Monkeypox Update

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Advisory Committee on Immunization Practices
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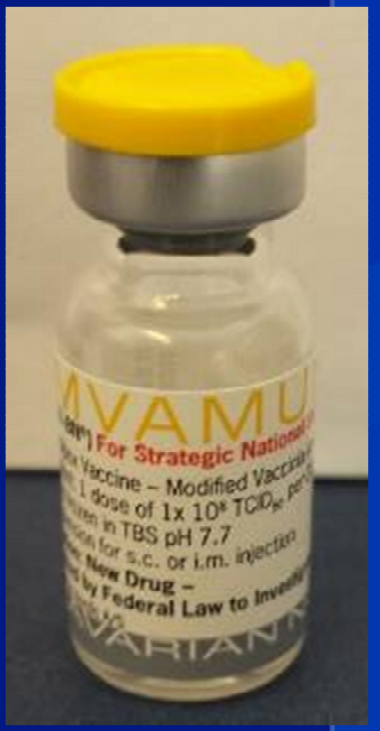
National Center for Emerging and Zoonotic Infectious Diseases
Division of High Consequence Pathogens and Pathology

Medical Countermeasures Stockpiled for Orthopoxviruses

- **Vaccines**
  - JYNNEOS
  - ACAM2000
- **Treatment**
  - Tecovirimat
  - Vaccinia Immune Globulin Intravenous (VIGIV)
  - Cidofovir

JYNNEOS

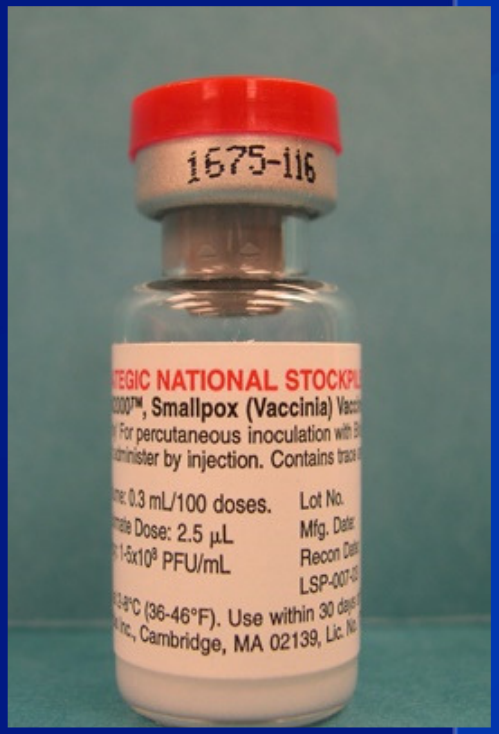


- **JYNNEOS is a live vaccine produced from the strain Modified Vaccinia Ankara-Bavarian Nordic (MVA-BN), an attenuated, non-replicating orthopoxvirus**
  - Also known as IMVAMUNE, IMVANEX, MVA
- **Licensed by FDA in September 2019**
- **Indication**
  - JYNNEOS is indicated for prevention of smallpox and monkeypox disease in adults 18 years of age and older determined to be at high risk for smallpox or monkeypox infection
  - CDC is developing an Expanded Access Investigational New Drug Protocol to allow the use of JYNNEOS for monkeypox in pediatric populations

https://www.fda.gov/vaccines-blood-biologics/jynneos

ACAM2000

- **ACAM2000 is a live vaccinia virus vaccine**
- **Licensed by FDA in August 2007**
- **Replaced Dryvax - license withdrawn by manufacturer and remaining vaccine destroyed**
- **Indication**
  - ACAM2000 is indicated for active immunization against smallpox disease for persons determined to be at high risk for smallpox infection
  - CDC-held Emergency Access Investigational New Drug Protocol allows use for Non-Variola Orthopoxvirus Infection (e.g., monkeypox) during an outbreak



https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5708a6.htm
https://www.fda.gov/media/75792/download

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.

Vaccine Supply

- **JYNNEOS**
  - As of June 14, the SNS held more than 36,000 courses in its immediate inventory
  - ~150,000 courses to be delivered in the next few weeks
  - ~500,000 courses to be delivered this year
  - ~250,000 courses to be manufactured from existing bulk vaccine to be delivered later this year
  - ~7.9 million courses that could be filled and finished upon request by the government
- **ACAM2000**
  - >100 Million doses

https://aspr.hhs.gov/ASPRBlog/Pages/BlogDetailView.aspx?ItemID=432
https://www.bavarian-nordic.com/investor/news/news.aspx?news=6584

Pre-Exposure Prophylaxis

- **On November 3, 2021, the Advisory Committee and Immunization Practices (ACIP) voted to recommend vaccination for select persons at risk for occupational exposure to orthopoxviruses**
- **Policy note published June 3, 2022**
  - Use of JYNNEOS (Smallpox and Monkeypox Vaccine, Live, Nonreplicating) for Preexposure Vaccination of Persons at Risk for Occupational Exposure to Orthopoxviruses: Recommendations of the Advisory Committee on Immunization Practices — United States, 2022

https://www.cdc.gov/mmwr/volumes/71/wr/mm7122e1.htm

Pre-Exposure Prophylaxis

- **People who should get PrEP include:**
  - Clinical laboratory personnel who perform testing to diagnose orthopoxviruses, including those who use polymerase chain reaction (PCR) assays for diagnosis of orthopoxviruses, including Monkeypox virus
  - Research laboratory workers who directly handle cultures or animals contaminated or infected with orthopoxviruses that infect humans, including Monkeypox virus, replication-competent Vaccinia virus, or recombinant Vaccinia viruses derived from replication-competent Vaccinia virus strains
  - Certain healthcare and public health response team members designated by public health authorities to be vaccinated for preparedness purposes

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

Pre-Exposure Prophylaxis

- **At this time, most clinicians in the United States and laboratorians not performing the orthopoxvirus generic test to diagnose orthopoxviruses, including monkeypox, are not advised to receive orthopoxvirus PrEP**
  - Laboratorians should consult with laboratory biosafety officers and supervisors to identify risks and precautions, depending on the type of work they are doing
  - Clinicians and laboratorians should use recommended infection control practices

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

ACIP Contraindications for ACAM2000 and JYNNEOS for PrEP

Contraindication	ACAM2000 Primary Vaccinees	ACAM2000 Revaccinees	ACAM2000 Household Contacts[1]	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			

Current Outbreak Response in the US

- **Surveillance (case identification, laboratory confirmation)**
- **Containment (isolation of cases, contact tracing)**
- **Vaccination of close contacts (PEP) based on risk exposure assessment***
  - High degree of exposure: PEP recommended
  - Intermediate degree of exposure: Informed clinical decision making recommended on an individual basis to determine whether benefits of PEP outweigh risks
  - Brief interactions and those conducted using appropriate PPE in accordance with Standard Precautions are not high risk and generally do not warrant PEP

* https://www.cdc.gov/poxvirus/monkeypox/clinicians/monitoring.html#exposure

Vaccine Strategy Considerations

- **Jurisdictions with larger numbers of cases are reporting that high percentages of contacts cannot be identified**
  - Several considering or planning for expanded vaccination
  - Electing similar approaches to strategies being used in Montreal and the UK
- **Currently limited supply of JYNNEOS**
- **Some jurisdictions have expressed concerns about potential serious adverse events with use of ACAM2000, especially considering that milder disease is typically being reported**
- **CDC using the Evidence to Recommendation (EtR) framework to structure deliberations and guide vaccine strategy**

Treatment Considerations for Monkeypox

- Many individuals infected with monkeypox virus have a mild, self-limiting disease course in the absence of specific therapy
- The prognosis for monkeypox depends on multiple factors such as previous vaccination status, initial health status, and concurrent illnesses or comorbidities

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

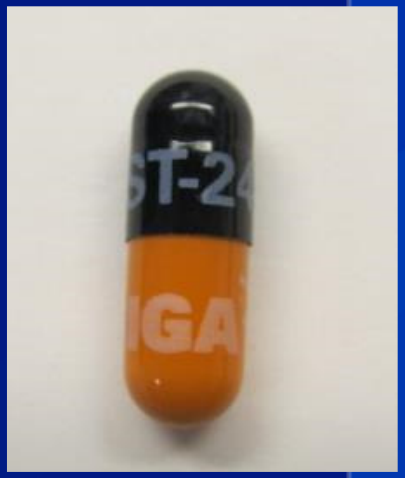
Treatment Considerations for Monkeypox

- **Persons who should be considered for treatment following consultation with CDC might include:**
  - Persons with severe disease (e.g., hemorrhagic disease, confluent lesions, sepsis, encephalitis, or other conditions requiring hospitalization)
  - Persons who may be at high risk of severe disease:
    - People with immunocompromising conditions (e.g., HIV/AIDS, leukemia, lymphoma, generalized malignancy, etc.)
    - Pediatric populations, particularly patients younger than 8 years of age
    - Pregnant or breastfeeding women
    - People with a history or presence of atopic dermatitis, people with other active exfoliative skin conditions
    - People with one or more complication
- **Persons with monkeypox virus aberrant infections that include its accidental implantation in eyes, mouth, or other anatomical areas where monkeypox virus infection might constitute a special hazard (e.g., the genitals or anus)**

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

Tecovirimat

- **Tecovirimat is an antiviral medication that is approved by the FDA for the treatment of human smallpox disease in adults and pediatric patients weighing at least 13 kg**
  - Also known as TPOXX or ST-246

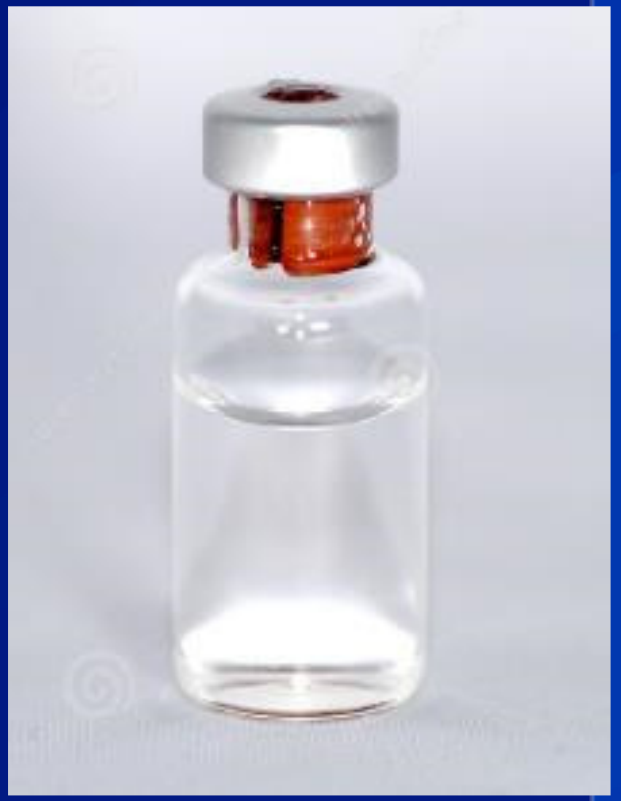


- **Oral capsule and IV formulations approved by FDA in July 2018 and May 2022, respectively**
- **Indication**
  - Tecovirimat is indicated for the treatment of human smallpox disease in adults and pediatric patients weighing at least 3 kg
  - CDC-held Emergency Access Investigational New Drug Protocol allows use of Tecovirimat for Non-Variola Orthopoxvirus Infection (e.g., monkeypox)
    - Includes allowance for opening an oral capsule and mixing its content with liquid or soft food for pediatric patients weighing less than 13 kg
- **Available from the Strategic National Stockpile as an oral capsule formulation or an intravenous vial**

https://www.accessdata.fda.gov/drugsatfda_docs/label/2018/208627s000lbl.pdf

Vaccinia Immune Globulin Intravenous (VIGIV)

- **VIGIV is licensed by FDA for the treatment of complications due to vaccinia vaccination, including:**
  - Eczema vaccinatum
  - Progressive vaccinia
  - Severe generalized vaccinia
  - Vaccinia infections in individuals who have skin conditions
  - Aberrant infections induced by vaccinia virus (except in cases of isolated keratitis)

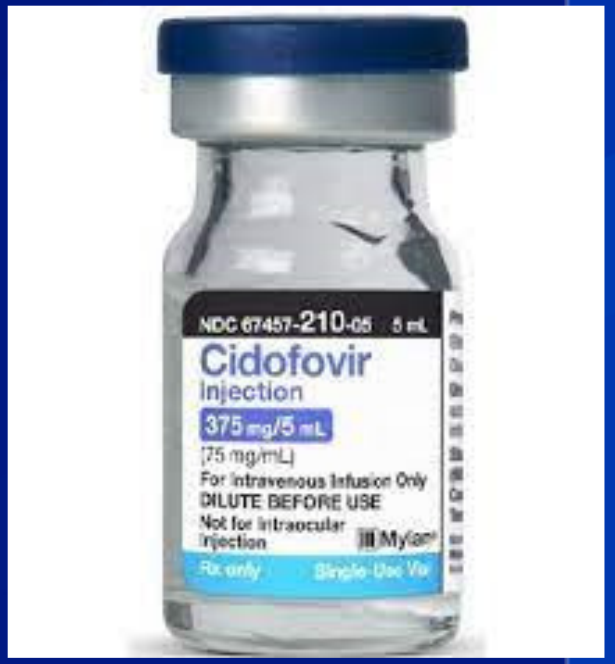


- **CDC-held Emergency Access Investigational New Drug Protocol allows use of VIGIV for Non-Variola Orthopoxvirus Infection (e.g., monkeypox)**

https://www.fda.gov/vaccines-blood-biologics/approved-blood-products/vaccinia-immune-globulin-intravenous-human

Cidofovir

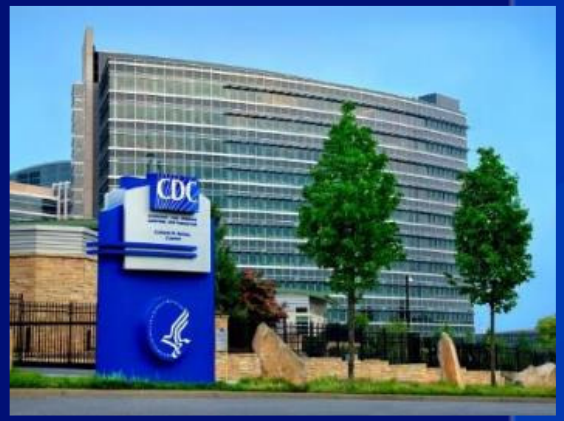
- Cidofovir (also known as Vistide) is an antiviral medication that is approved by the FDA for the treatment of cytomegalovirus (CMV) retinitis in patients with Acquired Immunodeficiency Syndrome (AIDS)
- CDC-held Emergency Access Investigational New Drug Protocol allows the use of Cidofovir for Non-Variola Orthopoxvirus Infection (e.g., monkeypox)



https://www.accessdata.fda.gov/drugsatfda_docs/label/1999/020638s003lbl.pdf

Medical Countermeasure Requests

- CDC is available for consultations to assist with medical countermeasure utilization including appropriate vaccine and antiviral use
- Clinicians should work with State or Territorial Health Authorities to requests vaccines, Tecovirimat, VIGIV, or cidofovir
- Health departments can reach CDC consultants through the CDC Emergency Operations Center



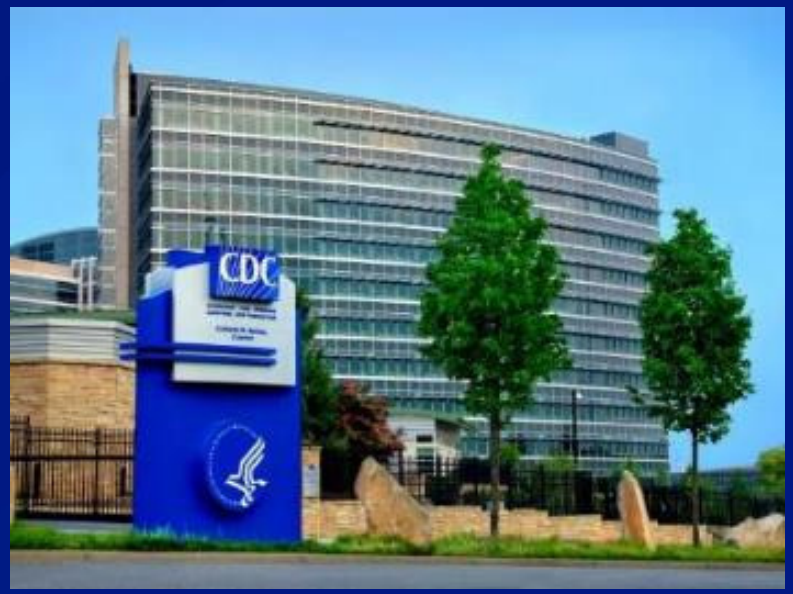
Questions?

For more information please contact Centers for Disease Control and Prevention

Telephone: 1-800-CDC-INFO (232-4636)/TTY: 1-888-232-6348

E-mail: cdcinfo@cdc.gov Web: http://www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.



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