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Mpox Surveillance Based on Rash Characteristics — 13 Emergency Departments, United States, June–December 2023

Carl T. Berdahl, MD[1,2]; Anusha Krishnadasan, PhD[3]; Kavitha Pathmarajah, MPH[3]; Gregory J. Moran, MD[2,3]; Jesus R. Torres, MD[2,3]; Matthew Waxman, MD[2,3]; William Mower, MD, PhD[2,3]; Omai B. Garner, PhD[2,4]; Lorenzo P. Duvergne[2,4]; Anne W. Rimoin, PhD[5]; Pamina M. Gorbach, DrPH[5]; David A. Talan, MD[2,4]; *EMERGE*ncy ID NET Study Group

Abstract

In 2022, a global mpox outbreak occurred, primarily affecting gay and bisexual men who have sex with men (GBMSM). To screen for mpox's reemergence and investigate potentially unsuspected cases among non-GBMSM, prospective surveillance of patients aged ≥3 months with an mpox-compatible rash (vesicular, pustular, ulcerated, or crusted) was conducted at 13 U.S. emergency departments (EDs) during June–December 2023. Demographic, historical, and illness characteristics were collected using questionnaires and electronic health records. Lesions were tested for monkeypox virus using polymerase chain reaction. Among 196 enrolled persons, the median age was 37.5 years (IQR = 21.0–53.5 years); 39 (19.9%) were aged <16 years, and 108 (55.1%) were male. Among all enrollees, 13 (6.6%) were GBMSM. Overall, approximately one half (46.4%) and one quarter (23.5%) of enrolled persons were non-Hispanic White and non-Hispanic Black or African American, respectively, and 38.8% reported Hispanic or Latino (Hispanic) ethnicity. Unstable housing was reported by 21 (10.7%) enrollees, and 24 (12.2%) lacked health insurance. The prevalence of mpox among ED patients evaluated for an mpox-compatible rash was 1.5% (95% CI = 0.3%–4.4%); all persons with a confirmed mpox diagnosis identified as GBMSM and reported being HIV-negative, not being vaccinated against mpox, and having engaged in sex with one or more partners met through smartphone dating applications. No cases were identified among women, children, or unhoused persons. Clinicians should remain vigilant for mpox and educate persons at risk for mpox about modifying behaviors that increase risk and the importance of receiving 2 appropriately spaced doses of JYNNEOS vaccine to prevent mpox.

Introduction

On May 23, 2022, CDC activated its mpox outbreak response, and on July 23, the World Health Organization declared mpox a Public Health Emergency of International Concern (*1*). Approximately 30,000 U.S. clade II mpox cases were reported in 2022; although cases declined sharply during late 2022, mpox has continued to spread at low levels.*,† Whereas the majority of infections occurred among gay and bisexual men who have sex with men (GBMSM) (*1*), cases also occurred among women, children, and other persons with no reported sexual contact, including those experiencing homelessness or working in crowded settings (*2*). Serologic surveys during the peak of the outbreak suggested that some cases went undiagnosed, although the rate of undiagnosed cases among persons at high risk was low (*3*).

* https://www.cdc.gov/poxvirus/mpox/response/2022/index.html
† https://worldhealthorg.shinyapps.io/mpx_global/

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Concern regarding mpox resurgence is related to low vaccination coverage among persons at risk for mpox, the possibility of infection in persons who have been vaccinated, and incomplete knowledge about risk factors among persons living in congregate settings (*4*,*5*). Recent reports have described mpox outbreaks in major U.S. metropolitan areas, including Chicago (March–June 2023) (*6*) and Los Angeles (May–August 2023) (*7*).

Emergency departments (EDs) disproportionately care for persons with increased risk, including those susceptible to contracting infectious diseases, sexual and gender minorities, persons living with HIV, and those who are unhoused, work or live in congregate settings, and abuse alcohol or other drugs. Therefore, to screen for mpox's reemergence among all potentially affected persons, surveillance based on rash characteristics, rather than epidemiologic risk factors or clinician suspicion, was conducted through *EMERGE*ncy ID NET (https://www.emergencyidnet.org), a U.S. ED-based emerging infections surveillance network.

Methods

Study Design and Enrollment Qualifications

A multicenter observational mpox surveillance project was conducted at 13 ED hospital sites.[§] During June–December 2023, patients aged ≥3 months evaluated in a participating ED with an mpox-compatible rash, defined as one or more lesions that appeared pustular, vesicular, crusted, or ulcerated, were enrolled. A qualifying rash was the only entry criterion; epidemiologic mpox risk factors and other illness characteristics were not considered inclusion criteria. Site coordinators received instruction and ongoing feedback regarding rash identification and characterization from project principal and site investigator physicians. Exclusion criteria included the following conditions: 1) previous enrollment, 2) predesignated as not wishing to participate in research, 3) not English- or Spanish-speaking, 4) unable to provide consent, 5) rash present for >4 weeks, and 6) only lesions >2 cm in diameter, excluding erythema.

[§] Baystate Medical Center (Springfield, Massachusetts); Cedars-Sinai Medical Center (Los Angeles, California); Hennepin County Medical Center (Minneapolis, Minnesota); Johns Hopkins Hospital (Baltimore, Maryland); Olive View-UCLA Medical Center (Los Angeles, California); Oregon Health and Science University (Portland, Oregon); Ronald Reagan UCLA Medical Center (Los Angeles, California), Temple University Hospital (Philadelphia, Pennsylvania); University Health Truman Medical Center, University of Missouri-Kansas City (Kansas City, Missouri); University of Iowa Hospitals and Clinics (Iowa City, Iowa); University of Mississippi Medical Center (Jackson, Mississippi); University of New Mexico Hospitals (Albuquerque, New Mexico); and Valleywise Health Medical Center (Phoenix, Arizona).

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During the enrollment visit, demographic, historical, and illness characteristics were collected through patient (or parent) and clinician questionnaires; electronic health record review was completed 5–7 days after the enrollment visit. Two skin swabs were collected from lesions located on different body sites (when possible) from each patient. Swabs were tested at UCLA Clinical Microbiology Laboratory by polymerase chain reaction (PCR) that included targets for both nonvariola orthopoxvirus and monkeypox virus.

Assessment of Sensitivity of Case Finding

To assess case-finding sensitivity and characterize differences between enrolled and eligible nonenrolled patients, project sites performed monthly audits of project-qualifying nonenrolled ED patients and those receiving hospital mpox PCR testing based on the ED provider's clinical and epidemiologic suspicion during the patient's usual ED care, which occurred independently of the solely rash-based mpox surveillance project. Audit lists included project-eligible ED patients with rash associated with *International Classification of Diseases, Tenth Revision* (ICD-10) codes R21 (rash and other nonspecific skin eruption), B00 (herpesviral [herpes simplex] infections), B01 (varicella [chickenpox]), B02 (zoster [herpes zoster]), B03 (smallpox), B04 (monkeypox), and B08 (other viral infections characterized by skin and mucous membrane lesions), and with usual-care mpox PCR testing orders. Demographic and illness characteristics of enrolled and eligible nonenrolled patients were compared.

Data Analysis

Descriptive statistics were used to characterize the study population. The frequency of PCR-diagnosed mpox among ED patients evaluated for an mpox-compatible rash and 95% CIs were calculated using the test of binomial proportion. Data were analyzed using SAS statistical software (version 9.4; SAS Institute). This activity was reviewed by the participating sites' institutional review boards, deemed not research, and was conducted consistent with applicable federal law.[¶]

Results

Enrollee Characteristics

Among 196 enrollees, the median age was 37.5 years (range = 0.7–88 years), 39 (19.9%) were aged <16 years, and 108 (55.1%) were male (Table 1), including 13 (6.6%) GBMSM (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/157004). Approximately one half (91; 46.4%) of enrollees

TABLE 1. Demographic and medical history characteristics of patients evaluated for an mpox-compatible rash (N = 196) — 13 emergency departments, United States, June–December 2023

Characteristic	No. (%)*
Age	
Median age, yrs (IQR)	37.5 (21.0–53.5)
Median age, range	0.7–88.0
<16 yrs	39 (19.9)
Sex assigned at birth	
Female	88 (44.9)
Male	108 (55.1)
Gender	
Female	71/157 (45.2)
Male	82/157 (52.2)
Genderqueer/gender nonconforming	1/157 (0.6)
Transgender man/trans man	1/157 (0.6)
Other or declined to answer	2/157 (1.3)
Sexual orientation	
Straight or heterosexual	126/157 (80.3)
Lesbian or gay	10/157 (6.4)
Bisexual	4/157 (2.5)
Queer, pansexual, or questioning	3/157 (1.9)
Other	1/157 (0.6)
Don't know or declined to answer	13/157 (8.3)
Race and ethnicity	
Asian, NH	4 (2.0)
Black or African American, NH	46 (23.5)
Native American or American Indian, NH	5 (2.6)
White, NH	91 (46.4)
Hispanic or Latino	76 (38.8)
Multiple races, NH	17 (8.7)
Declined to answer or unable to obtain	7 (3.6)
Other	25 (12.8)
Insurance status	
Private	51 (26.0)
Medicaid	74 (37.8)
Medicare	35 (17.9)
Veterans or Tricare	4 (2.0)
Other	20 (10.2)
Not insured	24 (12.2)
Unsure or missing	6 (3.1)
Unstable housing during the previous 3 months	21 (10.7)
Immunocompromised[†]	24 (12.2)
Received STI diagnosis in the previous year	14/157 (8.9)
HIV-positive (by self-report)	9/157 (5.7)
Received mpox vaccine	2/157 (1.3)
Sexually active during the previous 3 months	86/157 (54.8)
Alcohol and substance use	
Alcohol binging	39/157 (24.8)
Smoked cigarettes, vaped, or chewed tobacco	51/157 (32.5)
Used cannabis or tetrahydrocannabinol	42/157 (26.8)
Injected drugs	9/157 (5.7)
Noninjection stimulant use	13/157 (8.3)
Noninjection opioid use	11/157 (7.0)
Amyl nitrate ("popper") use	6/157 (3.8)

Abbreviations: NH = non-Hispanic; STI = sexually transmitted infection.
* For questions that were only asked of participants aged ≥16 years (157), the denominator is presented, and percentages are out of 157.
† Defined as currently undergoing treatment for rheumatoid arthritis, HIV/AIDS, or cancer.

¶ 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.

were non-Hispanic White and approximately one quarter (46; 23.5%) were non-Hispanic Black or African American. Hispanic or Latino (Hispanic) ethnicity was reported by 76 (38.8%) enrollees. Twenty-one (10.7%) enrollees reported unstable housing and 24 (12.2%) lacked health insurance.

Rash Characteristics

Enrollees had a median of 10 lesions, with a median lesion diameter of 0.5 cm (Table 2). Rashes were described as vesicular (50.5%), crusted (41.8%), pustular (27.0%), and ulcerated (22.5%). Twelve (6.1%) participants were assessed by their

TABLE 2. Characteristics of rash and treatment among patients evaluated for an mpox-compatible rash (N = 196) — 13 emergency departments, United States, June–December 2023

Characteristic	No. (%)
Rash lesions*	
Number, median (IQR)	10 (40–20)
Number, range	1–200
Diameter, cm, median (IQR)	0.5 (0.5–1.5)
Diameter, cm, range	0.1–21.0
Previous visit for current rash	68 (34.7)
Days with active rash	
0–3	69 (35.2)
4–7	65 (33.2)
8–14	43 (21.9)
15–30	19 (9.7)
Painful rash	140 (71.4)
Itchy rash	135 (68.9)
Contact with a person who had similar rash	14 (7.1)
Reported subjective or measured fever during previous 14 days	55 (28.1)
Location of first rash swab	
Head, face, or neck	34 (17.4)
Trunk	31 (15.8)
Groin or buttocks	25 (12.8)
Upper extremity	44 (22.5)
Lower extremity	39 (19.9)
Oral	22 (11.2)
Anus	1 (0.5)
Location of second rash swab (n = 190 enrollees)†	
Head, face, or neck	32/190 (16.8)
Trunk	30/190 (15.8)
Groin or buttocks	18/190 (9.5)
Upper extremity	45/190 (23.7)
Lower extremity	46/190 (24.2)
Oropharynx	17/190 (9.0)
Anus	2/190 (1.1)
Clinician's suspicion regarding mpox diagnosis	
Very unlikely	129 (66.5)
Unlikely	45 (23.2)
Neutral	8 (4.1)
Likely	3 (1.6)
Very Likely	9 (4.6)
Usual-care mpox swab performed	13 (6.6)
Usual-care mpox PCR test positive§	2/13 (15.4)
Surveillance mpox PCR test positive	3/196 (1.5)
STI testing results¶	
Chlamydia	4 /18 (22.2)
Gonorrhea	2/14 (14.3)
Herpes	6/25 (24.0)
HIV	3/31 (9.7)
Syphilis	7/25 (28.0)
Trichomonas	2/7 (28.6)
No STI test performed	142 (72.0)

TABLE 2. (*Continued*) Characteristics of rash and treatment among patients evaluated for an mpox-compatible rash (N = 196) — 13 emergency departments, United States, June–December 2023

Characteristic	No. (%)
Medications administered in an ED	
Antibiotics	42 (21.4)
Antiviral (e.g., acyclovir or valacyclovir)	20 (10.2)
Steroids	19 (9.7)
Tecovirimat (TPOXX)	0 (—)
ED diagnosis	
Allergic reaction	3 (1.5)
Cellulitis	16 (8.2)
Contact dermatitis	11 (5.6)
Eczema	7 (3.6)
Hand, foot, and mouth disease	5 (2.6)
Herpes simplex	13 (6.6)
Insect bite	0 (—)
Mpox	3 (1.5)
Rash	59 (30.1)
Scabies	1 (0.5)
Shingles	36 (18.4)
URI, influenza, influenza-like illness, or viral syndrome	0 (—)
Other diagnosis	105 (53.6)
ED disposition	
Discharged home	153 (78.1)
Discharged to SNF	2 (1.0)
Discharged to self-care (street/unhoused)	3 (1.5)
Admitted to this hospital	35 (17.9)
Left against medical advice	3 (1.5)
Medications prescribed at ED discharge	
Antibiotics	49 (25.0)
Antiviral (e.g., acyclovir or valacyclovir)	46 (23.5)
Steroids	33 (16.8)
Tecovirimat (TPOXX)	1 (0.5)
45-day follow-up phone call completed (n = 131)	131 (66.8)
Rash status at 45 days	
Resolved	89/131 (67.9)
Better	30/131 (22.9)
About the same	9/131 (6.9)
Worse	3/131 (2.3)

Abbreviations: ED = emergency department; HPV = human papillomavirus; PCR = polymerase chain reaction; SNF = skilled nursing facility; STI = sexually transmitted infection; URI = upper respiratory infection.

* Three participants had lesion counts noted as "too numerous to count" and were not included in this calculation. Lesion counts were missing for four participants.

† Second rash swab was not obtained from six participants.

§ Two patients receiving testing through the surveillance project were also suspected through their usual ED care of having mpox and received hospital mpox PCR testing. Both patients received positive mpox test results by the surveillance and hospital laboratory tests.

¶ Number with positive test result among total number tested.

treating ED clinician as being likely or very likely to have mpox as the cause of their rash, and 13 enrollees (6.6%) underwent usual-care testing for mpox.

Mpox Patient Characteristics

Among all 196 enrollees, three (1.5%) received a positive monkeypox virus PCR test result; all three identified as GBMSM and reported being HIV-negative, not vaccinated against mpox, and having engaged in sex with one or more partners they met through smartphone dating applications (Table 3). All three patients were assessed by the treating ED clinician as being "very likely" to have mpox. No mpox cases were identified among women, children, or persons experiencing homelessness.

Comparison of Enrolled and Eligible Nonenrolled Participants

A total of 67 patients received testing for mpox at hospital laboratories at study sites as part of their usual ED care (13 of whom were also enrolled and tested through the project); three (4.5%) received positive test results, two of whom were also identified in the study. Among all 196 enrolled participants, 13 (6.6%) also received usual-care testing, two of whom received a positive hospital PCR test result, which was

TABLE 3. Characteristics of enrollees with positive monkeypox virus test results — California, Minnesota, and Oregon, June–December 2023

Characteristic	Patient 1	Patient 2	Patient 3
Study site location	Los Angeles, California	Minneapolis, Minnesota	Portland, Oregon
Age, yrs	29	30	42
Race and ethnicity	Black or African American, NH	White, NH	Declined race, Hispanic or Latino
Location of lesions	Groin and oropharynx	Face, neck, and abdomen	Hand and genitals
No. of lesions	Three	Three	Two
Duration of rash at ED evaluation	6 days	Approximately 2 weeks	10 days
Patient description of lesions	Painful	Tender and itchy	Painful and itchy
Clinician description of lesions, lesion diameter	Pustular, crusted, 0.5–1 cm	Crusted, 2 cm	Vesicular, 0.5 cm
Additional signs and symptoms	Fever, chills, myalgias, fatigue, headache, sore throat, and diarrhea	Chills, myalgias, fatigue, nasal congestion, lymphadenopathy, diarrhea, tenesmus, and dysuria	Fever, chills, myalgia, fatigue, headache, lymphadenopathy, and dysuria
Sexual orientation	Gay	Gay	Gay
Previous evaluation and findings	STI clinic 3 days earlier, positive mpox test result, and presumptive syphilis diagnosis	Different ED examination 13 days earlier, and provisional diagnosis of Klebsiella, mpox or MRSA (pending mpox test result)	Previously examined in urgent or primary care where he was told he might have mpox
Treatment before ED visit	Prescribed tecovirimat and underwent treatment for suspected syphilis with penicillin G benzathine	Prescribed trimethoprim-sulfamethoxazole	Prescribed doxycycline, azithromycin, and valacyclovir
Social and sexual behavior during previous 3 months	Sexually active, including with male partners met via smartphone apps, and inconsistent condom use	Sexually active, including with male partners met via smartphone apps, participated in oral and anal sex, and never used condoms; used a non-injectable stimulant; attended at least one large, crowded gathering (e.g., music festival, rave, or other crowded social event); participated in group sex and sex parties; and traded sex for money, drugs, a place to stay, and gifts	Sexually active, including with male partners met via smartphone apps, used condoms consistently, and reported opioid use and amyl nitrate use
Living situation	Unstable housing (currently living with roommate)	Stable housing with one roommate	Stable housing, living with two roommates
STI	HIV-negative and taking HIV preexposure prophylaxis	Received diagnosis of and treatment for chlamydia and gonorrhea in the previous year, HIV-negative, and not taking HIV preexposure prophylaxis	HIV-negative and taking HIV preexposure prophylaxis
Mpox vaccination	No	No	No
ED disposition	Admitted for IV hydration and continued tecovirimat treatment with dehydration due to oropharyngeal lesions	Discharged from an ED with mpox diagnosis and no discharge prescriptions	Discharged from an ED with diagnosis of possible mpox and bacteremia, and a discharge prescription for amoxicillin

Abbreviations: ED = emergency department; IV = intravenous; MRSA = methicillin-resistant *Staphylococcus aureus*; NH = non-Hispanic; STI = sexually transmitted infection.

concordant with the project test results (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/157005) (Table 2). Among 991 nonenrolled patients with qualifying rash associated with ICD-10 codes, 54 (5.5%) received usual-care testing for mpox, one (1.9%) of whom received a positive result. This patient, a male aged 25 years, was not included because he was examined in an ED during a period outside of project staff member coverage hours; no further demographic or risk information was available. Overall, the enrolled population was demographically similar to the eligible nonenrolled audited patients, but enrolled patients were more likely than were nonenrolled patients to have been admitted to a hospital (17.9% versus 9.9%).

Summary

What is already known about this topic?

After the 2022 global mpox outbreak, which primarily affected gay and bisexual men who have sex with men (GBMSM), U.S. cases declined, but low-level transmission continued. Local outbreaks have raised concern about mpox reemergence, including previously unsuspected cases among non-GBMSM.

What is added by this report?

During June–December 2023, among 196 patients aged ≥3 months evaluated at 13 U.S. emergency departments for an mpox-compatible rash irrespective of epidemiologic risk factors, three (1.5%) mpox cases were identified, all among unvaccinated GBMSM who had engaged in sex with one or more partners they met through smartphone dating applications.

What are the implications for public health practice?

Clinicians should remain vigilant for monkeypox virus infections, particularly among GBMSM, and educate patients about the importance of risk reduction and JYNNEOS vaccination.

Discussion

During June–December 2023, the prevalence of mpox among patients in 13 U.S. EDs who were evaluated for an mpox-compatible rash was low: among 196 enrolled patients, three (1.5%) received a positive monkeypox virus PCR test result, all of whom were unvaccinated GBMSM who engaged in sexual activity with partners they met through smartphone applications. Only an estimated 23% of the U.S. population at risk for mpox exposure had received vaccination during May 2022–January 2023 (*8*). No cases were identified among women, children, and unhoused persons. These findings add to a body of evidence indicating that mpox continues to circulate among persons at risk for mpox, primarily GBMSM with sexual risk factors (*4*,*6*,*7*), and underscore the importance of educating persons at risk for mpox regarding behavioral risks and encouraging these persons to be vaccinated (*9*).

Limitations

The findings in this report are subject to at least four limitations. First, the project was limited to 13 EDs and included a small sample size; thus, these findings might not be generalizable to other areas. Second, case-finding sensitivity was suboptimal because site staff members were unable to enroll all eligible patients for reasons that included the lack of night and weekend project personnel coverage and rapid discharge of eligible patients. However, the representativeness of the project population was supported by the audit, which indicated that enrolled and nonenrolled eligible patients were demographically similar and included a similar proportion of persons for whom hospital mpox testing was ordered by clinicians as part of their usual ED care. Further, approximately three times as many project patients received mpox testing (196) as did ED patients who received usual ED care (67), which identified only one additional case. Despite the presence of an mpox-compatible rash, a clinician's index of suspicion for mpox likely was lower, and testing was infrequently ordered for non-GBMSM patients. Third, eligibility based on rash features might have been inconsistent across sites because of variation in staff member interpretation of rash descriptors. To mitigate this limitation, site coordinators attended a series of onboarding meetings and subsequent monthly meetings to address ongoing questions about rash appearances. Finally, the sample size did not permit investigation of factors associated with mpox, such as the actual number of sex partners, knowingly engaging in sex with a person with an mpox-compatible rash, or frequency of nonsexual skin-to-skin contact; future work with larger sample sizes and more cases could facilitate assessment of these risk factors.

Implications for Public Health Practice

Mpox cases continue to occur in the United States. In addition, mpox remains endemic in other parts of the world. Although no clade I cases have yet been reported in the United States (*10*), public health officials are currently closely monitoring clade I in the Democratic Republic of the Congo because it appears to be more transmissible and to result in more severe disease than does clade II, which caused the 2022 global outbreak. Clinicians should remain vigilant for monkeypox virus infections, particularly among GBMSM at increased risk, and educate patients on ways to lower their risk, including the importance of receiving 2 appropriately spaced doses of JYNNEOS vaccine to prevent mpox (*9*).

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*EMERGE*ncy ID NET Study Group

Brett Faine, University of Iowa Hospitals & Clinics, Iowa City, Iowa; Jon K. Femling, University of New Mexico Hospitals, Albuquerque, New Mexico; James W. Galbraith, University of Mississippi Medical Center, Jackson, Mississippi; Derek Isenberg, Temple University Hospital, Philadelphia, Pennsylvania; Jonathan Jui, Oregon Health & Science University, Portland, Oregon; Frank LoVecchio, Valleywise Health Medical Center, Phoenix, Arizona; Johanna C. Moore, Hennepin County Medical Center, Minneapolis, Minnesota; Utsav Nandi, University of Mississippi Medical Center, Jackson, Mississippi; Richard Rothman, Johns Hopkins Hospital, Baltimore, Maryland; Howard Smithline, Baystate Medical Center, Springfield, Massachusetts; Mark T. Steele, University Health Truman Medical Center, University of Missouri-Kansas City, Kansas City, Missouri; Amy M. Stubbs, University Health Truman Medical Center, University of Missouri-Kansas City, Kansas City, Missouri; Sam S. Torbati, Cedars-Sinai Medical Center, Los Angeles, California.

Corresponding author: David A. Talan, dtalan@ucla.edu.

[1]Cedars-Sinai Medical Center, Los Angeles, California; [2]David Geffen School of Medicine at UCLA, Los Angeles, California; [3]Olive View-UCLA Medical Center, Los Angeles, California; [4]Ronald Reagan UCLA Medical Center, Los Angeles, California; [5]UCLA Fielding School of Public Health, Los Angeles, California.

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Cases of Meningococcal Disease Associated with Travel to Saudi Arabia for Umrah Pilgrimage — United States, United Kingdom, and France, 2024

Madhura S. Vachon, PhD[1]; Anne-Sophie Barret, MPH[2]; Jay Lucidarme, PhD[3]; John Neatherlin, MPH[4]; Amy B. Rubis, MPH[4]; Rebecca L. Howie, PhD[4]; Shalabh Sharma, MS[5]; Daya Marasini, PhD[4]; Basanta Wagle, PhD[5]; Page Keating, MSPH[6]; Mike Antwi, MD[6]; Judy Chen, MPH[6]; Tingting Gu-Templin, PhD[6]; Pamala Gahr, MPH[7]; Jennifer Zipprich, PhD[7]; Franny Dorr, MPH[8]; Karen Kuguru, MPA[9]; Sarah Lee[9]; Umme-Aiman Halai, MD[9]; Brittany Martin, MPH[10]; Jeremy Budd[11]; Ziad Memish, MD[12]; Abdullah M. Assiri, MD[13]; Noha H. Farag, MD, PhD[14]; Muhamed-Kheir Taha, MD, PhD[15]; Ala-Eddine Deghmane, PhD[15]; Laura Zanetti, PharmD[2]; Rémi Lefrançois, MD[2]; Stephen A. Clark, PhD[16]; Ray Borrow, PhD[3]; Shamez N. Ladhani, PhD[16]; Helen Campbell, PhD[16]; Mary Ramsay, MBBS[16]; LeAnne Fox, MD[4]; Lucy A. McNamara, PhD[4]

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Invasive meningococcal disease (IMD), caused by infection with the bacterium *Neisseria meningitidis*, usually manifests as meningitis or septicemia and can be severe and life-threatening (*1*). Six serogroups (A, B, C, W, X, and Y) account for most cases (*2*). *N. meningitidis* is transmitted person-to-person via respiratory droplets and oropharyngeal secretions. Asymptomatic persons can carry *N. meningitidis* and transmit the bacteria to others, potentially causing illness among susceptible persons. Outbreaks can occur in conjunction with large gatherings (*3*,*4*). Vaccines are available to prevent meningococcal disease. Antibiotic prophylaxis for close contacts of infected persons is critical to preventing secondary cases (*2*).

Umrah, an Islamic pilgrimage to Mecca, Saudi Arabia, can be performed at any time during the year. Hajj is an annual Islamic pilgrimage, occurring this year during June 14–19. Hajj and Umrah pilgrimages attract millions of travelers annually from more than 184 countries (*4*). In 2024, 30 million pilgrims performed Umrah during the month of Ramadan (March 10–April 8, 2024); approximately 13.5 million were international travelers (Z Memish, MD, AlFaisal University, personal communication, May 2024).*

Large meningococcal disease outbreaks associated with Hajj and Umrah were reported in 1987, 1992, and 2000–2001 (*4*). Since 2002, Saudi Arabia has required documentation of either a quadrivalent meningococcal (MenACWY) polysaccharide vaccine within the last 3 years or a MenACWY conjugate vaccine within the last 5 years and administered ≥10 days before arrival for all pilgrims aged ≥1 year entering the country.† However, enforcing this requirement is challenging, because Umrah can occur at any time of year, and many pilgrims are not traveling on an Umrah-specific visa. One study estimated vaccination compliance for Umrah to be 41% (*4*). Several studies have examined vaccination coverage among Hajj pilgrims, reporting highly variable estimates (*4*). An investigation was initiated after reports in 2024 of Umrah-associated IMD cases in the United States, the United Kingdom, and France.

Investigation and Outcomes

On April 17, 2024, CDC was notified of two IMD cases§ in the United States in persons with recent Umrah travel to Saudi Arabia. On April 23, public health authorities in the United Kingdom and France alerted CDC to additional Umrah travel–associated cases in those countries. CDC issued an Epidemic Information Exchange (Epi-X)¶ notice on April 24, requesting that U.S. jurisdictions report any Saudi Arabia travel–associated IMD cases. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.**

As of May 29, 12 Saudi Arabia travel–associated cases have been identified from three countries: the United States (five), France (four), and the United Kingdom (three). Seven patients were male, and five patients were female. Two cases occurred in persons aged 0–12 years, four each among adults aged 25–44 and 45–64 years, and two among adults aged ≥65 years. The 10 adult patients traveled to Saudi Arabia, and the two child patients were household contacts of a nonpatient asymptomatic adult traveler. Nine patients were unvaccinated, and the vaccination status of three patients was unknown. All travelers visited Saudi Arabia during March–May 2024, and symptom onset occurred upon return to their country of origin in April and May (Figure).

Isolates from 11 patients were available for whole-genome sequencing, 10 of which were identified as *N. meningitidis* serogroup W (NmW, sequence type ST-11, clonal complex CC11), and one (from a U.S. patient) was serogroup C (NmC, ST-12790, CC4821). The U.S. NmC isolate, one U.S. NmW isolate, and one French NmW isolate had a genomic marker (*gyrA* T91I) for ciprofloxacin resistance. Antimicrobial

* https://gulfnews.com/world/gulf/saudi/saudi-arabia-umrah-pilgrims-in-ramadan-topped-30-million-1.1713008730892

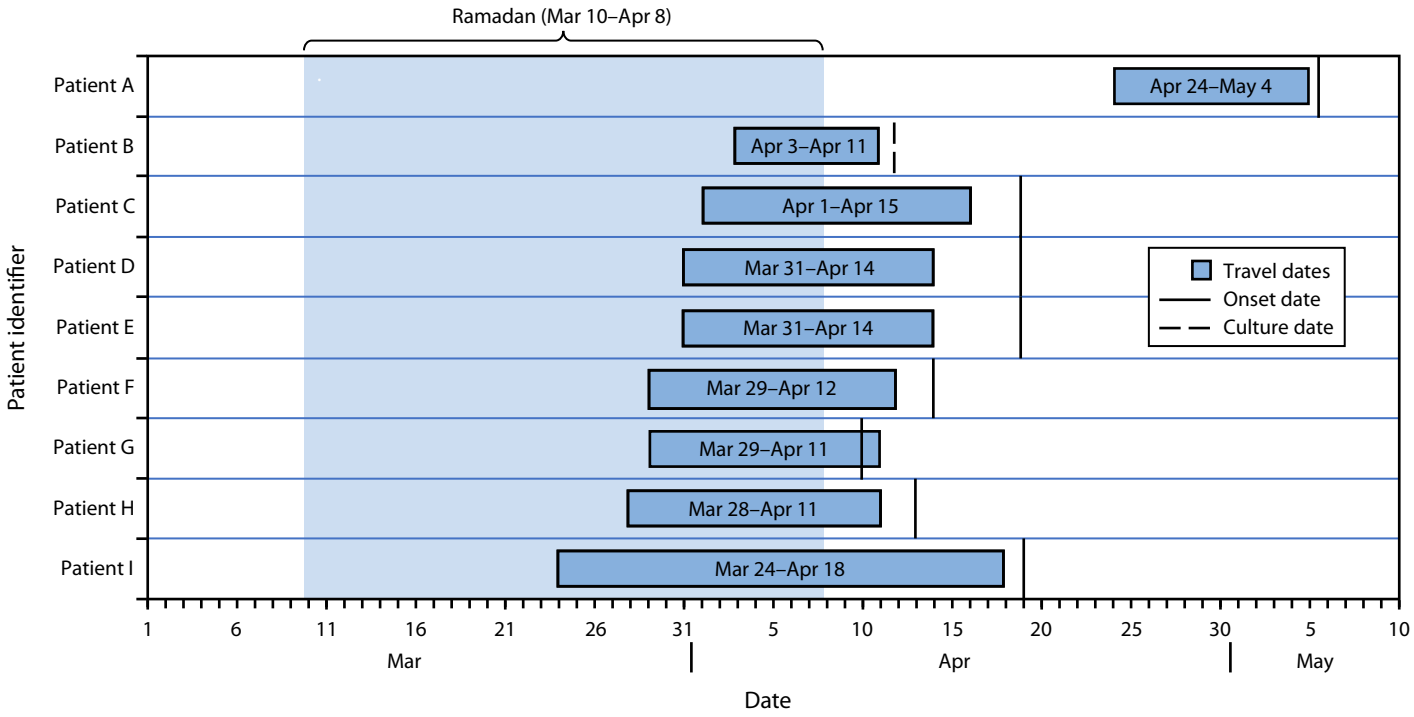
† https://www.moh.gov.sa/en/HealthAwareness/Pilgrims_Health/Documents/Health-Regulations-En.pdf; https://www.moh.gov.sa/en/HealthAwareness/Pilgrims_Health/Documents/Health-Regulations-Umrah-EN.pdf

§ https://ndc.services.cdc.gov/case-definitions/meningococcal-disease-2015/

¶ https://www.emergency.cdc.gov/epix/index.asp

** 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.

FIGURE. Dates of symptom onset* and Umrah-related travel among nine patients† who had received positive test results for invasive meningococcal disease after travel to Saudi Arabia — United States, United Kingdom, and France, March–May 2024



* Culture date is indicated for one patient for whom reported onset date reflected symptoms unrelated to meningococcal disease. The travel dates for index travelers are shown for cases that occurred among persons who were close contacts of travelers.
† Exact travel and onset dates were unavailable for three patients.

susceptibility testing conducted for nine NmW isolates confirmed that two were resistant to ciprofloxacin. Serogroup and antimicrobial susceptibility could not be determined for one U.S. case because no isolate was available.

Preliminary Conclusions and Actions

Although vaccination is required for Hajj and Umrah pilgrims, all identified cases occurred among persons who were either unvaccinated or whose vaccination status was unknown. It is important that persons considering travel to perform Hajj or Umrah consult with their health care providers, and providers can ensure that pilgrims aged ≥1 year have received a MenACWY vaccine within the last 3–5 years (depending upon vaccine type received) and ≥10 days before entering Saudi Arabia (*4*). Pilgrims should seek immediate medical attention if they develop signs or symptoms consistent with meningococcal disease.††

†† Signs and symptoms might include fever, headache, stiff neck, nausea, vomiting, photophobia or altered mental status (meningitis) or fever, chills, fatigue, vomiting, cold extremities, severe aches and pains, rapid breathing, diarrhea, and, in advanced stages, a petechial or purpuric rash (meningococcemia).

Summary

What is already known about this topic?

Outbreaks of meningococcal disease can occur in conjunction with large gatherings, including Islamic Hajj and Umrah pilgrimages.

What is added by this report?

Twelve meningococcal disease cases associated with Umrah travel to Saudi Arabia have been identified. Nine patients were unvaccinated; vaccination status of three patients was unknown. Ciprofloxacin-resistant strains were identified in three of 11 cases with available antimicrobial susceptibility testing data.

What are the implications for public health practice?

Pilgrims aged ≥1 year entering Saudi Arabia should have received a quadrivalent meningococcal (MenACWY) vaccine within the last 3–5 years (depending on vaccine type). Rifampin, ceftriaxone, or azithromycin should be preferentially considered for prophylaxis of close contacts of Saudi Arabia travel–associated cases.

Health departments should ascertain whether patients with meningococcal disease have traveled to Saudi Arabia or been in close contact with travelers to Saudi Arabia. CDC has published guidance on parameters specifying antibiotic selection for prophylaxis of close contacts of meningococcal disease patients (*5*). Close contacts of people with meningococcal disease should receive antibiotic chemoprophylaxis as soon as possible after exposure, regardless of immunization status, ideally < 24 hours after the index patient is identified. Aligned with this guidance and considering that ciprofloxacin-resistant strains were identified in three of 11 cases with available information, prophylaxis with rifampin, ceftriaxone, or azithromycin should be preferentially considered instead of ciprofloxacin for close contacts of patients with Saudi Arabia travel–associated cases.[§§]

[§§] https://emergency.cdc.gov/han/2024/han00508.asp

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Corresponding author: Madhura S. Vachon, urg8@cdc.gov.

[1] Epidemic Intelligence Service, CDC; [2]Santé publique France, Saint Maurice, France; [3]Meningococcal Reference Unit, UK Health Security Agency, Manchester Royal Infirmary, Manchester, United Kingdom; [4]Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, CDC; [5]ASRT, Inc, Smyrna, Georgia; [6]New York City Department of Health and Mental Hygiene, New York, New York; [7]Minnesota Department of Health; [8]Hennepin County Public Health, Minneapolis, Minnesota; [9]Los Angeles County Department of Public Health, Los Angeles, California; [10]California Department of Public Health; [11]Ohio Department of Health; [12]College of Medicine, Alfaisal University, Riyadh, Saudi Arabia; [13]Ministry of Health, Riyadh, Saudi Arabia; [14]CDC Middle East and North Africa Regional, Office of the Director, Global Health Center; [15]Invasive Bacterial Infections Unit and the National Reference Center for Meningococci and Haemophilus Influenzae, Institut Pasteur, Paris, France; [16]Immunisation Division, UK Health Security Agency, Colindale, London, United Kingdom.

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Notes from the Field

Anthrax on a Sheep Farm in Winter — Texas, December 2023–January 2024

Julie M. Thompson, DVM, PhD[1,2]; Kelly Spencer[3]; Melissa Maass[3]; Susan Rollo, DVM, PhD[3]; Cari A. Beesley, MS[1]; Chung K. Marston[1]; Alex R. Hoffmaster, PhD[1]; William A. Bower, MD[1]; Maribel Gallegos Candela, MS[4]; John R. Barr, PhD[4]; Anne E. Boyer, PhD[4]; Zachary P. Weiner, PhD[1]; María E. Negrón, DVM, PhD[1]; Erin Swaney[3]; Briana O'Sullivan, MPH[3]

Anthrax is a rare but serious infectious zoonotic disease caused by the spore-forming bacterium *Bacillus anthracis*. In North America, animal outbreaks typically occur during summer in hot, dry weather (*1*). Rare cases among humans usually follow direct contact with or processing of anthrax-infected animals or contanimated animal products such as hides, hair, or wool (*1*,*2*). In early 2024, an unusual case of confirmed cutaneous anthrax* acquired during the winter in a geographic region with enzootic anthrax occurred, and an investigation was undertaken. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.†

Investigation and Outcomes

On January 4, 2024, a male rancher aged 50–59 years was evaluated at hospital A for fever, leukocytosis, a black eschar on his right wrist, and extensive edema and blistered lesions on his right arm; he was febrile and had an elevated white blood cell count (Table); anthrax was suspected to be the etiology. Eleven days earlier, on December 24, 2023, he had butchered a lamb that had died suddenly on his ranch, located in a Texas county adjacent to a region with enzootic anthrax, known as the "Anthrax Triangle."§ Before its death, the lamb was healthy and showed no sign of disease. Five persons reported exposure to the lamb. The patient and another person seasoned and cooked the meat; the well-cooked meat was then consumed at a meal with three other persons. Among these five persons, only the index patient exhibited symptoms consistent with cutaneous anthrax, and none experienced symptoms consistent with gastrointestinal anthrax.¶

The patient was initially seen by a general practitioner on January 1 and commenced a course of cephalexin for empiric treatment of soft tissue infection. Anthrax was not initially suspected as the etiology of his symptoms. After 3 days of empiric antibiotic therapy without response, the patient was evaluated at hospital A. A detailed clinical history and the patient's clinical signs and symptoms raised the index of suspicion for anthrax, and wound swabs and blood were collected before initiation of antimicrobial monotherapy for presumed nonsystemic, cutaneous anthrax. The patient showed signs of systemic involvement and dual therapy for anthrax (ciprofloxacin and clindamycin) was initiated (*3*) the same day. The following morning, he was transferred to hospital B, a larger facility equipped for a more extensive evaluation of his severe edema and malaise. The Texas Department of State Health Services Laboratory performed real-time polymerase chain reaction (PCR) testing and culture from the patient's wound swabs. Two wound swabs were positive for *B. anthracis* DNA** by real-time PCR; however, culture did not yield an organism consistent with *B. anthracis*. The patient recovered and was discharged after 1 week, on January 12.

The lamb was suspected to be the source of the patient's illness and, in light of suspected anthrax, interviews were conducted with the patient and his family members. On January 6 and January 11, two ewes subsequently died on the farm with ocular and nasal hemorrhage. Nasal swabs were collected ≥12 hours after death and sent to the Texas A&M Veterinary Medical Diagnostic Laboratory for culture for *B. anthracis*. Test results from both animals were negative; however a high level of clinical and epidemiologic suspicion for anthrax remained. No other animal deaths occurred during the remaining winter season.

* The national standardized case definition accepted in 2018 by the Council of State and Territorial Epidemiologists defines a confirmed case of cutaneous anthrax as including at least one specific or two nonspecific symptoms and signs that are compatible with cutaneous anthrax (a small, painless, pruritic papule on an exposed surface, a vesicle, or a depressed black eschar; edema or erythema; lymphadenopathy; and fever) and confirmatory laboratory criteria (culture and identification from clinical specimens; demonstration of *B. anthracis* antigens in tissues by immunohistochemical staining; evidence of a fourfold rise in antibodies between acute and convalescent sera; detection of *B. anthracis* or anthrax toxin genes by PCR; or detection of lethal factor [LF] in clinical serum specimens by LF mass spectrometry). https://ndc.services.cdc.gov/case-definitions/anthrax-2018/

† 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.

§ The "Anthrax Triangle" represents the geographic region of Texas where laboratory-confirmed animal anthrax cases are most frequent and is bounded by the towns of Eagle Pass, Ozona, and Uvalde. Counties represented in this region include Crockett, Edwards, Kinney, Maverick, Sutton, Uvalde, Val Verde, and Zavala counties.

¶ Signs and symptoms of gastrointestinal anthrax include fever and chills, neck swelling, sore throat, hoarseness, painful swallowing, nausea, vomiting, diarrhea, headache, abdominal pain, and abdominal distention. https://www.cdc.gov/anthrax/about/index.html#cdc_disease_basics_symptoms-symptoms

** Laboratory Response Network–validated real-time PCR test result considered positive for the presence of *B. anthracis* DNA if all three signatures (BA1, BA2, and BA3) cross the threshold within 40 cycles.

TABLE. Timeline of events and diagnostics related to investigation of an anthrax case on a sheep farm in winter — Texas, December 2023–January 2024.

Date	Event	Diagnostic test, sample or source (collection date), location performed	Result	Interpretation
Dec 24, 2023	Lamb death, butchering	—	—	—
Dec 25, 2023	Patient consumed cooked lamb meat	—	—	—
Jan 1, 2024	Patient visited general practitioner	—	—	—
	Cephalexin* 500 mg per os (by mouth) every 8 hrs prescribed			
Jan 4, 2024	Patient developed blisters, edema, and eschar	CBC, blood, (Jan 4), Hospital A	Eosinophils count 0 $10^3/\mu$L (Ref = 0–0.40)	Low–normal
	Patient visited Hospital A		Eosinophils percent 0.02% (Ref = 1.00%–5.00%)	Low
	Swabs, serum, and blood cultures collected		Erythrocyte MCH 31.2 pg (Ref = 27.0–31.0)	Normal–high
	Vancomycin† 1 g IV every 24 hrs prescribed		Erythrocyte MCHC 36.0 g/dL (Ref = 33.0–37.0)	Normal–high
	Vancomycin† discontinued		Erythrocyte MCV 86.6 fL (Ref = 80.0–105.0)	Normal
	Ciprofloxacin§ 400 mg IV every 8 hrs prescribed		Erythrocyte count 5.21 x $10^6/\mu$L (Ref = 4.20–6.10)	Normal
	Clindamycin§ 600 mg IV every 8 hrs prescribed		Hematocrit 45.1% (Ref = 42.0%–52.0%)	Normal
			Hemoglobin 16.3 g/dL (Ref = 14.0–16.0)	High
			Leukocytes count 14.65 x $10^3/\mu$L (Ref = 4.80–10.80)	High
			Lymphocytes count 0.43 $10^3/\mu$L (Ref = 1.20–3.40)	Low
			Monocytes count 0.39 $10^3/\mu$L (Ref = 0.10–0.60)	Normal
			Monocytes percent 7.36% (Ref = 1.70%–9.30%)	Normal
			MPV 7.0 fL (Ref = 7.4–10.4)	Low
			Neutrophils count 13.77 $10^3/\mu$L (Ref = 1.40–6.50)	High
			Neutrophils percent 94.01% (Ref = 42.00%–75.20%)	High
			Platelet count 191 x $10^3/\mu$L (Ref = 130–400)	Normal
Jan 5, 2024	Patient transferred to Hospital B Swabs, serum, and blood collected	—	—	—
Jan 6, 2024	Ewe #1 death, hemorrhage from eyes and nose	—	—	—
Jan 8, 2024	—	Culture, patient swab (Jan 5), Hospital B	No growth	—
		Real-time PCR,¶ patient swab (Jan 6), TX DSHS	Positive	—
Jan 11, 2024	Ewe #2 death, hemorrhage from eyes and nose	Culture, patient swab (Jan 6), TX DSHS	No growth	—
Jan 12, 2024	Patient discharged	Real-time PCR,¶ patient swab (Jan 4), TX DSHS	Positive	—
	Swabs collected from both ewes	Culture, patient swab (Jan 4), TX DSHS	No growth	—
Jan 15, 2024	Convalescent serum collected from patient	Culture, ewe #1 swab (Jan 12), TVMDL	No growth	—
		Culture, ewe #2 swab (Jan 12), TVMDL	No growth	—
Jan 30, 2024	—	ELISA,** serum (Jan 4), CDC	0 μg/mL	—
		ELISA,** serum (Jan 15), CDC	31.4 μg/mL	—
Jan 31, 2024	—	Mass spectrometry,†† serum (Jan 4), CDC	11.9 ng/mL	—
		Mass spectrometry,†† serum (Jan 15), CDC	Below limit of detection	—

Abbreviations: CBC = complete blood count; ELISA = enzyme-linked immunosorbent assay; fL = femtoliter (10^{-15} L); HCP = health care provider; IgG = immunoglobulin G; IV = intravenous; MCH = mean corpuscular hemoglobin; MCHC = mean corpuscular hemoglobin concentration; MCV = mean corpuscular volume; MPV = mean platelet volume; PCR = polymerase chain reaction; pg = picogram (10^{-12} g); Ref = reference value or range; TVMDL = Texas A&M Veterinary Medical Diagnostic Laboratory; TX DSHS = Texas Department of State Health Services.

* Cephalosporins are contraindicated for the treatment of naturally occurring *Bacillus anthracis* because of intrinsic resistance.

† Not approved by the Food and Drug Administration for anthrax postexposure prophylaxis or treatment.

§ Antimicrobial treatment for systemic anthrax when meningitis has been excluded should include two or more antimicrobial drugs with activity against *B. anthracis:* one or more should have bactericidal activity, and one or more should be a protein synthesis inhibitor.

¶ Laboratory Response Network–validated real-time PCR test result considered positive for the presence of *B. anthracis* DNA if all three signatures (BA1, BA2, and BA3) cross the threshold within 40 cycles.

** A more than fourfold rise in anti-protective antigen IgG concentration between the paired acute and convalescent sera is indicative of seroconversion. If the acute serum IgG is ≤3.7 μg/mL, seroconversion is considered to have occured if the convalescent serum result is more than fourfold over 3.7 μg/mL (14.8 μg/mL).

†† Total lethal factor activity was analyzed using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry using established, Clinical Laboratory Improvement Amendments–approved analytical methods. These tests have not been cleared or approved by the Food and Drug Administration. The performance characteristics have been established by CDC. The limit of detection is 0.0027 ng/mL. Results for serum are reported in ng/mL.

Paired sera from the patient were sent to CDC to measure anti-protective antigen (PA) antibodies and lethal factor (LF), a toxin produced by *B. anthracis*, using enzyme-linked immunosorbent assay (ELISA) and mass spectrometry, respectively. A more than fourfold increase in the concentration of anti-PA immunoglobulin G[††] was noted between serum specimens collected 11 days apart, indicating exposure to *B. anthracis*. LF concentration was 11.9 ng/mL in the acute serum sample,[§§] one of the highest LF levels ever measured in a patient with cutaneous anthrax at CDC or any other location (*4*). Cooked meat from the lamb was stored frozen for 2 weeks and sent to CDC for real-time PCR and culture. DNA extraction was performed on three separate sections of tissues; all were positive for *B. anthracis* by real-time PCR despite no culture growth.

Preliminary Conclusions and Actions

Nonculture testing through real-time PCR, ELISA, and mass spectrometry at CDC Laboratory Response Network sites was critical to confirming the diagnosis of anthrax considering of the unusual seasonality and inability to culture *B. anthracis*. Older evidence suggests that first-generation cephalosporins might be effective against *B. anthracis* (*5*) and might have prevented culture growth. However, treatment of naturally occurring *B. anthracis* with cephalosporins is contraindicated because of intrinsic resistance (*3*). This patient recovered only after receiving treatment with antimicrobials effective against anthrax (*3*).

The lack of culture growth from the two ewes could be attributed to factors including delayed sampling, handling, storing, or shipping swabs. *B. anthracis* DNA was detected in cooked meat from the lamb, and there was no culture evidence of viable bacteria from the meat. The infecting bacteria possibly were inactivated when the meat was cooked at high temperatures; however, there is no safe way to prepare meat for human consumption from an animal that has died of anthrax.

This outbreak occurred on a farm adjacent to the Anthrax Triangle in Texas and near the location of a 2019 human cutaneous anthrax case that was associated with an outbreak in animals, which included 25 culture-positive animal cases (*2*). In both the 2019 case and the current case, the patients reported direct skin exposure to animal carcasses, emphasizing the importance of avoiding processing carcasses of animals that unexpectedly die of unknown causes in this region regardless of the season. If animals must be moved, personal protective equipment should be worn. There was no clear history of routine vaccination against anthrax for this herd, or whether the remaining herd was vaccinated after the three animal deaths. Concerns about vaccine-associated adverse events among goats and horses were previously reported in this area (*2*), and routine animal vaccination remains essential in preventing anthrax in animals and subsequent spillover into humans (*1*).

Summary

What is already known about this topic?

Anthrax is a zoonotic disease. In North America, cases among humans usually follow sporadic animal outbreaks during the hot, dry summer months.

What is added by this report?

An unexpected anthrax outbreak occurred during winter in a Texas county adjacent to the Anthrax Triangle, a region with enzootic anthrax. Confirmatory nonculture evidence of *Bacillus anthracis* infection was identified in a lamb and a symptomatic patient who prepared its meat for consumption.

What are the implications for public health practice?

Routine anthrax vaccination of animals is needed in this geographic region with known enzootic anthrax. Processing animals that die suddenly from unknown causes should be avoided, irrespective of the season.

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Terry S. Hensley, Texas A&M Veterinary Medical Diagnostic Laboratory.

Corresponding author: Cari A. Beesley, fts3@cdc.gov.

[1]Division of High-Consequence Pathogens and Pathology, National Centers for Emerging and Zoonotic Infectious Diseases, CDC; [2]Epidemic Intelligence Service, CDC; [3]Texas Department of State Health Services; [4]Division of Laboratory Sciences, National Center for Environmental Health, CDC.

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[††] A more than fourfold increase in anti-PA immunoglobulin G (IgG) concentration between the paired acute and convalescent sera is indicative of a seroconversion. If the acute serum IgG is ≤3.7 μg/mL, seroconversion is evident if the convalescent serum result increases more than fourfold over 3.7 μg/mL (14.8 μg/mL).

[§§] Total LF activity was analyzed using matrix-assisted laser desorption/ionization time-of-flight mass spectrometry using established, Clinical Laboratory Improvement Amendments–approved analytical methods. These tests have not been cleared or approved by the Food and Drug Administration. The performance characteristics have been established by CDC. The limit of detection is 0.0027 ng/mL. Results for serum are reported in ng/mL

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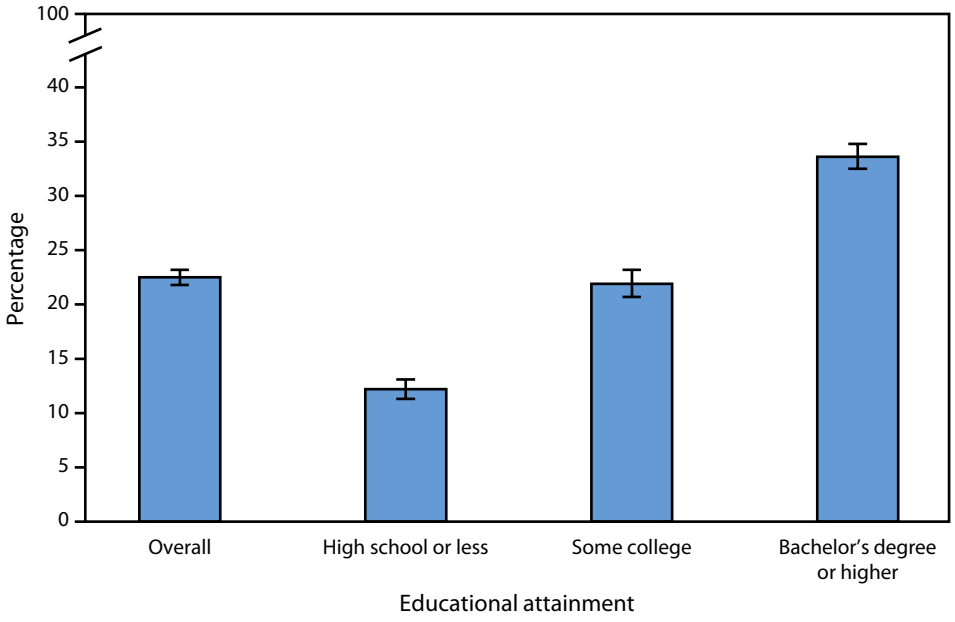
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Aged ≥25 Years† Who Met the 2018 Federal Physical Activity Guidelines for Both Muscle-Strengthening and Aerobic Physical Activity,§ by Educational Attainment — United States, 2022



* Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population, with 95% CIs indicated by error bars.
† Data are not shown when age is missing.
§ Per U.S. Department of Health and Human Services 2018 *Physical Activity Guidelines for Americans, 2nd edition* (https://health.gov/paguidelines). The aerobic physical activity guideline was met if the respondent reported engaging in ≥150 minutes per week of moderate-intensity aerobic physical activity or ≥75 minutes per week of vigorous-intensity aerobic physical activity, or an equivalent combination. The muscle-strengthening guideline was met if the respondent reported performing muscle-strengthening activities on ≥2 days per week.

In 2022, 22.5% of adults met federal guidelines for both muscle-strengthening and aerobic physical activity. The percentage of adults who met these guidelines increased with increasing educational attainment, from 12.2% among adults who completed high school or less to 33.6% among those with a bachelor's degree or higher.

Supplementary Table: https://stacks.cdc.gov/view/cdc/155046

Source: National Center for Health Statistics, National Health Interview Survey, 2022. https://www.cdc.gov/nchs/nhis.htm

Reported by: Gelila Haile, MPH, tyz1@cdc.gov; Benjamin Zablotsky, PhD.

For more information on this topic, CDC recommends the following link:
https://www.cdc.gov/physical-activity-basics/benefits/index.html

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