

## Tularemia in New Mexico

Tularemia, also known as rabbit fever, is a zoonotic disease caused by the bacterium *Francisella tularensis*. Tularemia is found throughout the northern hemisphere, and the primary reservoir hosts are rabbits and rodents. Ticks serve as both reservoirs and vectors of tularemia. Typically, humans become infected through tick or deerfly bites or by handling infected animals. Less commonly, infection may be acquired by direct contact or ingestion of contaminated water, food or soil; by inhaling airborne bacteria; or from animal bites.

### Human Cases of Tularemia

Tularemia in humans presents with diverse clinical manifestations related to the route of introduction and virulence of the disease agent. The incubation period is usually 3 to 5 days, but may range from 1 to 14 days. Onset is usually sudden with common symptoms of high fever, chills, fatigue, body aches, headache and nausea. Most often it presents in its ulceroglandular form as a skin ulcer or eschar at the site of inoculation of the organism together with swelling of the regional lymph nodes. Other presentations include glandular (lymphadenitis with no apparent primary ulcer), oropharyngeal (from ingestion of contaminated food or water), primary pneumonic (inhalation of infectious material), oculoglandular (conjunctivitis and lymphadenitis after inoculation of the conjunctival sac), and typhoidal with no localizing signs. All forms of tularemia can progress to secondary pneumonia, meningitis, or sepsis. Streptomycin is considered the antibiotic of choice with gentamicin an acceptable alternative that is more widely available.<sup>1</sup> Tetracyclines, chloramphenicol, and ciprofloxacin have also been shown to be effective (Table 1). Treatment with aminoglycosides and ciprofloxacin should be continued for 10 days while treatment with bacteriostatic agents should be continued for at least 14 days to reduce the chance of relapse.

New Mexico averages 1.5 tularemia cases/year (1990-2006), accounting for a small number of the approxi-

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**Table 1. Tularemia antimicrobials and dosages for humans.<sup>1</sup>**

Adults	
Preferred Choices	Streptomycin, 1 g IM twice daily Gentamicin, 5 mg/kg IM or IV once daily §
Alternative Choices	Doxycycline, 100 mg IV twice daily Chloramphenicol, 15 mg/kg IV 4 times daily § Ciprofloxacin, 400 mg IV twice daily §
Children	
Preferred Choices	Streptomycin, 15 mg/kg IM twice daily (should not exceed 2 g/d) Gentamicin, 2.5 mg/kg IM or IV 3 times daily §
Alternative Choices	Doxycycline; if weight ≥45 kg, 100 mg IV twice daily; if weight <45 kg, give 2.2 mg/kg IV twice daily Chloramphenicol, 15 mg/kg IV 4 times daily § Ciprofloxacin, 15 mg/kg IV twice daily (should not exceed 1 g/d) §
Pregnant Women	
Preferred Choices	Gentamicin, 5 mg/kg IM or IV once daily § Streptomycin, 1 g IM twice daily
Alternative Choices	Doxycycline, 100 mg IV twice daily Ciprofloxacin, 400 mg IV twice daily §

§ Not a US Food and Drug Administration-approved use

mately 135 cases/year in the U.S.<sup>2</sup> In 2006 there were seven human cases of tularemia in New Mexico. The first case occurred in early May after the patient skinned a rabbit caught by his dog in Bernalillo County. Four cases occurred in July and August, each with a history of an arthropod bite. Three cases had exposures in San Juan County and one case's most likely arthropod exposure was in Rio Arriba County.

These first five cases presented with fever, sweats/chills, myalgia, and ulcerative skin lesions. Four of them reported swollen lymph nodes and weakness, three cases reported headache, and only one case reported cough, chest pain, shortness of breath, and abdominal symptoms. The sixth case occurred in September in a patient from Santa Fe County who presented with pneumonic tularemia. The source of infection was unknown, but possibly from inhalation of contaminated dust. The last case occurred in October in a patient from Los Alamos County who presented with typhoidal signs and secondary meningitis. All seven cases were treated with antibiotics and recovered.

### **Companion Animal Cases of Tularemia**

Dogs and cats are susceptible to tularemia and can become infected through the bite of an infected arthropod or by ingestion of, or direct contact with, infected tissues. Cats may be more susceptible to tularemia than dogs, and clinical disease in the literature is best described in cats. Feline tularemia can range from severe overwhelming infection with pneumonia, to milder illness with lymphadenopathy and fever, to asymptomatic infection. Other clinical signs include lethargy, depression, dehydration, hepatosplenomegaly, oral or lingual ulcers, and icterus.<sup>3</sup>

During 2004 and 2005, 33 companion animals (28 dogs and 5 cats) were diagnosed with laboratory-confirmed tularemia in New Mexico (out of 425 dogs and cats tested) based on serologic testing by the Department of Health's Scientific Laboratory Division (SLD). Three cases were confirmed by culture of a lymph node aspirate. The majority of positive cases were from Santa Fe (21) and Bernalillo (6) counties, but positive cases were also diagnosed from Taos (3), Rio Arriba (2), and Los Alamos (1) counties. Cases occurred nearly every month of the year, with the peak from April through June.

Symptoms were reported for 20 of the 33 animal cases. The most commonly observed signs of tularemia in these cases were fever, lethargy, and anorexia (Table 2). These are also the most commonly observed signs of plague in cats<sup>4</sup> and dogs. In 33% of the cases, the owner reported their pet had contact with or had eaten a rabbit or rodent during the week before onset or was a known hunter. None of the owners or veterinarians reported an attached tick on the animal. Other reported

symptoms included seizures, meningitis, labored breathing, and dehydration.

Antibiotic treatment recommendations for dogs and cats infected with tularemia include gentamicin, doxycycline, tetracycline, chloramphenicol, and enrofloxacin (Table 3). To prevent relapse, treatment should be continued for 10 days for bacteriocidal products and 14 days for bacteriostatic antimicrobials.<sup>5</sup>

### **Diagnostic Testing**

Laboratory testing for tularemia includes serology, direct fluorescent antibody or culture of blood, lymph node aspirate, or abscess material. SLD tests samples for both plague and tularemia, since both present with similar symptoms and either can result from similar animal exposures.

A probable case of tularemia in a human is defined as a positive DFA/FA on blood or tissue (usually lymph node or abscess), or an elevated microagglutination test (MAT) titer on a single serological sample. A tularemia titer of <64 is considered negative, 64 is equivocal, and 128 or higher is positive. A confirmed case is demonstrated by a four-fold change in acute and convalescent serological samples, or isolation of *F. tularensis* from blood or tissue culture.

In companion animals, single acute serologic specimens are problematic, especially in areas enzootic for both plague and tularemia. It is not unusual to have negative results in the acute phase of illness as detectable antibodies may not occur until 8 to 10 days after exposure. Also, many animals will continue to have an elevated titer many months after an acute infection, especially if they are subsequently exposed to other infected rodents. Paired sera taken 2 to 3 weeks apart that show a four-fold change in antibody titer are necessary for confirmation. A common situation occurred recently in a cat from Santa Fe County that had a tularemia MAT titer of 128 and a negative plague titer of <4 on an acute serum sample. A convalescent sample obtained 3 weeks later showed the tularemia MAT titer still at 128 while the plague titer was confirmatory with a greater than 4-fold rise to 1024. Therefore, convalescent serologic testing can be used to confirm the diagnosis; but blood or lymph node aspirate cultures are most important in the diagnosis of acute cases as treatment and case response for plague and tularemia can differ, especially in pneumonic cases.

### Public Health and Infection Control

Person-to-person transmission of tularemia has not been reported but it has been directly transmitted from an infected cat to a person. Dogs can potentially transmit tularemia to people though it has not been documented in the literature (one human inhalation case was acquired while shearing a dog). Tularemia bacteria can be present in the saliva and/or purulent lesions of dogs and cats. A review paper looked at all published cat-associated human tularemia cases from 1928-1992.<sup>6</sup> They found 51 cases; details were available for 15. Most cases were acquired from a bite, one from a scratch and two from casual contact. Thirteen of 15 human cases had the ulceroglandular form. Five developed pneumonia, and two died. No human tularemia cases resulted from exposure to the New Mexico animal cases reviewed here.

Pneumonic tularemia is not known to be transmitted person-to-person or animal-to-person. However tularemia in culture and in the environment can be aerosolized and tularemia bacteria can survive several weeks. Infection control practices at human and veterinary hospitals should include standard precautions of hand washing, gloves, mask, eye protection (when procedures are likely to generate splashes or sprays), and disinfection of contaminated surfaces and equipment. Droplet isolation of the patient is not necessary unless pneumonic plague has not been ruled out. An animal is considered infectious until it has received 72 hours of appropriate antibiotic treatment and shown clinical improvement (i.e., afebrile). Veterinarians should be encouraged to keep the animal hospitalized during this time so that owners aren't unnecessarily exposed to infectious secretions, especially when trying to give antibiotic pills. Pet owners should be educated about not allowing animals to hunt and using a tick control product on their pet. Suspect plague or tularemia cases in both humans and animals should be reported immediately to the Epidemiology and Response Division (24/7 number: 505-827-0006) so that environmental exposures and exposures to veterinary staff and pet owners can be assessed. A fever watch (monitoring temperature twice a day for up to 14 days) or antibiotic prophylaxis may be recommended.

**We acknowledge and thank all the New Mexico physicians and veterinarians who provided information on these cases.**

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**Table 3. Tularemia antimicrobials and dosages for dogs and cats.<sup>5</sup>**

Gentamicin*	6.6 mg/kg (3mg/lb), IM, IV, or SC, q 24h or divided q 12 h or q 8h
Doxycycline	5 mg/kg (2.3mg/lb), PO, q 24h to q 12h
Tetracycline	25 mg/kg (11.4 mg/lb), PO, q 8h
Chloramphenicol	Cats: 50 mg/kg (22.7 mg/lb) PO or IM, q 12h  Dogs: 100 mg/kg initially, then 50 mg/kg, q 8h
Enrofloxacin	2.5 mg/kg (1.1 mg/lb) PO or IM, q 12h

\* Adjust dosage for animals with renal failure.

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Table 2. Reported symptoms and history for 33 companion animal tularemia cases, New Mexico, 2004 and 2005.

Symptoms Reported	20/33 (61%)
Fever (ranged from 103.9 – 106.5 F)	16/20 (80%)
Lethargy	7/20 (35%)
Anorexia or weight loss	8/20 (40%)
Lymphadenitis	3/20 (15%)
History of rodent/rabbit exposure or hunting	11/33 (33%)
No known rodent/rabbit exposure or no information given	22/33 (67%)