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Clade II Mpox Infections Among Cruise Ship Passengers and Crew Members — United States, 2024

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Abstract

During the global clade II mpox outbreak, cases have disproportionately affected gay, bisexual, and other men who have sex with men (MSM). Cruise ship travel–associated mpox infections have not been previously described. During January 25–April 18, 2024, CDC was notified of eight mpox cases among cruise travelers on four ships: four among crew members and four among passengers. Seven cases were laboratory-confirmed as clade II *Monkeypox virus*. All exposure histories indicated male-to-male sexual contact. No patients were hospitalized, and none died. Crew members with mpox received their diagnoses on board and were isolated while infectious. Contacts were identified, monitored, and assessed for mpox postexposure prophylaxis (mpox vaccination). No crew members with mpox had been vaccinated against mpox. Passengers with mpox received their diagnoses after cruising on voyages marketed to gay and bisexual men, with symptom onset dates suggesting voyage exposures. For one cruise ship, two of the three reports of mpox among passengers were received after health departments were notified of potential cruise-associated exposures, and letters were sent to other passengers. Three of the four passengers with mpox had received 2 doses of JYNNEOS vaccine in 2022. Cruise lines should consider educating crew members on symptoms, risks, and preventive measures related to mpox and working with medical personnel to facilitate mpox vaccination as preexposure prophylaxis for eligible crew members. Cruise passengers who are eligible, predominantly MSM, should receive mpox vaccine before cruise travel. For cruise voyages marketed to gay and bisexual men, having mpox vaccine available on board would facilitate timely postexposure prophylaxis, if indicated; mpox prevention messaging and education before and during a voyage are also recommended.

Introduction

In May 2022, a global outbreak of clade II mpox emerged, resulting in approximately 100,000 cases in 122 countries. In the United States, mpox case counts peaked in summer 2022 and decreased by early 2023 but continue to be reported (*1*). As of June 1, 2025, approximately 35,000 mpox infections had been reported in the United States, predominantly affecting gay, bisexual, and other men who have sex with men (MSM) (*2*). Mpox disease is caused by the orthopoxvirus *Monkeypox virus*, and is diagnosed using real-time polymerase chain reaction (PCR) testing. Transmission occurs through close contact (including sexual or intimate contact) with an infectious person or contact with contaminated materials such as clothing or bedding (*3*). The disease can begin with prodromal symptoms including fever, malaise, chills, headache, or lymphadenopathy, followed by a disseminated rash that may be located on hands, feet, chest, face, or mouth or near the genitals, including penis, testicles, labia, vagina, and anus.* Illness typically lasts 2–4 weeks

* Clinical Features of Mpox | Mpox | CDC

Continuing Education examination available at https://www.cdc.gov/mmwr/mmwr_continuingEducation.html

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and, for the majority of patients, treatment is supportive including pain management. Severity of illness depends on the health of the patient and the site of exposure. Mpox infections associated with cruise ship travel have not been previously described.

Investigation and Results

During January 25–April 18, 2024, CDC was notified of eight mpox infections among cruise travelers on four ships.[†] Four infections were among crew members, including one three-person cluster. Passenger infections occurred on two cruises marketed to gay and bisexual men. Seven of the eight cases were laboratory-confirmed as clade II *Monkeypox virus*, the strain circulating globally (*3*); the other case was clinically compatible and met epidemiologic criteria, and therefore was classified as suspected.[§] The patients were men aged 30–49 years, most of whom had rash and fever; none were hospitalized, and none died (Table 1). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[¶]

Cruise Ship A

On January 25, 2024, cruise ship A reported three crew members (patients 1–3) with rash, fever, lymphadenopathy, and cough to CDC; onset dates spanned January 18–25. On January 31, PCR testing detected orthopoxvirus in all three crew members. CDC confirmed clade II *Monkeypox virus* for all specimens.

Cruise ship A medical personnel isolated patients and interviewed them to ascertain exposures, identify contacts, and categorize their exposure risk. MicrobeTrace (version 9.0; CDC) (*4*) was used to visualize the contact-tracing network (Figure). The network consisted of 19 persons: the index patient (node 1) reported sexual contact[**] with two partners (nodes 2 and 3), resulting in a three-patient cluster with 16 other contacts (nodes A–P). The second patient (node 2) reported an additional sexual partner (node N). Remaining contacts had nonintimate exposures: seven health care workers (nodes F–L), six of whom (all but node L) were exposed to all patients; four cabinmates (nodes B, C, M, and O); two coworkers (nodes D and E); one friend (node P); and one cabin steward (node A).

No crew-member patients with mpox or their contacts had received mpox vaccination as preexposure prophylaxis (PrEP) and none reported being immunocompromised. Cruise ship A

[†] Federal regulations (42 CFR 71.21) require the master of a ship sailing from a non-U.S. port and destined for a U.S. port to immediately report to CDC any death or certain illnesses among the ship's passengers or crew members, including travelers who have disembarked or were removed from the ship due to illness or death (Reporting Death or Illness on Ships | Port Health | CDC). In addition, CDC receives notifications from U.S. health departments of communicable disease of public health concern in recent travelers.

[§] Mpox Case Definitions | Mpox | CDC

[¶] 45 C.F.R. part 46. 102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

[**] Because mpox lesions occur on parts of the body not covered by barrier methods, information on known protective barriers, such as condoms, was not collected for any of the identified patients. Safer Sex, Social Gatherings, and Mpox | Mpox | CDC

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TABLE 1. Reported characteristics of patients with mpox (N = 8) associated with four cruise ship voyages — United States, 2024

Characteristic	No.
Sex	
Male	8
Age group, yrs	
30–39	5
40–49	3
Traveler type	
Crew member	4
Passenger	4
Clinical signs and symptoms	
Rash	7
Lesion, location	
Genitals	4
Face	3
Extremities	3
Trunk	2
Fever	6
Lymphadenopathy	3
Cough	3
Myalgia	2
Tenesmus	2
Malaise	1
Sore throat	1
Pruritus ani	1
Headache	1
Outcome	
Hospitalization	0
Death	0
Received preexposure prophylaxis*	**3**
Crew member (n = 4)	0
Passenger (n = 4)	3

* 2 doses of JYNNEOS vaccine.

procured and offered mpox vaccine as postexposure prophylaxis (PEP) to all identified contacts. Five of 16 received 2 doses of JYNNEOS vaccine: three health care workers (nodes F, H, and J) and one coworker (node E) received PEP during days 6–9 after exposure. One sexual partner (node N) received PEP 16 days postexposure (2 days beyond the recommended PEP window).[††] Cruise ship A monitored contacts for mpox signs and symptoms until 21 days postexposure; no secondary cases were identified.

Cruise Ship B

On February 7, 2024, a health department in the state of Washington notified CDC of a passenger with confirmed clade II mpox (patient 4) who developed symptoms of tenesmus and pruritus ani 2 days after voyaging on a cruise marketed to gay and bisexual men with approximately 5,000 passengers (cruise ship B). Patient 4 reported approximately 50 sexual partners during the voyage. Despite the absence of personally identifying information to fully trace contacts, CDC initiated public health interventions because of concerns about additional exposures. At CDC's recommendation, the travel company distributed notification letters to all passengers and crew members regarding their *Monkeypox virus* exposure risk (Table 2). CDC obtained aggregate counts of the voyage's passengers by U.S. state or country of residence and sent notifications to 58 U.S. state health jurisdictions via CDC's Epidemic Information Exchange (Epi-X)[§§] and to 68 countries' International Health Regulations (IHR) National Focal Points. In addition, CDC notified the respective IHR National Focal Points for the three countries where cruise ship B had ported. On February 14, 2024, in response to the Epi-X notification, a California health department notified CDC of a second laboratory-confirmed clade II mpox case in a passenger on cruise ship B (patient 5) who experienced a genital rash on the day of disembarkation. Also on February 14, a Florida health department notified CDC of a suspected mpox case also in a cruise ship B passenger (patient 6), who experienced fever, myalgia, general pain, tenesmus, and a rash on the trunk, extremities, and perianal area 3 days after voyaging. Because patient 6's specimen was not suitable for PCR testing, the case was categorized as suspected. Patients 5 and 6 reported having had 25 and four sexual partners during the voyage, respectively; neither provided personally identifying information for sexual partners. All three passenger patients associated with cruise ship B's voyage had received 2 doses of JYNNEOS vaccine in 2022.

Cruise Ship C

On March 26, 2024, a health department in Kentucky notified CDC of a confirmed clade II mpox case (patient 7) in a passenger who had traveled on a cruise marketed to gay and bisexual men with approximately 3,000 passengers (cruise ship C). His symptoms began 10 days after he concluded the voyage, and he reported having approximately 40 sexual partners on board. CDC received notification 31 days after the voyage (i.e., postincubation period). In addition, the notification occurred after the 14-day window for PEP administration. Hence, public health interventions were not initiated. The patient had no history of mpox vaccination.

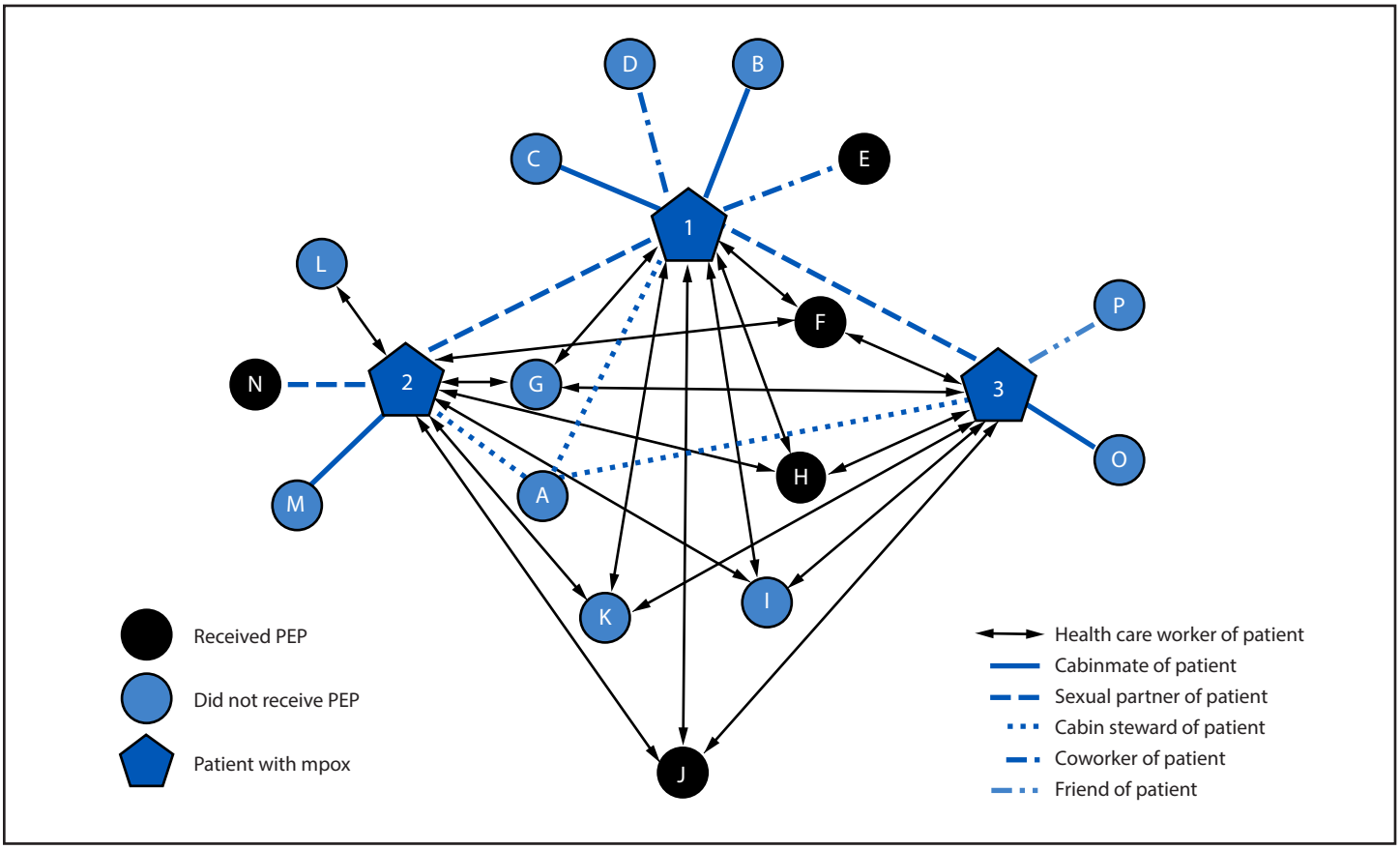
Cruise Ship D

On April 18, 2024, a California health department notified CDC of a confirmed clade II mpox case (patient 8) in a crew member on cruise ship D. On March 29, the patient went to the ship medical center with facial and extremity lesions and a history of sexual contact with a male partner before his March 19 ship embarkation; he reported no sexual contact while on board. CDC assisted cruise ship D with the case

[††] Interim Clinical Considerations for Use of Vaccine for Mpox Prevention in the United States | Mpox | CDC

[§§] Epi-X: The Epidemic Information Exchange

FIGURE. Contact-tracing network for three crew-member patients with mpox (nodes 1–3) and 16 contacts (nodes A–P) — cruise ship A, United States, January–February, 2024



Abbreviation: PEP = postexposure prophylaxis (JYNNEOS vaccine).

investigation, contact tracing, and PEP recommendations. Eight exposed crew-member contacts were identified; none reported history of mpox vaccination, and none was immunocompromised. No contacts met high or intermediate exposure risk criteria[¶¶] for mpox; therefore, PEP was not recommended. Contacts were monitored for 21 days, and none developed mpox. Patient 8 reported that mpox vaccine for PrEP was not available in his home country.

Discussion

This report highlights the potential for mpox transmission on cruise ships for both passengers and crew members. Prompt interventions that were conducted by cruise ship A might have prevented further transmission, including isolation of patients, contact tracing, and postexposure vaccination of unvaccinated contacts. None of the crew-member patients had previously completed the mpox vaccination series, despite being eligible to get the vaccine.[***]

Passenger patients were identified after voyaging on cruises marketed to gay and bisexual men. All developed symptoms on the day of disembarkation or after voyage completion, making it more likely that they were exposed, rather than sources of exposure, on the voyage; the index cases for these two voyages remained undetected. All identified passenger patients reported multiple sexual partners on board, suggesting widespread exposures and possibly additional undetected cases. Despite the lack of availability of personally identifying information to fully trace potential contacts, informational notifications identified two passenger patients.

Most of the passenger patients had received 2 doses of JYNNEOS vaccine in 2022. The occurrence of mpox infection in fully vaccinated persons is consistent with prior reports of infections in previously vaccinated persons, associated with multiple potential exposures (*5*). Although some persons might still become infected with mpox after completing the JYNNEOS vaccination series, mpox vaccination can help prevent illness, decrease disease severity, and prevent hospitalization and death (*5*–*7*).

[¶¶] Mpox Monitoring and Risk Assessment for People Exposed in the Community | Mpox | CDC
[***] Mpox Vaccination | Mpox | CDC

TABLE 2. Characteristics of patients with mpox and their contacts on four cruise ships and associated public health interventions, by voyage — United States, 2004

Cruise ship	Voyage type	No. of mpox cases		No. of contacts*				Public health intervention
		Crew member	Passenger	Received PrEP†	Identified	Sexual contact	Received PEP†	
A	Routine	3	0	0	16	1	5	Case isolation, contact tracing and monitoring, and mpox PEP
B	Marketed to gay and bisexual men	0	3	3	79	79	Unknown	Ship notification letters to passengers and crew members; CDC notifications to U.S. health departments and health authorities of affected countries
C	Marketed to gay and bisexual men	0	1	0	40	40	Unknown	None
D	Routine	1	0	0	8	0	0	Case isolation; contact tracing and monitoring

Abbreviations: PEP = postexposure prophylaxis; PrEP = preexposure prophylaxis.
* Contacts were enumerated while obtaining patients' exposure histories or during contact tracing (cabinmates, cabin stewards, coworkers, friends, health care workers, and sexual partners).
† 2 doses of JYNNEOS vaccine.

Summary

What is already known about this topic?

During the global clade II mpox outbreak, cases have disproportionately affected gay, bisexual, and other men who have sex with men (MSM). Cruise ship travel–associated mpox infections have not been previously described.

What is added by this report?

During January 25–April 18, 2024, CDC was notified of eight mpox cases on four cruise ships: four among crew members and four among passengers. All cases occurred among MSM; five of eight patients had not been vaccinated against mpox.

What are the implications for public health practice?

Cruise lines should consider educating crew members on symptoms, risks, and preventive measures related to mpox and working with medical personnel to facilitate mpox vaccination for eligible crew members. Cruise passengers who are recommended to get the vaccine should receive mpox vaccine before travel. For cruise voyages marketed to gay and bisexual men, mpox-prevention messaging and education before and during voyages are recommended.

Because the effectiveness of mpox vaccine for PEP is unclear and the challenge of identifying eligible persons within 4 days of exposure (when PEP is most effective), mpox vaccine as PrEP is preferred. Cruise lines should consider educating crew members on symptoms, risks, and preventive measures related to mpox and working with medical personnel to facilitate mpox vaccination as preexposure prophylaxis for eligible crew members, to help protect them from infection and reduce risk for potential onboard exposures. Cruise passengers who are eligible should receive mpox vaccine before cruise travel, with the second dose administered at least 2 weeks before travel to optimize effectiveness (*8*). Persons receiving mpox vaccine should be informed that infections might occur despite vaccination but could be less severe. For cruise voyages marketed to gay and bisexual men, having mpox vaccine available on board would facilitate timely PEP, if indicated; disseminating mpox prevention messaging and education††† to passengers and crew members before and during a voyage are also recommended.

††† Preventing Mpox | Mpox | CDC

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Clade Ib Mpox Outbreak — Kenya, July 2024–February 2025

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Abstract

Since July 2024, Kenya has been experiencing an mpox outbreak caused by clade Ib *Monkeypox virus (*MPXV), a newly recognized variant that has spread from the Democratic Republic of the Congo to multiple countries within and outside of Africa. This report describes the characteristics of laboratory-confirmed clade Ib mpox cases in Kenya during the first 7 months of the outbreak. Among 447 suspected cases during July 2024–February 2025, a total of 48 (10.7%) were confirmed by polymerase chain reaction testing. Most confirmed cases occurred along a highway from the Indian Ocean port in Mombasa to Malaba at the Ugandan border, a transportation corridor that links Kenya to other East and Central African countries. Among the 48 confirmed cases, 27 (56.3%) occurred among persons associated with the transportation corridor, including truck drivers (12; 25.0%), sex workers (eight; 16.7%), and persons employed at or near trucking stopovers (seven; 14.6%). Sexual transmission was suspected in 30 (62.5%) cases, based on the patient's history or locations of the lesions; 11 (22.9%) patients also had HIV infection, one of whom died. Clade Ib MPXV in Kenya appears to be primarily sexually transmitted and concentrated in specific groups at high risk for infection. Public health measures, including vaccination, might be most effective if they focus on these specific groups and geographic areas.

Introduction

Mpox is an emerging global public health threat, with outbreaks primarily caused by clade II *Monkeypox virus* (MPXV) reported from multiple countries since 2022 (*1*–*3*). Since late 2023, the eastern region of the Democratic Republic of the Congo (DRC) has reported an increase in cases caused by a newly recognized subclade, clade Ib MPXV. This strain has spread primarily through sexual transmission in countries that have not previously reported mpox cases (*3*,*4*). In August 2024, the Africa Centres for Disease Control and Prevention and the World Health Organization both escalated the clade Ib mpox outbreak to their highest respective public health threat levels.* Although clade I MPXV has historically been associated with small outbreaks in Central Africa after zoonotic transmission in rural forested areas with limited human-to-human spread, sustained human-to-human transmission appears to be an important characteristic of this outbreak (*5*,*6*). Information on the epidemiologic characteristics of clade Ib mpox is limited. Kenya confirmed its first clade Ib mpox case on July 29, 2024.† This report describes the characteristics of patients with confirmed mpox cases during the first 7 months of the clade Ib outbreak. These findings can be used to guide response strategies.

Methods

Data Sources

Epidemiologic and clinical information was extracted from mpox outbreak investigation documents for July 29, 2024, through February 28, 2025, including case investigation forms, outbreak investigation reports, and information from health care facilities about characteristics of patients with confirmed cases. Persons with suspected infection identified at health care facilities or through contact tracing investigations were isolated, either at a health facility or at their homes, and interviewed by public health workers using a standardized questionnaire to collect demographic, clinical, and behavioral information. Contact tracing was conducted for persons with confirmed mpox cases to identify potential secondary cases. A suspected mpox case was defined as the occurrence of an unexplained rash and at least one constitutional symptom (headache, fever of >101.3°F [>38.5°C], lymphadenopathy, myalgia, back pain, or asthenia) in a person with either recent (within the preceding 3 weeks) travel to a country experiencing an mpox outbreak or contact with such a person within the preceding 3 weeks. A confirmed case was defined as a suspected case with a positive MPXV polymerase chain reaction (PCR) or genomic sequencing result. MPXV PCR testing was performed at the Kenya National Public Health Laboratory.§ The MPXV clade was confirmed through genomic sequencing (*7*) at the Kenya

* Africa CDC | Africa Declares Mpox a Public Health Emergency of Continental Security, Mobilizing Resources Across the Continent; World Health Organization | WHO Director-General Declares Mpox Outbreak a Public Health Emergency of International Concern

† Other countries with sustained transmission of clade Ib mpox: Burundi, Democratic Republic of the Congo, Kenya, Malawi, Rwanda, South Sudan, Tanzania, Uganda, and Zambia (CDC | Mpox in the United States and Around the World: Current Situation). Sustained transmission was defined as at least 10 confirmed cases associated with community transmission reported during the past 6 weeks, or alternatively, one to nine confirmed cases associated with community transmission reported from at least four geographic locations.

§ Specimens were collected by swabbing lesions on least two body locations of each patient. Each patient's swabs were placed together in the same media and transported to the National Public Health Laboratory in Nairobi.

Medical Research Institute/Walter Reed Army Institute of Research laboratory in Kisumu.

Exposure Categories

MPXV exposures were categorized as suspected sexual contact, nonsexual contact, or unknown contact. Cases suspected to be sexually transmitted were those diagnosed in a person who reported a new sexual partner or who engaged in transactional sex during their incubation period and those for which the investigation suggested exposure through sex (e.g., a symptomatic sexual partner or primary lesions in the genital area). Nonsexually transmitted cases were defined as those for which the investigation did not suggest sexual transmission (e.g., a case in a child living in the same household). The exposure category for cases that were not classified as sexually or nonsexually transmitted were classified as unknown. A prodrome was defined as experiencing any signs or symptoms (e.g., fever or headache) at least 1 day before rash onset.

Analysis

Descriptive analyses of confirmed cases[¶] were performed in R (version 4.4.2; R Foundation). The Kenya Ministry of Health (MOH) and county health departments granted permission to conduct investigations as part of an ongoing public health emergency, and patients consented to interviews and MPXV testing. This activity was reviewed by CDC, deemed not research, and conducted consistent with applicable federal law and CDC policy.[**]

[¶] Four children who were household contacts of a single person with a confirmed case received positive MPXV test results (specimens taken via nasopharyngeal swab) but remained asymptomatic. PCR cycle threshold values were high (indicating low virus levels); no serologic testing was conducted to assess for evidence of MPXV exposure. The four children were not included in the analysis because their test results were suspected to be a result of environmental or laboratory contamination, which has previously been documented with MPXV (CDC | CDC's Laboratory Outreach Communication System (LOCS). 08/23/2022: Lab Advisory: Mpox virus testing considerations to prevent false positive test results).

Results

Characteristics of Patients with Confirmed Clade Ib Mpox

Among 447 suspected cases tested by PCR during July 2024–February 2025, a total of 48 (10.7%) were confirmed positive. All confirmed clade Ib mpox cases in Kenya (Figure 1) were detected along a transportation corridor that connects Kenya's international southeastern seaport in Mombasa with Malaba, on the country's western border with Uganda (Figure 2). Among the 48 persons with confirmed mpox, 28 (58.3%) were women, and the median age was 35.0 years (IQR: 29.0–38.0 years) (Table). Three (6.3%) were children aged ≤14 years. Eleven (22.9%) patients had HIV infection, all of whom had received some HIV treatment. A prodrome was reported by 17 (35.4%) patients. All persons with confirmed cases developed a generalized body rash, and 33 (68.7%) had genital lesions. Most patients had at least one health care visit for their illness before mpox was suspected, including 24 (50.0%) with one visit and 16 (33.3%) with two or more visits. The median interval between rash onset and laboratory confirmation was 7.5 days (IQR: 5–13 days).

[**] 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

FIGURE 1. Number of clade Ib mpox cases, by week of confirmation (N = 48) — Kenya, July 2024–February 2025

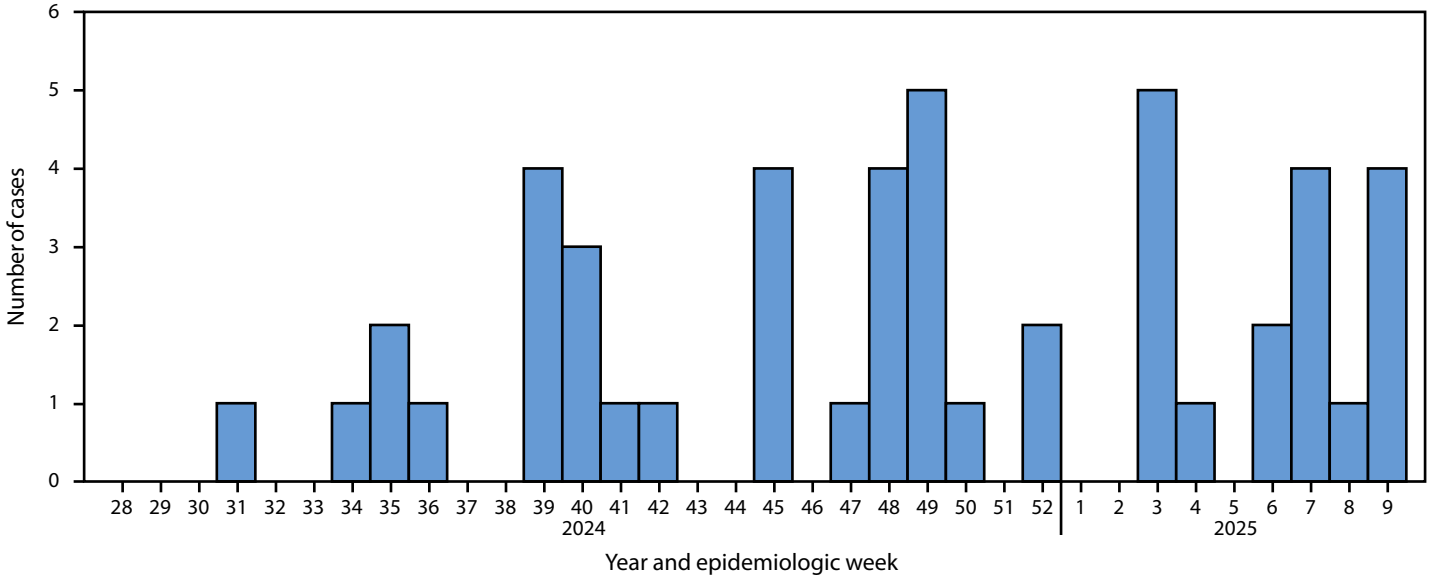
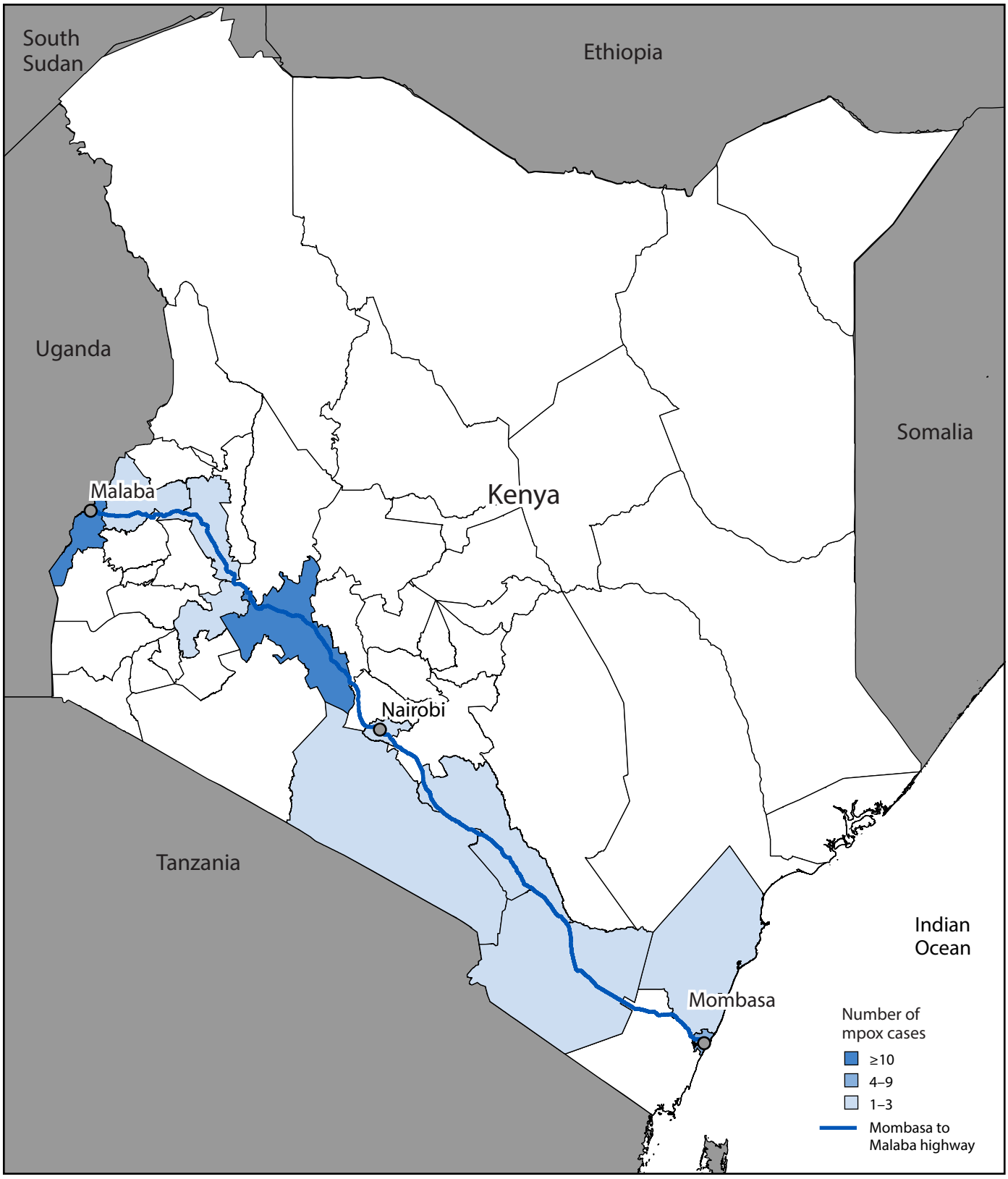


FIGURE 2. Number of confirmed clade Ib mpox cases, by county of report and proximity to the highway from Mombasa to Malaba — Kenya, July 2024–February 2025*



* Number and percentage of cases, by county: Bungoma: three (6%); Busia: 12 (25.0%); Kajiado: two (4%); Kericho: two (4%); Kilifi: two (4%); Makueni: two (4%); Mombasa: nine (19%); Nairobi: three (6%); Nakuru: 10 (21%); Taita Taveta: two (4%); Uasin Gishu: one (2.1%).

TABLE. Demographic and clinical characteristics of persons with confirmed clade Ib mpox (N = 48) — Kenya, July 2024–February 2025

Characteristic	No. (%)
Sex	
Female	28 (58.3)
Male	20 (41.6)
Age group, yrs	
0–14	3 (6.3)
15–29	6 (12.5)
30–44	36 (75.0)
≥45	3 (6.3)
Occupation	
Truck driver	12 (25.0)
Sex worker	8 (16.7)
Employee at or near a truck stopover	7 (14.6)
Other occupation	9 (18.8)
Housewife	6 (12.5)
None (e.g., child)	6 (12.5)
HIV status	
Negative	11 (22.9)
Positive	11 (22.9)
Unknown	26 (54.2)
History of international travel	
Yes*	18 (37.5)
No	27 (56.2)
Unknown	3 (6.3)
Suspected sexual transmission	
Yes	30 (62.5)
No	5 (10.4)
Unknown	13 (27.1)
No. of health care visits before mpox suspected	
0	3 (6.3)
1	24 (50.0)
≥2	16 (33.3)
Unknown	5 (10.4)
No. of days from symptom onset† to laboratory confirmation	
≤2	3 (6.3)
3–5	15 (31.3)
6–9	11 (22.9)
≥10	19 (39.6)
No. of close contacts§	
0	0 (—)
1–4	9 (18.8)
5–9	9 (18.8)
10–19	8 (16.7)
≥20	8 (16.7)
Unknown	14 (29.2)
Prodrome present	
Yes	17 (35.4)
No	31 (64.6)
Signs and symptoms	
Generalized rash	48 (100)
Fever	41 (85.4)
Genital lesions	33 (68.7)
Headache	20 (41.7)
Sore throat	19 (39.6)
Cough	14 (29.2)
Lymphadenopathy	7 (14.6)
Outcome	
Recovered (one fetal death)¶	47 (97.9)
Death**	1 (2.1)

* Countries visited included the Democratic Republic of the Congo, Rwanda, Tanzania, and Uganda, all of which are experiencing clade Ib mpox outbreaks at the time of this report.
† If a prodrome was present (any signs or symptoms such as fever or headache at least 1 day before rash onset), the date of rash onset was used.
§ Number of close contacts was not collected for six cases.
¶ A pregnant woman with confirmed mpox recovered but delivered a stillborn fetus at 38 gestational weeks.
** One patient died 30 days after rash onset. The patient, who had advanced HIV disease, was hospitalized for cryptococcal meningitis and had secondarily superinfected anogenital lesions and severe constipation.

Outcomes of Patients with Confirmed Clade Ib Mpox

One patient died. The patient had advanced HIV disease and was not receiving antiretroviral therapy.†† The death occurred 30 days after rash onset while the patient was hospitalized for cryptococcal meningitis and had secondarily superinfected anogenital lesions and severe constipation. In addition, a pregnant woman delivered a stillborn fetus at 38 gestational weeks. All other patients recovered.

Potential Sources of Exposure

Among patients with confirmed cases, 18 (37.5%) reported travel to nearby countries experiencing active clade Ib mpox outbreaks during their incubation period (i.e., DRC, Rwanda, Tanzania, or Uganda); five (10.4%) did not have an epidemiologic link to any other cases or report recent travel. Twelve cases (25.0%) occurred in truck drivers; eight (16.7%) in sex workers, all of whom reported having clients who were truck drivers; and seven (14.6%) in persons employed at or near truck stopovers. Genomic sequencing of specimens from 33 patients with confirmed mpox identified the circulating strain as clade Ib MPXV (Kenya MOH, Mpox Situation Report 180, unpublished data, March 3, 2025).

MPXV was suspected to have been transmitted through sexual contact for 30 (62.5%) patients; other means of transmission included close, nonsexual household contact (five; 10.4%) and unknown means (13; 27.1%). The median number of close contacts per case was 7.5 persons (IQR: 4.3–15.8). Among 490 identified close contacts, 10 secondary cases were identified (secondary transmission rate: 2.0%).

Public Health Response

The Kenya MOH led the mpox outbreak response. MOH activated the Kenya Public Health Emergency Operations Center (EOC), an incident management system, after detecting

†† The patient who died met World Health Organization stage 4 classification criteria for a severe opportunistic infection that indicates significant immune suppression (World Health Organization | WHO case definitions of HIV for surveillance and revised clinical staging and immunological classification of HIV-related disease in adults and children). The official cause of death was not available at the time of this report.

the index case, and affected counties activated their county-level emergency operations centers. Field epidemiologists investigated confirmed cases and conducted contact tracing. Persons with a diagnosis of confirmed mpox were isolated in hospitals or their homes. MOH heightened its mpox surveillance, including developing and circulating case definitions and clinical management guidelines for frontline health workers across Kenya. MOH also intensified screening measures at points of entry[§§] for travelers with mpox signs and symptoms, linking travelers with suspected cases to public health workers, as well as increased distribution of mpox information. Laboratory systems were strengthened with MPXV PCR capability established in four laboratories in Kenya, and genomic sequencing was used to confirm the clade (*7*). Kenya instituted public awareness efforts by briefing the media, distributing educational materials, and meeting with affected groups and the public. Kenya requested and received mpox vaccine as part of the Access and Allocation Mechanism and is planning a July 2025 vaccination campaign for the highest risk groups.[¶¶] Through the EOC, MOH collaborated with other Kenyan government agencies and multilateral entities to respond to the mpox outbreak.

Discussion

A clade Ib mpox outbreak has been occurring in Kenya since July 2024. Most confirmed cases occurred in persons associated with the transportation corridor that links Kenya to other East and Central African countries, many of which have ongoing clade Ib mpox outbreaks. The interaction between truck drivers and sex workers might play a role in mpox transmission in this country. Evidence of secondary transmission appears limited; however, the risk for ongoing transmission remains because of the country's regional commercial connectivity. Widespread mpox in Kenya could directly affect the health care system, which is already managing an HIV epidemic; HIV is a risk factor for severe mpox (*8*). Although HIV affects the general population in Kenya, certain populations are disproportionately affected, including sex workers. The one reported death associated with clade Ib mpox in Kenya occurred in a person with HIV infection that was complicated by an opportunistic infection. Public health interventions, including mpox vaccination, that focus on groups at high risk for infection could be important to mitigating additional spread and limiting morbidity and mortality.

Kenya's mpox outbreak highlights the challenges of controlling infectious disease outbreaks in highly connected geographic regions. Multiple mpox cases in persons who traveled to countries with widespread clade Ib transmission and who had no epidemiologic links to other cases in Kenya suggest that multiple introductions are occurring in the country. However, the identification of cases in persons with no travel history or epidemiologic link to other cases also suggests undetected community transmission in Kenya. Genomic epidemiology might supplement epidemiologic findings from case investigations by providing insights into potential transmission networks among cases that otherwise seem unrelated. Whereas many initial infections appear to have been acquired through sexual contact, subsequent transmission within households can occur if appropriate isolation measures are not implemented.

During the first 7 months of the clade Ib mpox outbreak in Kenya, the country documented approximately 500 MPXV tests. Although MOH has circulated case definitions and trained health care workers in mpox diagnosis, case management, and infection prevention, the testing numbers are low, possibly reflecting lack of knowledge about mpox in the general public and among health care workers. Some patients made several health care visits before mpox was suspected. The differential diagnosis of mpox is broad. One of the primary conditions that confounds diagnosis is infection with varicella (chickenpox) (*9*,*10*), which causes seasonal outbreaks in Kenya. Additional outreach to increase awareness of mpox signs and symptoms could facilitate timely detection of cases and isolation of patients. Although multiple laboratories in Kenya can conduct molecular testing, mpox testing was only available in four laboratories in Nairobi and Kisumu during the period in this report. Expanding mpox laboratory diagnostics in other geographic areas and using rapid diagnostic tests with adequate sensitivity could also reduce the time between symptom onset and mpox confirmation. Vaccinating persons highest at risk for acquiring mpox might help halt transmission within Kenya and to other countries.

The increasing numbers of mpox cases globally in recent years is likely a result of many factors. These include increases in mpox exposures (i.e., increases in sexual transmission, ease of international travel, and encounters with animal reservoirs), improvements in disease surveillance, and decreasing population-level immunity to orthopoxviruses, the genus that includes MPXV and *Variola virus* (smallpox), as the cohort vaccinated against smallpox ages (*3*).

Limitations

The findings in this report are subject to at least two limitations. During outbreaks, staff members responsible for data collection often are also responding to other demands of the public health emergency, which can affect the completeness and quality of the data. Second, surveillance and laboratory

[§§] World Health Organization | Considerations for Border Health and Points of Entry for Mpox

[¶¶] Republic of Kenya, Ministry of Health | Kenya Receives 10,700 Doses of Mpox Vaccines for the High Risk Population

Summary

What is already known about this topic?

Since July 2024, Kenya has been experiencing an mpox outbreak caused by clade Ib *Monkeypox virus*, a newly recognized subclade.

What is added by this report?

Among 48 laboratory-confirmed clade Ib mpox cases diagnosed in Kenya during July 2024–February 2025, a total of 27 (56.3%) occurred among persons who worked as truck drivers, or were in contact with them, along a highway from Mombasa to Malaba, a transportation corridor that links Kenya to other East and Central African countries. Two thirds (30; 63%) of the cases were likely to have been sexually transmitted. Eleven (23%) patients also had HIV infection, one of whom died.

What are the implications for public health practice?

Public health measures, including vaccination focusing on those most at risk for mpox such as truck drivers, sex workers, and persons traveling to countries with ongoing clade Ib mpox outbreaks, might help stop the spread of the disease within Kenya and to other countries.

gaps might have resulted in missed cases and an overall underestimation of total number of cases.

Implications for Public Heath Practice

As the mpox outbreak evolves in Kenya, public health measures focusing on interventions to interrupt transmission are critical, such as vaccination of persons at highest risk for infection, including truck drivers and sex workers (preexposure prophylaxis) and close contacts of mpox patients (postexposure prophylaxis).*** The strengths of Kenya's existing HIV program could be used to improve risk communication and outreach efforts and minimize mpox-associated morbidity and mortality among groups disproportionately affected by both viruses. Public health messaging focusing on sexual and nonsexual transmission also are important for controlling the outbreak. These interventions could help protect populations at risk for severe mpox, including those living with HIV, and help prevent mpox transmission to other countries.

*** World Health Organization | Mpox

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Use of JYNNEOS (Smallpox and Mpox Vaccine, Live, Nonreplicating) for Persons Aged ≥18 Years at Risk for Mpox During an Mpox Outbreak: Recommendations of the Advisory Committee on Immunization Practices — United States, 2023

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Abstract

Since the worldwide eradication of smallpox in 1980, orthopoxvirus vaccines had been used nearly exclusively by persons at risk for occupational exposure to orthopoxviruses, including *Monkeypox virus*, the virus that causes mpox. However, during recent years, the epidemiology of mpox has been changing in countries where the animal reservoirs are believed to live and where endemic transmission has been known to occur for decades. CDC issues outbreak-specific vaccination recommendations based on the epidemiology at the time specific cases or clusters are identified; however, because of the increased risk for U.S. mpox outbreaks, the Advisory Committee on Immunization Practices (ACIP) reviewed results from a previously performed modified Grading of Recommendations Assessment, Development, and Evaluation of the 2-dose JYNNEOS (smallpox and mpox vaccine, live, nonreplicating) vaccination series and an Evidence to Recommendations (EtR) framework addressing multiple domains (e.g., benefits, harms, and target population values and preferences). Based on this assessment, ACIP recommended the use of JYNNEOS (a live, replication-deficient vaccinia virus vaccine) for persons aged ≥18 years at risk for mpox during an mpox outbreak (irrespective of clade). Because the cause of future mpox outbreaks and the populations affected by these outbreaks remain uncertain, public health authorities will continue to issue outbreak-specific vaccination guidance when outbreaks occur. A clade IIb mpox outbreak that began in 2022 continued to cause substantial morbidity and mortality >1 year later. Although CDC had issued outbreak-specific vaccination guidance, it was anticipated that the outbreak would be protracted. For this reason, ACIP reviewed a second EtR framework about outbreaks and in 2023 recommended JYNNEOS for persons aged ≥18 years at risk for acquiring mpox during the multinational clade IIb outbreak. As of 2025, cases continue to occur; however, the future need for the recommendation will be reassessed as the outbreak evolves. Mpox vaccination is not routinely recommended for health care personnel during mpox outbreaks, including during the ongoing clade IIb outbreak.

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Introduction

Monkeypox virus and Mpox Disease

Mpox is a zoonotic infection caused by *Monkeypox virus* (MPXV), a double-stranded DNA virus in the *Orthopoxvirus* genus. The disease is endemic in certain West and Central African countries, particularly in remote and forested areas, where the (as yet undetermined) animal reservoirs are believed to live. Infection is spread from person-to-person via direct contact with infectious lesions (including during sex), respiratory secretions, and fomites; infection can result in deep-seated, well-circumscribed, and often painful lesions that can involve various parts of the body including palms and soles. In endemic countries, mpox can spread from infected animals to humans. The first human mpox case was identified in the Democratic Republic of the Congo in 1970 (*1*) and was initially confused with smallpox, a disease also caused by an orthopoxvirus (*Variola virus*), but that was globally eradicated by 1980 (*2*). Two clades (subtypes) of mpox are recognized: clade I (endemic in the Central African Republic, the Democratic Republic of the Congo, Gabon, the Republic of the Congo, and part of Cameroon), and clade II (endemic in Côte d'Ivoire, Liberia, Nigeria, Sierra Leone, and part of Cameroon). Each clade has been further categorized into subclades because of mutations or deletions in the genome (*3*,*4*).

U.S. Mpox Cases Before and During 2022

During 2003, the first mpox outbreak outside of Africa occurred in the United States. The outbreak was caused by clade IIa[†] MPXV and resulted in 47 human cases in six midwestern states, all of which were associated with pet prairie dogs that had previously been housed with small mammals imported from West Africa.[§] Outbreaks associated with exposure to MPXV-infected animals have not reoccurred in the United States; however, other types of mpox outbreaks have occurred. Twice during 2021, unrelated clade IIb cases were recognized

[†] Subclade designations were made after the global clade IIb outbreak in 2022. When the newer sequences were identified as clade IIb, the previous ones were retrospectively designated clade IIa.

[§] Past U.S. Cases and Outbreaks | Mpox | CDC

among travelers from a country with endemic MPXV (*5*,*6*). No secondary cases occurred, but close contacts were monitored for 21 days and postexposure vaccinations considered. In May 2022, a global outbreak caused by clade IIb MPXV began, disproportionately affecting certain gay, bisexual, and other men who have sex with men (MSM) (*7*). Vaccinations were recommended for pre- and postexposure prophylaxis but unlike other mpox outbreaks in the United States, this outbreak has had a protracted course; to date, there have been approximately 35,000 U.S. cases,[¶] and long-term sequelae and deaths have been reported (*8*,*9*).

Coincident with U.S. outbreaks, mpox epidemiology has been changing in countries where the virus is endemic. Cases are 1) no longer restricted to remote and isolated regions, 2) occurring in higher numbers than in previous years, and 3) occurring in certain countries that have not reported a single human MPXV infection in decades (*10*). Reasons for the changes have been hypothesized to include deforestation, demographic changes, population movement, and waning protection after cessation of routine smallpox vaccination (*1*). These epidemiologic patterns have increased the risk for future mpox outbreaks, including in the United States.

Currently Licensed Orthopoxvirus Vaccines and Previous Vaccination Recommendations

Two orthopoxvirus vaccines are currently licensed in the United States. ACAM2000[**] is a live, replication-competent vaccinia virus vaccine licensed in 2007; JYNNEOS (smallpox and mpox vaccine, live, nonreplicating),[††] is a live, replication-deficient vaccinia virus vaccine licensed in 2019. In 2022, ACIP had recommended JYNNEOS, as an alternative to ACAM2000, for persons aged ≥18 years at risk for occupational exposure to orthopoxviruses (*11*). The recommendations were not limited to MPXV and were developed before the 2022 clade IIb outbreak, when U.S. cases were sporadic and fewer persons were at risk for MPXV exposure. A modified Grading of Recommendations Assessment, Development, and Evaluation (GRADE) that had been performed at that time compared JYNNEOS (the more recently licensed vaccine) to ACAM2000 (a derivative of the vaccine used to eradicate smallpox). There were no ACIP recommendations about mpox outbreaks; however, CDC issued interim vaccination recommendations at the time a specific case or cluster of cases was identified. A single U.S. case was considered an outbreak because of the rarity of these occurrences and the substantial resources needed to investigate and offer vaccinations (*5*); however, outbreaks were typically short in duration, so vaccination recommendations were also typically short term. JYNNEOS was available for the first time in the United States during the 2022 outbreak and has a more favorable safety profile and fewer contraindications than does ACAM2000 (*11*); for this reason, JYNNEOS has been the vaccine used nearly exclusively during the 2022 outbreak.

Consideration for JYNNEOS Use During Mpox Outbreaks

Because of increased risk for mpox outbreaks in the United States, ACIP began considering data about the use of JYNNEOS for persons aged ≥18 years at risk for mpox during future mpox outbreaks. The populations at risk differ depending on the epidemiology of a specific outbreak; therefore, public health authorities will continue to issue outbreak-specific guidance, including the populations for whom vaccinations are recommended. However, unlike other U.S. mpox outbreaks, the specific clade IIb outbreak that began in 2022 had continued to cause substantial morbidity and mortality more than 1 year after CDC had recommended JYNNEOS; in addition, only one in four persons recommended to receive the vaccine had received both JYNNEOS doses.[§§] Anticipating a more protracted outbreak than has occurred during previous U.S. outbreaks, ACIP also considered an outbreak-specific recommendation about use of JYNNEOS for persons aged ≥18 years at risk during that specific outbreak.

Methods

ACIP Mpox Work Group

The ACIP Mpox Work Group was constituted to review available evidence (e.g., vaccine effectiveness, safety, and mpox epidemiology); it comprised experts in diverse disciplines, including laboratory, public health, regulatory affairs, preparedness, and various clinical topics (e.g., immunology, vaccine safety, vaccination strategy, infection control, worker safety, occupational health, HIV and other sexually transmitted infections, mpox, obstetrics and gynecology, and pediatrics). Federal partners represented multiple U.S. agencies. During September 30, 2022–October 25, 2023, the work group held 30 weekly or biweekly teleconferences to review the scientific evidence.

Recommendation Considerations

The work group reviewed the 2022 GRADE assessment findings and considered domains within the Evidence to Recommendations (EtR) framework (a process for transparently describing information considered in moving recommendations from evidence to decisions).[¶¶] Data were considered for use of JYNNEOS for persons aged ≥18 years 1) at risk

[¶] U.S. Case Trends: Clade II Mpox | Mpox | CDC
[**] Package Insert - ACAM2000 | FDA
[††] Package Insert - JYNNEOS (Refrigerator) | FDA
[§§] JYNNEOS Vaccine Coverage by Jurisdiction | Mpox | Poxvirus | CDC
[¶¶] Evidence-Based Recommendations for ACIP | ACIP | CDC

for acquiring mpox during any mpox outbreak and 2) at risk during the ongoing global clade IIb outbreak. Evaluated domains included benefits and harms, target population values and preferences, and issues of resource use, acceptability to stakeholders, feasibility of implementation, and anticipated impact on vaccine access. In preparation for a vote, ACIP considered these data and newly collected information from the 2022 outbreak. ACIP also reviewed language about the use of JYNNEOS for persons at occupational risk for exposure to MPXV during an mpox outbreak and considerations for future mpox outbreaks.

Summary of Findings and Rationale for Recommendations

No clinical disease endpoints are available comparing the effectiveness of vaccines against mpox, but prelicensure data involved geometric mean titers and seroconversion data. The 2022 GRADE review*** evaluated these data from three randomized controlled studies and 15 observational studies. After considering the published studies in GRADE, the work group estimated with moderate certainty that the 2-dose JYNNEOS primary series provides a small increase in disease prevention against MPXV compared with that provided by ACAM2000.††† The work group also had low certainty that fewer serious adverse events occur after the JYNNEOS primary series compared with those after the ACAM2000 primary series and that fewer events of myopericarditis occur after the JYNNEOS primary series than after the ACAM2000 primary vaccination. Based on the sum total of their assessment, including the EtR frameworks,§§§,¶¶¶ ACIP voted unanimously in favor of two recommendations.

Recommendations

On February 22, 2023, ACIP voted to recommend the 2-dose JYNNEOS vaccination series**** for persons aged ≥18 years who are considered to be at risk for mpox during an mpox outbreak.†††† On October 25, 2023, ACIP voted to recommend the 2-dose JYNNEOS vaccination series for persons aged ≥18 years who are at risk for acquiring mpox during the ongoing clade IIb outbreak that began in 2022. For the latter vote, persons at risk included 1) MSM§§§§ who, during the past 6 months, have had or anticipate experiencing at least one of the following: a new diagnosis of one or more sexually transmitted infections, more than one sex partner, sex at a commercial sex venue, or sex in association with a large public event in a geographic area where mpox transmission is occurring; 2) sexual partners of persons who have any of these risk factors; and 3) persons who anticipate experiencing any of these risk factors.¶¶¶¶

Clinical Considerations

Clinical considerations have been communicated on the CDC website since the start of the multinational clade IIb outbreak in 2022. These considerations were also reviewed by ACIP and included in this report.

Vaccine Effectiveness

Like other licensed orthopoxvirus vaccines, JYNNEOS contains vaccinia virus, a less virulent orthopoxvirus than either MPXV or variola virus (the causative agent of smallpox). Owing to a high level of protein identity among orthopoxviruses, vaccinia virus vaccines elicit antibodies that provide cross-protection against other orthopoxviruses, including MPXV; this cross-protection was the foundation for the successful global smallpox eradication campaign (*2*). Vaccinia virus and MPXV have a high level (>90%) of nucleotide identity (*12*), and real-world data from the clade IIb outbreak demonstrate vaccine effectiveness (VE) of the 2-dose series ranging from 66% to 89% (*13*–*16*). VE is unlikely to differ across mpox clades because JYNNEOS is a whole-virus vaccine, which elicits an immune response to many vaccinia viral proteins (not to just a subset of viral proteins, as might occur with subunit vaccines). VE might depend on the route of exposure (e.g., mucosal versus other), frequency of exposure, and level of immunocompromise of affected persons. Infections despite vaccination could occur; however, JYNNEOS prevented or decreased the severity of many infections during the ongoing clade IIb outbreak and is expected to be similarly effective during future outbreaks (irrespective of clade).

*** Grading of Recommendations, Assessment, Development, and Evaluation (GRADE): Use of JYNNEOS (orthopoxvirus) vaccine primary series for research, clinical laboratory, response team, and healthcare personnel (Policy Questions 1 and 2) | ACIP | CDC

††† Although this reflects the findings of the analysis, basic science data which are not included in GRADE supports that ACAM2000 would likely be more effective in prevention of mpox (or smallpox) than JYNNEOS.

§§§ Evidence to Recommendations 1

¶¶¶ Evidence to Recommendations 2

**** Dose 2 should be administered 28 days after dose 1.

†††† Public health authorities will determine whether an mpox outbreak is occurring; a single case might be considered an mpox outbreak at the discretion of public health authorities. Other circumstances in which a public health response might be indicated include ongoing risk for introduction of mpox into a community because of disease activity in another geographic area.

§§§§ Wording previously published (Recommended Adult Immunization Schedule for ages 19 years or older-2024 U.S. | CDC) has been amended to comply with Executive Order 14168. Defending Women from Gender Ideology Extremism and Restoring Biological Truth to the Federal Government – The White House

¶¶¶¶ Because there might be stigma associated with affirming risk factors, clinicians should consider vaccinating persons who request vaccination (i.e., self-attest to vaccine eligibility) without requiring specification of the criterion that deems eligibility.

Population Considerations

Future mpox outbreaks might differ epidemiologically by populations affected, numbers of cases, and types of activities for which vaccination is indicated. Because of this inherent variability, public health authorities will issue guidance specific to each outbreak. Vaccination might be advised for preexposure or postexposure protection, for a few persons or many persons, and for persons with only certain exposures or risk factors (e.g., medical, behavioral, or occupational). The specific vaccination recommendations will depend on the epidemiology of the outbreak. For the ongoing clade IIb outbreak, the epidemiology is well understood, and for this reason, ACIP was able to specify persons at risk. However, as epidemiology for this outbreak evolves, public health authorities will continue to issue additional guidance. As of 2025, cases, including deaths, continue to occur. To avoid potential stigma associated with affirming risk factors during the ongoing outbreak, clinicians should consider vaccinating persons who request vaccination (i.e., self-attest to vaccine eligibility) without requiring specification of eligibility criteria. Clinicians and public health authorities should be aware that sexual partners of MSM with a new diagnosis of one or more sexually transmitted infections, more than one sex partner, sex at a commercial sex venue, or sex in association with a large public event in a geographic area where mpox transmission is occurring are recommended to be vaccinated. Such persons might include women. However, MSM without risk factors (e.g., those in a monogamous relationship) are not among the population recommended to be vaccinated.

JYNNEOS is contraindicated in persons with a history of a severe allergic reaction (e.g., anaphylaxis) after a previous JYNNEOS dose or to any component of the vaccine (*17*). Similar to other vaccines, JYNNEOS might be less effective in severely immunocompromised persons, but it has been shown to be safe and immunogenic in persons with well-controlled HIV, atopic dermatitis, eczema, or other exfoliative skin conditions (*18*,*19*). No human data regarding safety of JYNNEOS administration during pregnancy or breastfeeding are available; however, JYNNEOS is a nonreplicating vaccine, and data from animal models, including rats and rabbits, have shown no evidence of harm to a developing fetus (Table 1). CDC does not recommend vaccination for any persons who have recovered from mpox or any other orthopoxvirus infection because recovery from MPXV infection (regardless of clade) likely confers protection from either clade of mpox. Persons who have recovered from mpox can experience reinfection; however, CDC surveillance data suggest this is very rare. Surveillance data through June 2025 suggest that reinfections have occurred in <0.001% of U.S. persons who previously had mpox. In these rare instances, the second infection was generally milder than the initial infection.*****

Health Care Personnel and Laboratorians

For decades, ACIP has recommended that some U.S. persons at occupational risk for exposure to orthopoxviruses receive preexposure vaccination (*20*). Most of these persons have

***** Interim Clinical Considerations for Use of Vaccine for Mpox Prevention in the United States | Mpox | CDC

TABLE 1. Clinical considerations for use of JYNNEOS* in special populations during an mpox outbreak — United States, 2025

Population	Clinical considerations
Persons with atopic dermatitis, eczema, or other exfoliative skin conditions	• No precautions needed. • Studies described in the package insert have indicated JYNNEOS is safe and effective in these circumstances.
Persons with immunocompromising conditions†	• No precautions needed. • JYNNEOS is safe in these persons because although it is a live virus vaccine, the virus is nonreplicating; it therefore acts like a nonlive vaccine but similar to other vaccines, JYNNEOS might be less effective in persons with severe immunocompromise • Affected persons should be counseled so that preventing exposures remains a high priority regardless of vaccination status.
Pregnant women	• Available data on JYNNEOS administered during pregnancy are insufficient to determine vaccine-associated risk in pregnancy; however, the package insert describes data involving animal models (e.g., rat and rabbit models) that have shown no evidence of harm to the developing fetus.
Breastfeeding women	• The safety and efficacy of JYNNEOS during breastfeeding have not been evaluated. • No studies have evaluated whether JYNNEOS affects milk production or safety to breastfed infants. However, because JYNNEOS is replication-deficient, it likely does not present a risk of transmission to breastfed infants and can be administered to the mother if vaccination is indicated based on risks.
Persons aged <18 years§	• Data currently do not indicate any safety signals. • Vaccination is permitted for children aged <18 years who are at risk for mpox • VIGIV (purified immunoglobulin from persons vaccinated with ACAM2000) should be considered in lieu of JYNNEOS if postexposure vaccination is indicated for infants aged <6 months. • ACIP is continuing to assess available data and will make changes to recommendations as needed.

Abbreviations: ACIP = Advisory Committee on Immunization Practices; VIGIV = vaccinia immune globulin intravenous.
* Package Insert - JYNNEOS (Refrigerator) | FDA
† Altered Immunocompetence | Vaccines & Immunizations | CDC
§ CDC recommendations for use of JYNNEOS during mpox outbreaks for persons aged <18 years is outlined at Interim Clinical Considerations for Use of Vaccine for Mpox Prevention in the United States | Mpox | CDC

been research laboratory personnel who work with orthopoxviruses; however, some clinical laboratory personnel who work in Laboratory Response Network laboratories (a network of domestic and international laboratories established to respond to biologic and chemical threats and emerging infectious diseases[†††††]) were included for smallpox preparedness, and since the early 2000s, when the concern for biothreats (e.g., due to anthrax) was at its peak, some jurisdictions began maintaining limited cadres of vaccinated health care personnel as well.[§§§§§]

At the time the 2022 ACIP recommendations for JYNNEOS were being developed, mpox cases rarely occurred in the United States, and data regarding transmission in health care settings were primarily from countries with endemic MPXV, where personal protective equipment (PPE) is inconsistently available. A single occupationally acquired case had been reported in a health care provider in the United Kingdom; however, this case was associated with inadequate PPE (*21*).

With the onset of the 2022 outbreak, transmission of mpox in U.S. health care settings was evaluated. Few occupationally acquired cases occurred among health care personnel (fewer than 25 cases, accounting for <0.08% of all U.S. cases), and no cases among laboratorians. Because infection prevention and control practices were found to be effective in preventing transmission, CDC has not routinely recommended vaccination of clinical laboratory personnel or health care personnel who care for patients during the ongoing outbreak. ACIP agreed that the 2022 recommendations regarding use of JYNNEOS for persons at occupational risk for orthopoxvirus infections apply for persons at risk whether or not an active mpox outbreak is occurring. However, for health care personnel and clinical laboratorians at occupational risk exclusively during an mpox outbreak, the committee concurred that data support JYNNEOS not being routinely recommended. Vaccination of a small number of these persons could be considered on a case-by-case basis if site- and activity-specific biosafety risk assessments during an outbreak suggest that vaccination is warranted; however, these are expected to be rare (Table 2).

Vaccination Schedule and Duration of Protection

JYNNEOS is recommended as a 2-dose subcutaneous vaccination series, with the second dose administered 28 days after the first. Similar to other multidose vaccines, the second dose could be administered up to 4 days[¶¶¶¶¶] before the recommended 28-day interval (i.e., 24–27 days after the first dose). If the second dose is not administered during the recommended interval, it should be administered as soon as possible; however, there is no need to restart the series if the interval between doses is prolonged (e.g., >1 year). The duration of protection after the 2-dose series is still being studied, but recently published data indicate protection might be >5 years (*22*). At this time, persons who have been vaccinated with the 2-dose JYNNEOS series do not require an additional dose, nor do they need to be revaccinated during a future outbreak. Although the 2-dose JYNNEOS series may not be as effective in severely immunocompromised persons, it is not known whether additional doses will improve effectiveness; in addition, some data have suggested that more than 2 doses may cause increased reactogenicity (*22*) and for this reason, additional doses are not recommended. As more data become available, CDC might provide additional guidance.

Timing of Administration of Other Vaccines and of Immunoglobulin Products

JYNNEOS is a live virus vaccine. However, because the vaccinia virus component is nonreplicating, it is managed in nearly every situation as if it were a nonlive vaccine. Unlike other live virus vaccines, no minimum interval is required between receipt of JYNNEOS and other vaccines; however, at this time, theoretical considerations regarding temporal proximity of administration of JYNNEOS and COVID-19 vaccines, and JYNNEOS and

[†††††] About the Laboratory Response Network | The Laboratory Response Network Partners in Preparedness | CDC

[§§§§§] CDC interim guidance for revaccination of eligible persons who participated in the US civilian smallpox preparedness and response program

[¶¶¶¶¶] Timing and Spacing of Immunobiologics | Vaccines & Immunizations | CDC

TABLE 2. Advisory Committee on Immunization Practices preexposure vaccine recommendations for persons at occupational risk for exposure to orthopoxviruses only during an mpox outbreak, including the clade IIb outbreak that began in 2022 — United States, 2025

Population	Recommendation on a case-by-case basis
Health care personnel who care for patients infected with mpox	• Recommended infection prevention and control practices are effective in preventing transmission. • ACIP recommends use of JYNNEOS (as an alternative to ACAM2000) based on shared clinical decision-making, i.e., vaccination can be offered based on site- and activity-specific biosafety risk assessments (e.g., inadequate availability of personal protective equipment during humanitarian missions for mpox in endemic countries).
Clinical laboratory personnel who handle specimens* that during an mpox outbreak, might have a higher possibility of containing replication-competent *Monkeypox virus*	• ACIP recommends use of JYNNEOS (as an alternative to ACAM2000) based on shared clinical decision-making. • Recommended infection prevention and control practices are effective in preventing transmission.

Abbreviation: ACIP = Advisory Committee on Immunization Practices.

* Specimens include lesion material, throat swabs, oral swabs, and rectal swabs. Science Brief: Detection and Transmission of Mpox (Formerly Monkeypox) Virus During the 2022 Clade IIb Outbreak | CDC Archive

TABLE 3. Clinical considerations for temporal administration of other vaccines and of immunoglobulin products in relation to JYNNEOS vaccine administration*

Vaccine or immunoglobulin	Guidance
Vaccine	
Live, replicating virus vaccines (e.g., yellow fever, measles, and varicella virus vaccines)	• No required interval between JYNNEOS vaccine and live, replicating virus vaccines, because unlike other live virus vaccines, JYNNEOS does not replicate to induce an immune response. • For the purposes of planning administration of other vaccines, JYNNEOS may be considered similar to nonlive virus vaccines.
COVID-19 vaccines	• No required minimum interval between receiving any COVID-19 vaccine and JYNNEOS vaccine (e.g., for mpox prevention), regardless of which vaccine is administered first. • Persons (particularly adolescent and young adult males) who are recommended to receive both vaccines might consider waiting 4 weeks between vaccines, because of the observed risk for myocarditis and pericarditis after receipt of ACAM2000 orthopoxvirus vaccine and COVID-19 vaccines and the hypothetical risk for myocarditis and pericarditis after JYNNEOS vaccine. • If a patient's risk for mpox or severe disease due to COVID-19 is increased, administration of JYNNEOS and COVID-19 vaccines should not be delayed. • This guidance might be revised if the concern for myocarditis and pericarditis abates.
Immunoglobulin products	
Antibody containing preparations (e.g., blood products, IVIG) except VIGIV	• No minimum interval between most immune globulins and JYNNEOS vaccine; the former are not associated with mpox prevention but might be administered because of other medical problems. • Antibodies to measles and varicella are high in immune globulin products; administration of these in close temporal proximity to the measles and varicella live virus vaccines can prevent the vaccine virus from entering cells and being effective; however, unlike for measles and varicella, antibodies to orthopoxviruses including *Monkeypox virus,* are believed to be low in most antibody containing products, including during the ongoing outbreak.
VIGIV (purified immunoglobulin from persons vaccinated with ACAM2000)†,§	• VIGIV is the only known antibody-containing preparation that could potentially interfere with JYNNEOS vaccine. This is because antibody in VIGIV might interfere with entry of the vaccine virus into cells, As a live virus vaccine, entry into cells is essential to effectiveness. • Because VIGIV could interfere with immune response to JYNNEOS necessitating an additional JYNNEOS dose at a later time, VIGIV should not be administered in temporal proximity to JYNNEOS, and JYNNEOS should be delayed if VIGIV was recently administered. The duration for which it should be delayed is currently unknown. CDC can be consulted for case-specific guidance. • During outbreaks, it is acceptable for VIGIV and JYNNEOS to have been administered in temporal proximity (e.g., if JYNNEOS vaccine was administered to a patient as postexposure prophylaxis but the patient went on to develop a severe manifestation of mpox for which VIGIV is recommended). • Public health authorities oversee access to VIGIV and can provide additional guidance if indicated.

Abbreviations: IVIG = intravenous immune globulin; VIGIV = vaccinia immune globulin intravenous.

* JYNNEOS is a live virus vaccine but because it is replication-deficient, guidance differs from that for other live virus vaccines (e.g., yellow fever, measles, and varicella vaccines)

† VIGIV is maintained by the U.S. Department of Health and Human Services' Center for the Strategic National Stockpile and only available under certain circumstances and via consultation with CDC's on-call poxvirus subject matter experts (CDC Emergency Operations Center: 404-639-3311). Indications for VIGIV are outlined in the Investigational New Drug protocol. Expanded Access IND Protocol: Use of Vaccinia Immune Globulin Intravenous (VIGIV, CNJ-016) for Treatment of Human Orthopoxvirus Infection in Adults and Children | CDC

§ Interim Clinical Treatment Considerations for Severe Manifestations of Mpox — United States, February 2023 | MMWR | CDC

vaccinia immune globulin intravenous (VIGIV), are recognized. Although JYNNEOS has not been reported to be associated with myopericarditis, ACAM2000 (a live, replication-competent smallpox and mpox vaccine) is known to be associated with myocarditis.****** Because some COVID-19 vaccines have also been associated with myocarditis,†††††† persons (particularly adolescent and young adult males) who are recommended to receive COVID-19 and JYNNEOS vaccines might consider waiting 4 weeks between vaccines out of an abundance of caution. If there is a need for VIGIV to be administered in close temporal proximity to JYNNEOS vaccination, CDC should be consulted for case-specific guidance§§§§§§ (Table 3).

Strategies for Consideration During Outbreaks

During the 2022 U.S. outbreak of clade IIb MPXV, initial demand for vaccination was high, and supplies were limited. To address this shortage, intradermal administration of JYNNEOS was advised as a dose-sparing strategy; intradermal administration required one fifth of the subcutaneous dose and assessments indicated VE comparable to JYNNEOS administered subcutaneously (*14*). Although the intradermal vaccination technique is similar to that used for application of tuberculin skin tests, not all providers were comfortable with this technique. In addition, intradermal JYNNEOS vaccination was associated with a visible nodule or hyperpigmentation at the site of administration, which was stigmatizing for some persons.

Individual jurisdictions implemented measures including mass vaccination sites and other efforts to make vaccines available to communities with either a high mpox incidence

****** ACAM2000 (Smallpox Vaccine) Questions and Answers | FDA

†††††† CDC. Clinical considerations: myocarditis after COVID-19 vaccines

§§§§§§ VIGIV is maintained by the U.S. Department of Health and Human Services' Center for the Strategic National Stockpile and only available under certain circumstances and via consultation with CDC's on-call poxvirus subject matter experts (CDC Emergency Operations Center: 404-639-3311). Investigational New Drug protocol | CDC

Summary

What is already known about this topic?

CDC provides interim vaccination guidance for self-limited mpox outbreaks; however, a clade IIb outbreak that began in 2022 has had a protracted course, and the risk for U.S. mpox outbreaks has increased.

What is added by this report?

In 2023, the Advisory Committee on Immunization Practices (ACIP) recommended JYNNEOS (smallpox and mpox vaccine, live, nonreplicating) for persons aged ≥18 years who are at risk for mpox during any mpox outbreak and who are at risk for mpox during the ongoing clade IIb outbreak.

What are the implications for public health practice?

ACIP recommends JYNNEOS during outbreaks to improve vaccination coverage and limit the scope of outbreaks. As of 2025, the clade IIb outbreak has continued; the need for vaccinating persons at risk will be reassessed as the outbreak evolves.

or limited access to health care. Some jurisdictions prioritized first doses and delayed administration of the second dose until adequate supplies were available (*23*).

At this time, there is an abundance of JYNNEOS vaccine supply; therefore, vaccine doses should be administered subcutaneously. However, if a shortage occurs, JYNNEOS can be administered intradermally. Regardless of vaccine supply and strategy, decisions about vaccine administration during an outbreak should ensure fair and prudent distribution of doses. Vaccinated persons should be advised that peak antibody response is achieved 2 weeks after receipt of the second dose, but that even a single dose provides some protection (*13–16*). Vaccinations should be provided along with counseling that breakthrough infections could still occur and the importance of other prevention strategies.

Reporting Adverse Events

Adverse events following vaccination can be reported to the Vaccine Adverse Event Reporting System (VAERS). Reporting is encouraged for any clinically significant adverse event, even if it is unclear whether the vaccine caused the event. Information on how to submit a report to VAERS is available at Vaccine Adverse Event Reporting System (VAERS) or by telephone at 1-800-822-7967.

Future Research

Because the proportion of immunocompromised persons has increased in the United States (*24*), information about VE of JYNNEOS among severely immunocompromised persons (e.g., persons with advanced HIV) will be critical to guiding future recommendations. In addition, if more mpox outbreaks occur in the United States, it will be important to know whether there is durable protection after JYNNEOS vaccination or after resolved infection, and if not, when a booster dose might be needed. Because JYNNEOS behaves like a nonlive virus vaccine and is recommended as a 2-dose series, its role as postexposure prophylaxis is poorly understood; studies are ongoing to understand VE of JYNNEOS postexposure vaccination.

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