

Francisella tularensis

Disease Agent:

- *Francisella tularensis*

Disease Agent Characteristics:

- Gram-negative coccobacillus, aerobic, nonmotile, nonspore-forming bacterium
- Order: Thiotrichales; Family: Francisellaceae
- Size: 0.2-0.7 µm × 0.2 µm
- Nucleic acid: The genome of *Franciscella tularensis* is 1892 kb of DNA.
- While the organism grows in appropriate cell-free bacteriologic media, it is widely regarded to be an intracellular pathogen.
- The organism survives long-term freezing (i.e., up to 3 years in frozen rabbit meat).
- 10% bleach can be used for surface decontamination.

Disease Name:

- Tularemia
- Rabbit fever

Priority Level:

- Scientific/Epidemiologic evidence regarding blood safety: Theoretical
- Public perception and/or regulatory concern regarding blood safety: Absent
- Public concern regarding disease agent: Very low, but low in regions where outbreaks have occurred

Background:

- Occurs naturally in several areas of the US, usually in rural areas. Historically, most cases of tularemia occurred in the summer (arthropod bites) and winter (hunters coming into contact with infected rabbit carcasses).
- First described in the US in 1911 and has been reported from all states except Hawaii
- Removed from the list of nationally notifiable diseases in 1994, but it was reinstated in 2000 because of increased concern about potential use of *F. tularensis* as a biologic weapon
- Classified among the highest priority for bioterrorism agents by the CDC (Category A)

Common Human Exposure Routes:

- Inhalation: Bacterium aerosolized when animals skinned or shredded by lawnmowers
- Tick or fly bites by infected vectors

Likelihood of Secondary Transmission:

- Highly unlikely

At-Risk Populations:

- Taxidermists, landscape workers, hunters
- A threat as a bioterrorist weapon for susceptible populations

Vector and Reservoir Involved:

- Ixodid ticks (*Dermacentor variabilis*, *D. andersoni*, *Amblyomma americanum*)
- Biting flies, specifically the deer fly (*Chrysops discalis*)
- Mosquitoes in Sweden, Finland, and the former Soviet Union
- Infected mammals are the reservoir.

Blood Phase:

- Bacteremia can persist for weeks in symptomatic infections; asymptomatic bacteremia has not been demonstrated.
- Agent found in monocytes

Survival/Persistence in Blood Products:

- Unknown

Transmission by Blood Transfusion:

- Theoretical

Cases/Frequency in Population:

- Approximately 100-125 cases reported in the US each year
- In recent years, a seasonal increase in incidence has occurred (late spring and summer), when arthropod bites are most common.
- Outbreaks of tularemia in the US have been associated with muskrat handling, tick bites, deerfly bites, and lawn mowing or cutting brush.
- Sporadic cases in the US have been associated with contaminated drinking water and various laboratory exposures.

Incubation Period:

- Usually 3-5 days, but can take weeks

Likelihood of Clinical Disease:

- Disease likelihood will vary based on exposure rate and immune status of host. Immunocompromised persons are more likely to have complications.

Primary Disease Symptoms:

- Skin ulcers, swollen and painful lymph nodes, sudden fever, chills, headaches, diarrhea, muscle aches, joint pain, dry cough, and progressive weakness
- Pneumonia-like symptoms also are possible, particularly when the agent is inhaled.

Severity of Clinical Disease:

- More severe infections can be and are fatal, particularly if left untreated.

Mortality:

- Varies by exposure route and subspecies but untreated inhalation tularemia may have a mortality rate of from 30 to 60%.

Chronic Carriage:

- Unknown in humans

Treatment Available/Efficacious

- Once diagnosed, infection is treatable with antibiotics (tetracyclines and fluoroquinolones). Antibiotic treatment is efficacious.

Agent-Specific Screening Question(s):

- No specific question is in use.
- Not indicated because of the low incidence of infection and lack of evidence of transfusion transmission.
- No sensitive or specific question is feasible.
- Under circumstances of a bioterrorism threat, the need for and potential effectiveness of specific donor-screening questions would need to be addressed.

Laboratory Test(s) Available:

- No FDA-licensed blood donor screening test exists.
- Culture, microagglutination based on fourfold rise in titers, EIA, and PCR available

Currently Recommended Donor Deferral Period:

- No FDA Guidance or AABB Standard exists.
- Prudent practice would be to defer donor until signs and symptoms are gone and any course of treatment is complete.

Impact on Blood Availability:

- Agent-specific screening question(s): Not applicable; in response to a bioterrorism threat, impact of a local deferral would be significant.
- Laboratory test(s) available: Not applicable

Impact on Blood Safety:

- Agent-specific screening question(s): Not applicable; unknown impact in response to a bioterrorism threat
- Laboratory test(s) available: Not applicable

Leukoreduction Efficacy:

- Unknown

Pathogen Reduction Efficacy for Plasma Derivatives:

- Specific data indicate that the multiple steps in the fractionation process are robust and capable of inactivating and/or removing bacteria at concentrations that may be present in plasma.

Other Prevention Measures:

- A vaccine is presently under review but is not approved for use in the US.
- Vector avoidance

Other Comments:

- Outbreaks of pneumonic tularemia, particularly in low-incidence areas, should prompt consideration of bioterrorism.

Suggested Reading:

1. Centers for Disease Control and Prevention. Tularemia—United States, 1990-2000. *Morb Mortal Wkly Rep MMWR* 2002;51:182-4.
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3. Farlow J, Wagner DM, Dukerish M, Stanley M, Chu M, Kubota K, Petersen J, Keim P. *Francisella tularensis* in the United States. *Emerg Infect Dis* 2005;11:1835-41.
4. Feldman KA, Ensore R, Lathrop S, Matyas BT, McGill M, Schriefer ME, Stiles-Enos D, Dennis DT, Petersen LR, Hayes EB. An outbreak of primary pneumonic tularemia on Martha's Vineyard. *N Engl J Med* 2001;345:1601-6.
5. Schmid GP, Kornball AN, Connors CA, Patton C, Carney J, Hobbs J, Kaufmann AF. Clinically mild tularemia associated with tick-borne *Francisella tularensis*. *J Infect Dis* 1983;148:63-7.