

Nebraska Department of Health and Human Services

Health Alert Network

UPDATE

October 3, 2024

Increase in Tularemia Cases in Nebraska

Background

To date, 18 cases of tularemia have been reported to the Nebraska Department of Health and Human Services in 2024, an increase above the annual average of 10.8 cases over the last five years (2019–2023). Of particular concern is an increase in reported cases during the month of September. In contrast with the previous five years in which only one case was reported on average, seven cases have been reported to date in September 2024. Of these, four (57%) have been classified as the pneumonic form of tularemia, which is characterized by cough, chest pain, and difficulty breathing. This results from inhaling dusts or aerosols containing *Francisella tularensis*. Inhalation of infective aerosols can be generated while handling animal hides, cleaning areas contaminated with dried rodent carcasses, moving contaminated grain, or by mowing over infected animal carcasses. Healthcare providers should keep tularemia as a differential diagnosis for individuals presenting with pneumonia-like symptoms particularly for patients with a compatible exposure history.

Tularemia

Tularemia is caused by the bacteria *Francisella tularensis*. This bacterium is found in nature in rabbits, muskrats, prairie dogs, and other rodents. Human infection occurs through several routes, including tick or deer fly bites, skin contact with infected animals, bites from infected cats, ingestion of contaminated water, or inhalation of contaminated dusts or aerosols.

Disease signs and symptoms vary depending on how the bacteria enters the body, with illness severity ranging from mild to life-threatening. All forms are accompanied by fever, which can be as high as 104°F. Forms of tularemia include:

- **Ulceroglandular:** Typically occurs following a tick or deer fly bite or after handling of an infected animal. A skin ulcer appears at the site where the bacteria entered the body. The ulcer is accompanied by swelling of regional lymph glands, usually in the armpit or groin.
- **Glandular:** Similar to ulceroglandular tularemia but without an ulcer. Also generally acquired through the bite of an infected tick or deer fly or from handling sick or dead infected animals.
- **Oculoglandular:** Occurs when the bacteria enter through the eye. This can occur when a person is butchering an infected animal and touches their eyes. Symptoms include irritation and inflammation of the eye and swelling of lymph glands in front of the ear.
- **Oropharyngeal:** Results from eating or drinking contaminated food or water. Patients with oropharyngeal tularemia might experience sore throat, mouth ulcers, tonsillitis, and swelling of lymph glands in the neck.
- **Pneumonic:** This is the most serious form of tularemia. Symptoms include cough, chest pain, and difficulty breathing. This form results from breathing dusts or aerosols containing the organism. It can also occur when other forms of tularemia (e.g., ulceroglandular) are left untreated and the bacteria spread through the bloodstream to the lungs.

- **Typhoidal:** Characterized by any combination of the general symptoms (which may include fever, chills, headache, malaise, fatigue, lack of appetite, muscle aches, chest discomfort, cough, vomiting, diarrhea, and/or abdominal pain) without the localizing symptoms of other syndromes.

Laboratory Diagnosis:

Depending on the form of illness, appropriate specimens include swabs or scrapings of skin lesions, lymph node aspirates or biopsies, pharyngeal swabs, sputum specimens, gastric aspirates, and blood (for cultures) or serum (for serological testing).

- The most definitive means of confirming a diagnosis of tularemia is identifying growth of *F. tularensis* in culture. Upon receipt of a suspected culture, the Nebraska Public Health Laboratory (NPHL) can confirm identification of *F. tularensis* following established Centers for Disease Control and Prevention (CDC) Laboratory Response Network (LRN) procedures.
- A presumptive diagnosis of tularemia can be made through testing of specimens using IFA, IHC staining, or PCR.
- A confirmed diagnosis of tularemia can also be established serologically by demonstrating a 4-fold change in specific antibody titers between acute and convalescent sera. Convalescent sera should be drawn at least 4-weeks after illness onset. This method can be useful for confirming a diagnosis but has limited use for clinical management.

In patients that present with symptoms and history highly suggestive of tularemia, clinicians should consider culture to facilitate recovery and confirmed identification of *F. tularensis*. If tularemia is suspected, laboratory staff should be alerted to ensure safety precautions are in place to prevent exposure and infection in the lab workers.

Laboratorians should review the direct Gram stain report before opening culture plates. Note that *Francisella tularensis* is oxidase negative, tube catalase weak positive, and beta-lactamase positive.

Watch for trigger points that indicate the need for the Laboratory Response Network's (LRN) Rule-out protocol. If any trigger points are present, all cultures should be manipulated in a certified Biological Safety Cabinet.

Trigger points specifically for *Francisella tularensis* include:

- Tiny pleomorphic poorly stained Gram-negative coccobacilli.
- Interpretation of Gram stain very difficult due to minute size, often reported as not otherwise specified (NOS).
- Slow growth at ≤ 48 hours, gray-white, opaque, shiny, or wet colonies.
- Better growth on Chocolate agar.
- May initially grow on blood agar (BAP) if cultured from blood, subsequent passage to BAP may fail to grow.

If trigger points are present, perform the LRN Rule-out protocol as defined in the *NPHL Bench Guide for Hazardous Pathogens* http://nphl.org/documents/NPHLBenchGuide_FINAL20131221.pdf .

If a hazardous organism **CAN** be ruled out by the LRN protocol, culture plates can then safely be handled on an open bench or tested with automated kit systems for identification.

If a hazardous organism **CANNOT** be ruled out by the LRN protocol, please immediately notify the laboratory manager, infection control, and local/state health department. Please also contact the Nebraska Public Health Laboratory (NPHL) as soon as possible via the NPHL 24/7 emergency pager at 402-888-5588.

Following NPHL notification, suspected cultures of *F. tularensis* must be shipped or transported as a Category A organism. Shipping guidance can be provided by NPHL staff or can be referenced in the following location: [Specimen Packaging & Shipping - NPHL](#)

Treatment:

Commonly used antibiotics to treat tularemia include gentamicin, ciprofloxacin, or doxycycline. Treatment is typically indicated for 10 to 21 days depending on the stage of illness and medication used. Refer to Table 1 below for the treatment recommendations.

Table 1. Treatment Recommendations for Tularemia

Source: CDC Tularemia Website <https://www.cdc.gov/tularemia/hcp/clinical-care/index.html>

Age Category	Drug	Dosage	Maximum	Duration (Days)
Adults	Gentamicin*	5 mg/kg IM or IV daily (with desired peak serum levels of at least 5 mcg/mL)	Monitor serum drug levels	10 – 14
	Ciprofloxacin*	400 mg IV or 500 mg PO twice daily	N/A	10 – 14
	Doxycycline	100 mg IV or PO twice daily	N/A	14 – 21
Children	Gentamicin*	2.5 mg/kg IM or IV 3 times daily**	Monitor serum drug levels	10 – 14
	Ciprofloxacin*	15 mg/kg IV or PO twice daily	800 mg per day	10 – 14
	Doxycycline	2.2 mg/kg IV or PO twice daily	100 mg IV or PO twice daily	14 – 21
*Not a U.S. FDA-approved use but has been used successfully to treat patients with tularemia.				
**Once-daily dosing could be considered in consultation with a pediatric infectious disease specialist and a pharmacist.				

Note: Gentamicin is preferred for treatment of severe tularemia. Dose should be adjusted for renal insufficiency. For tularemia meningitis, combination therapy should be considered in consultation with an infectious disease specialist.

For More Information, Please Visit

“Confirmed Case of Longstanding Respiratory *Francisella tularensis holarctica* Infection: Nebraska, 2022”: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10828931/>

CDC Tularemia Website: <https://www.cdc.gov/tularemia/>

Tickborne Disease of the United States: A Reference Manual for Healthcare Providers: <https://www.cdc.gov/ticks/hcp/data-research/tickborne-disease-reference-guide/index.html>

Jeff Hamik, MS
 Vector-Borne Disease Epidemiologist
 402-471-2937

Timothy Tesmer, MD
 CMO Public Health
 402-471-8566