



## Just the Facts...

### Tularemia

**Q. What is tularemia?**

A. Tularemia is an infection of animals and humans caused by the bacterial organism *Francisella tularensis*. There are two different biovars (strains) of *F. tularensis*: biovar *tularensis*, the primary type found in North America, is highly virulent and results in serious illness, while biovar *palearctica* is less virulent and produces milder symptoms. Tularemia is sometimes called rabbit fever or deer fly fever.



**Q. How prevalent is tularemia?**

A. Tularemia occurs throughout North America, Europe, the former Soviet Union, China and Japan. Worldwide, there are approximately 500,000 cases per year. In the United States, tularemia is reported during every month of the year for an annual total of 100-300 cases. Typically, the highest numbers of cases occur in the Midwest, particularly in Oklahoma, Arkansas, and Missouri.

**Q. How does a person get tularemia?**

A. There are many routes of exposure to *F. tularensis*: penetration of the skin or mucous membranes (e.g., when handling the carcasses of infected animals, especially rabbits); being bitten by an infected tick or fly (especially deer flies); eating insufficiently cooked meat from infected animals (rabbit meat can remain infective even after being frozen for several years); drinking contaminated water; or by inhaling aerosolized bacteria (e.g. dust from contaminated soil or particles from laboratory samples). *F. tularensis* is considered a potential bioterrorism agent because of the highly infectious nature of aerosolized organisms. Person-to-person transmission has not been reported.

**Q. What kinds of arthropods can transmit *F. tularensis*?**

A. Ticks are the most common arthropod source of transmission, and they include the wood tick, *Dermacentor andersoni*, the American dog tick, *D. variabilis*, and the lone star tick, *Amblyomma americanum*. Less commonly, tularemia has been associated with the bite of the deer fly *Chrysops discalis*, and in Sweden, the mosquito *Aedes cinereus*. Flies can be infective for 14 days, and ticks throughout their lifetime.

**Q. How serious is tularemia?**

A. The severity of symptoms depends on the type of infecting strain of *F. tularensis*, the size of the exposure dose (number of bacteria introduced), and the route of introduction (inhalation, arthropod bite, skin contact, ingestion). If left untreated, the case fatality rate can reach 5%-15%.

**Q. What are the symptoms of tularemia?**

A. Symptoms vary widely and begin 1-10 days (usually 2-4) following infection. In those cases where a person becomes infected by skin contact, for example by handling an infected animal carcass, symptoms can include a slow-growing ulcer at the site where the bacteria entered the skin (oftentimes on the hand) and swollen lymph nodes. This is known as ulceroglandular infection and it is the most common form of tularemia, accounting for over 80% of cases. The ulcer begins as a red, itchy bump that slowly enlarges and then ulcerates. Occasionally, no ulcer forms and lymph node enlargement may be the only sign of infection. Those who ingest the bacteria may report a sore throat, abdominal pain, diarrhea and vomiting. If the bacteria are inhaled, a pneumonia-like illness can follow. This is usually the most damaging route of infection. However, pneumonia may also be a complication of tularemia that is acquired via any of the routes of infection. Other symptoms of tularemia may include abrupt onset of fever (sometimes high: 103-104°F), headache, chills, extreme weakness or exhaustion, muscle pain, drenching sweats, dry cough, delirium, and septicemia (infection throughout the blood stream). The disease may resemble typhoid fever.

**Q. How is tularemia diagnosed?**

A. Tularemia should be considered as a possibility for any patient who has an unexplained fever and has had recent exposure to ticks, biting flies, rabbits, or animal tissue in a geographic area where the disease is known to exist. Diagnosis is usually made based on clinical symptoms and supported by blood tests that show a rising antibody titer to *F. tularensis*. Blood tests usually become positive during the second week of illness. The blood of patients with brucellosis may cross-react with *F. tularensis* antigens, causing a false positive result; however, antibody titers are usually much lower for brucellosis infections than for tularemia. Isolation of the organism from an ulcer, lymph node, or sputum is confirmatory for tularemia, but this is not routinely attempted due to the danger of exposure for laboratory personnel. In addition, biopsy of infected lymph nodes must be performed with extreme care because of the likelihood for inducing septicemia in the patient as a result of bacteria released during the procedure.

**Q. What is the treatment for tularemia?**

A. Streptomycin is the drug of choice. Gentamicin is also effective. Therapy should continue for at least 7-14 days. Tetracycline and chloramphenicol may also be used, but relapses occasionally occur. *F. tularensis* is also susceptible to 3<sup>rd</sup> generation cephalosporins (cefotaxime or ceftriaxone). When diagnosis is initially unclear, but tularemia is suspected, these cephalosporins may be administered in combination with streptomycin or gentamicin. Highly virulent organisms that are resistant to streptomycin have been reported.

**Q. Does past infection with *F. tularensis* make a person immune?**

A. One episode of tularemia generally confers long-term immunity; however, reinfection has been reported.

**Q. What can I do to reduce my risk of becoming infected with *F. tularensis*?**

A. Follow these precautions to help prevent tularemia:

- Wear rubber gloves when skinning or handling animals, especially rabbits.
  - Cook meat from wild game, especially rabbits and rodents such as squirrels, thoroughly before eating.
  - Instruct children not to handle any sick or dead animals.
  - Avoid drinking untreated water.
  - Avoid the bites of ticks and flies by using protective clothing and insect repellents, and by checking for ticks frequently, as described below:
    - Wear proper clothing as a physical barrier against ticks and biting flies – long pants tucked into boots or tightly-woven socks; long sleeve shirt; shirt tucked into pants; and light-colored clothing so as to more easily spot ticks.
    - Check your skin and clothing periodically for ticks. Remove any attached ticks from your skin as soon as they are discovered. Exercise caution during removal as body fluids and feces from infected ticks can be contaminated with *F. tularensis*.
    - Use both skin and clothing repellents that have been approved by the Environmental Protection Agency (EPA). They are safe and effective.
      - For your skin, use a product that contains 20-50% **DEET** (N,N-diethyl-meta-toluamide). **DEET** in higher concentrations is no more effective.
      - Use **DEET** sparingly on children, and don't apply to their hands, which they often place in their eyes and mouths.
      - Apply **DEET** lightly and evenly to exposed skin; do not use underneath clothing. Avoid contact with eyes, lips, and broken or irritated skin.
      - To apply to your face, first dispense a small amount of **DEET** onto your hands and then carefully spread a thin layer.
      - Wash **DEET** off when your exposure to ticks, biting flies, and other arthropods ceases.
      - For your clothing, use a product that contains **permethrin**. **Permethrin** is available commercially for use on clothing as 0.5% spray formulations.
      - **Permethrin** should only be used on clothing, never on skin.
      - When using any insect repellent, always FOLLOW LABEL DIRECTIONS.
      - Do not inhale aerosol formulations.
    - For optimum protection, soldiers should utilize the **DOD INSECT REPELLENT SYSTEM**. In addition to proper wear of the battle dress uniform (BDUs)(pants tucked into boots, sleeves down, undershirt tucked into pants), this system includes the concurrent use of both skin and clothing repellents that are available in the military supply system:
      - Standard military skin repellent: 33% **DEET** lotion, long-acting formulation, one application is effective for up to 12 hours, **NSN 6840-01-284-3982**.
      - Standard military clothing repellents, either: aerosol spray, 0.5% **permethrin**, one application remains effective through 5-6 washes, **NSN 6840-01-278-1336**; or impregnation kit, 40% **permethrin**, one application remains effective for the life of the uniform (at least 50 washes), **NSN 6840-01-345-0237**.
- Keep lawns well mowed to reduce favorable tick habitat.
  - Keep yard clear of brush, weeds, and woodpiles to discourage feeding and nesting of wild mammals that may carry ticks.
  - Groom pets to prevent ticks from being transported into the home.
  - Laboratory personnel should follow Biosafety Level 2 precautions when processing human specimens; however, all work with cultures should be performed at Biosafety Level 3.

