# Francisella tularensis

Microbiology:

* F. tularensis is fastidious and requires cysteine or cystine (or another sulfhydryl source) for growth > BCYE agar
* It is a small, aerobic, pleomorphic gram-negative coccobacillus.
* It is nonmotile and non–spore forming.
* F. tularensis is a facultative intracellular pathogen
* Oxidase negative and catalase positive and urease negative
* FTU-1 β-lactamase positive
* BSL-3

Exposures:

1. skinning, dressing, or eating infected, undercooked animals like rabbits, muskrats, beavers, squirrels, and birds
2. Wild animals sold as pets, such as prairie dogs or hamsters, have also been linked to outbreaks
3. Coyote bites
4. Athropods: Lone Star tick (North America) and mosquitoes in Northern Europe

* Worldwide distribution with cases from Sudan and Australia.

## Routes

* Inhalation of aerosolized organisms
* Ingestion
* Occupational
* Solid organ transplant

## Clinically

Clinically, tularemia can be mistaken for malaria, brucellosis, rickettsioses, leptospirosis, meningococcemia, and viral syndromes like influenza

General Clinical Presentation: Tularemia typically starts abruptly after an average incubation period of 3 to 5 days, though it can range from 1 to 21 days. Initial symptoms are often non-specific and flu-like:

• Fever (can be high, up to 40°C [104°F]).

• Chills and rigors.

• Headache (often severe or frontal).

• Malaise and fatigue.

• Myalgias (muscle aches).

• Anorexia.

• Nausea and vomiting.

• Cough.

• Sore throat.

## Six Classic Clinical Forms:

**1. Ulceroglandular Tularemia:**

* Most common form, accounting for 45% to 80% of reported cases.
* Characterised by a skin lesion (papule, vesicle, or ulcer) at the site of entry, often from a tick bite or direct contact with infected animals. This papule undergoes necrosis, leaving a tender ulcer with a raised border that may take weeks to heal and leave a scar.
* Always accompanied by painful regional lymphadenopathy.
* Lymph node suppuration (abscess formation) is the most common complication and can occur even after antibiotic therapy.

**2. Glandular Tularemia:**

◦ Presents with tender regional lymphadenopathy as the primary manifestation.

**3. Oculoglandular Tularemia:**

◦ Occurs when the conjunctiva is the initial site of infection, typically from mechanical transfer of organisms to the eye by fingers.

◦ Presents with severe conjunctivitis (often unilateral) and ipsilateral preauricular adenopathy.

◦ Complications can include corneal ulceration and dacryocystitis.

**4. Oropharyngeal Tularemia:**

◦ Results from ingestion of contaminated water or food.

◦ Predominant complaints include fever, severe throat pain, and a neck mass due to lymphadenopathy.

◦ Exudative pharyngitis or tonsillitis is common, and ulcers may be present.

◦ Cervical, pre-parotid, and retropharyngeal adenopathy may occur, sometimes bilaterally or with abscess formation.

**5. Typhoidal Tularemia:**

◦ A febrile illness without prominent lymphadenopathy and no apparent portal of entry.

◦ Symptoms can include fever, chills, headache, myalgia, sore throat, anorexia, nausea, vomiting, diarrhoea, and abdominal pain.

◦ Diarrhoea is a major manifestation in this form.

◦ Can have a dramatic presentation with acute prostration and rapid death, or a protracted illness.

◦ Secondary pleuropulmonary involvement is fairly frequent.

**6. Pneumonic Tularemia:**

◦ Results from direct inhalation of the organism or secondary hematogenous spread to the lung.

◦ Considered the most severe form and would be the anticipated variant after intentional aerosol release of organisms (e.g., in a bioterrorism event).

◦ Common symptoms include fever, cough (often dry), substernal tightness, and pleuritic chest pain.

◦ Physical examination may be non-specific or reveal rales, consolidation, and a friction rub.

◦ Can lead to respiratory failure and adult respiratory distress syndrome.

◦ Chest radiographs may show nodular pulmonary infiltrates, pleural effusions, or hilar/mediastinal lymphadenopathy.

Other Clinical Features and Complications:

• Rashes: Secondary rashes are relatively common (up to 52% of cases) and can appear within the first 2 weeks of symptoms, or be delayed. These include diffuse maculopapular, vesiculopapular eruptions, pustules, erythema nodosum, erythema multiforme, acneiform lesions, and urticarial and vasculitis-like eruptions. A maculopapular lesion at the entry site with subsequent ulceration is characteristic of ulceroglandular disease.

• Neurologic Complications: Meningitis and encephalitis can occur, typically with mononuclear cell pleocytosis in the CSF. Brain abscesses are rare complications. Neuropsychiatric symptoms, including chronic fatigue, difficulty concentrating, and sleep disturbances, have been reported.

• Organ Involvement: Hepatomegaly and splenomegaly can occur, especially in typhoidal forms. Rare complications include pericarditis, peritonitis, osteomyelitis, splenic rupture, thrombophlebitis, endocarditis, and aortitis.

• Other Symptoms: Conjunctival suffusion (redness without exudate) is characteristic of leptospirosis but also can occur in tularemia. A pulse-temperature deficit has been noted in up to 42% of patients.

## Severity and Mortality:

◦ F. tularensis subsp. tularensis (type A), primarily found in North America, is the most virulent and causes more severe disease. Case fatality rates without appropriate treatment can be as high as 60% historically. Even with treatment, mortality rates are 2% to 4%.

◦ F. tularensis subsp. holarctica (type B), found predominantly in Asia, Australia, and Europe, is less virulent. Little to no tularemia-related mortality is reported in Europe and Asia where only type B causes the disease.

◦ F. tularensis subsp. novicida and F. philomiragia are of low pathogenicity and primarily cause infection in immunocompromised or significantly comorbid patients.

• Prognosis: Features associated with a worse prognosis include increasing age, serious coexisting medical conditions, symptoms lasting 1 month or longer before treatment, significant pleuropulmonary disease, typhoidal illness, renal failure, delayed diagnosis, and inappropriate antibiotic therapy.

Treatment: streptomycin (or gentamicin), ciprofloxacin