MONKEYPOX

Multinational Monkeypox Response: Epidemiology and Public Health Updates

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IDWeek
Wednesday October 19, 2022

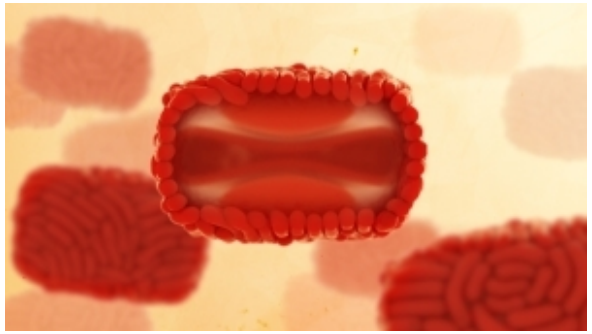
- Conflicts of interest: None

Objectives

- Communicate changing landscape of monkeypox before 2022 global outbreak
- Share commonalities between historic cases of monkeypox and those occurring during the ongoing outbreak
- Describe epidemiology of 2022 U.S. cases
- Increase awareness of severe infections that can be life-threatening

Monkeypox virus

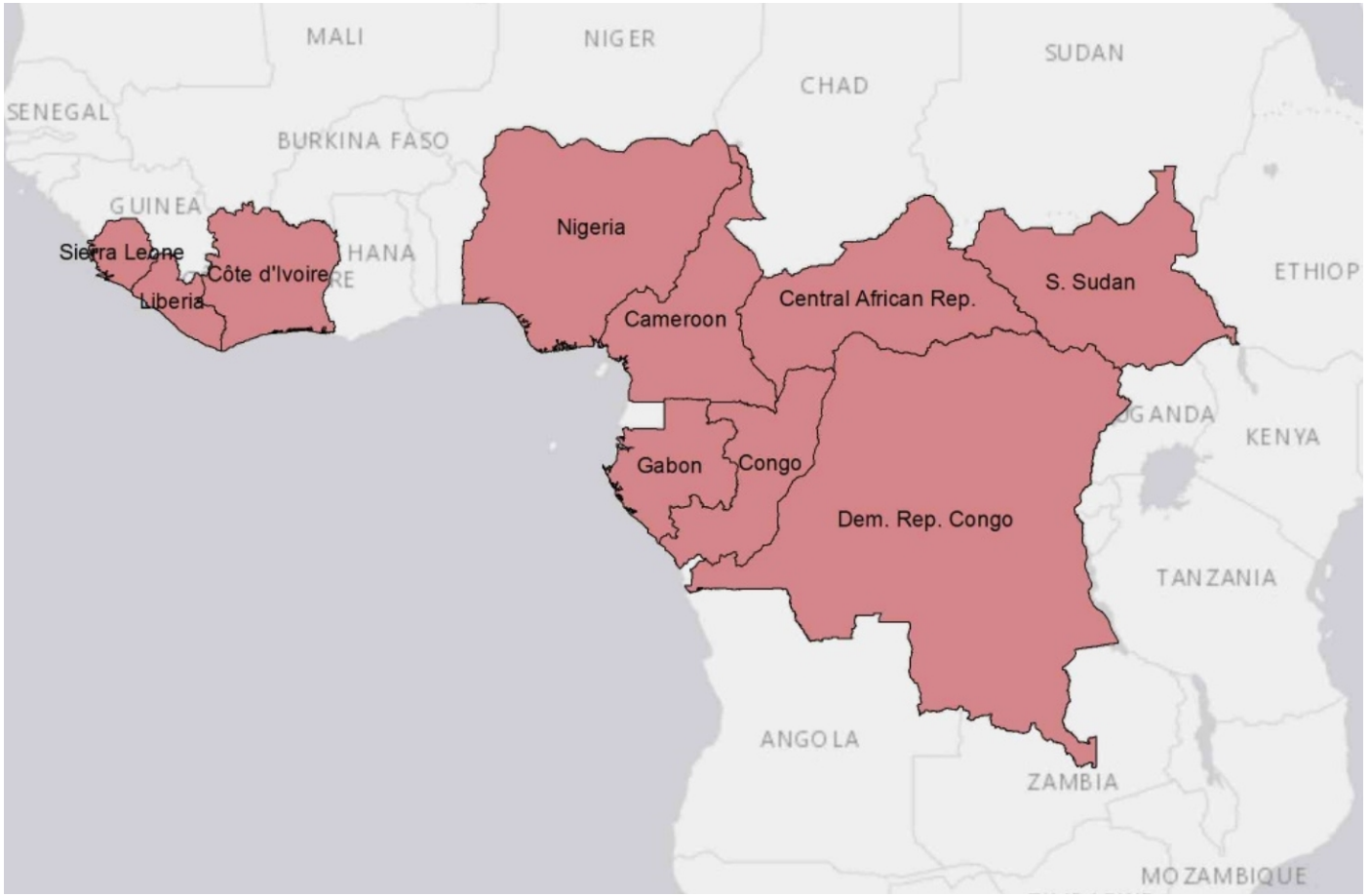
- Causes monkeypox
- Belongs to same virus genus as Variola virus, the virus that causes smallpox
- Presumed animal reservoir: small mammals in forested regions of Africa*
- First confirmed human disease: 1970, Democratic Republic of Congo (DRC)
- 2 clades: Clade I and Clade II; Clade II: historically fewer severe outcomes



*No definitive reservoir(s) identified; however, multiple studies suggest a few species of squirrels (Funisciurus, Heliosciurus), rodents (Cricetomys, Graphiurus), and shrews (Petrodromus)

Changing landscape: Countries in Africa with “classic” case(s) before 2022

- Classic presentation involves noticeable, diffuse rash preceded by prodrome
- In last 20 years: Increase in cases in DRC
- Since 2015, re-emergence (after 30-40 years of no cases): Sierra Leone, Liberia, Cameroon, Nigeria
- Most cases in DRC and Nigeria



Countries in Africa with at least one reported case of human monkeypox

Some proposed reasons for increased cases

- Increased human interaction with monkeypox virus reservoirs
  - Population growth
  - Deforestation
  - Climate change
- Small proportion of people with immunity
  - Declining smallpox vaccine immunity among those vaccinated
  - No smallpox vaccination of younger populations
- Improvements in disease detection

2003 U.S. outbreak

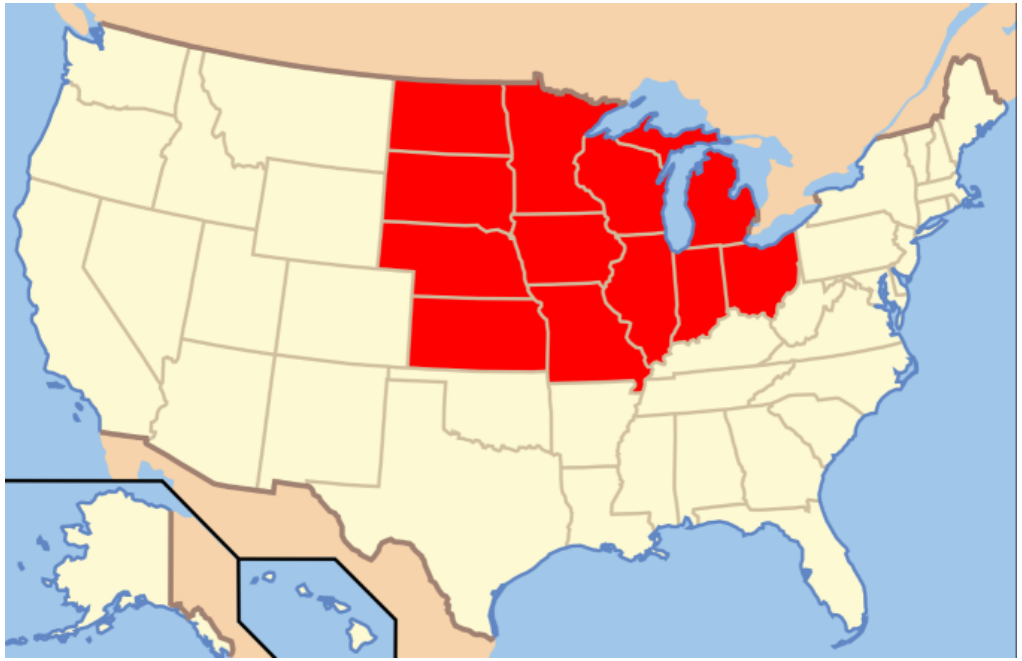
- 47 confirmed or probable human cases
- Bites or scratches from pet prairie dogs
- No person-to-person spread

1 → 2 → 3

Infected small mammals imported from Ghana to Texas

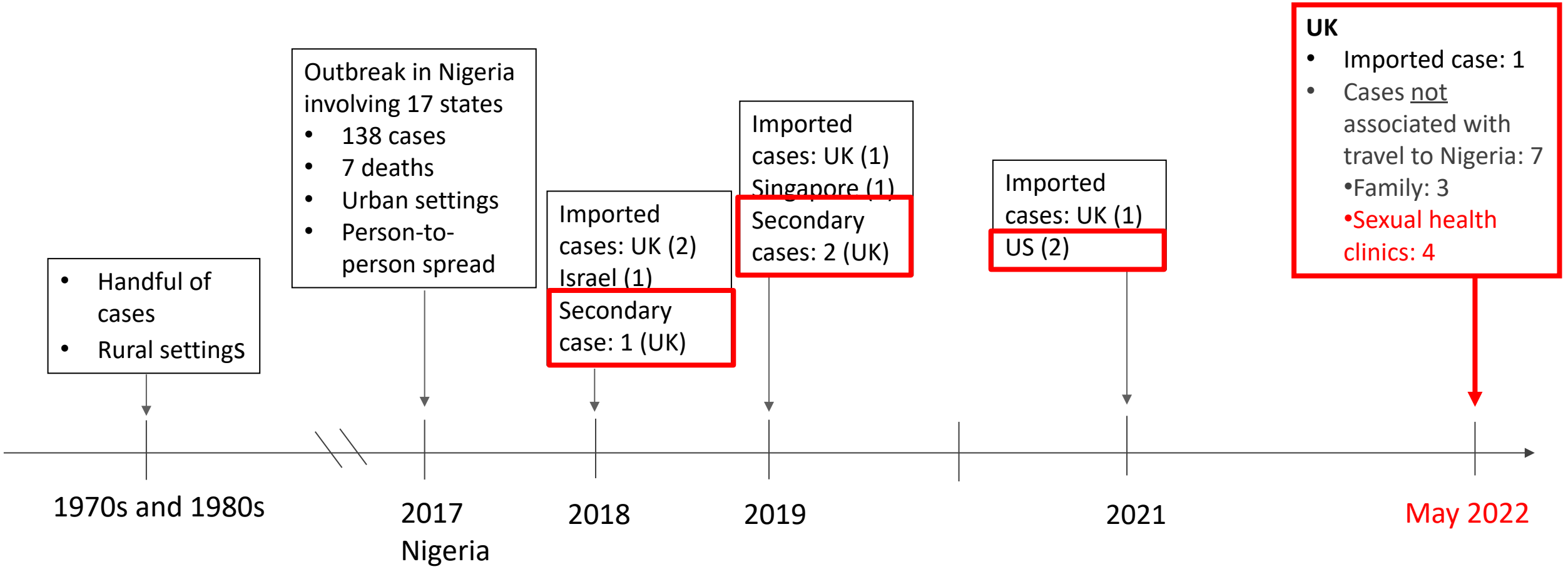
Some small mammals housed with prairie dogs in Illinois animal facility

Prairie dogs sold as pets



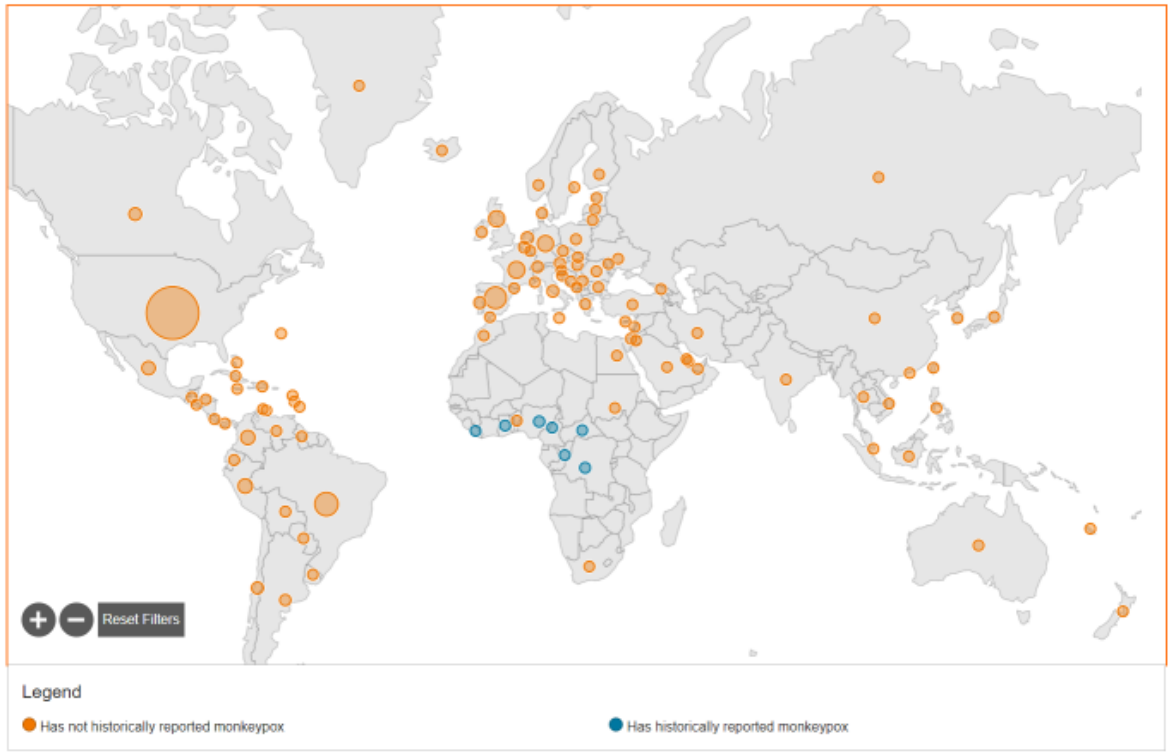
https://www.cdc.gov/poxvirus/monkeypox/outbreak/us-outbreaks.html

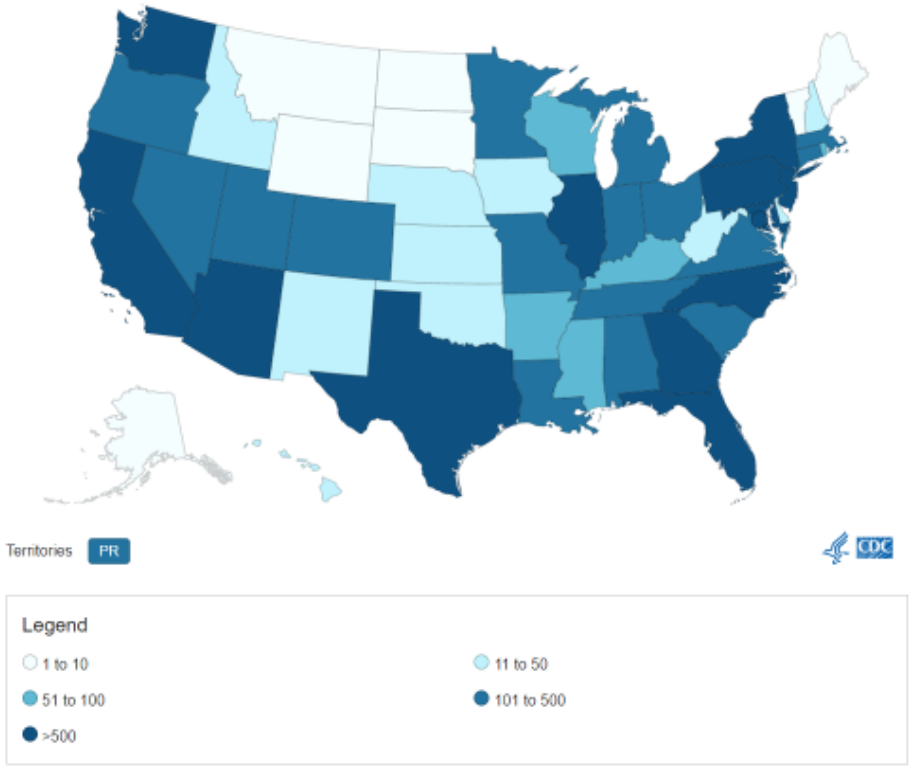
Clade II Human Monkeypox virus infections (West Africa)



UK cases triggered worldwide detection (as of 10/14/2022)

- Confirmed worldwide cases: 73,288
- Locations that have not historically reported monkeypox: 102
- Confirmed and probable U.S. cases (in 50 states, Washington D.C., and Puerto Rico): 27,317

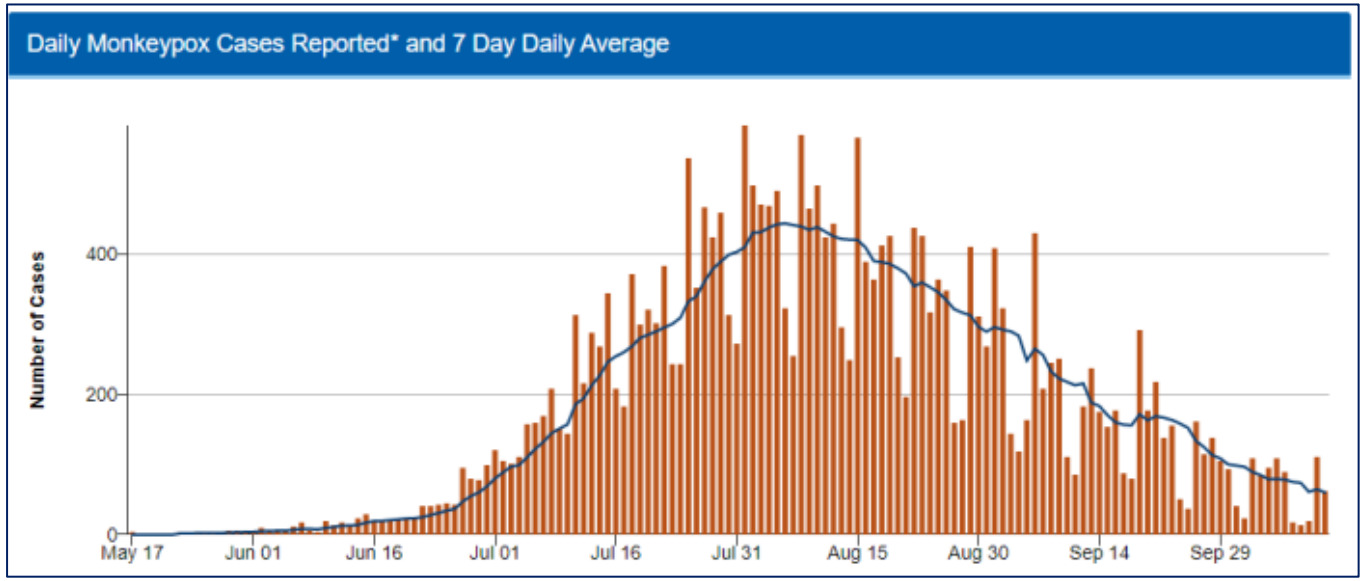




https://www.cdc.gov/poxvirus/monkeypox/response/2022/index.html

Seven day average of U.S. cases since start of 2022 outbreak

- Case counts decreasing after peak ~ August 9, 2022
- Male-to-male sexual contact (MMSC) most common
- Some cases in women, children, and men who do not report recent MMSC
- Demographic shift: white non-Hispanic → black and Hispanic



https://www.cdc.gov/poxvirus/monkeypox/response/2022/mpx-trends.html

Clinical presentation consistent with some features of previous infections

1970–present

Countries endemic for monkeypox

2003

United States

First lesion at site of exposure (bite or scratch)

2022

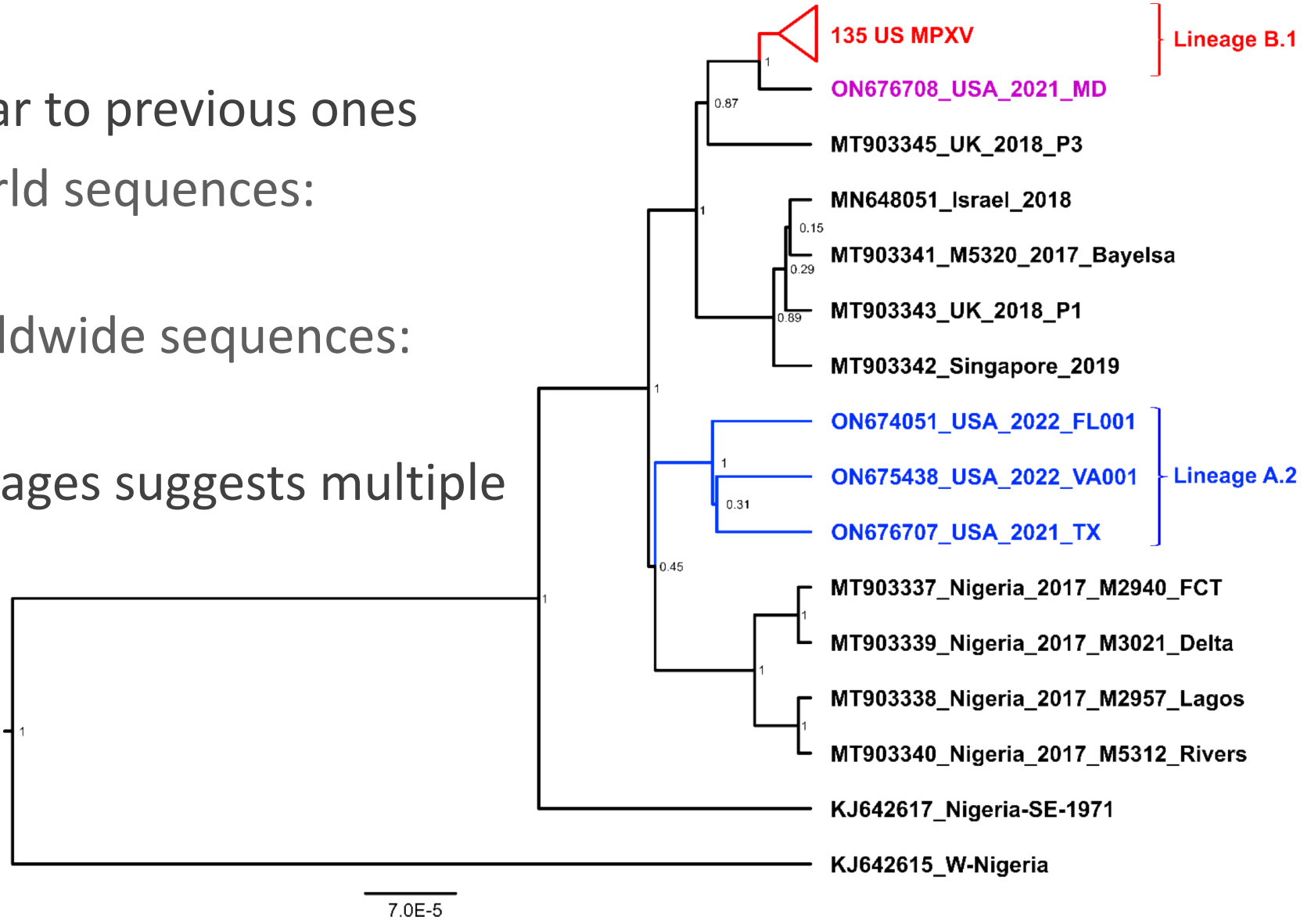
Globally

Small, localized lesions

- Firm, deep-seated, well circumscribed, painful, often umbilicated lesions
- Can involve palms and soles
- Associated with lymphadenopathy, fever, sore throat
- Severe manifestations in people who are immunocompromised

CDC Genomic surveillance of some U.S. and global viruses

- 2022 sequences similar to previous ones
  - Most U.S. and world sequences: Lineage B.1
  - Rare U.S. and worldwide sequences: Lineage A.2
- Identification of 2 lineages suggests multiple virus introductions



Clade II Phylogeny

https://www.biorxiv.org/content/10.1101/2022.06.10.495526v1

Differences between classic monkeypox and current cases

Characteristic	Classic monkeypox	2022 outbreak
Zoonotic transmission	Yes	No
Person-to-person spread	Occurred but not well defined	Extensive in MSM* networks
Location of lesions	Widespread rash, including on genitals	Localized or scattered rash, often limited to or involving genitals
Transmission Respiratory secretions (e.g., saliva) Close skin-to-skin contact Fomites	 Yes Yes Yes	 Yes Extensive Yes
Diagnosis Differential diagnosis Co-infections	 Chickenpox Yes (chickenpox)	 Sexually transmitted infections, hand-foot-mouth disease, molluscum contagiosum, miscellaneous skin rash, bug bite, chickenpox Yes

*MSM: gay, bisexual, and other men who have sex with men

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Co-infections	Yes (chickenpox)	Yes

Route of exposure may be responsible for some atypical features; further genome sequencing underway

Gender and characteristics as of October 12, 2022

- Men: 25,275
  - Report recent MMSC: 11,029
  - Do not report recent MMSC: 3,386
  - Missing data: 10,860
- Women: 1168
  - Cisgender: 972
  - Transgender women: 196
- Children: ~100 cases
  - ≤ 12 years: direct skin-to-skin contact with household member (adult)
  - Adolescents: Consensual MMSC most likely route
  - Black and Hispanic children disproportionately affected

- Route of exposure is unclear for many cases
- Understanding exposures that led to transmission is a priority

Transmission during ongoing outbreak

- Correctional facilities: Investigation at Cook County, Illinois jail
  - No secondary cases; virus DNA (but no viable virus) detected on one surface
- Healthcare personnel presumably due to work exposure: 3 cases
  - Sharps injuries while attempting to unroof lesions. Localized, self-limited infections
  - Lesions should be vigorously swabbed; unroofing discouraged
- People experiencing homelessness
  - Cases identified, including severe cases
  - Anecdotally may be mostly in people experiencing unsheltered homelessness
  - Vigilance needed
- Daycare settings and schools: No known secondary cases
- Reverse zoonoses to animals: Uncertainty about reported cases

Passive surveillance: Some manifestations of monkeypox reported to CDC*

- Independent of immune status
  - Eyes: conjunctivitis, corneal ulcers, keratitis
  - Neuro: encephalitis, transverse myelitis
  - Genitourinary: phimosis, rectal and urethral strictures
  - Cardiac: myocarditis
- Immunocompromised due to advanced HIV, organ or stem cell transplant
  - Skin: Large, necrotic lesions affecting large percentage of body surface, lesions continue to develop over weeks
  - Gastrointestinal manifestations: Odynophagia, bowel obstruction, diarrhea
  - Bacterial superinfections and sepsis
  - Disseminated illness and death

*Pulmonary nodules anecdotally reported unclear if causally associated with monkeypox, arthritis reported in recent publication

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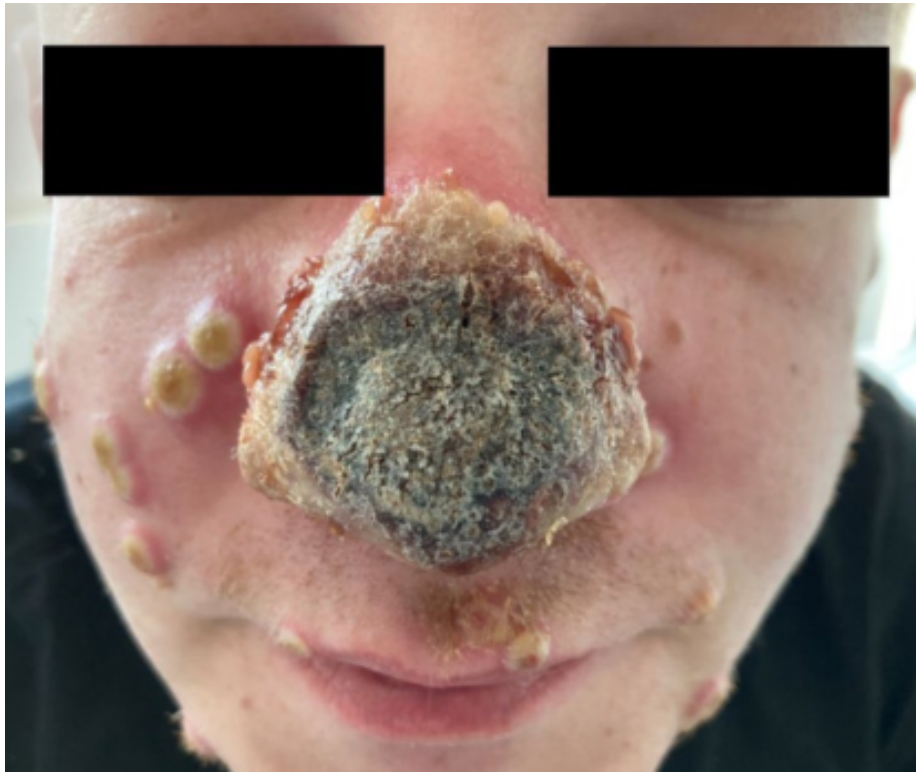
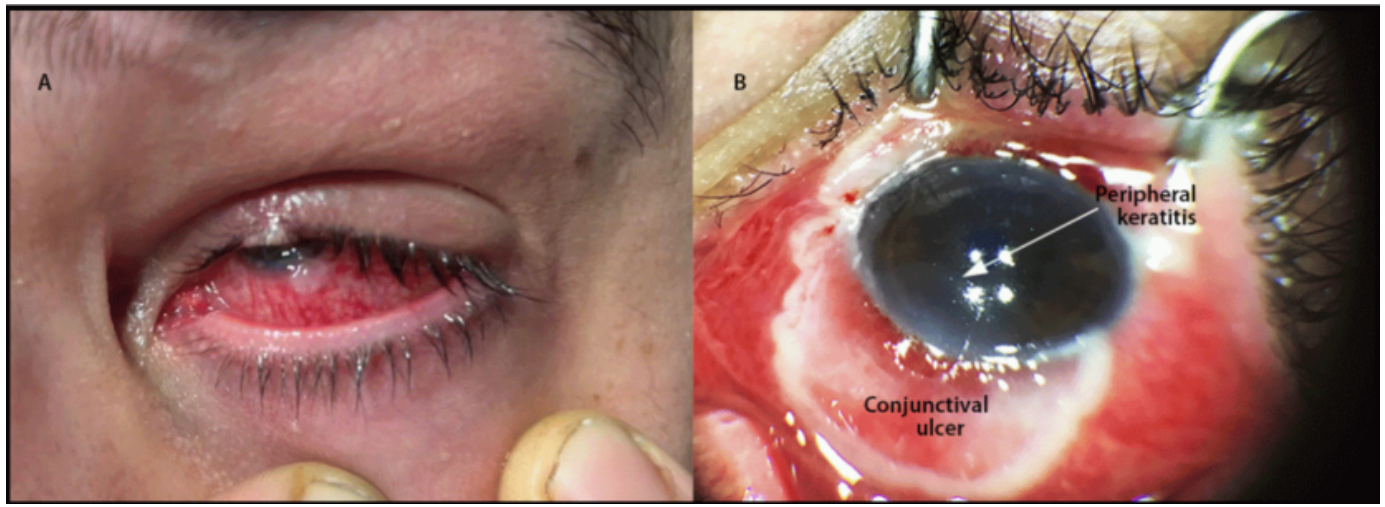


Boesecke C, Monin MB, van Bremen K, Schlabe S, Hoffmann C. Severe monkeypox-virus infection in undiagnosed advanced HIV infection. Infection. 2022 Aug 15.



Cash Goldwasser S, Labuda SM, McCormick DW et al. (2022) Ocular monkeypox, United States—July-September 2022. MMWR. 2022 Oct

Persistent epidemiology questions

- Reason for exponential case counts during 2022
- Nature of close contact associated with some cases*
- Non-lesion sites that can be tested; interpretation of positive test results
- Potential for seasonal increase in case counts
- Reverse zoonosis: human-to-animal transmission
- Sustained effectiveness of prevention strategies on case counts

*Some cases reported in people without MMSC or known intimate contact with a patient with monkeypox

Summary

- Ongoing global outbreak, predominantly affecting MSM
- Genome sequences coupled with commonalities in rash and transmission through close skin-to-skin contact suggest atypical features may be due to route of transmission
- Black and Hispanic men disproportionately affected
- No sustained transmission in communities outside of MSM networks
- Severe cases among people who are immunocompromised

For more information, contact CDC

1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

Or visit the 2022 U.S. Monkeypox Outbreak Response website:

www.cdc.gov/monkeypox