

Tularemia in Animals in South Dakota

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Tularemia is a rare but potentially severe disease that can develop in many species of wild and domestic animals, but especially rabbits, rodents, cats, and humans. Since the summer of 2002, a total of 12 cases of tularemia have been diagnosed in animals submitted to the Animal Disease Research and Diagnostic Laboratory (ADRDL) at South Dakota State University (SDSU). Diagnoses of tularemia at SDSU are made in most years—from 2002 to 2008, at least one case of tularemia has been diagnosed each year, with four diagnoses made in 2006.

Tularemia is caused by a gram-negative bacterium called *Francisella tularensis*. The organism is named for Edward Francis, a US Public Health surgeon who dedicated his life to researching the organism; and for Tulare County, California, where the syndrome was first described in ground squirrels in 1911. The organism can affect many species of animals, but in the United States, rodents and rabbits (particularly cottontails) are the important hosts. Various species of ticks (American dog tick, Lone Star tick, and the Rocky Mountain wood tick) are important maintenance hosts and biologic vectors.

Of the domestic animals, cats and dogs are the most commonly affected species, although clinical signs are more common in cats. There is evidence in endemic areas that many dogs seroconvert to *F. tularensis*, but clinical reports of illness are rare. In livestock, sheep are the most commonly affected species, but horses and calves have also been affected. In these species, young animals—lambs, foals, and calves—seem to be more frequently affected.

Francisella tularensis is highly infective. As few as 10 to 50 organisms inhaled or otherwise introduced into the body can cause illness in humans. The organism, besides surviving in its maintenance hosts and vectors (insects), can survive for long periods of time (weeks to months) in water, soil, and dead animal carcasses. Dogs and cats often become infected through the bite of an insect carrier or from eating or contacting infected prey, and livestock usually are infected through bites from the carrier insects. As such, conditions that promote tularemia in an area can often be related to an increase in rabbit or rodent populations (or a decrease in their predators), along with environmental conditions that promote survival of the vectors.

People become infected usually by contact with the vectors (ticks, deerflies, and possibly mosquitoes) or through contact (bite, or scratch) with an infected animal. Cats can infect people without showing clinical signs themselves. People have also been infected after mowing over dead rabbits with lawn mowers and inhaling the agent! Because it is so highly infectious, *F. tularensis* is classified as a Category A agent of bioterrorism. In South Dakota, tularemia is a reportable disease for both people and animals.

Many different types of clinical signs may result from infection with tularemia in people and animals. Tularemia in cats can result in symptoms ranging from non clinical infection to

mild illness with swollen lymph nodes and fever to severe overwhelming infection and death. In sheep and other livestock, general, non-specific signs are commonly noted. These include: fever, sluggishness, stiffness, and decreased appetite. Clinical signs in rabbits and rodents are lethargy and sluggishness, making these animals easy prey for cats and other predators.

Definitive diagnosis of tularemia in animals is achieved by demonstration of *F. tularensis* in blood, tissues, or exudates from affected animals, or by demonstration of a specific antibody response (see box).

Tularemia Diagnosis:

A. Demonstration of *F. tularensis* in affected animals (Use appropriate personal protective measures when obtaining samples for diagnosis)

1. Bacterial culture

a) Clinically affected animals

- i) Swab of exudate from draining lymph nodes or lesions
- ii) Blood samples
- iii) Biopsy of lymph node or lesions

b) Post-mortem samples (Submit fresh and formalin-fixed tissues)

- i) Spleen
- ii) Liver
- iii) Lung
- iv) Kidney

2. PCR testing of tissues (of particular use when tissue or sample quality is poor; SDSU ADRDL currently forwards tularemia PCR testing to University of Wyoming VDL)

a) Tissues as described above under (1) Bacterial culture

B. Demonstration of antibodies specific to *F. tularensis* in serum

1. Card agglutination test (SDSU ADRDL currently forwards to New Mexico State; 1 ml serum required)

- Demonstrable antibodies are normally not present for 2-3 weeks following initial infection
- Titers greater than 1:80 are presumptive; otherwise a 4-fold rise in titer between acute and convalescent samples is diagnostic

Tularemia in humans results in any one of six syndromes, the most common of which is the “ulceroglandular” form, where a sore develops at the point of entry of the bacteria, accompanied by swelling in the local lymph nodes. The most severe form is the primary pneumonic (lung infection) form, but is relatively rare. Tularemia is diagnosed yearly in people in South Dakota. During 2008, ten individuals were reported to the SD Dept. of Health with tularemia. This is twice the median number of cases in South Dakota over the past five years. Most cases were from central South Dakota.

Treatment of tularemia in animals centers on use of an appropriate antibiotic, along with supportive care. An animal is considered infectious until it has received 72 hours of appropriate antibiotic treatment and shown clinical improvement (without fever).

Examples of recent animal cases seen at SDSU's ADRDL:

1. Cat from west-central South Dakota, with a history of routine hunting of rabbits and rodents. Lately, a die-off of rabbits in the immediate area had been noted. Cat presented with signs of incoordination, dehydration, and lack of appetite.

Pathologic findings included: abscesses in lungs, swollen lymph nodes in jaw area and in abdomen, and areas of necrosis (dead tissue) in the spleen. Microscopically, there was inflammation in the lungs, liver, spleen, lymph nodes, and intestine. The tissues were positive by culture and PCR (polymerase chain reaction: a very sensitive method of bacterial detection) for *F. tularensis*.

Later, a dead cottontail was submitted from the same locale. Lesions included enlarged spleen and white pinpoint spots on the liver. Inflammation of the liver, intestine, and lung were found microscopically. *F. tularensis* was isolated from lung, liver, kidney, and spleen.

2. Cat from southern South Dakota near Missouri River. Its owner had reported losing other cats with similar signs for over three years. Clinically, the cat was emaciated, and had jaundice and diarrhea. Inflammation and swelling of the lymph nodes and liver were seen. The diagnosis of tularemia was made by using special stains on microscope slides from the submitted tissue.

3. Cat from central South Dakota that had "eaten a tame rabbit that had died". Clinical findings included swollen lymph nodes in the jaw area. There were small tan spots in and swelling of the lymph nodes. *F. tularensis* was confirmed by culture from lymph nodes and PCR.

Tularemia is a relatively rare but serious disease that has potential to cause disease in people through their contact with infected animals or insect vectors. Animal owners--cat owners especially--should, as always, observe their animals closely for signs of illness and contact their veterinarian as soon as possible when unusual signs develop. Proper use of tick and insect repellants on pets and livestock is another good practice to prevent transmission of this and other vector-borne diseases. Cat owners should use caution, and consult their veterinarian, when using many of the insect repellants that are available. Many products that are labeled for use on dogs oftentimes will be toxic for cats. People themselves should also use insect repellants when outside with their animals and take proper precautions when disposing of dead animals that are found (wearing gloves, double-bagging).

Resources:

1. Feldman KA. Tularemia. **J Am Vet Med Assoc** 2003; 222: 725-730.

2. SD Department of Health. December 2008 South Dakota Infectious Disease Summary (Provisional Data). Available at: <http://doh.sd.gov/ID/MonthlyReport/Dec08.pdf> Accessed July 13, 2009.

3. JAVMA Zoonosis Update. Tularemia. Available at: <http://www.avma.org/reference/zoonosis/zntulare.asp> Accessed July 14, 2009.

4. Reynolds PJ, Wendelboe A, Ettestad P. Tularemia in New Mexico. Available at: <http://www.health.state.nm.us/pdf/Tularemia%20in%20New%20Mexico.pdf>. Accessed July 23, 2009.

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