Tularemia
By Angel Nava

**Etiological Agent:** Tularemia is caused by the bacterium *Francisella tularensis*. When it comes to classifying this bacterium from a taxonomical aspect, its Taxon Identifier is 119858 and its rank as a subspecies can help identify it. Its Linage from least specific to highly specific is as follows: Bacteria, Proteobacteria, Gammaproteobacteria, Thiotrichales, Francisellaceae, Francisella and *Francisella tularensis*. (2, 5)

**Transmission:** The bacterium causing this disease is highly infection and may enter the human body via direct contact with the skin, eyes and mouth. By inhaling aerosols or dust contaminated with this species of bacteria, humans can also acquire this disease. (1, 2, 3)

**Reservoir:** There are various vectors that are reservoirs for this disease. Within the United States, the ticks that transmit this disease are the dog tick (*Dermacentor variabilis*), the wood ticks (*Dermacentor andersoni*), and the lone star tick (*Amblyomma americanum*). In addition, deer flies (*Chrysops spp*) have been shown to spread this disease in the western United States.

When handing a dead animal’s tissue or infected animal, extreme cautious must be used in order to avoid the transmission of this disease. There has been an increased likelihood of contracting this disease if individuals partake in hunting wild rodents such as rabbits, muskrats and prairie dogs. Astonishingly enough, domestic cats and hamsters are very susceptible to this disease as well, and have been known to transmit this to humans. (1, 2, 4)

**General Characteristics/ Key Tests for Identification:**
When identifying this type of bacteria, a tiny, mostly unicellular, non-motile gram-negative cocobacilli are its key characteristics. When biochemical testing occurs, *Francisella tularensis* results in, oxidase negative, catalase positive and urease negative. When culturing this bacterium, Chocolate Agar (CA) and Cysteine Heart Agar (CHA), are the two main agars used to cultivate this tiny gram-negative cocobacilli. After culturing, growth of this bacterium usually occurs and is most visible on day 2-5 containing thin lipid rich capsule. In order to be able to successfully culture, a tissue biopsy, whole blood in EDTA or from a blood culture or a swab of the lesion is required. (1,2, 3)

**Signs & Symptoms:** When someone becomes infected with this bacteria, a sudden fever, chills, headaches, muscle aches, joint pain, dry cough and progressive weakness are all key symptoms. These symptoms emerge typically within day 3-5 of exposure however it has been recorded of some individuals of being asymptomatic up to day 14. In some cases, infected individuals can also experience angina (chest pain), bloody sputum, pneumonia and can sometimes even stop breathing.

However, while these symptoms are the general signs and symptoms attributed with this Tularemia, symptoms ultimately depend on the way a person was exposed, the route. These different exposure types can lead to ulcers being present on the skin or mouth, swelling and pain around the lymph glands and pain in the eyes. (2, 3,4)

**Virulence Factors:** The exact virulence factors of this bacterium haven’t been very well outlined, however it has been established that the pathogenesis of this bacterium occur
predominantly within macrophages of the host's cells. This bacterium's virulence directly correlates with the capability of the organisms to replicate within the macrophages. After replication occurs, the bacteria are released from the macrophages and apoptosis of the host follows shortly. The lipid capsule that surrounds this bacterium has been noted to be necessary for protection against serum-mediated lysis. In addition, the presences of type IV Pili appear to aid this bacterium with the whole replication process. (2,3,4)

**Treatment:** Tularemia can be difficult to diagnose. The symptoms it produces can be easily confused with another disease. Blood test and culture samples help confirm the diagnosis. If results are indeed positive, treatment for this disease includes antibiotics such as Streptomycin, Gentamicin, Doxycycline, and Ciprofloxacin. With treatment usually lasting for 10 to 21 days depending on the severity of the disease, this disease is in fact treatable. (2,3)

**Control/Prevention:** There are various ways one can acquire Tularemia and even more ways to prevent and control the spread of this bacterium. If possible, completely avoid handling sick or dead animals, unless wearing appropriate personal protective equipment such as gloves and eye/face protection shield. It is also possible to ingest this bacterium when eating improperly cooked meats, thus, it is of high importance to cook all meats thoroughly. Since one of the most common vectors of this disease is tick, one must avoid their bites by using adequate amounts of insect repellent containing DEET. When it comes to drinking water, water should only be drunk from a safe and clean source. These simple tips will help avoid any contamination or exposure with this disease and many other diseases in general. (2,3)

**Current Outbreak and Information:** While Tularemia can be spread by insect vectors, handling infected animal carcasses, eating or drinking contaminated food and even breathing in the bacteria, Tularemia is not known to be transferred from person to person. The Center of Disease Control (CDC) has recognized Francisella tularensis extremely infectious nature as a potential biological weapon. If used as weapon, the CDC believes this bacterium could be expended as a air aerosol infecting a lot of person who inhale it. The inhalation would cause severe respiratory disorder that could be life threatening if not immediately treated. While this weapon could be extremely successful due to the highly infectious and tiny nature of this bacterium, this weapon would have to be highly sophisticated and advanced diminishing the likelihood of this ever happening.

Nonetheless, the CDC has made all the necessary preparations to combat this potential threat. By over stocking antibiotics, organizing a nation wide program where states share information about any peaks in diseases and creating innovative educational tools for health care workers, the media and the general public, the CDC has taken the essential precaution measurements to counter this hypothetical threat.

The CDC has reported a total of 1,208 cases of Tularemia during the years of 2001 to 2010. Of these 1,208 cases, “64% were categorizes as confirmed and 35% as probable.” In addition, their findings have let them to conclude that by race, American Indians/Alaska Natives had the highest annual risk of exposure to this bacterial disease. In addition, the CDC has noticed a correlation addressing the highest reported cases being associated with specific months of the year. Due to the fact that the arthropods are the most common carriers of this disease, it is of crucial importance to understand when they are most active. The CDC has reported the highest activity of these
arthropods during the months of May through September. This fact coincides with an “increased outdoor human activity” meaning higher contact risk with these arthropods. 

*Francisella tularensis* the agent causing Tularemia, is a tiny, gram-negative extremely infectious bacteria. Spread typically by arthropods and rodents. Although it’s highly infectious, not much is known about its virulence factor. Tularemia can cause some life threatening side effects if not treated by antibiotics immediately. However, the Center of Disease Control has taken all the necessary steps for precaution to counter and prepare against this disease making Tularemia notoriously famous for its highly infectious nature. (1,2,3,4,5)

Sources


