

## Notes from the Field

### Diagnosis and Investigation of Pneumonic Plague During a Respiratory Disease Pandemic — Wyoming, 2021

Allison W. Siu, DVM<sup>1</sup>; Courtney Tillman, MPH<sup>2</sup>;  
Clay Van Houten, MS<sup>2</sup>; Ashley Busacker, PhD<sup>2,3</sup>; Alexia Harrist, MD<sup>2</sup>

In September 2021, the Wyoming Department of Health (WDH) was notified of a suspected case of pneumonic plague in an adult who was admitted to a Wyoming hospital following a 48-hour history of worsening cough, dyspnea, and acute onset of hemoptysis. The patient reported no recent travel history or ill contacts but noted interacting with two pet cats that were ill. Health care providers initially suspected COVID-19 because of compatible symptoms, no history of COVID-19 vaccination, and increased SARS-CoV-2 (the virus that causes COVID-19) community transmission in Wyoming during this period.

Approximately 48 hours after symptom onset, the patient received a negative SARS-CoV-2 antigen test result at a provider's office. The patient was hospitalized later that day for worsening symptoms and received two negative SARS-CoV-2 laboratory-based nucleic acid amplification test results. Lung imaging was consistent with community-acquired pneumonia. Respiratory specimens tested negative for common viral pathogens on a respiratory panel. Within 48 hours of admission, the patient required mechanical ventilation and developed sepsis. The patient was treated for pneumonia and sepsis with azithromycin, piperacillin-tazobactam, and vancomycin. Seventy-two hours after the patient was admitted to the hospital, blood and sputum cultures did not indicate a causative pathogen. Because of the patient's history of exposure to cats that were ill, an infectious diseases specialist recommended repeating a sputum culture with Gram stain and empiric treatment with ciprofloxacin. Gram-negative bacilli were detected, and the Wyoming Public Health Laboratory subsequently confirmed *Yersinia pestis* as the pathogen.

WDH immediately conducted interviews to determine exposure source, identify close contacts requiring postexposure prophylaxis (PEP) (1), and guide public health prevention measures. Interviews with veterinary clinic staff members and review of records revealed that one cat had died from an undiagnosed severe illness after onset of respiratory symptoms; serologic testing of specimens from the surviving cat for *Y. pestis* by CDC was negative. WDH interviews with local animal control and state wildlife officials revealed no known epizootic near the patient's residence, which was in a rural area of Wyoming; however, both pet cats were known to

spend time indoors and outdoors and were not treated with flea control products.

To guide PEP recommendations, WDH reviewed medical records, collaborated with hospital infection preventionists, and interviewed the patient's friends, family members, neighbors, and work colleagues. Twenty-two close contacts were identified (19 health care workers and three personal contacts). All received PEP within 1 week of the patient's symptom onset, and none developed illness. The patient recovered and was discharged 35 days after hospital admission.

Environmental assessment of the patient's residence was conducted by a professional pest management company. Plague prevention measures included flea mitigation and rodent habitat elimination to reduce abundance of potential flea-harboring rodents. WDH shared plague prevention materials by press release and disseminated educational materials to community members.

*Y. pestis* is reportable in Wyoming (2) and is endemic in rodents and their fleas statewide. Persons can become infected through the bite of an infected flea or contact with infected animals including pets (3), underscoring the importance of year-round flea control for pets. Pneumonic plague is the only clinical form of the disease that can be transmitted between persons through respiratory droplets and if left untreated is almost always fatal (1). This is the second case of primary pneumonic plague and the seventh of any form of plague in Wyoming's documented history. Nationwide, 18 cases of pneumonic plague were reported during 1942–2018 (4).

Rapid identification and diagnosis of *Y. pestis* is crucial for effective patient treatment and public health response. Despite the delay in diagnosis, WDH was able to rapidly coordinate timely public health intervention and effective community outreach. Furthermore, recognition of patient contact with cats that were ill was critical in prompting change to first-line antibiotic treatment effective against plague. Exposure to infected cats is a substantial plague risk in the United States (5), highlighting the importance of animal contact history during patient intake.

Overlooked diagnoses of rare pathogens can lead to significant consequences. This investigation highlights challenges associated with diagnosis and treatment of an illness from a rare pathogen whose symptoms mimic those of a pandemic illness, in this case, COVID-19. Timelier diagnosis might have resulted in initiation of effective antibiotic treatment closer to disease onset and decreased illness severity and hospitalization. Clinicians should be aware of the possibility of plague in patients with compatible symptoms and exposure history in areas where plague is endemic.

## Acknowledgments

Wyoming Public Health Laboratory; Bacterial Diseases Branch, Division of Vector-Borne Diseases, CDC.

Corresponding author: Allison Siu, mko8@cdc.gov.

<sup>1</sup>Epidemic Intelligence Service, CDC; <sup>2</sup>Wyoming Department of Health; <sup>3</sup>Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, CDC.

All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

## References

1. Nelson CA, Meaney-Delman D, Fleck-Derderian S, Cooley KM, Yu PA, Mead PS. Antimicrobial treatment and prophylaxis of plague: recommendations for naturally acquired infections and bioterrorism response. *MMWR Recomm Rep* 2021;70(No. RR-3):1–27. PMID:34264565 <https://doi.org/10.15585/mmwr.rr7003a1>
2. Wyoming Department of Health. Wyoming Department of Health reportable diseases and conditions. Cheyenne, WY: Wyoming Department of Health; 2020. <https://health.wyo.gov/wp-content/uploads/2020/04/2020ReportableListrevised-1.pdf>
3. Gage KL, Kosoy MY. Natural history of plague: perspectives from more than a century of research. *Annu Rev Entomol* 2005;50:505–28. PMID:15471529 <https://doi.org/10.1146/annurev.ento.50.071803.130337>
4. Kugeler KJ, Mead PS, Campbell SB, Nelson CA. Antimicrobial treatment patterns and illness outcome among United States patients with plague, 1942–2018. *Clin Infect Dis* 2020;70(Suppl 1):S20–6. PMID:32435801 <https://doi.org/10.1093/cid/ciz1227>
5. Gage KL, Dennis DT, Orloski KA, et al. Cases of cat-associated human plague in the western US, 1977–1998. *Clin Infect Dis* 2000;30:893–900. PMID:10852811 <https://doi.org/10.1086/313804>