Monkeypox Outbreak Update

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Monkeypox Outbreaks

- Nigeria has experienced continuous Monkeypox cases since September 2017
  - September 2017- April 2022
    - 558 suspected cases reported from 32 states of Nigeria
      - 241 were confirmed cases
      - 8 deaths recorded (Case Fatality Ratio: 3.3%)
- Exported cases to USA, UK, Singapore, and Israel have been reported.

https://www.who.int/emergencies/disease-outbreak-news/item/2022-DON381

Monkeypox in the US prior to 2022

- 2003 Outbreak
  - 47 confirmed and probable cases in six states (IL, IN, KS, MO, OH, WI)
  - Contact with pet prairie dogs, which were housed near imported small mammals from Ghana.
- July 2021 case
  - Traveler from Nigeria to Dallas, with connection through Atlanta
  - Monitored >50 moderate or low risk contacts
    - No high-risk contacts during travel, due to masking
- November 2021 case
  - Traveler from Nigeria to Maryland
    - No high-risk contacts during travel, due to masking

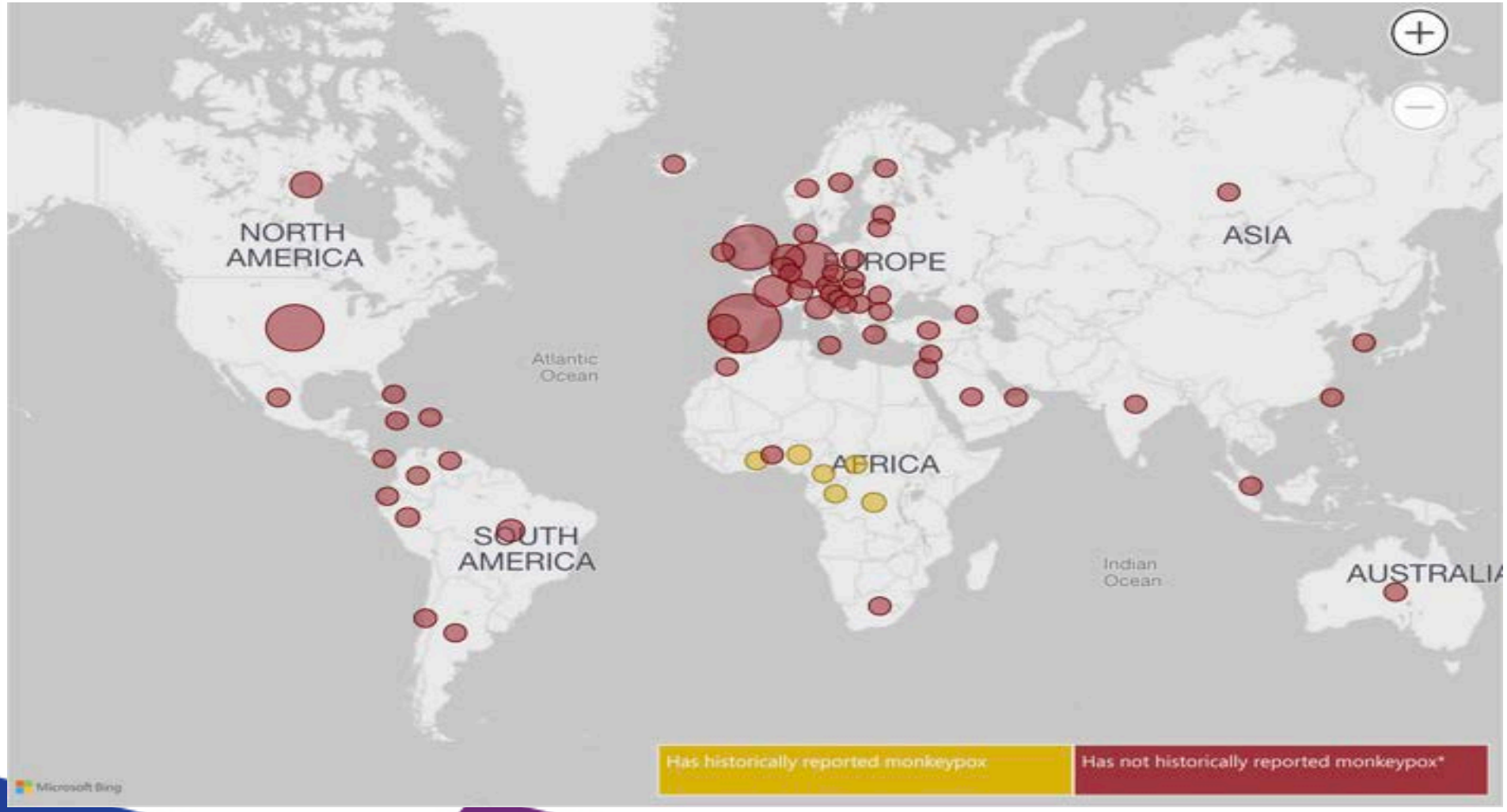
https://netec.org/2021/07/19/monkeypox-july-2021/

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

Monkeypox 2022

- As of May 16, 2022UK Health Security Agency (UKHSA) has confirmed a total of seven cases of Monkeypox in England
  - May 7
    - First confirmed patient who had recently traveled from Nigeria
  - May 14
    - Two additional cases of Monkeypox in individuals in the same household, but not linked to the previous confirmed case
  - May 16
    - Four additional cases, none of which had known connections with the previously confirmed cases, nor linked to travel to a country where Monkeypox is endemic
  - May 18
    - Portugal confirmed cases, monitoring 15 additional cases
    - Spain monitoring 23 cases

Monkeypox 2022

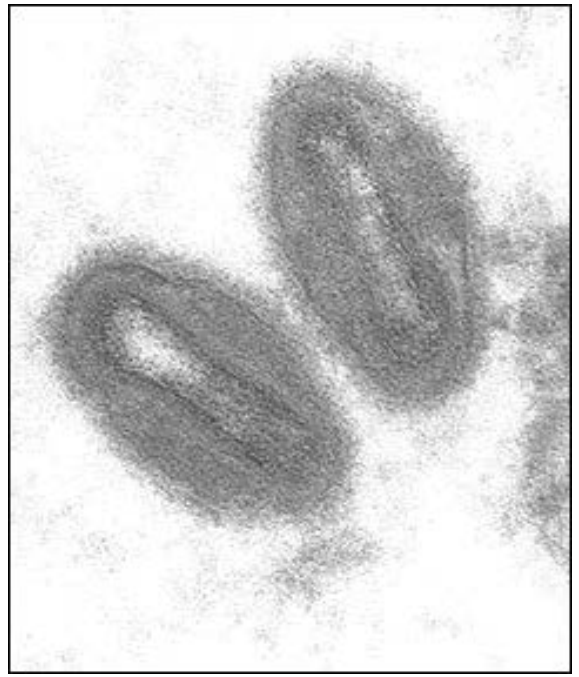


Monkeypox 2022

- Current Goals of WHO, collaborating agencies:
  - Increase understanding of transmission
    - Different patterns of transmission in different countries indicates multiple clades, virus mutation, poorly understood dynamics
    - All case counts are likely vast undercounts
  - Information sharing
    - Vital to maintaining global surveillance networks
  - Securing medical countermeasures
    - PPE to decrease risks of exposure
    - Vaccines, diagnostics, therapeutics
  - Address stigma, disinformation
    - Vital to restoring and ensuring trust in public health

Monkeypox – Overview

- Monkeypox is caused by monkeypox virus.
  - a member of the Orthopoxvirus genus in the family Poxviridae
    - Same genus as smallpox, cowpox, horsepox, and camelpox
- There are 2 distinct clades of monkeypox virus.
  - West African - thought to be less severe
  - Central African - more severe clinical manifestations, is easier to transmit from person-to-person and has a higher mortality rate than the West African clade



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

https://netec.org/2022/05/16/monkeypox-netec-special-pathogen-of-concern-situation-report-may-2022/

Monkeypox – Transmission

- Virus enters through broken skin, respiratory tract, or mucous membranes
- Animal → human: by bite or scratch, bush meat preparation, direct contact with body fluids, or indirect contact with lesion material (contaminated bedding)
- Human to human transmission can occur with monkeypox
  - Contact with lesions, body fluids, respiratory droplets, and contaminated materials such as bedding or clothing.

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

https://netec.org/2022/05/16/monkeypox-netec-special-pathogen-of-concern-situation-report-may-2022/

Monkeypox – Presentation

- Monkeypox is less deadly than smallpox
  - Mortality ~ 1 in 10 people with symptoms
- Incubation period is 6 to 13 days but can range from 5 to 21 days.
- Illness begins with non-specific viral prodrome symptoms
  - Fever, headache, body aches, and **swelling of the lymph nodes**

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

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Monkeypox - Clinical

- Pox rash may occur 1-7 days after initial symptoms.
- Progresses to a widespread rash on the face and body that can last 2-4 weeks
- Progresses from macules to papules to vesicles to pustules
  - Followed by umbilication, scabbing, and desquamation
  - All lesions should be in nearly same stage
  - **Lesions contain highly infections material and should be covered immediately**
- A patient is considered infectious from 5 days prior to the onset of the rash until the lesions have crusted and a fresh layer of skin has formed

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

https://netec.org/2022/05/16/monkeypox-netec-special-pathogen-of-concern-situation-report-may-2022/

Monkeypox – Current cases

- Atypical features of current cases
- Rash often starts in genital and perianal areas
- Rash may or may not disseminate to other parts of body
- Prodromal symptoms may be mild or non-existent

https://emergency.cdc.gov/coca/ppt/2022/052422_slides.pdf

Monkeypox

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

Serious Communicable Diseases Unit

Monkeypox – CDC Case Definition

- **Suspect Case**
  - New characteristic rash OR
  - Meets one of the epidemiologic criteria and has a high clinical suspicion for monkeypox
- **Probable Case**
  - No recent other Orthopoxvirus exposure (eg ACAM2000 vaccination) AND
  - Demonstration of the presence of
    - Orthopoxvirus DNA by polymerase chain reaction of a clinical specimen OR
    - Orthopoxvirus using immunohistochemical or electron microscopy testing methods OR
    - Demonstration of detectable levels of anti-orthopoxvirus IgM antibody during the period of 4 to 56 days after rash onset

https://www.cdc.gov/poxvirus/monkeypox/clinicians/case-definition.html

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- **Probable Case**
  - No recent other Orthopoxvirus exposure (eg ACAM2000 vaccination) AND
  - Demonstration of one of the presence of:
    - Orthopoxvirus DNA by PCR
    - Orthopoxvirus IHC or EM
    - Detectable levels of anti-orthopoxvirus IgM 4-56 days after rash onset
- **Confirmed Case**
  - Monkeypox virus DNA by PCR or Next-Generation sequencing OR
  - Isolation of Monkeypox virus in culture

https://www.cdc.gov/poxvirus/monkeypox/clinicians/case-definition.html

Monkeypox – CDC Epidemiologic

- **Epidemiologic Criteria**

  Within 21 days of illness onset:
  - Reports having contact with a person or people with a similar appearing rash or who received a diagnosis of confirmed or probable monkeypox OR
  - Had close or intimate in-person contact with individuals in a social network experiencing monkeypox activity, this includes men who have sex with men (MSM) who meet partners through an online website, digital application (“app”), or social event (e.g., a bar or party) OR
  - Traveled outside the US to a country with confirmed cases of monkeypox or where Monkeypox virus is endemic OR
  - Had contact with a dead or live wild animal or exotic pet that is an African endemic species or used a product derived from such animals (e.g., game meat, creams, lotions, powders, etc.)
- **Exclusion Criteria**

  A case may be excluded as a suspect, probable, or confirmed case if:
  - An alternative diagnosis* can fully explain the illness OR
  - An individual with symptoms consistent with monkeypox does not develop a rash within 5 days of illness onset OR
  - A case where high-quality specimens do not demonstrate the presence of Orthopoxvirus or Monkeypox virus or antibodies to orthopoxvirus

https://www.cdc.gov/poxvirus/monkeypox/clinicians/case-definition.html

Monkeypox – Prevention

- **Identify, Isolate, and Inform!**
- The COVID-19 precautions such as masking and physical distancing are likely to reduce the risk of exposure and transmission.
- Avoid contact with any materials, such as bedding, that has been in contact with a sick animal or person.
- Isolate infected patients from others who could be at risk for infection.

Monkeypox - Treatment

- There are no specific licensed treatments available for monkeypox
  - There are known countermeasures that might be effective
- Tecovirimat (TPOXX; ST-246)
  - inhibits p37, a highly conserved protein in all orthopoxviruses
  - →prevents the formation viral envelope
  - FDA approved (2018) for smallpox; kept in US Strategic National Stockpile
- Brincidofovir (Tembexa)/Cidofovir
  - Brincidofovir was FDA approved (2021) for smallpox;
  - Unclear availability
- Vaccinia immune globulin (VIG)
  - Only available through CDC

https://www.cdc.gov/poxvirus/monkeypox/clinicians/treatment.html

https://www.nejm.org/doi/full/10.1056/nejmoa1705688

Monkeypox - Treatment

- Medical Countermeasures can be requested from the
  - CDC EOC 770-488-7100
  - CDC Drug Service 404-639-3670; drugservice@cdc.gov
- Requests for vaccines for PEP, Tecovirimat, or VIGIV should come from State or Territorial Health Authorities
- Vaccine for PrEP will be supplied by CDC Drug Service

https://www.cdc.gov/poxvirus/monkeypox/clinicians/treatment.html

Monkeypox - Vaccines

- Vaccines
  - JYNNEOS has been approved by FDA (2021) for the prevention of monkeypox and smallpox
    - Non-replicating MVA vaccine
    - Unclear number of doses in US Strategic National Stockpile
    - Prioritized for high-risk contacts of monkeypox cases
  - ACAM2000 is approved by FDA for prevention of smallpox
    - Live Vaccinia vaccine
    - CDC held eIND for prevention of Monkeypox during outbreak setting

https://www.cdc.gov/poxvirus/monkeypox/clinicians/smallpox-vaccine.html

ACAM2000 and JYNNEOS

	ACAM2000	JYNNEOS
Vaccine virus	Replication-competent vaccinia virus	Replication-deficient Modified vaccinia Ankara
"Take"	"Take" occurs	No "take" after vaccination
Inadvertent inoculation and autoinoculation	Risk exists	No risk
Serious adverse event	Risk exists	Fewer expected
Cardiac adverse events	Myopericarditis in 5.7 per 1,000 primary vaccinees	Risk believed to be lower than that for ACAM2000
Effectiveness	FDA assessed by comparing immunologic response and "take" rates to Dryvax*	FDA assessed by comparing immunologic response to ACAM2000 & animal studies
Administration	Percutaneously by multiple puncture technique in single dose	Subcutaneously in 2 doses, 28 days apart

*Both ACAM2000 and Dryvax are derived from the NYC Board of Health strain of vaccinia; ACAM2000 is a "second generation" smallpox vaccine derived from a clone of Dryvax, purified, and produced using modern cell culture technology.

https://emergency.cdc.gov/coca/ppt/2022/052422_slides.pdf

ACIP Contraindications for ACAM2000 and JYNNEOS for PrEP

Contraindication	ACAM2000 Primary Vaccinees	ACAM2000 Revaccinees	ACAM2000 Household Contacts	JYNNEOS
History or presence of atopic dermatitis	X	X	X	
Other active exfoliative skin conditions	X	X	X	
Conditions associated with immunosuppression	X	X	X	
Pregnancy	X	X	X	
Aged <1 year	X	X	X	
Breastfeeding	X	X		
Serious vaccine component allergy	X	X		X
Known underlying heart disease (e.g., coronary artery disease or cardiomyopathy)	X	X		
Three or more known major cardiac risk factors	X			

https://emergency.cdc.gov/coca/ppt/2022/052422_slides.pdf

Monkeypox Resources

- NETEC Blogs
  - Overview: https://repository.netecweb.org/exhibits/show/monkeypox/monkeypox
  - EMS: https://netec.org/2022/05/19/ems-response-to-the-current-outbreak-of-monkeypox/
  - Lab: https://repository.netecweb.org/exhibits/show/monkeypox/item/1669
  - Waste: https://netec.org/2021/07/21/monkeypox-waste-management/
- CDC
  - https://www.cdc.gov/poxvirus/monkeypox/outbreak/current.html
  - https://www.cdc.gov/poxvirus/monkeypox/index.html
- WHO
  - https://www.who.int/health-topics/monkeypox