Tularemia in Washington

The organism responsible for tularemia was isolated in 1911 from ground squirrels at a study site in Tulare County, California. Variously named *Bacterium tularense* and *Pasteurella tularensis*, the organism was eventually called *Francisella tularensis* after the bacteriologist Dr. Francis who led studies that linked the organism to deer fly fever in humans.

The Organism

*Francisella tularensis* infects lagomorphs such as wild rabbits or hares, and rodents such as voles, squirrels, muskrats, beavers, and prairie dogs. Domestic rabbits can become infected if kept outdoors near wildlife. Pet hamsters have been a source of exposure. Domestic cats that hunt rodents can become infected and transmit tularemia to humans. In addition, the organism has been investigated as a potential biological weapon due to its low infectious dose, relatively severe symptoms, and capacity to be aerosolized.

Exposure occurs when handling infected animals or their tissues, by ingesting undercooked meat, through tick (several species) or deer fly bites that previously bit an infected animal, or by inhaling contaminated dust or aerosols. In Europe, mosquitoes might serve as vectors. Infected animal carcasses can contaminate water, resulting in waterborne infection. Farming or landscaping machinery (e.g., mowers, harvesters) can aerosolize animal carcasses or rodent nests. Because the organism readily aerosolizes in the laboratory, handling *F. tularensis* cultures without correct biosafety measures can result in inhalation of the organism.

As a facultative intracellular bacterium, *F. tularensis* multiplies in macrophages, which might in part determine its virulence. Tularemia
causes general symptoms such as fever, chills, fatigue, muscle aches, and headache. More specific symptoms reflect the route of exposure:

<table>
<thead>
<tr>
<th>Syndrome</th>
<th>Symptoms</th>
<th>Exposures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulceroglandular</td>
<td>Skin ulcer, with swelling of regional lymph glands (usually armpit or groin)</td>
<td>Tick or deer fly bite; cuts or scrapes while handling infected animal</td>
</tr>
<tr>
<td>Glandular</td>
<td>Swelling of regional lymph glands</td>
<td></td>
</tr>
<tr>
<td>Oculoglandular</td>
<td>Eye irritation and inflammation, swelling of lymph nodes in front of ear</td>
<td>Touching eye while handling infected animal material</td>
</tr>
<tr>
<td>Oropharyngeal</td>
<td>Sore throat, mouth ulcers, tonsillitis, swelling of lymph glands in the neck</td>
<td>Ingesting contaminated food or water</td>
</tr>
<tr>
<td>Intestinal</td>
<td>Diarrhea, abdominal pain, vomiting</td>
<td></td>
</tr>
<tr>
<td>Pneumonic</td>
<td>Dry cough, chest pain, shortness of breath</td>
<td>Inhalation of contaminated dust or aerosol; secondary to bacteremia</td>
</tr>
<tr>
<td>Typhoidal or septicemic</td>
<td>General symptoms, no localization as with other types, can progress to shock</td>
<td>Any route of exposure</td>
</tr>
</tbody>
</table>

Ulceroglandular tularemia is the most common syndrome. The lymphadenopathy with tularemia is generally painful, and infections can be confused with plague. Untreated tularemia can progress to respiratory failure, shock and death. The case fatality rate varies with the strain of organism and the clinical syndrome. Early diagnosis and antibiotic treatment improve the prognosis, although deaths still occur.

**Epidemiology of Tularemia**

Tularemia occurs throughout much of the Northern Hemisphere, with different animal reservoirs and arthropod vectors. The different strains and therefore the severity of cases vary geographically. Cases and rare outbreaks occur in Russian, Eastern Europe, Scandinavia, and less commonly in Western Europe. Japan and northern China also report cases each year.

In recent years tularemia cases have been reported from most parts of the United States including Washington. About 125 cases are reported annually nationwide, predominantly in central states. In 2015, an unusual increase of tularemia cases was observed in Colorado, Nebraska, South Dakota,
Tularemia is endemic in Washington with one to ten cases reported each year (typically one to five cases annually). Two deaths have occurred in the state during the past decade; one in 2009 and one in 2015. Sources of infection reported in Washington include arthropod bites, animal bites, handling animal carcasses, contact with contaminated water, and use of farming or landscaping equipment. Infections are more common among men (69% of cases) and a peak of cases occurs during the summer months, likely due to increased outdoor activities which constitutes a risk for exposure.

**Response and Prevention**

Tularemia cases in Washington generally occur individually and have readily identified risks. Any cluster of tularemia cases, particularly pneumonic cases or cases in a group without usual risk factors, must be evaluated for potential intentional exposures.

Laboratory exposures to tularemia require a public health response. The local health jurisdiction should evaluate laboratory staff for exposure to a culture of *F. tularensis*. The Office of Communicable Disease Epidemiology can assist with evaluation and monitoring. Individuals with high-risk exposures, such as laboratorians who reported having worked with a culture on an open bench or used widespread aerosol generating procedures (e.g., vortexing, spills, catalase tests) should take two weeks of antibiotic prophylaxis (generally doxycycline). Those with low-risk exposures, such as laboratory staff present in the room while cultures were worked on with on an open bench should be placed on a two week symptom watch.

The risk of acquiring tularemia can be reduced by avoiding exposure to the reservoirs and vectors. Individuals engaging in outdoor activities should use repellents and other measures to reduce tick and deer fly bites. Surface water used for drinking or cooking should be treated. Those using mowers or other landscaping machines should avoid mowing over animals or rodent nests. Hunters and trappers should use gloves when handling animals, particularly rabbits, muskrats, prairie dogs, or other lagomorphs and rodents, and avoid contaminating streams or ponds with animal blood or carcasses. Meat from these animals, and other wild animals in general, should be thoroughly cooked before eating.

Tularemia infections are rare in Washington, but can result in serious disease. Although the risk of acquiring tularemia is very low in our state, simple precautions can prevent exposure. Local health jurisdictions can conduct investigations and provide appropriate recommendations.
Resources

DOH tularemia investigation guideline:

Avoiding tick bites: http://www.doh.wa.gov/CommunityandEnvironment/Pests/Ticks

CDC’s fact sheet on laboratory exposures to *Francisella tularensis*:
https://www.cdc.gov/tularemia/resources/lab/TularemiaLabExposureFactSheet.pdf

Tularemia reported from a hamster bite:
https://www.cdc.gov/mmwr/preview/mmwrhtml/mm5351a3.htm

Increase in tularemia in 2015: https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6447a4.htm