

Tularemia

REPORT IMMEDIATELY

(Rabbit Fever, Deer-fly Fever, Ohara Disease, Francis Disease)



Section 1:

ABOUT THE DISEASE

A. Etiologic Agent

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

B. Clinical Description

To a great extent, the nature of the illness that occurs with tularemia reflects the route of transmission as well as the virulence of the infecting strain. Almost all cases have a rapid onset of fever and lymphadenopathy (inflamed lymph nodes). Bacteremia (bacteria in the blood), should it develop, may last for two weeks if untreated, and lesions may contain the organism for up to a month. Illness usually falls into one of the following categories:

Glandular	Patients present with one or more enlarged and painful lymph nodes that may become filled with pus.
Oculoglandular	Patients presenting with pus-producing conjunctivitis, enlarged lymph nodes of the neck or near the ears, and usually, fever, chills, and malaise.
Oropharyngeal	After ingestion of bacteria in contaminated food or water, patients present with a painful pharyngitis (with or without ulceration), abdominal pain, diarrhea, and vomiting.
Pneumonic (Pulmonary)	This form occurs as a primary infection following inhalation of organisms, or secondary to bacteremia; symptoms include non-productive cough, difficulty breathing, and chest pain. Patchy bilateral infiltrates are typically seen on chest x-ray.
Typhoidal	This is a rare form of tularemia, with development of enlarged and inflamed mesenteric lymph nodes, septicemia, abdominal pain (often protracted), diarrhea, vomiting, and gastrointestinal bleeding.
Ulceroglandular	Patients present with large, tender lymph nodes and a non-healing skin ulcer at the site of introduction of the bacteria, often accompanied by fatigue, chills, and malaise.

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

C. Vectors and Reservoirs

Tularemia is associated most often with wild animals; key reservoirs include rabbits, hares, voles, muskrats, beavers, and other rodents. Certain tick species can also act as a reservoir. Domestic mammals, including livestock and cats, can acquire and spread the disease. Tularemia vectors in the U.S. include certain ticks, deer flies, and horse flies. The common dog tick, *Dermacentor variabilis*, is most often implicated in cases in the Northeast.

D. Modes of Transmission

Probably no bacterial agent has more diversified modes of transmission than *F. tularensis*. Infection can occur by direct contact with an infected animal (e.g., while skinning/dressing wild game, especially rabbits and rodents); by arthropod bite (deer flies, horse flies, and ticks); by ingestion (e.g., contaminated untreated drinking water, contaminated unpasteurized milk, or contaminated undercooked rabbit or hare meat); or by 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). A pneumonic tularemia outbreak on Martha's Vineyard, spanning the summers from 2000–2005, is believed to be associated with inhalation of contaminated particles of dust, soil, or grass generated during outdoor landscaping activities. Less commonly, infection may occur by mechanical transmission of the bacteria through bites or scratches of dogs, cats, carnivorous mammals, or birds of prey that have recently killed or fed on infected animals. Laboratory infections can also occur; these frequently present as pulmonary or typhoidal tularemia. Tularemia is generally not directly transmitted from person to person.

F. tularensis is quite hardy. It survives for weeks to months in cool water or mud, for up to three months in tap water, and for as long as six months in dry straw litter. Frozen (e.g., in rabbit meat), it 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.

E. Incubation Period

The incubation period for tularemia ranges from 1–14 days, but is usually 3–5 days.

F. Period of Communicability or Infectious Period

Tularemia is generally not directly transmitted from person to person. However, 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. Flies can remain infective for 14 days, and ticks are infective throughout their lifetime. Rabbit meat frozen at 5°F (–15°C) can remain infective for over 3 years.

G. Epidemiology

Tularemia occurs throughout North America and in many parts of continental Europe, the former Soviet Union, China, and Japan. Type A *F. tularensis*, found only in the U.S., is common in rabbits (cottontail, jack, and snowshoe) and is frequently transmitted by a tick bite. In North America, Type B *F. tularensis* strains are commonly found in mammals other than rabbits. Tularemia is relatively uncommon in Massachusetts. On average, three cases are reported each year, usually in individuals who are living, working, or vacationing in Cape Cod, Martha's Vineyard, or Nantucket. Tularemia cases in Massachusetts are generally reported during the summer and early fall months.

Between 2000–2001, 21 cases of tularemia were reported to the MDPH, with 19 of those cases associated with an outbreak on Martha's Vineyard. A study completed by the MDPH, with assistance from the Centers for Disease Control and Prevention (CDC), found that persons who were involved in brush cutting or lawn mowing activities on Martha's Vineyard were at a higher risk of disease. It is probable that cases became infected after inhaling aerosolized contaminated particles of dust, soil, or grass.

Additional cases of pneumonic tularemia, primarily among individuals engaged in landscaping activities, were reported from Martha's Vineyard in the summers of 2002–2005.

H. Bioterrorist Potential

F. tularensis is a Category A bioterrorist agent. If acquired and properly disseminated, *F. tularensis* could cause a serious public health challenge.



Section 2:

REPORTING CRITERIA AND LABORATORY TESTING

A. What to Report to the Massachusetts Department of Public Health (MDPH)

Report any suspicion of tularemia called to your attention by a health care provider or any positive laboratory test result pertaining to tularemia. Also report any potential exposure that may be a bioterrorist event.

Note: See Section 3C for information on how to report a case.

B. Laboratory Testing Services Available

The MDPH State Laboratory Institute (SLI), Bioterrorism Response Laboratory (BRL) provides testing services for clinical specimens for *F. tularensis*. Specimens are tested by serology (on serum samples) and/or culture. Acceptable specimens include serum, blood cultures, biopsy tissue, and swabs taken from lesions. Laboratories can also submit isolates for identification and confirmatory testing. In addition, the BRL requests submission of all *F. tularensis* isolates for further testing for disease surveillance purposes.

For more information, call the BRL—24 hours a day, 7 days a week—at (617) 590-6390. The BRL must be notified prior to specimen submission.



Section 3:

REPORTING RESPONSIBILITIES AND CASE INVESTIGATION**A. Purpose of Reporting and Surveillance**

- ◆ To identify where tularemia occurs in Massachusetts.
- ◆ To focus preventive and control measures.
- ◆ 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 to stop transmission from such a source.
- ◆ To identify cases and clusters of human illness that may be associated with bioterrorism.

B. Laboratory and Health Care Provider Reporting Requirements

Tularemia is reportable to the local board of health (LBOH). The MDPH requests that health care providers immediately report to the LBOH in the community where the case is diagnosed, all confirmed or suspect cases of tularemia, as defined by the reporting criteria in Section 2A.

Laboratories performing examinations on any specimens derived from Massachusetts residents that yield evidence of *F. tularensis* infection shall immediately report such evidence of infection, directly by phone, to the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850.

For questions related to tularemia in animals or to report a suspect case of tularemia in an animal, contact the Massachusetts Department of Agricultural Resources (MDAR), Division of Animal Health, Dairy Services, and Biosecurity (DAH) at (617) 626-1795, or fax the information to the DAH at (617) 626-1850.

C. Local Board of Health (LBOH) Reporting and Follow-Up Responsibilities*Reporting Requirements*

MDPH regulations (*105 CMR 300.000*) stipulate that tularemia is reportable to the LBOH and that each LBOH must report any confirmed or suspect case of tularemia, as defined by the reporting criteria in Section 2A. Cases should be reported to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS), using a MDPH *Tularemia Case Report Form* (found at the end of this chapter). Refer to the *Local Board of Health Timeline* at the end of this manual's *Introduction* section for information on prioritization and timeliness requirements of reporting and case investigation.

Under *105 CMR 300.140, Reporting of Animal Diseases with Zoonotic Potential by Veterinarians*, any veterinarian or LBOH with knowledge of an animal disease potentially infectious to humans must also report the disease to the DAH by phone at (617) 626-1795, or by faxing the information to (617) 626-1850.

Case Investigation

If a LBOH learns of a suspect or confirmed case of tularemia, or any potential exposure that may be a bioterrorism event, it should call the MDPH immediately, any time of day or night, at (617) 983-6800 or (888) 658-2850.

1. Case investigation of tularemia in Massachusetts residents will be directed by the MDPH Division of Epidemiology and Immunization. If a bioterrorist event is suspected, the MDPH and other response agencies will work closely with the LBOH and will provide instructions/information on how to proceed.
2. Following immediate notification of the MDPH, the LBOH may be asked to assist in completing an official MDPH *Tularemia Case Report Form* (found at the end of this chapter). Most of the information required on the form can be obtained from the health care provider or from the medical record. Use the following guidelines to assist in completing the form:
 - a. Demographic information: Accurately record the contact information for the case as well as the case's age, sex, race, and occupation.
 - b. Clinical information: Note the symptom onset date and check off all reported symptoms. Also note whether the case is pregnant or has any underlying immunosuppressive conditions. Note what treatment was given, if any. Record whether the case was hospitalized including location, associated dates, and physician contact information.
 - c. Laboratory information: Check off all appropriate tests performed, and attach a copy of any laboratory results.
 - d. Exposure information: Use the approximate incubation period range for tularemia (1–14 days). Specifically, focus on the period beginning about 1 day prior to the case's onset date back to approximately 14 days before onset for the following exposures: tick bites, contact or other exposure to rabbits or other wild animals, brush cutting or mowing activities, travel history, and pets.
 - e. Include any additional comments regarding the case.
 - f. If you have made several attempts to obtain case information but have been unsuccessful (e.g., the case or health care provider does not return your calls or respond to a letter, or the case refuses to divulge information or is too ill to be interviewed), please fill out the form with as much information as you have gathered. Please note on the form the reason(s) why it could not be filled out completely.
3. After completing the form, attach laboratory report(s) and fax or mail (in an envelope marked "Confidential") to ISIS. The confidential fax number is (617) 983-6813. Call ISIS at (617) 983-6801 to confirm receipt of your fax. The mailing address is:

MDPH, Office of Integrated Surveillance and Informatics Services (ISIS)
305 South Street, 5th Floor
Jamaica Plain, MA 02130
Fax: (617) 983-6813

4. Institution of disease control measures is an integral part of case investigation. It is the responsibility of the LBOH to understand, and if necessary, institute the control guidelines listed in Section 4.



Section 4:

CONTROLLING FURTHER SPREAD**A. Isolation and Quarantine Requirements (105 CMR 300.200)**

None.

B. Protection of Contacts of a Case

There is no immunization or prophylaxis for contacts of cases. Inpatient cases with draining lesions and those with the pulmonary form of the disease should be cared for in accordance with standard precautions. No restrictions are indicated for outpatient management.

C. Managing Special Situations*Reported Incidence Is Higher Than Usual/Outbreak Suspected*

If the number of cases of tularemia reported in your city/town is higher than usual or if you suspect an outbreak, consult with the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, as soon as possible. The Division, with cooperation from the LBOH, will initiate an investigation to determine the source of infection and the mode of transmission. A common exposure (such as tick bites or unpasteurized milk) should be sought, and applicable preventive or control measures should be instituted. The MDPH Division of Epidemiology and Immunization will help determine a course of action to prevent further cases and can perform surveillance for cases across town lines, which would otherwise be difficult to identify at the local level.

Response to a Tick Bite

The longer a tick remains attached, the higher the likelihood of disease transmission. Whenever an attached tick is removed from the body, one should monitor one's health for the appearance of rash, fever, or flu-like symptoms, and one should immediately seek the advice of a health care provider should any symptoms occur, especially if the tick was attached for more than 24 hours. It may be helpful to save the tick after removal for two reasons: 1) if the person who was bitten goes on to develop signs or symptoms such as fever, flu-like symptoms, or a rash, it may be helpful for the physician to know the type of tick; and 2) depending on the circumstances of the bite (i.e., when a person was bitten, the type of tick, how long it was attached), a physician may choose to preventively treat a person who was bitten. The tick may be kept either securely sealed in a small plastic bag or attached, with clear tape, to a piece of paper. For individuals who do not wish to keep the tick, it can be either drowned in alcohol or flushed down the toilet.

Note: The MDPH does not provide either tick identification or tick testing services. A listing of agencies that provide these services for a fee is available on the MDPH website at www.mass.gov/dph/cdc/epii/lyme/lymebp.htm.

If an individual chooses to have the tick tested for a tickborne disease, the following information should be taken into account:

- ◆ Tests performed on the ticks are not perfect, and they do not test for all infections that ticks may carry. Therefore, even with a negative result, people should still monitor for the appearance of rash, fever, or other unusual symptoms and should immediately seek the advice of a health care provider, should any symptoms occur.

- ◆ If someone has been infected by a tick bite, symptoms may begin to occur even before the results of tick testing are available. Should any symptoms develop, people should not wait for tick testing results before seeking medical advice.
- ◆ A positive test on a tick is not an automatic indication that treatment is needed. A positive test indicates that the tick was infected but not that the tick was successful in spreading the infection to the person bitten. The longer a tick is attached, the greater the chance that it will spread infection. Positive test results should be discussed with a health care provider.

Note: Refer to the MDPH Foodborne Illness Investigation and Control Reference Manual for comprehensive information on investigating foodborne illness complaints and outbreaks. Copies of this manual have been made available to LBOH. It can also be located on the MDPH web site in PDF format at www.mass.gov/dph/fpp/refman.btm.

If bioterrorism is suspected, the MDPH and other response agencies will work closely with the LBOH and will provide instructions/information on how to proceed.

D. Preventive Measures

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 MDPH Center for Environmental Health, Food Protection Program (FPP) or the MDPH Division of Epidemiology and Immunization. The FPP is reachable at (617) 983-6712.

Personal Preventive Measures/Education

There is no available vaccine for tularemia. The best way to protect oneself is to avoid tick-infested areas or contact with potentially infected animals, and to take precautions when conducting landscaping activities. One may reduce one's risk of tularemia by taking the following preventive measures:

- ◆ In areas where contact with ticks cannot be avoided, individuals should take the following precautions:
 - Wear long, light-colored pants tucked into socks or boots, and a long-sleeved shirt.
 - Stay on trails when walking or hiking, and try to avoid areas with tall grass.
 - Use a repellent that contains DEET (the chemical N-N-diethyl-meta-toluamide), and follow the directions on the label. Choose a product that will provide protection for the amount of time spent outdoors. DEET products should not be used on children <2 months of age and should be used in concentrations of 30% or lower for older children and adults. Repellents that contain permethrin can only be applied to clothing, not to exposed skin.
- ◆ After spending time in tick-infested areas, individuals should check themselves, their children, and any pets for ticks. Adult dog ticks are about the size of a small watermelon seed. Parts of the body that ticks prefer include the back of the knees, armpits, scalp, groin, and back of the neck. Any attached ticks should be removed using fine-point tweezers. The tick should not be squeezed or twisted, but grasped close to the skin and pulled straight out using steady pressure. (See Section 4C for more information.)

- ◆ Avoid any direct contact with wild animals (especially rabbits and rodents), their droppings, or carcasses. Individuals who notice a sick or injured wild animal should call the local animal control officer.
- ◆ Minimize rodent and rabbit populations near the home by keeping woodpiles off the ground and in sunny areas, by fencing off any garden areas, by never leaving pet food outside after a pet has eaten, and by securing all garbage in rodent-proof containers.
- ◆ Avoid drinking water that may have been contaminated by wild animals, especially rabbits or rodents. If drinking water is received from a well, be sure it is protected from contamination by wild animals.
- ◆ Use gloves, an appropriate respirator, and eye protection (e.g., goggles) when skinning or dressing wild animals. Any wild game should be thoroughly cooked before being eaten, and as with other raw meats, steps should be taken to avoid cross-contamination (i.e., hands, utensils, and surfaces should all be thoroughly washed after handling any raw meats or meat products, and the juices from raw meats should not come into contact with any cooked or ready-to-eat foods.)
- ◆ Domestic cats and dogs can become infected with tularemia if they come into contact with an infected animal. In rare situations, they may spread tularemia to people. Do not allow pets to roam outdoors unsupervised. If your pets do go outside unsupervised, they should be in a secured yard or kennel. Individuals should speak to their veterinarian if their dog or cat shows any signs of illness, such as fever, loss of appetite, or listlessness.
- ◆ Talk to a veterinarian about appropriate tick control measures (tick collars, repellents) to protect pets from ticks and to prevent pets from bringing ticks into the home.

To help prevent individuals from getting sick from tularemia when they do outdoor landscaping activities, advise the following:

- ◆ Check the area where they are working for dead animal bodies before using any lawn-mowing or brush-cutting equipment. Never handle an animal body with bare hands. Always use gloves or a shovel to gently clean up the body, and either bury it or double bag it in plastic and throw it in the trash.
- ◆ Keep all outdoor landscaping equipment (e.g., lawn mowers, brush cutters, weed whackers) well-maintained, and use equipment according to the manufacturer's instructions. When using such equipment, try not to create a lot of dust from the soil or grass.
- ◆ Use an appropriate respirator for added protection. Respirators are generally not expensive and may be purchased at hardware supply stores. Look for respirators that say "N-95" and "NIOSH certified" on the package.
- ◆ Be aware that N-95 respirators, and other similar respirators, depend on a complete seal of the respirator to the face to provide good protection. Many things, such as facial hair (even the stubble of a few days' growth), absence of one or both dentures, and deep facial scars, can prevent a complete seal, and therefore, lessen the protection provided by the respirator.
- ◆ Be aware that N-95 respirators, and other similar respirators, make breathing more difficult and can place strain on the heart and lungs. Individuals who have any heart or lung conditions, such as heart disease or asthma, should talk to their doctors before using such a respirator.

A Tularemia Public Health Fact Sheet is available from the MDPH Division of Epidemiology and Immunization or on the MDPH website at www.mass.gov/dph. Click on the “Publications and Statistics” link, and select the “Public Health Fact Sheets” section under “Communicable Disease Control.” Additional information on tularemia as well as other diseases spread by ticks in Massachusetts can be found on the MDPH Tickborne Disease Website at www.mass.gov/dph/cdc/epii/lyme/lymehp.htm.



ADDITIONAL INFORMATION

The following is the formal CDC case definition for tularemia. It is provided for your information only and should not affect the investigation and reporting of a case that fulfills the criteria in Section 2A of this chapter. (The CDC and the MDPH use the CDC case definitions to maintain uniform standards for national reporting.) For reporting to the MDPH, always use the criteria outlined in Section 2A.

Note: The most up-to-date CDC case definitions are available on the CDC website at www.cdc.gov/epo/dphsi/casedef/case_definitions.htm.

Clinical Description

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

- ◆ Glandular (regional lymphadenopathy with no ulcer);
- ◆ Intestinal (intestinal pain, vomiting, and diarrhea);
- ◆ Oculoglandular (conjunctivitis with preauricular lymphadenopathy);
- ◆ Oropharyngeal (stomatitis or pharyngitis or tonsillitis and cervical lymphadenopathy);
- ◆ Pneumonic (primary pleuropulmonary disease);
- ◆ Typhoidal (febrile illness without early localizing signs and symptoms); and
- ◆ Ulceroglandular (cutaneous ulcer with regional lymphadenopathy).

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

Presumptive	<ul style="list-style-type: none"> ◆ Elevated serum antibody titer(s) to <i>F. tularensis</i> antigen (without documented four-fold or greater change) in a patient with no history of tularemia vaccination; or ◆ Detection of <i>F. tularensis</i> in a clinical specimen by fluorescent assay.
Confirmatory	<ul style="list-style-type: none"> ◆ Isolation of <i>F. tularensis</i> in a clinical specimen; or ◆ Four-fold or greater change in serum antibody titer to <i>F. tularensis</i>.

Case Classification

Probable	A clinically-compatible case with laboratory results indicative of presumptive infection.
Confirmed	A clinically-compatible case with confirmatory laboratory results.



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FORMS & WORKSHEETS

Tularemia

*(Rabbit Fever, Deer-fly Fever,
Ohara Disease, Francis Disease)*

Tularemia

REPORT IMMEDIATELY

(Rabbit Fever, Deer-fly Fever, Ohara Disease, Francis Disease)



LBOH Action Steps

This form does not need to be submitted to MDPH with the case report form. It is for LBOH use and is meant as a quick-reference guide to tularemia case investigation activities.

LBOH staff should follow these steps when tularemia is suspected or confirmed in the community. Also report any exposure to *F. tularensis* that may be bioterrorist in nature. For more detailed information, including disease epidemiology, reporting, case investigation and follow-up, refer to the preceding chapter.

- Immediately notify the MDPH Division of Epidemiology and Immunization, at (617) 983-6800 or (888) 658-2850, to report any suspect or confirmed case(s) of tularemia.
- To report a case or suspect case of tularemia in an animal, contact the Massachusetts Department of Agricultural Resources (MDAR), Division of Animal Health, Dairy Services, and Biosecurity (DAH) at (617) 626-1795 or fax the information to the DAH at (617) 626-1850.
- Assist MDPH with obtaining clinical specimens needed for laboratory confirmation, if necessary.
- Identify other potentially exposed persons.
- Fill out a MDPH *Tularemia Case Report* (attach laboratory results).
- Send the completed case report form (with laboratory results) to the MDPH Bureau of Communicable Disease Control, Office of Integrated Surveillance and Informatics Services (ISIS).