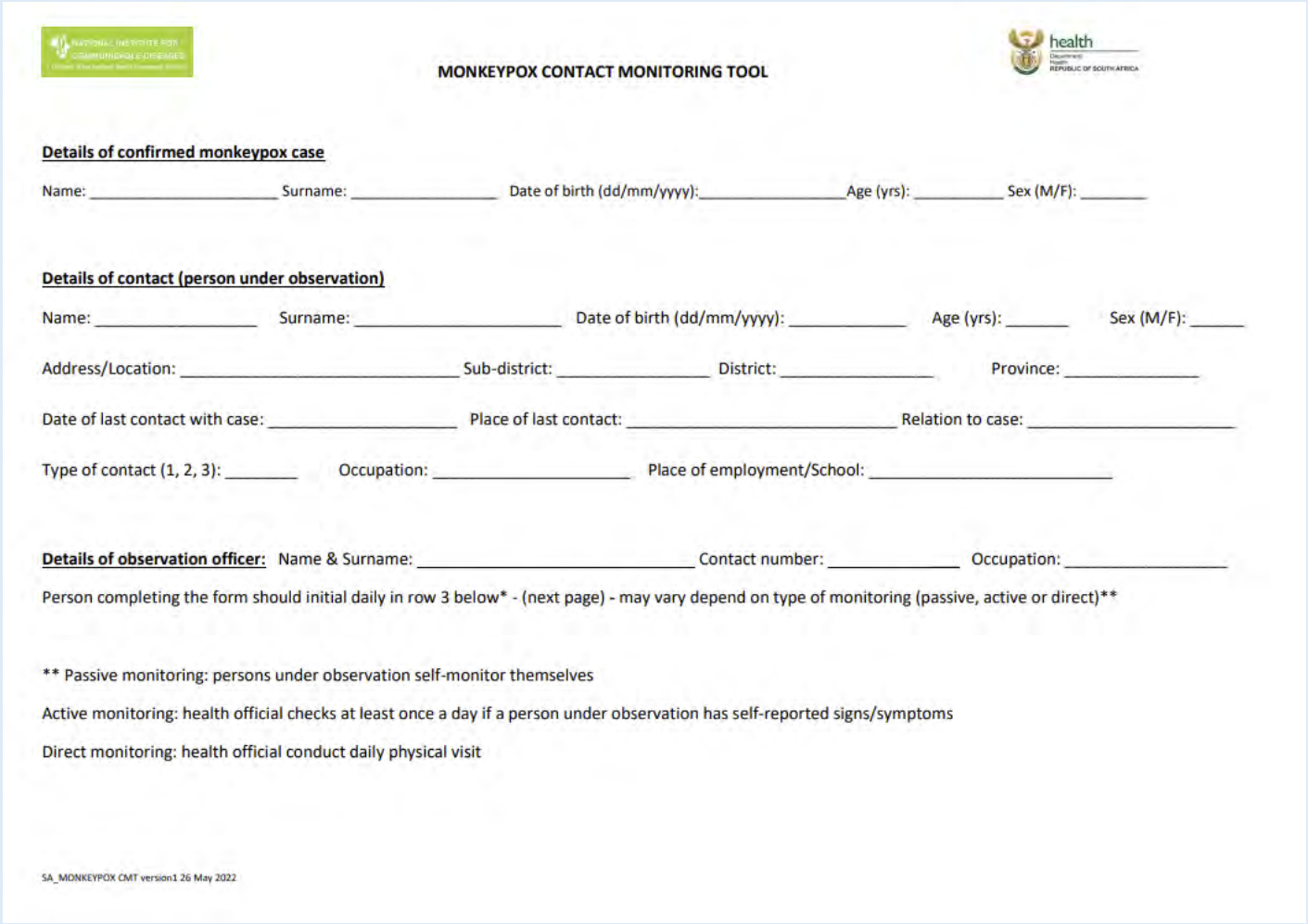
Name & Surname: _____ Occupation: _____ Contact number: _____ Date: _____ Facility name: _____

SA_MONKEYPOX CLF_27 May 2022

Source: https://www.nicd.ac.za/wp-content/uploads/2022/06/Annexure-A_Monkeypox-contact-listing-form.pdf

Contacts monitoring form

Example from South Africa



MONKEYPOX CONTACT MONITORING TOOL

Details of confirmed monkeypox case

Name: _____ Surname: _____ Date of birth (dd/mm/yyyy):_____Age (yrs): _____ Sex (M/F): _____

Details of contact (person under observation)

Name: _____ Surname: _____ Date of birth (dd/mm/yyyy): _____ Age (yrs): _____ Sex (M/F): _____

Address/Location: _____ Sub-district: _____ District: _____ Province: _____

Date of last contact with case: _____ Place of last contact: _____ Relation to case: _____

Type of contact (1, 2, 3): _____ Occupation: _____ Place of employment/School: _____

Details of observation officer: Name & Surname: _____ Contact number: _____ Occupation: _____

Person completing the form should initial daily in row 3 below* - (next page) - may vary depend on type of monitoring (passive, active or direct)**

** Passive monitoring: persons under observation self-monitor themselves

Active monitoring: health official checks at least once a day if a person under observation has self-reported signs/symptoms

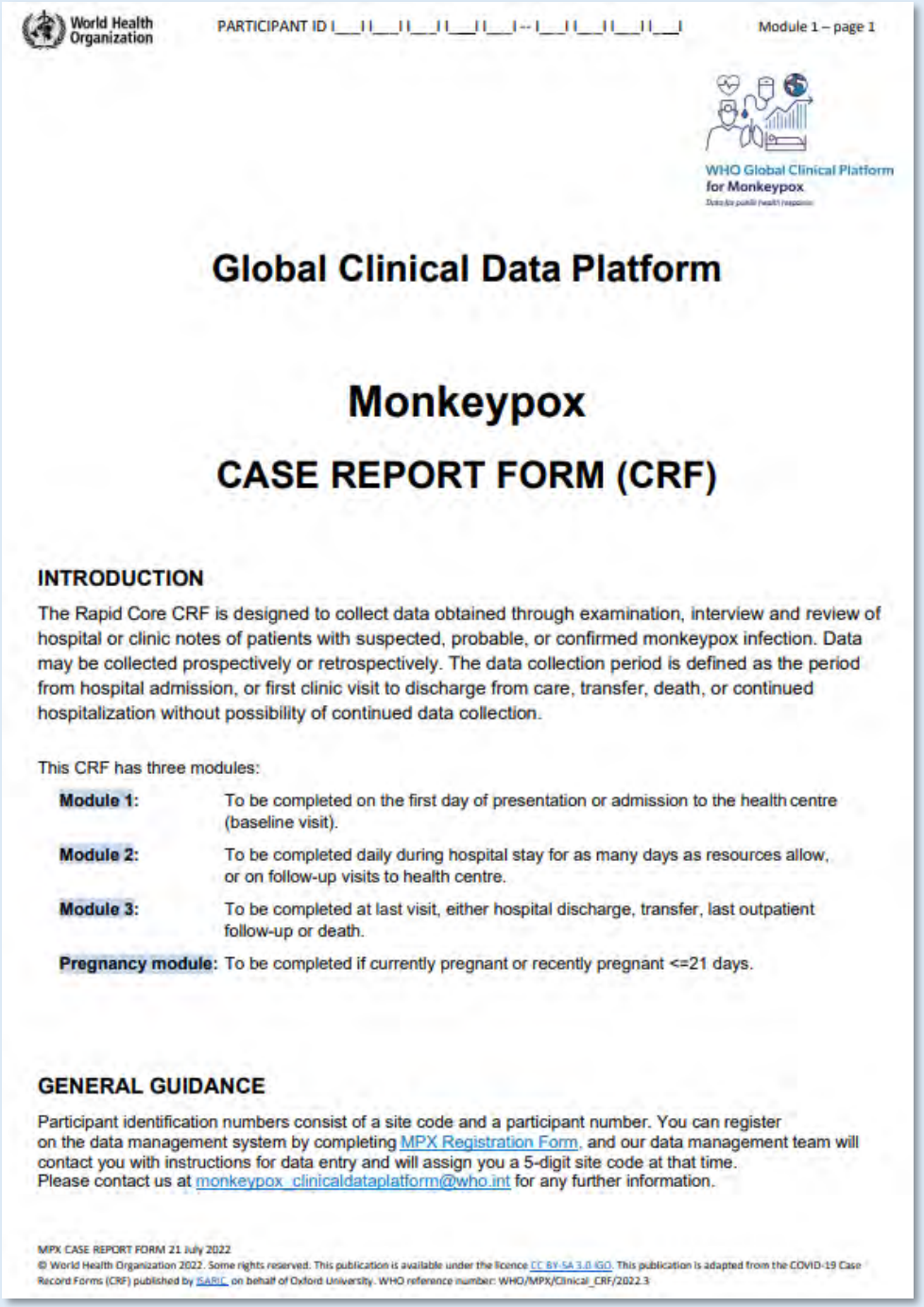
Direct monitoring: health official conduct daily physical visit

SA_MONKEYPOX CMT version1 26 May 2022

Source: National Institute for Communicable Diseases (NICD). Surveillance: key reference documents—contact monitoring tool (Jun 2022) [Internet c. 2023]. Johannesburg: NICH; 2022.

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)



World Health Organization PARTICIPANT ID |__|__|__|__|__|__|--|__|__|__|__|__| Module 1 – page 1

WHO Global Clinical Platform for Monkeypox

Global Clinical Data Platform

Monkeypox

CASE REPORT FORM (CRF)

INTRODUCTION

The Rapid Core CRF is designed to collect data obtained through examination, interview and review of hospital or clinic notes of patients with suspected, probable, or confirmed monkeypox infection. Data may be collected prospectively or retrospectively. The data collection period is defined as the period from hospital admission, or first clinic visit to discharge from care, transfer, death, or continued hospitalization without possibility of continued data collection.

This CRF has three modules:

Module 1:	To be completed on the first day of presentation or admission to the health centre (baseline visit).
Module 2:	To be completed daily during hospital stay for as many days as resources allow, or on follow-up visits to health centre.
Module 3:	To be completed at last visit, either hospital discharge, transfer, last outpatient follow-up or death.
Pregnancy module:	To be completed if currently pregnant or recently pregnant <=21 days.

GENERAL GUIDANCE

Participant identification numbers consist of a site code and a participant number. You can register on the data management system by completing MPX Registration Form, and our data management team will contact you with instructions for data entry and will assign you a 5-digit site code at that time.
Please contact us at monkeypox_clinicaldataplatform@who.int for any further information.

MPX CASE REPORT FORM 21 July 2022

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)

Reporting County or State: _____ Date of Initial Report: _____

CaseID*	Case Initials	Age	Sex	Onset date	Current Status	Location	Case category	Epilinks	Underlying conditions

Case ID (IDSR /Epid No): Unique identifier assigned to each case-patient

Case name or initials

Age in years or months under age 5 years; **Sex**: Male, Female, not known

Symptom onset: date mm/dd/yy; symptom type

Rash onset : Date mm/dd/yy; location of rash

Current status: Ill / recovered/, died

Location: Address, village, county / district, hospital

Case category: Confirmed, probable, suspect

Epi Links: Known exposures, affiliations or connections to other cases

Underlying conditions: Immunodeficiency, HIV status, malnutrition, medications

Appendix 2: Nigeria Monkeypox Case Investigation Form

Epid number:
Date of investigation: ___/___/___

Case recorded by name: _____ title _____ phone no. _____

Section 1: Patient Identity

1. Last Name _____ First Name _____
2. For children, father's name _____
3. Date of birth ___/___/___
4. Age in days (neonate) _____ Age in months (infant) _____ Age in years (others) ____
5. Gender : M F
6. Village/settlement/street of residence during the last 3 weeks _____
7. State _____ LGA _____ WARD _____
8. Nationality _____ Ethnicity / Tribe _____
9. Occupation of the patient _____

Section 2: Patient status

10. Status of the patient: Alive Dead
11. If dead, date of death: ___/___/___ Place of death: _____
12. Place of the funeral, name village: _____ LGA _____ State _____
13. Is a Smallpox vaccination scar present? Yes No

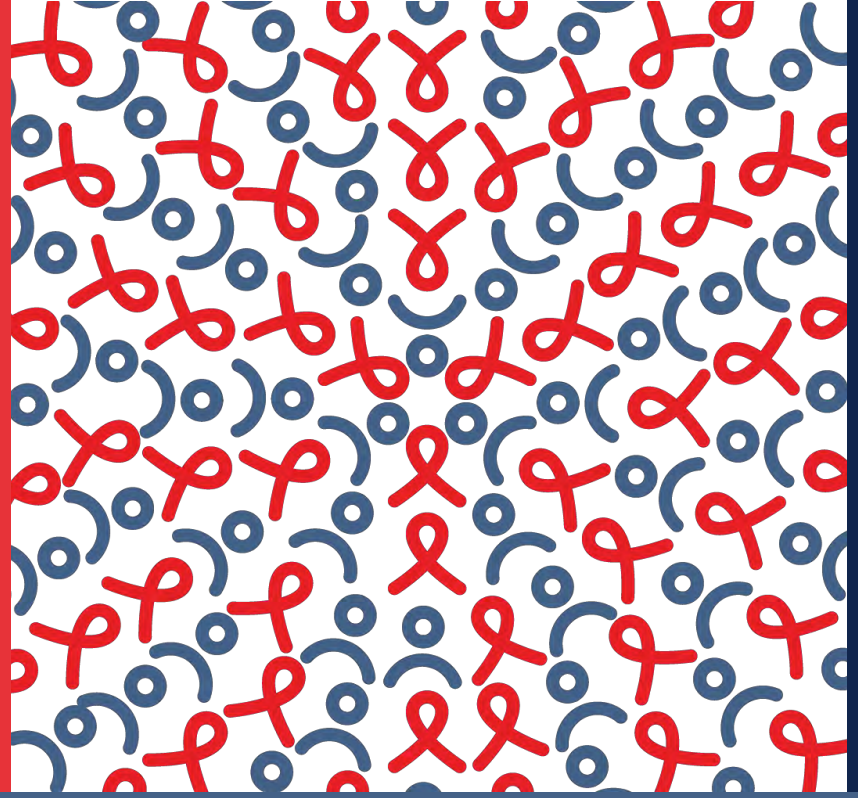
Section 3 : Clinical History / Presentation

14. Date of onset of symptoms: ___/___/___
15. Name of the village / LGA/ State where the patient got ill _____/_____/_____
Country _____
16. a. Did the patient travel anytime in the three weeks before becoming ill? Yes No
b. If yes, indicate the places (1) _____ (2) _____ (3) _____
Others _____
17. a. Did the patient travel during illness? Yes No
b. If Yes, indicate the places (1) _____ (2) _____ (3) _____
Others _____
18. Does the patient have a cutaneous eruption/rash? Yes No
19. If yes, date of onset for the rash: ___/___/___
20. Did the patient have fever? Yes No If yes, date of onset for the fever: ___/___/___
21. If there is active disease,
a. Are the lesions in the same state of development on the body? Yes No
b. Are all of the lesions the same size? Yes No
c. Are the lesions deep and profound? Yes No
22. Localization of the lesions: Face Legs Soles of the fee Palms of the hands
Thorax Arms Genitals All over the body
List other areas _____
23. Did the patient develop ulcers? Yes No

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

Stay Connected

EpiC Twitter

EpiC Webpage

EpiC Facebook

EpiC YouTube

EpiC Blog

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).

Meeting Targets and Maintaining Epidemic Control (EpiC). Mpox training for clinical providers. Durham (NC): FHI 360; 2023.