

# Tularemia

## IMMEDIATELY REPORTABLE DISEASE

Per N.J.A.C. 8:57, healthcare providers and administrators shall immediately report **by telephone** confirmed and suspected cases of tularemia to the health officer of the jurisdiction where the ill or infected person lives, or if unknown, wherein the diagnosis is made.

The health officer (or designee) **must immediately institute the control measures listed below in section 6, “Controlling Further Spread,”** regardless of weekend, holiday, or evening schedules. A directory of local health departments in New Jersey is available at <http://localhealth.nj.gov>.

If the health officer is unavailable, the healthcare provider or administrator shall make the report to the Department by telephone to (609) 826-5964, between 8:00 A.M. and 5:00 P.M. on non-holiday weekdays or to (609) 392-2020 during all other days and hours.



## 1 THE DISEASE AND ITS EPIDEMIOLOGY

### A. Etiologic Agent

*Francisella tularensis*, the agent of tularemia, is a small, gram-negative nonmotile coccobacillus bacterium. Two types of *F. tularensis* (A and B) occur in the United States. Type A organisms are classified as *F. tularensis* biovar *tularensis*, Type B organisms as *F. tularensis* biovar *holarctica*.

### B. Clinical Description

The clinical manifestations of tularemia vary in severity and presentation according to route of introduction and virulence of the agent. The onset of disease is typically sudden and influenza-like, with high fever (100°C - 104°C), chills, fatigue, muscle aches, joint pain, dry cough, headache, and diarrhea.

Illness may present as one of the following clinical syndromes:

- **Ulceroglandular** This is the most common form of tularemia and usually 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 animals.
- **Oculoglandular** This form occurs when the bacteria enter through the eye. This can occur when a person is butchering an infected animal and touches his or her eyes. Symptoms include irritation and inflammation of the eye and swelling of lymph glands in front of the ear.
- **Oropharyngeal** This form results from eating or drinking contaminated food or water. Patients with oropharyngeal tularemia may have 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** This form is characterized by any combination of the general symptoms (without the localizing symptoms of other syndromes)

Any form of tularemia may be complicated by hematogenous spread, resulting in secondary pleuropneumonia, sepsis, and, rarely, meningitis. Tularemia requires prompt identification and specific treatment to prevent development of serious symptoms.

Type A *F. tularensis* is more virulent; respiratory or ulceroglandular disease may result from contact with very few organisms. Type B organisms (*F. tularensis holarctica*) cause milder disease and require a higher dose to cause infection. The case-fatality ratio in untreated typhoidal tularemia can be 30–60%. Pulmonary tularemia requires prompt treatment to prevent a fatal outcome. The case-fatality ratio of Type A tularemia is 5–15% if untreated, primarily due to typhoidal or pulmonary disease.

### C. Reservoirs

Type A infections are acquired from rabbits or *Dermacentor* ticks. Type B infections are associated with a wide variety of mammalian hosts; rabbits, hares, and some rodents (e.g., beavers, muskrats) are particularly important. Domestic mammals, including livestock and cats, can acquire and spread the disease. Humans are usually dead-end hosts (i.e., they do not transmit the infection to others).

### D. Modes of Transmission

- *F. tularensis* infection can occur through multiple modes of transmission, including: Arthropod bite (deer flies, horse flies, and ticks; the American dog tick, *Dermacentor variabilis*, and the lone star tick, *Amblyomma americanum*, are the most often implicated ticks in the Northeast);
- Direct contact with infected animals (for example, while skinning/dressing wild game, especially rabbits and rodents);
- Ingestion (e.g., contaminated untreated drinking water, contaminated unpasteurized milk or contaminated undercooked rabbit or hare meat); or
- Inhalation (following exposure to cats with pulmonary tularemia, infectious aerosols generated while handling animal hides or cleaning areas with dried rodent carcasses, or infectious aerosols generated by winnowing, moving or loading contaminated grain).
- Less commonly, transmission may result from the bites or scratches of dogs, cats, carnivorous mammals or birds of prey that have killed or fed on infected animals.

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- Laboratory infections can also occur; these frequently present as pulmonary or typhoidal tularemia. NOTE: Cultures for patients with suspect infections should not be handled outside of biosafety-level 2 precautions. Clinicians suspecting tularemia should alert the laboratory receiving the specimen prior to processing.
- Person-to-person transmission has not been reported.

### E. Incubation Period

The incubation period for tularemia ranges from two to 14 days, and is dependent on the route of transmission, but is usually three to five days.

### F. Period of Communicability or Infectious Period

While person-to-person spread has not been reported, drainage from tularemic lesions is potentially infectious, and persons with the pulmonary form of tularemia may possibly aerosolize pathogenic bacteria during the course of their clinical illness.

*F. tularensis* is a resistant organism, surviving for weeks to months in cool water or mud, in tap water for up to three months, and in dry straw litter for as long as six months. Frozen (e.g., in rabbit meat), *F. tularensis* may remain infective for several years. Concentrations of chlorine attained in routine water purification are very effective at killing *F. tularensis*, as are trace amounts of copper sulfate or zinc.

### G. Epidemiology

Tularemia occurs throughout North America and in many parts of continental Europe, the former Soviet Union, China and Japan. In the United States, 314 cases were reported in 2015. There is an average of 1-2 cases of tularemia reported in NJ each year.

### H. Bioterrorism Potential

CDC considers *F. tularensis* to be a potential bioterrorism agent. If used in a bioterrorism attack, inhalation would be the most likely route of transmission and would present as pneumonia. *F. tularensis* could cause a serious public health challenge in terms of ability to limit the numbers of casualties and control other repercussions from such an attack.

## 2 CASE DEFINITION

## A. New Jersey Department of Health (NJDOH) Case Definition

The NJDOH Infectious & Zoonotic Disease Program follows the current case definition as published on the CDC National Notifiable Disease Surveillance System (NNDSS) website.

Tularemia Case Definition: <https://wwwn.cdc.gov/nndss/conditions/tularemia/>

Case definitions enable public health to classify and count cases consistently across reporting jurisdictions, and should not be used by healthcare providers to determine how to meet an individual patient's health needs. Every year, case definitions are updated using CSTE's Position Statements. They provide uniform criteria of nationally notifiable infectious and non-infectious conditions for reporting purposes. To search for other notifiable diseases' case definitions by name and by year, use the search tools on the left side of the NNDSS website: <http://wwwn.cdc.gov/nndss/>

### 1. Clinical Criteria

An illness characterized by several distinct forms, including the following:

- Ulceroglandular: cutaneous ulcer with regional lymphadenopathy
- Glandular: regional lymphadenopathy with no ulcer
- Oculoglandular: conjunctivitis with preauricular lymphadenopathy
- Oropharyngeal: stomatitis or pharyngitis or tonsillitis and cervical lymphadenopathy
- Pneumonic: primary pulmonary disease
- Typhoidal: febrile illness without localizing signs and symptoms

Clinical diagnosis is supported by evidence or history of a tick or deerfly bite, exposure to tissues of a mammalian host of *F. tularensis*, including via an animal bite, or exposure to potentially contaminated water.

### 2. Laboratory Criteria for Diagnosis

#### a. Supportive

- Elevated serum antibody titer(s) to *F. tularensis* antigen (without documented fourfold or greater change) in a patient with no history of tularemia vaccination, OR
- Detection of *F. tularensis* in a clinical or autopsy specimen by fluorescent assay, OR

- Detection of *F. tularensis* in a clinical or autopsy specimen by a polymerase chain reaction (PCR)

**b. Confirmatory**

- Isolation of *F. tularensis* in a clinical or autopsy specimen, OR
- Fourfold or greater change in serum antibody titer to *F. tularensis* antigen between acute and convalescent specimens

**3. Case Classification**

**CONFIRMED**

A clinically-compatible case with confirmatory laboratory evidence

**PROBABLE**

A clinically-compatible case with supportive laboratory evidence

## 3 LABORATORY TESTING

The Division of Public Health and Environmental Laboratories (PHEL) does not provide testing for tularemia, but testing is available at several commercial laboratories.

## 4 PURPOSE OF SURVEILLANCE AND REPORTING REQUIREMENTS

**A. Purpose of Reporting and Surveillance**

- To identify cases and clusters of human illness that may be associated with a bioterrorism event
- To identify where tularemia naturally occurs in New Jersey
- To determine whether the source of infection may be a major public health concern (e.g., a water supply, group camp, rodent die-off) and prevent further transmission.
- To focus prevention and control measures.

**B. Laboratory Reporting Requirements**

NJDOH requires laboratory directors to immediately report by telephone positive laboratory results to the health officer where the patient resides, or if unknown, to the jurisdiction

where the laboratory is located. If the health officer is unavailable, laboratory directors should call NJDOH (NJAC 8:57).

In the event a laboratory isolates *Francisella tularensis*, an immediate telephone call must be made to NJDOH to arrange confirmatory testing at PHEL.

### **C. Healthcare Provider Reporting Requirements**

Healthcare providers and administrators are required to immediately report by telephone both confirmed and suspect cases of tularemia to the health officer where the patient resides, or if unknown, where the patient is diagnosed. If the health officer is unavailable, providers should contact NJDOH at 609.826.5964 (weekdays), or (609) 392-2020 (nights/weekends).

### **D. Health Officer Reporting and Follow-Up Responsibilities**

Health Officers should immediately notify NJDOH by telephone of any known or suspect case of tularemia and initiate immediate public health investigation/response. Case information should be entered into CDRSS.

## **5 CASE INVESTIGATION**

### **A. Investigation**

1. It is the health officer's responsibility to investigate the case by interviewing the patient, physician and others who may be able to provide pertinent information. The [NJDOH Tularemia Investigation Worksheet](#) may be used to help guide the patient or physician interview.

If a bioterrorism event is suspected, NJDOH in conjunction with CDC and other response authorities will work closely with local health officer(s) and provide instructions/information on how to proceed.

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2. An epidemiologic investigation to identify the source of infection should be immediately initiated by the local health officer, focusing on the period 1-14 days prior to onset of symptoms. The following exposures should be investigated:
  - Animal contact: Ask the patient about potential direct or indirect residential, or recreational exposure to rabbits, rodents or other wild mammals (e.g., skinning, dressing, or performing necropsies). Also ask patient if there have been noted rabbit or rodent die offs near his/her property.
  - Inhalation: Ask patient about recent lawn mowing or landscaping activities and if rabbits or rodents were injured during those activities
  - Tick exposure: Ask the patient if they have removed an implanted tick during the incubation period
  - Food consumption: Ask the patient if they have consumed or handled insufficiently cooked meat from rabbits or other wild mammals
  - Laboratory exposure: Ask the patient if they are employed at a laboratory that may receive *F. tularensis* specimens
3. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the local health officer to understand and, if necessary, institute the control guidelines listed below in Section 6.

### B. Entry into CDRSS

Investigation worksheets DO NOT need to be mailed to IZDP as long as the information is entered into the appropriate fields and notes sections in CDRSS.

CDRSS Screen	Required Information
<b>Patient Info</b>	Enter demographic information, date reported to LHD, and illness onset date. If patient is under the age of 18, enter parent or guardian information under Patient Relations
<b>Clinical Status</b>	Enter date of initial health care evaluation, initial diagnosis, all medical facility and hospitalization dates, and all treatment information (including dosage and dates).



CDRSS Screen	Required Information
<b>Signs/Symptoms</b>	Check appropriate boxes for signs and symptoms and indicate their onset/resolution dates. Complete clinical symptoms are important for ensuring appropriate case classification. Enter additional symptoms by using the Add Symptom not Listed above or if unavailable, note additional symptom and findings in comments box.
<b>Laboratory Eval.</b>	If a chest x-ray was performed, enter date of exam and finding in Diagnostic Tests
<b>Risk Factors</b>	<ul style="list-style-type: none"> <li>• Tick exposure (location of bite)</li> <li>• Document if patient has a recent history of hunting or contact with animals or their carcasses– enter dates, addresses and species</li> <li>• Recent lawn mowing or related activities – document if rabbits or rodents were injured or died during landscaping activities</li> </ul>
<b>Case Comments</b>	Enter any additional information from the Investigational Worksheet that does not have a specific entry field in CDRSS

## 6 CONTROLLING FURTHER SPREAD

### A. Isolation and Quarantine Requirements

Isolation is not recommended for tularemia patients, given the lack of person-to-person transmission. In hospitals, standard precautions are recommended.

### B. Protection of Contacts of a Case

There is no immunization or prophylaxis for contacts of cases.

### C. Managing Special Situations

If a bioterrorism event is suspected, contact NJDOH immediately.

If a suspect *Francisella tularensis* culture is identified, call NJDOH immediately. NJDOH will assist the laboratory with identification of the organism, assessment of potential laboratory exposures and recommended prophylaxis and symptom monitoring for exposed individuals.

## 7 OUTBREAK SITUATIONS

- If multiple cases of tularemia occur in a city/town, or if an outbreak is suspected, investigate to determine the source of infection and mode of transmission. A common exposure (such as tick bites, contact with wild animals, or ingestion of contaminated water) should be sought and applicable preventive or control measures should be instituted. In accordance with NJAC 8:57, CDS should be contacted immediately at (609) 826-5964.
- CDS staff will help determine a course of action to prevent further cases and perform surveillance for cases that may cross several jurisdictions and therefore be difficult to identify at a local level.
- If a bioterrorism event is suspected, the NJDOH and other response authorities will work closely with local boards of health and provide instructions/information on how to proceed.

## 8 PREVENTIVE MEASURES

### A. Personal Preventive Measures/Education

- Hunters should wear gloves when skinning wild game, keep their hands/gloves away from their eyes and thoroughly wash their hands after handling wild game carcasses. Wild game meat should be cooked “well done” (to at least 150° F/65° C).
- When mowing or landscaping, don’t mow over sick or dead animals. When possible, check the area for carcasses prior to mowing. The use of masks may reduce the risk of inhaling the bacteria.
- Drink only treated water when in wilderness areas to avoid bacterial and protozoan diseases that can be transmitted via surface water.
- Tickborne disease prevention messages:
  - Know where ticks are: ticks live in or near wooded or grassy areas.
  - Always walk in the center of trails to avoid contact with ticks.
  - Keep your yard clean: mow lawns, clear brush and remove leaf litter.
  - Apply insecticides: use EPA-registered repellent with DEET on skin and permethrin on clothing, boots and camping gear
  - Cover up: wear long sleeves and pants tucked into socks to prevent ticks from getting under clothes.
  - Shower: showering can help find and wash off unattached ticks.
  - Inspect: check your body for ticks.

## B. Environmental Measures

In general, environmental measures are not necessary. In some cases however, improvements to drinking water supplies may be warranted. Additionally, implicated food items must be removed from the environment. A decision about removing implicated food items from the environment can be made in consultation with the NJDOH Food and Drug Safety Program at 609.826.4935.

## Additional Information

A Tularemia Fact Sheet and Tularemia Investigation Worksheet is available at the NJDOH website at <http://www.state.nj.us/health/cd/topics/tularemia.shtml>

## References

- American Academy of Pediatrics. 2000 *Red Book: Report of the Committee on Infectious Diseases, 25th Edition*. Illinois, Academy of Pediatrics, 2000.
- CDC. Case Definitions for Infectious Conditions under Public Health Surveillance. *MMWR* 1997; 46:RR-10.
- Chin, J., ed. *Control of Communicable Diseases Manual, 17th Edition*. Washington, DC, American Public Health Association, 2000.
- Massachusetts Department of Public Health, Division of Epidemiology and Immunization. *Guide to Surveillance and Reporting*. Massachusetts Department of Public Health, Division of Epidemiology and Immunization, January 2001.