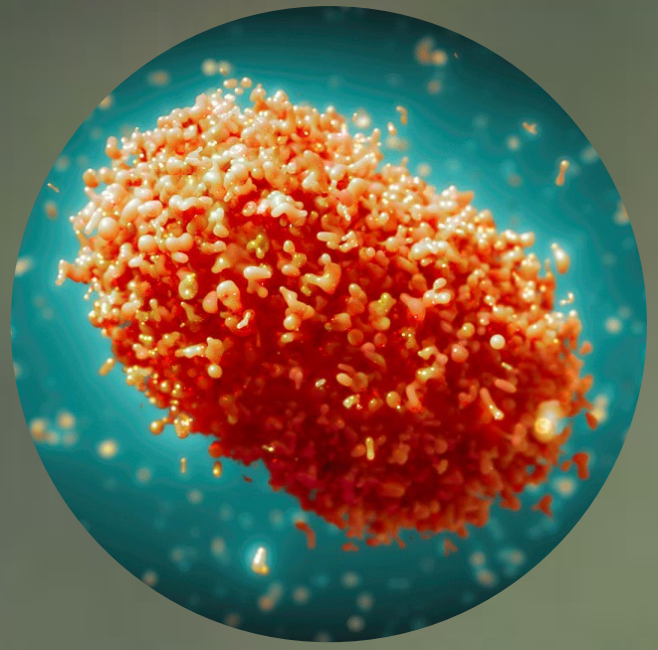
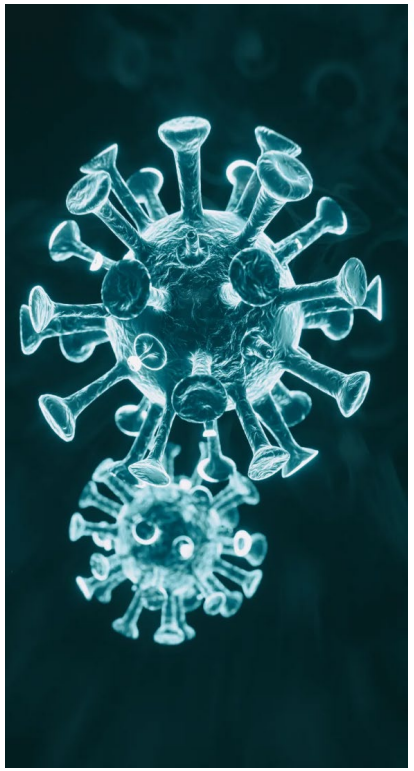


Mpox

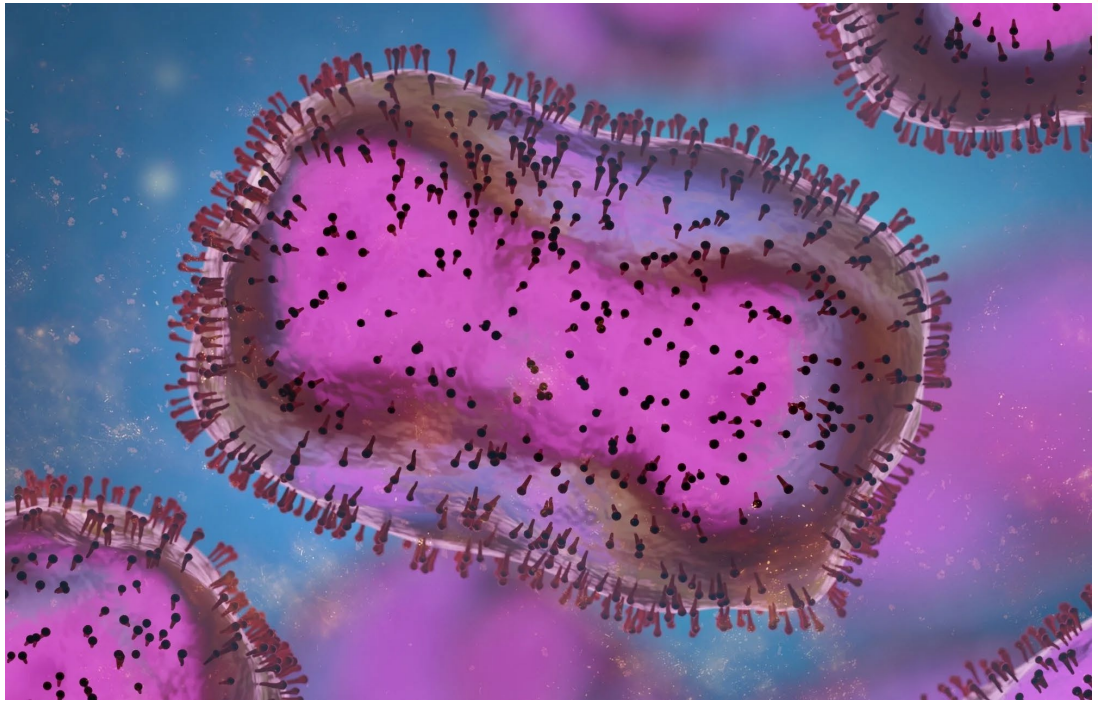
Mpox: Introduction

- Disease caused by infection with **Monkeypox Virus**
- is a **zoonotic** virus
- has been listed by the WHO in its list of diseases with **epidemic or pandemic potential.**
- Following eradication of smallpox in 1980 and the end of smallpox vaccination worldwide, mpox steadily emerged in central, east and west Africa. A **global outbreak** occurred in **2022–2023**.
- On 13th August 2024, Africa CDC officially declared Mpox a Public Health Emergency of Continental Security (PHECS)
- On 14th August 2024, WHO declared the Mpox outbreak a Public Health Emergency of **International Concern** (PHEIC)



Monkeypox: Virology

- belonging to the **Orthopoxvirus genus**.
- It is a *linear* **double-stranded DNA enveloped** virus
- belonging to the *Poxviridae* family.
- The subset includes Smallpox (variola), Vaccinia, and Cowpox viruses.
- hMPXV is a 200 to 250 nm large, brick-shaped, enveloped, cytoplasmic virus that binds to glycosaminoglycans to enter the host cells



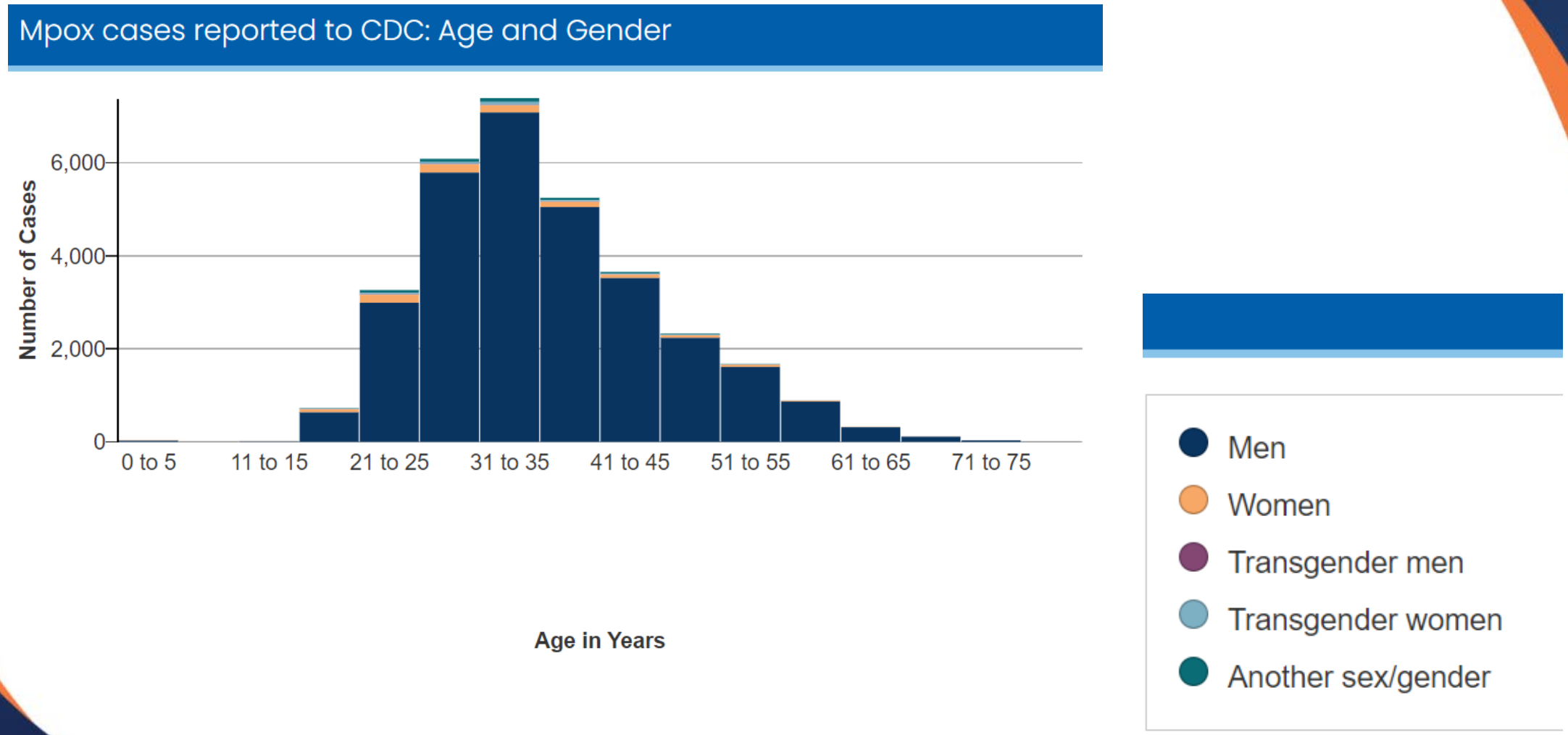
History of the virus

- The virus was **first isolated** in **1958** from smallpox-like vesiculopustular lesions amongst the captive imported monkeys (Java macaques) at the State Serum Institute in Copenhagen, Denmark.
- It was in **1970** that two separate incidents of smallpox-like disease in individuals from the **Democratic Republic of Congo** and Liberia were reported that led to the recognition of hMPXV as a distinct virus

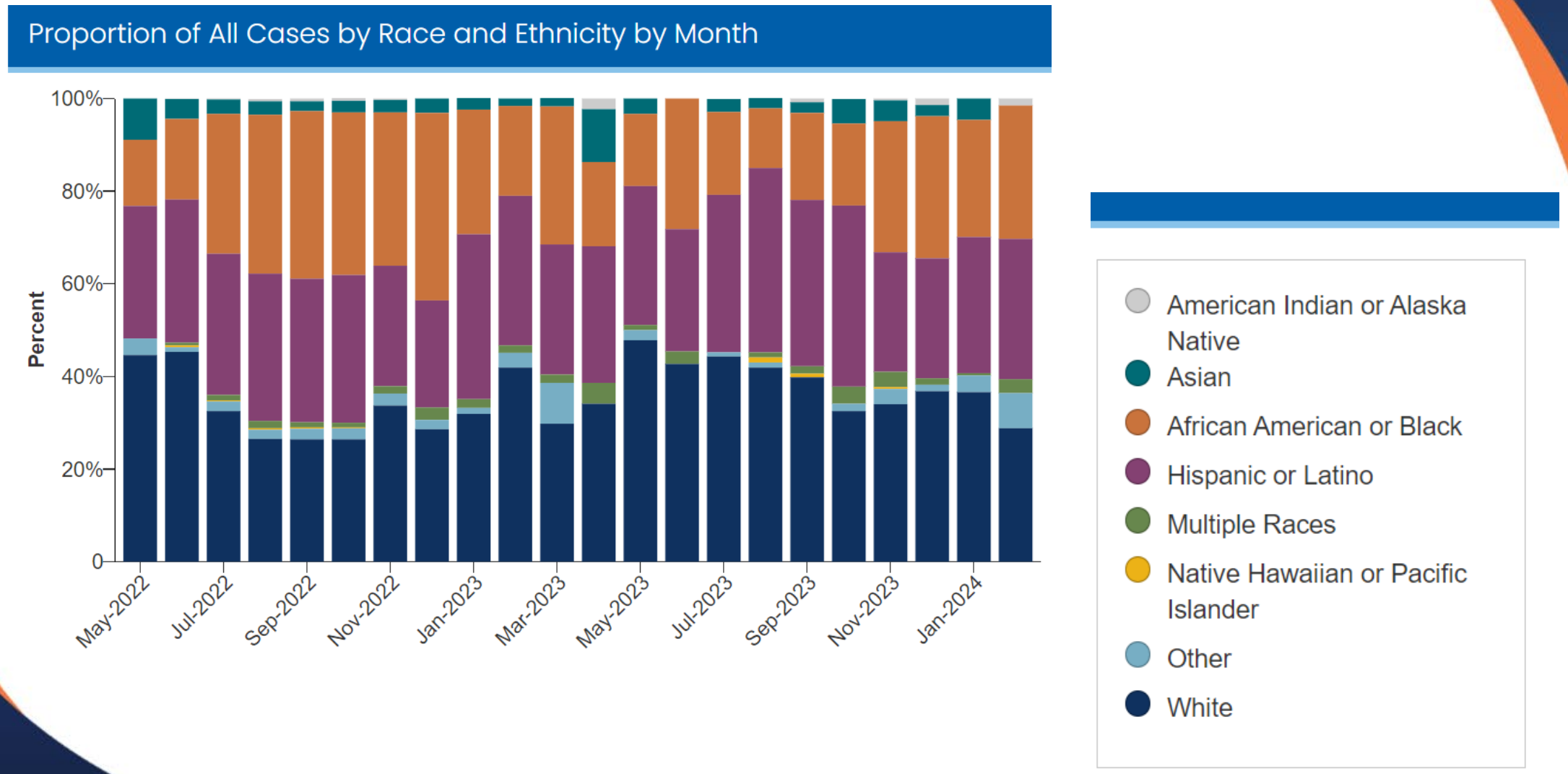
History of the virus

- In **2003,** the first report of an **outbreak outside Africa** was reported in the **US**, when a shipment of **exotic animals** including nine different species of mammals was imported from Ghana.
- The imported mammals were transported to different states with other animals, causing widespread infection of animals. Only after a 3-year-old girl was brought to the emergency after being bitten by a prairie dog, source tracing indicated a spill-over event.
- Human-to-human transmission with increasing global case numbers in **May 2022**.

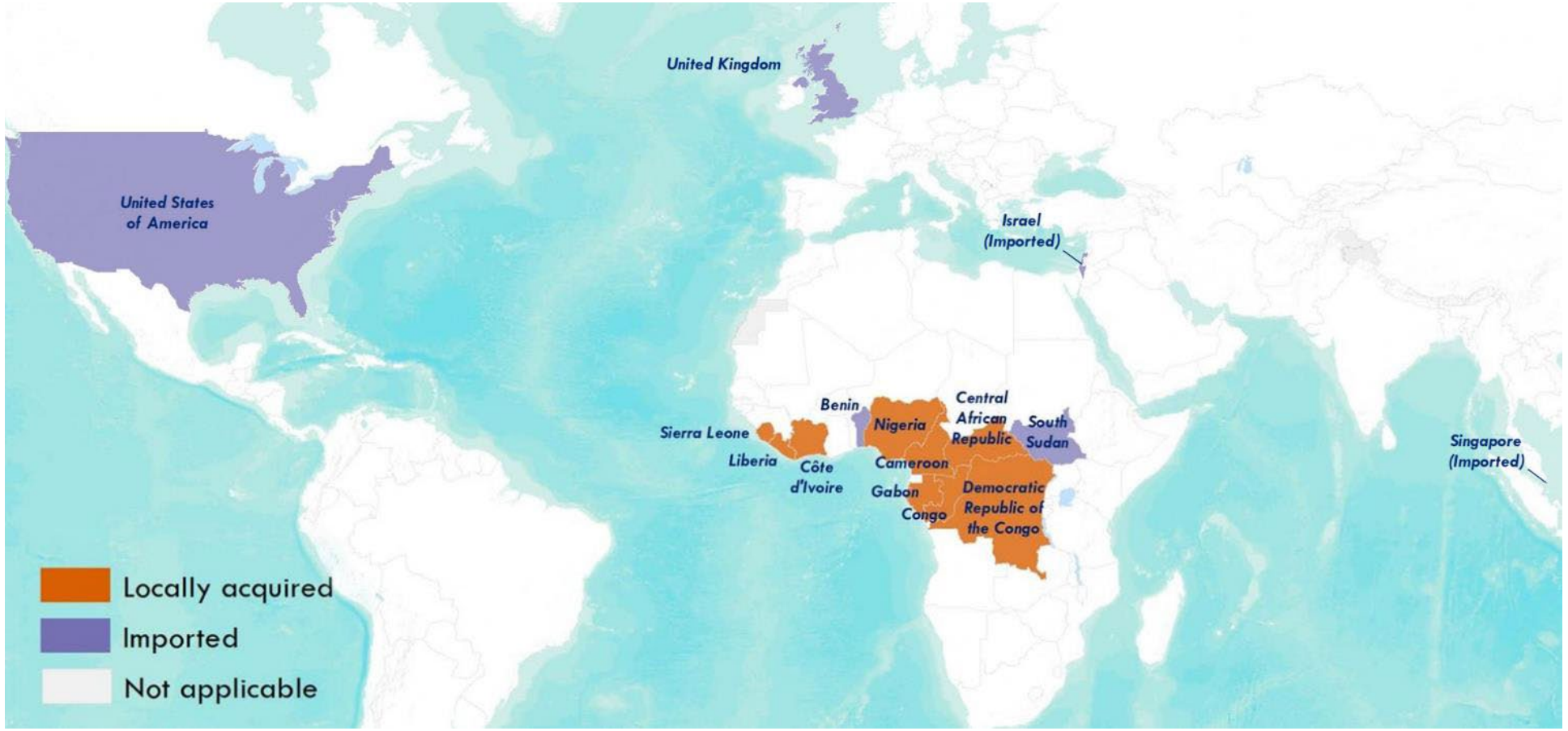
Mpox: Demography (Gender & Age)



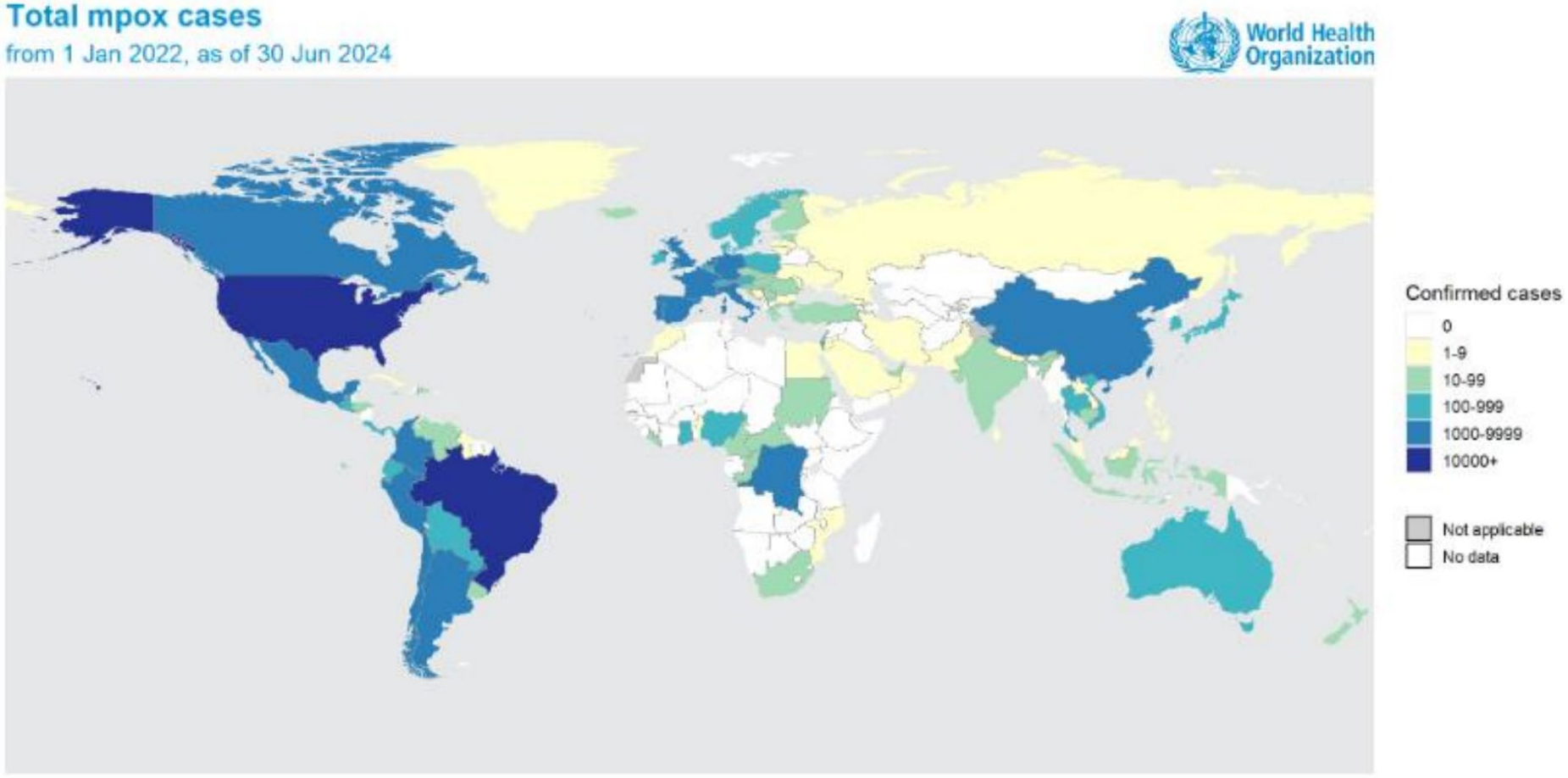
Mpox: Demography (By Race & Ethnicity)



Epidemiology



Confirmed Human Mpox cases in Africa 1970-2021



Geographic distribution of confirmed cases of mpox reported to or identified by WHO from official public sources, from 1 January 2022 to 30 June 2024

Global situation

From the beginning of the global Mpox outbreak in 2022 until the end of July 2024, a cumulative **total of 99,176** laboratory-confirmed cases of Mpox, including **208 deaths,** were reported to WHO from **116 countries.**

Table 1. Number of cumulative laboratory-confirmed mpox cases and deaths reported to WHO, by WHO Region, from 1 January 2022 through 30 June 2024

WHO Region	Total confirmed cases	Total deaths among confirmed cases	New cases reported in May	New cases reported in June	Monthly change in cases (%)
Region of the Americas	62 904	141	215	175	-19.0
European Region	27 529	10	141	100	-29.0
African Region	4 232	35	465	567	22.0
Western Pacific Region	3 491	10	120	81	-32.0
South-East Asia Region	925	11	22	11	-50.0
Eastern Mediterranean Region	95	1	0	0	-
Total	99 176	208	963	934	-3.0

Bangladesh & Neighboring countries

- No confirmed case in Bangladesh yet
- As of 10 August 2022, 162 MPX cases were found in Asia. Of these, nine cases were reported from India. Cases have been confirmed in Pakistan recently as well.
- Since Bangladesh shares a larger common border with India-Bangladesh is on high alert, UAE also confirms its monkeypox cases among the population. The first case in India was a migrant from UAE. Keeping this in mind, Bangladesh, also has a large number of a migrant in UAE making it more vulnerable.

Virus Types

- There are two types of *Monkeypox virus*: clade I and clade II.

✓ **Clade I Central Africa (Congo Basin)**:

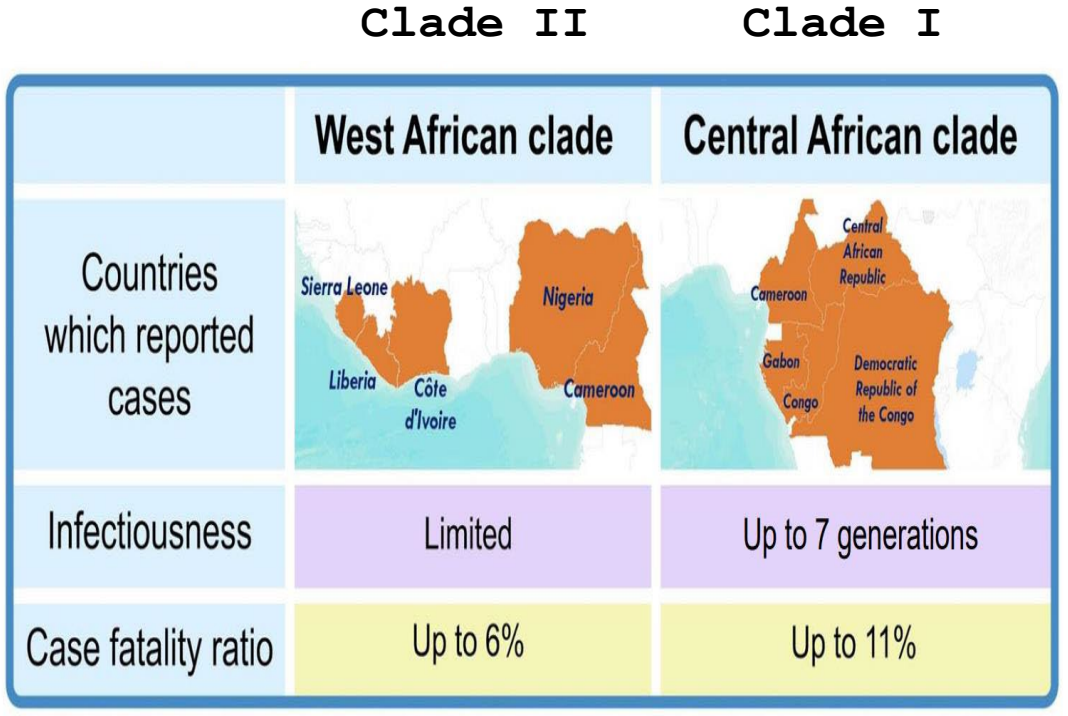
-severe illness and deaths

-some outbreaks have killed up to 10% of the people who get sick, although more recent outbreaks have had lower death rates.

✓ **Clade II West Africa:**

-less severe. More than 99.9% of people survive.

-type that caused the global outbreak that began in 2022.



Transmission

- **Both types of the virus** can spread through:

✓ Direct contact with **infected animals**

✓Close contact (including intimate contact) **with a person** with mpox

✓Direct contact with **contaminated materials**

Transmission

Direct contact with **infected animals)**

- The natural reservoir of the virus is unknown – various small mammals such as squirrels and monkeys are susceptible.
- Humans are incidental host.
- Contact with infected animals-

✓Prairie dogs

✓Squirrels

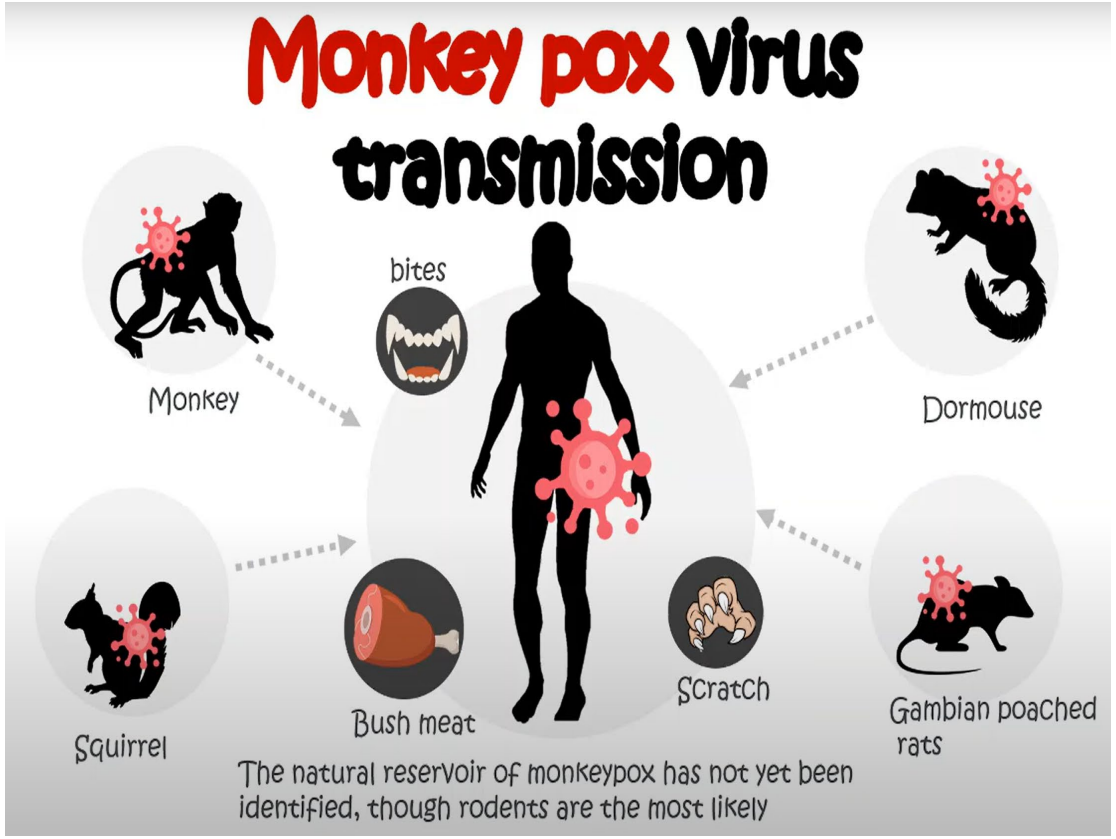
✓Monkeys

✓Giant pouched rats

✓Chinchillas, Shrews

✓Anteater

✓Marmots & Groundhogs



Transmission
Human-human contact)

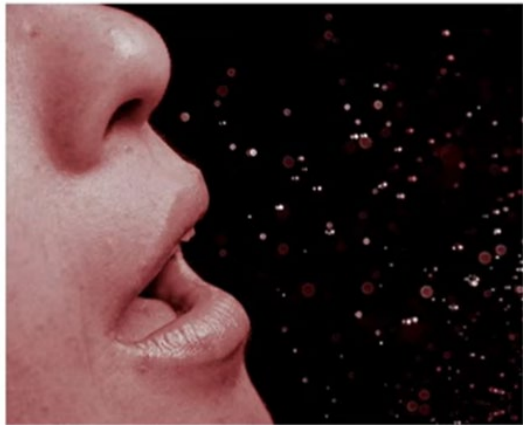
- **Direct or indirect contact with body fluids or lesion materials.**

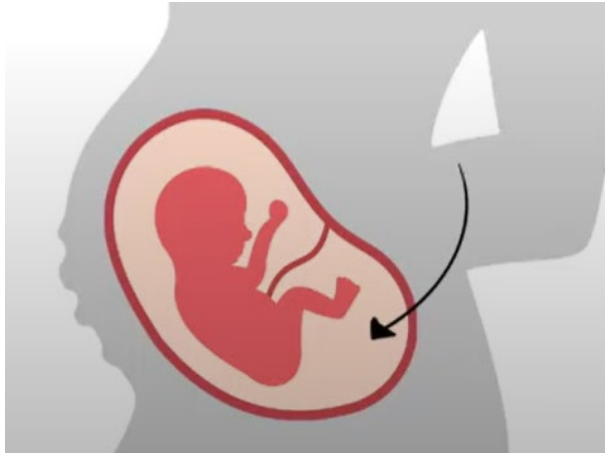
✓ Most (but not all) cases among men who identify as : bisexual, or men who have sex with men (MSM).

✓During the global outbreak that began in 2022, the virus mostly spread through sexual contact (although not a sexually transmitted disease).

Transmission (Human-human contact)

- **Exposure to respiratory secretions:** Prolonged face-face contact
- **Skin-to-skin contact** with a patient who has mpox
- **Risk for healthcare workers**: within 6 feet of a patient during any procedures that may create aerosols from oral secretions, skin lesions, or resuspension of dried exudates, without wearing an N95 or equivalent respirator (or higher) and eye protection
- **Vertical Transmission:** From an infected mother to developing fetus.

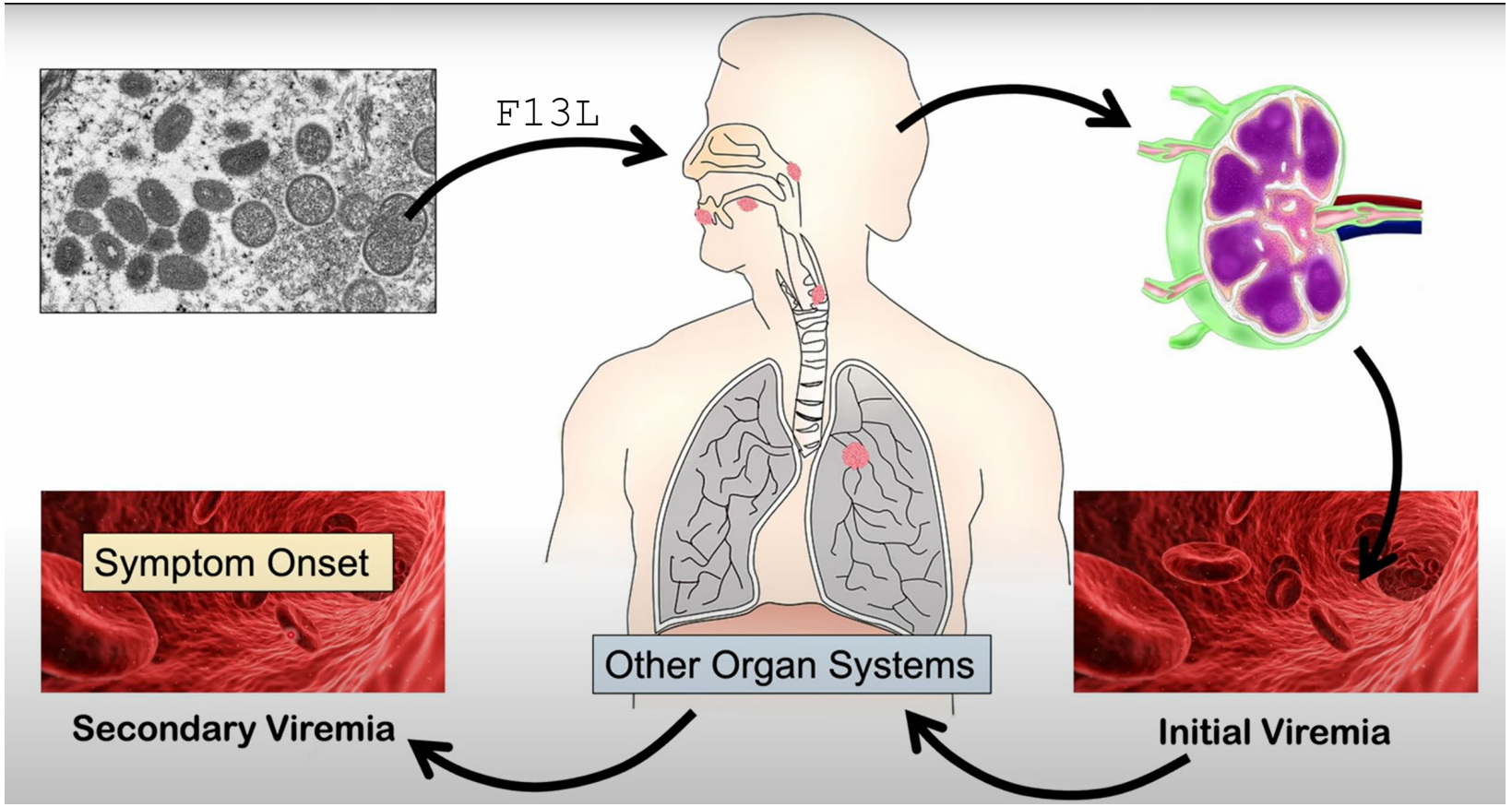




Transmission (Contact with infected materials)

- Shared towels and bedding/fabrics that had contact with skin lesions (infectious body fluids and scabs may be present)
- **Contact with fomites**

Viral Pathogenesis



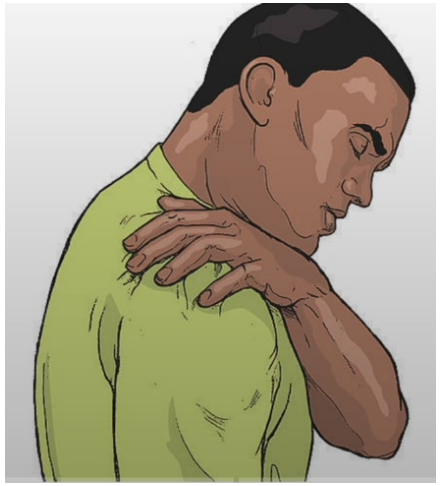
Incubation Period: ~12 Days (4-21 Days)

Mpox: Signs & Symptoms

Pre-Eruptive (Prodromal) Stage

Occurs 1-4 days prior to onset of rash

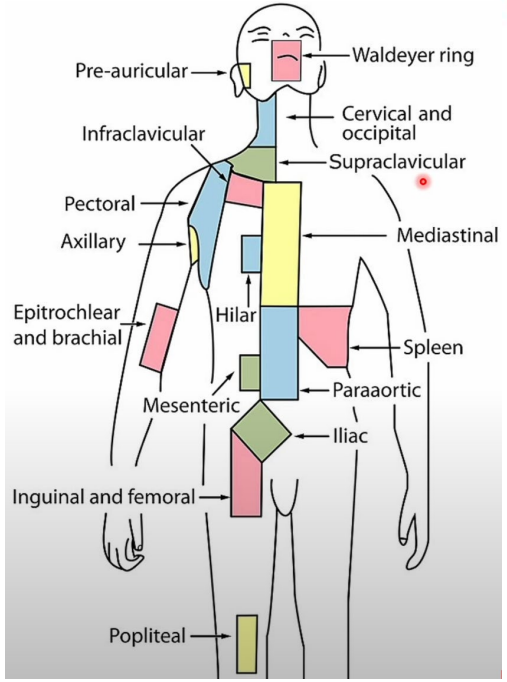
- Many cases are asymptomatic
- Fever (38.5-40.5C) :
  - -Most often the first sign
  - -Chills, sweats
- Severe headache
- Myalgias and backache
- Anorexia
- Malaise and fatigue
- Pharyngitis, dyspnea and cough



Mpox: Signs & Symptoms

Lymphadenopathy

- **Lymphadenopathy is a distinctive feature of mpox** compared to other diseases that may initially appear similar (chickenpox, measles, smallpox)
- Swollen, tender lymph nodes
- Occurs within 2-3days of fever onset
- Common locations: Cervical chain, submental, submandibular, inguinal



Mpox: Signs & Symptoms

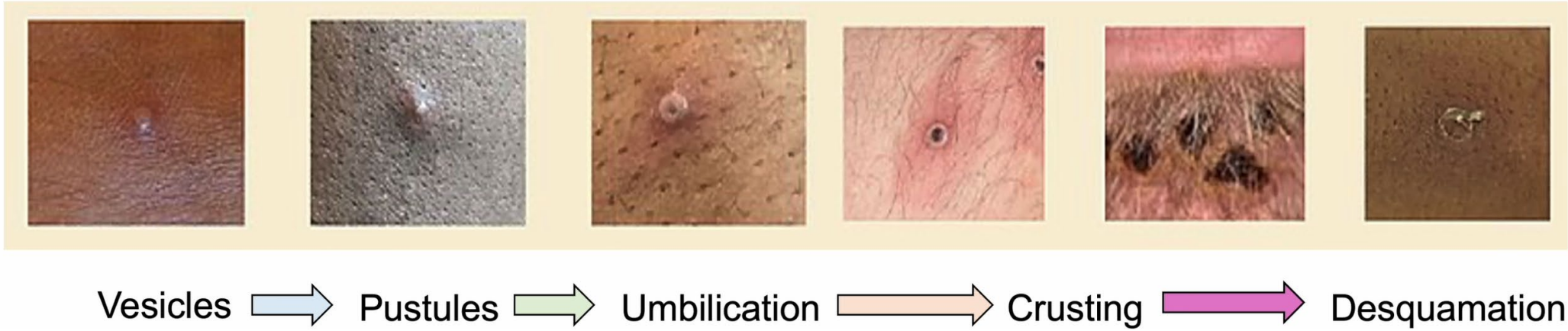
Eruptive (Exanthem) Stage

Skin Rash

- Rash often begins on the **oral mucosa** then spreads to face and other areas of the body
  - *denser on face, palms and sole*
  - also appears in trunk, extremities, scalp
  - in most recent cases, lesions first appear on ***perianal and genital areas***
- Vesicular (Vesicopustular rash) rash
- Lesions: 3-15mm in diameter, upto thousands

Mpox: Signs & Symptoms

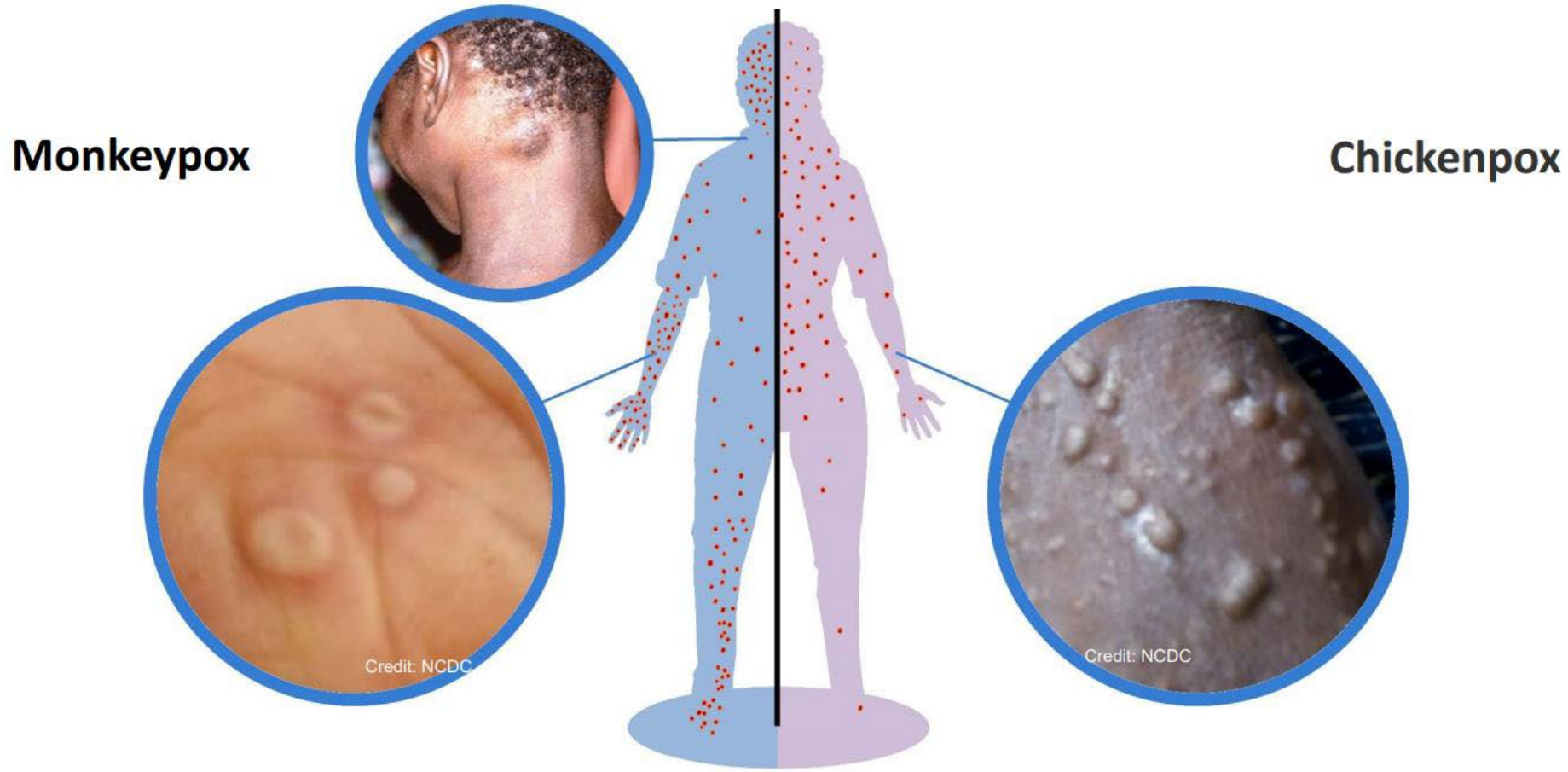
Skin Rash



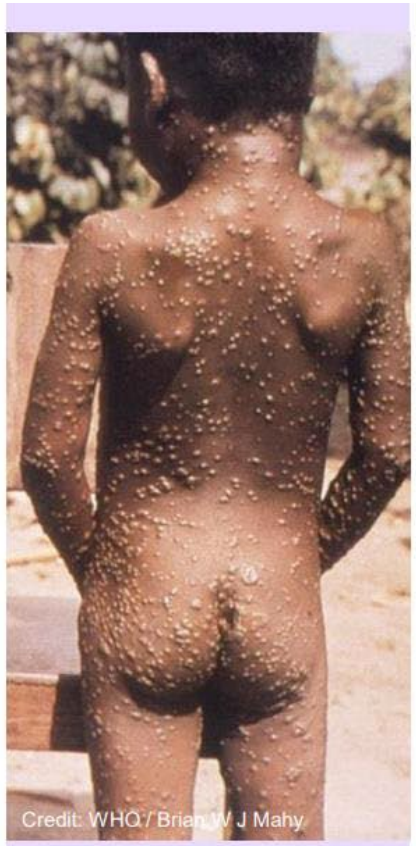
How to differentiate from other rash illness?

		Monkeypox	Chickenpox	Measles
Symptoms	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

How to differentiate from other rash illness?



How to differentiate from other rash illness?

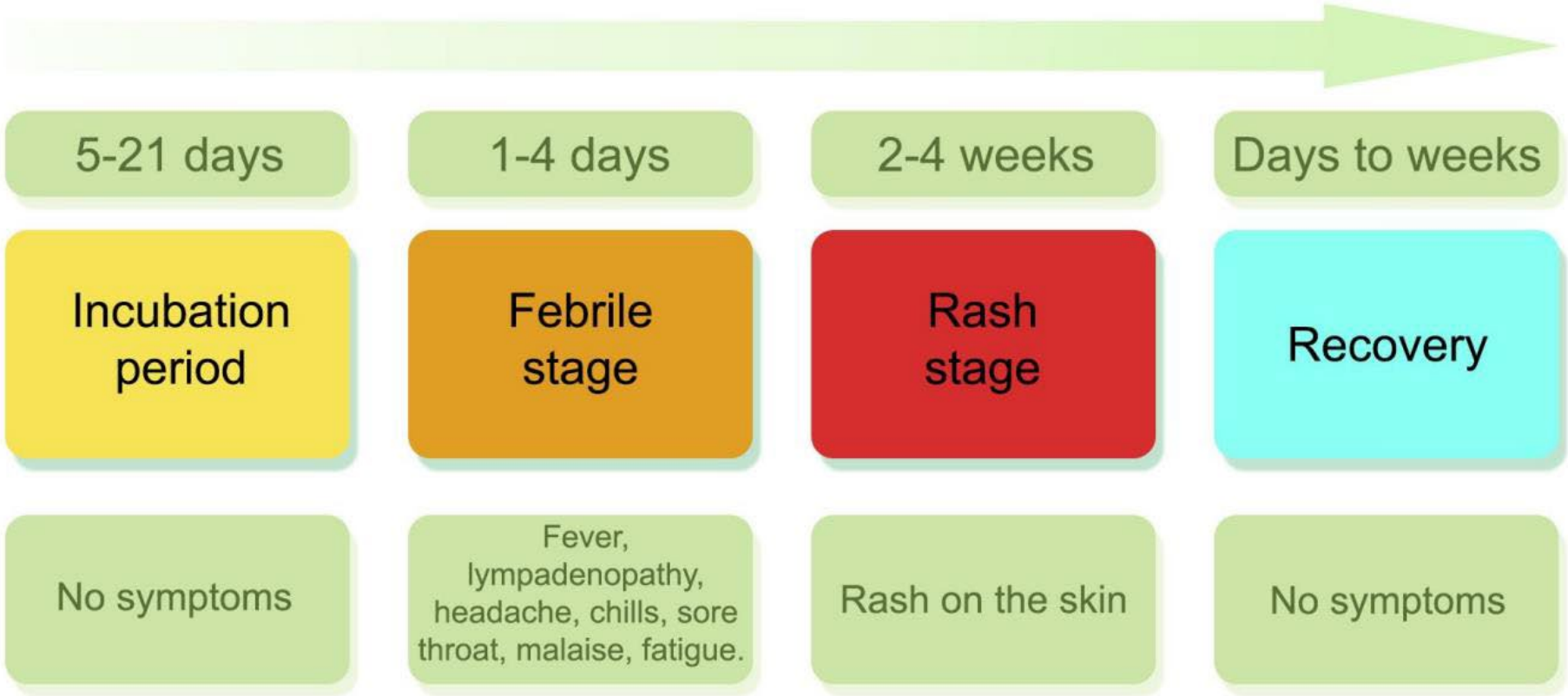


Monkeypox

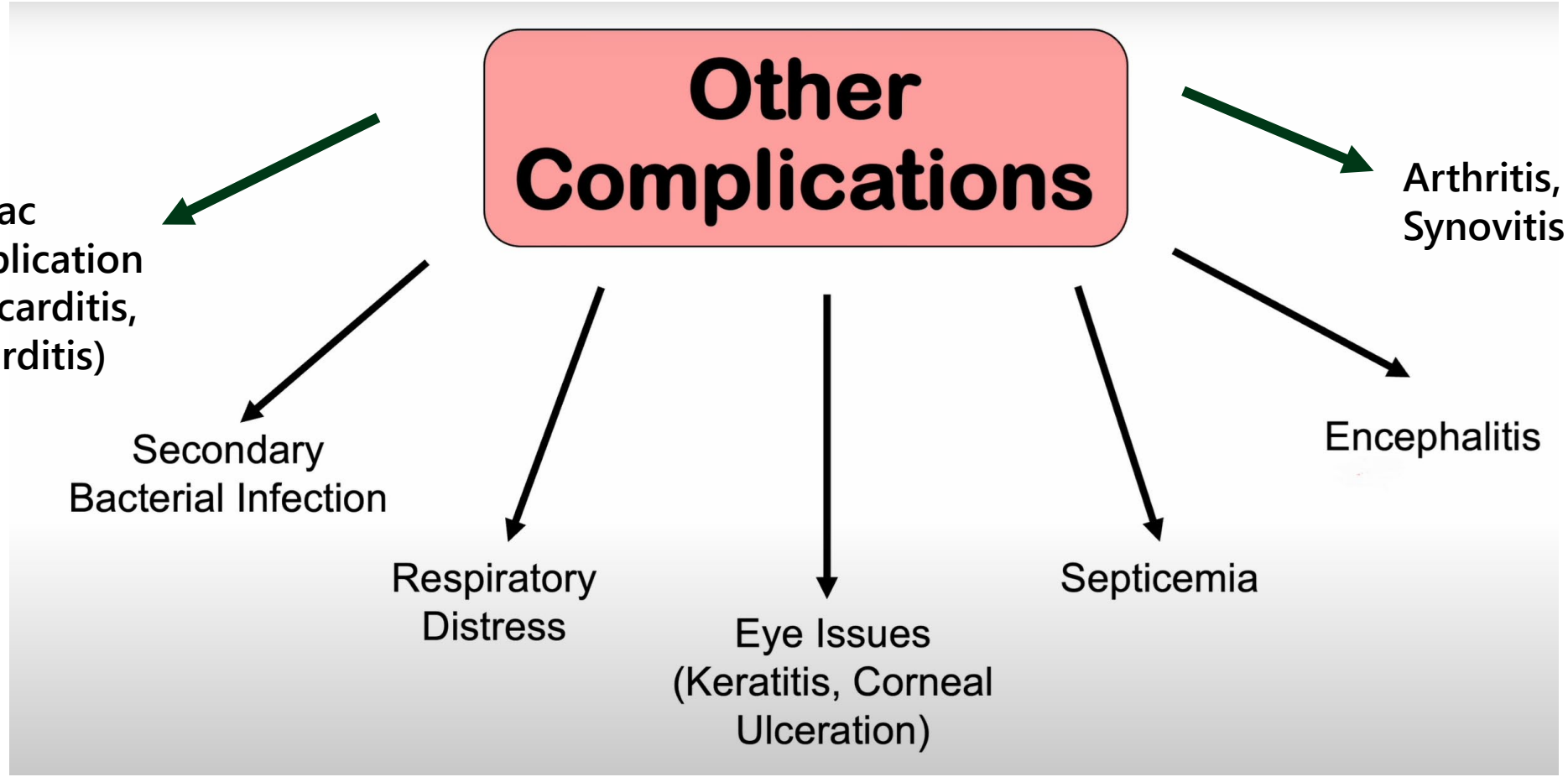
Chickenpox

Measles

An overview of Mpox symptom course



Mpox: How worse can it get?

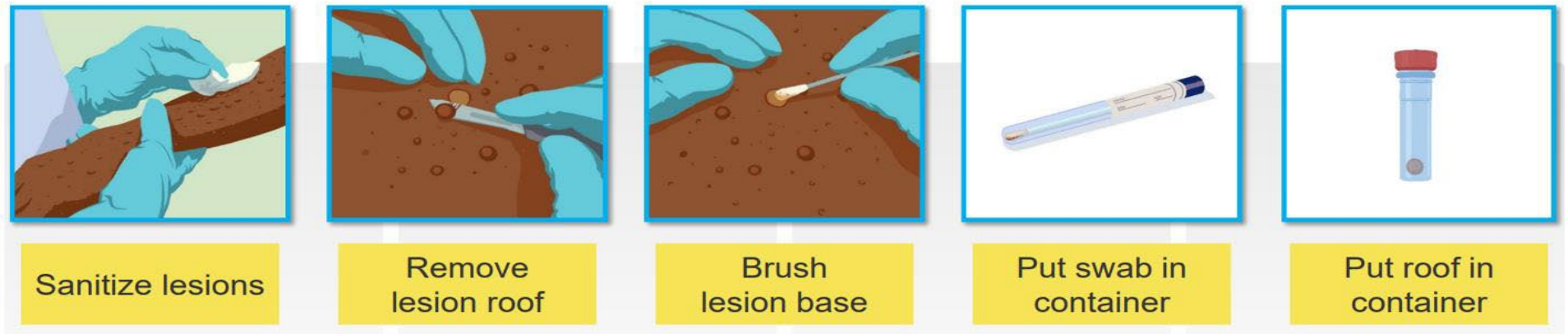


Mpox: Diagnosis

❑Laboratory investigations:

- Polymerase chain reaction ***(PCR)*** is the preferred laboratory test given its accuracy and sensitivity
- Tests can be done by collection of samples from swabs of lesion materials (fluid, roof,crust). Swabs in some cases can be taken from oropharynx or rectum/anus if skin rashes are absent.
- Electron microscopy for demonstrating orthopox virus
- Mpox virus isolation is culture

❑**Other diagnostic criteria**: Contact with infected individuals with symptoms at most 21 days after exposure



Differential diagnosis

Diffuse Rash

- Syphilis
- Varicella/VZV
- Disseminated herpes
- Molluscum contagiosum
- Other pox viruses
- Disseminated fungal infections
- Disseminated gonococcal infection

Proctitis

- Gonorrhea
- Chlamydia (including LGV)
- HSV

Risk assessment

Who are more at risk?

- People with severely weakened immune systems (HIV, DM, patient's immunosuppressive drugs)
- Children younger than 1
- Pregnant women
- Invasive route of infection
- Infected by Clade I (Congo basin/central African) Variant
- Healthcare workers
- Close contact with mpox patients
- People who recently travelled to endemic regions/outbreak areas.

✓**Protective factor:** Previous smallpox vaccination

Treatment

- Mostly self-limiting

-Typically resolves over the course of 2-4 weeks

- **Isolation** of the patient

-***Supportive care:***

✓Fever & pain management

✓Skin, eye & mouth care

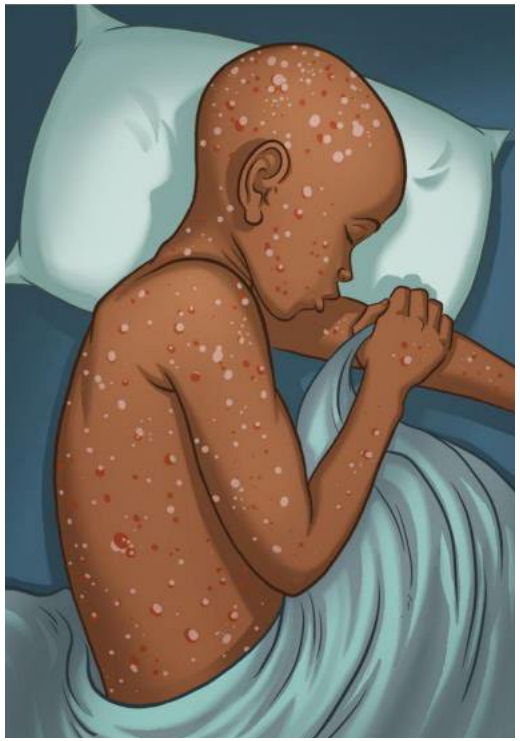
✓Respiratory care

✓Hydration & nutritional support

✓Mental health support

✓Prevention & treatment of complications

✓Infection prevention & control



Treatment

Rash may lead to severe or permanent **skin damage** and **fluid loss**

Rash & Skin care:

- ✓ Avoid **touching** or **scratching** lesions
- ✓Gentle washing
- ✓Keep **clean** & **dry**
- ✓ Topical or oral antibiotics, Nystatin cream if necessary
- ✓ Treating inguinal or genital ulcers with a warm saline sitz bath or light sofra-tulle dressing

Treatment:

- Mouth sores can be painful:

✓Wash mouth with warm clean salted water

✓For severe ulcers, antifungal or antibiotics can be considered

✓Vitamin C and other multivitamins

Treatment

- Occular infection: Eyes may develop infection or ulcers

✓ Vitamin A supplements

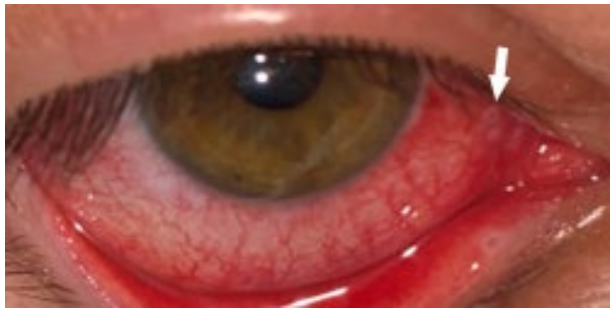
✓Protective eye pads

✓Topical or oral antibiotics in combination

✓Trifluridine eye drops/ointment

✓DO NOT USE STEROID ointments/drugs

✓Systemic antivirals needs consideration



Treatment: Antiviral

- Tecovirimat (TPOXX):

✓It has been demonstrated that **24 hours after exposure** to lethal hMPXV in monkeys, initiation of antiviral treatment is **more effective than smallpox vaccination**.

✓Tecovirimat (also known as TPOXX or ST-246) is a novel antiviral drug **stockpiled** for smallpox preparedness.

✓It is FDA-approved only for the treatment of smallpox in adults and children, based on animal efficacy data and safety data in 359 healthy adults.

✓The efficacy and safety of tecovirimat in treating any human orthopoxvirus infections has not yet been fully determined.

Treatment: Antiviral

- Tecovirimat (TPOXX):

✓However, there are currently ongoing clinical trials to assess whether tecovirimat is safe and effective in treating people with mpox disease, including the National Institutes of Health (NIH)'s Study of Tecovirimat for Mpox (STOMP).

✓Access to oral tecovirimat for treatment of mpox remains available through STOMP as the primary route. It is also available under CDC's EA-IND protocol for patients who meet eligibility criteria

Treatment: Antiviral

- Tecovirimat (TPOXX):

✓The drug targets the *F13L* gene leading to impediments in the envelopment of virions and their subsequent release from the infected cells

✓The antiviral regimen significantly reduces mortality and the number of MPX lesions.

✓Dose:

Oral

- 40 kg to <120 kg: 600 mg PO BID for 14 days
- ≥120 kg: 600 mg PO TID for 14 days
- Take within 30 minutes after eating a full meal

IV

- 35 kg to <120 kg: 200 mg IV over 6 hr q12hr for 14 days
- ≥120 kg: 300 mg IV over 6 hr q12hr for 14 days

Treatment: Antiviral

- **Cidofovir** is an antiviral medication that is approved by the FDA for the treatment of CMV retinitis in patients with AIDS and is commercially available as an **injection**.

-Data are not available on the effectiveness of cidofovir in treatment of MPXV infection in people.

-However, it has shown to be effective against orthopoxviruses in *in vitro* and animal studies.

-It is unknown whether a person with severe mpox infection will benefit from treatment with cidofovir, although its use may be considered in such instances.

Treatment: Antiviral

- **Brincidofovir**: 200mg 2 dose Bid orally

-treatment of human smallpox disease in adult and pediatric patients, including neonates.

-Data are not available on the effectiveness of brincidofovir in treating MPXV infection in people.

-However, it has shown to be effective against orthopoxviruses in *in vitro* and animal studies.

-Brincidofovir **should not be used simultaneously with cidofovir**.

Vaccines

- Vaccination against smallpox was demonstrated throughseveral observational studies to be about **85% effective** in preventing monkeypox
- At present, WHO recommends use of

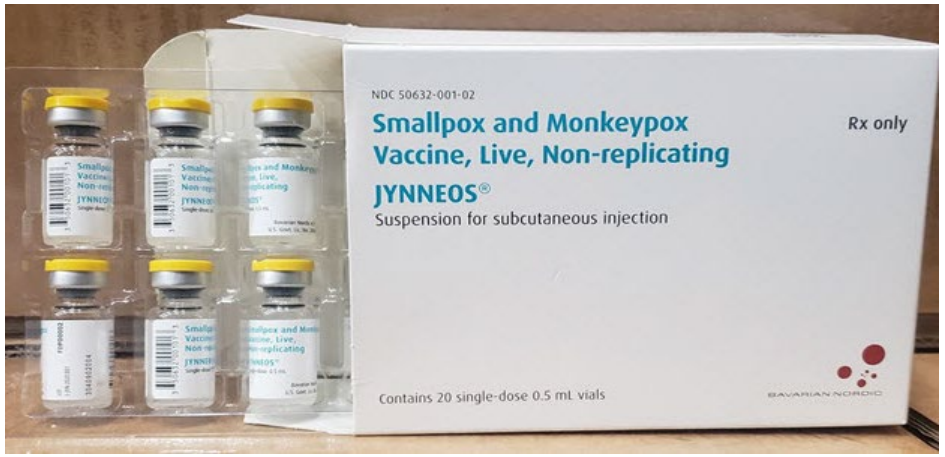
✓MVA(Modified Vaccinia Ankara) JYNNEOS or

✓LC16 vaccines, or the

✓ACAM2000 vaccine when the others are not available.

Vaccines

- Only people who are at risk (for example, someone who has been a close contact with someone who has mpox, or someone who belongs to a group at high risk of exposure to mpox such as the LGBT community) should be considered for vaccination.
- Mass vaccination is not currently recommended.
- Travellers who may be at risk based on an individual risk assessment with their healthcare provider may wish to consider vaccination.
- Vaccinia Immune Globulin Intravenous (VIGIV): VIGIV is licensed by the FDA to treat complications due to vaccinia vaccination. However, it has not been approved for the treatment of Mpox.
- It can also be given as post-exposure prophylaxis.



Prognosis

- Earlier demonstrations in Africa showed a mortality rate of around 1-10% (depending on clade variations)

✓ Often due to a secondary infection

✓The mortality rate is higher if co-infected with HIV

- In DR Congo of the 7,851 reported Mpox cases, 39% are children aged under 5, including 240 deaths (62% of the total).

- Prior small-pox vaccine leads to a milder form of the disease

Outbreak investigation of monkeypox

- **One case** of mpox is **considered an outbreak**
- Mpox is notifiable to WHO when unusual, unexpected or may lead to international spread
- Confirm the outbreak through-

✓Verifying S/S

✓Interview the index case

✓Exposure (through occupation/wildlife/ingestion/illperson)

✓Travel History

✓Vaccination history

✓Contact Tracing

Outbreak investigation of monkeypox

Possible areas of investigation

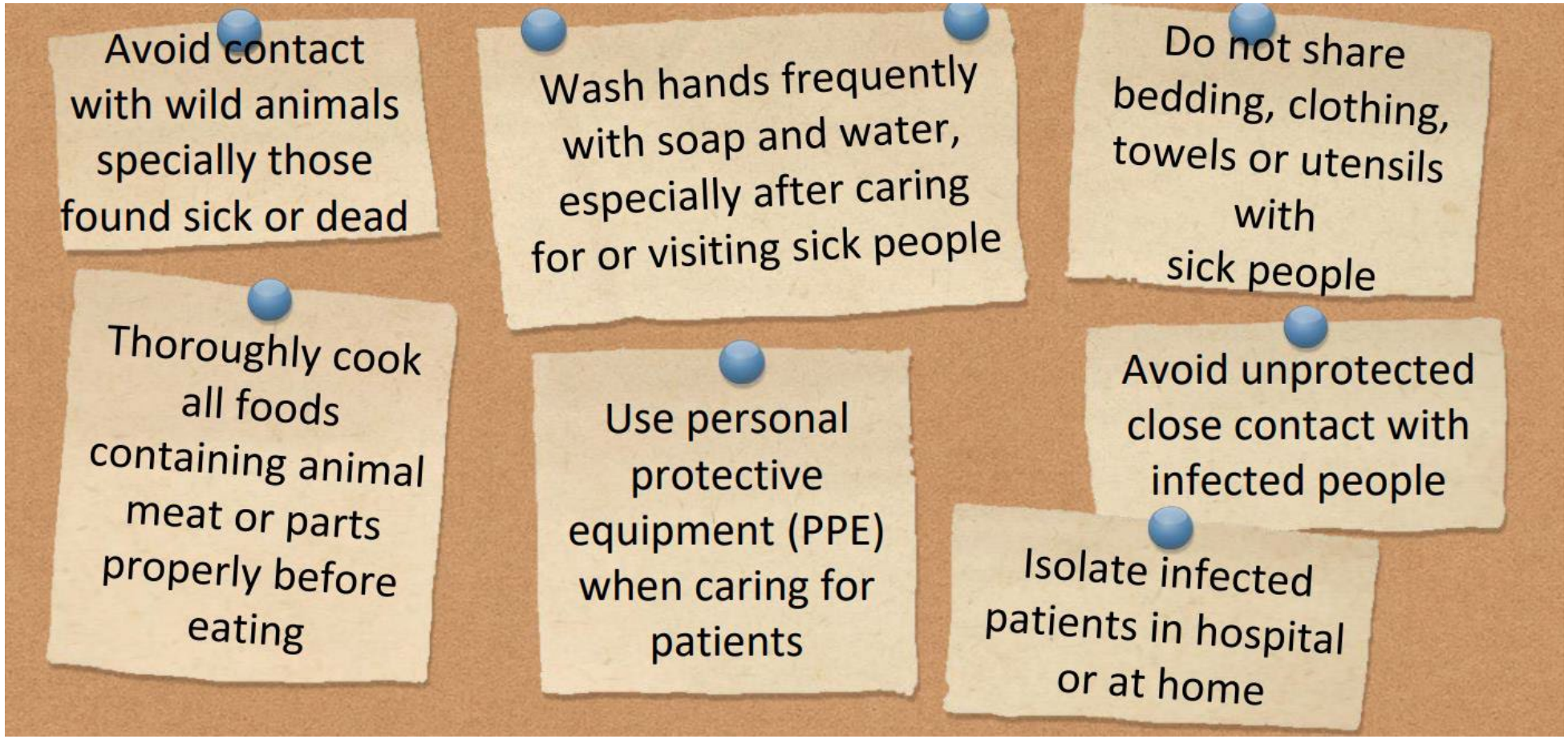
Investigation in health care setting

Investigation in the community

Animal health and environmental investigations

Follow-up of an exported case at origin and at destination

Raising Awareness



Thank
You