National Wildlife Disease Program

The NWDP Tularemia Update

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Tularemia Serosurveillance in Wildlife — 2010

Francisella tularensis is a bacterium that can cause disease in humans, wildlife, and domestic animals. Untreated disease in humans can be fatal. Its complex transmission cycle can include mammals and vectors, as well as aerosolized air-borne transmission and water-borne transmission. It also has infected hundreds of different mammal species and a wide-range of vectors. Combined, these factors make it difficult to know where to look for tularemia and to understand what factors are associated with tularemia seroprevalence.

In an attempt to better understand tularemia presence in the environment, the NWDP, in cooperation with numerous collaborators, began an intensive wildlife sampling campaign for 2010 that resulted in unprecedented numbers of wildlife sampled across a broad-range of the U.S. In 2010, 7,542 samples were tested from 53 species (Table 1). Coyotes were the most commonly collected species, accounting for 49.8% of all samples, with raccoon (15.7%) and beaver (8.7%) being the next most commonly sampled species. Only 28 samples tested positive and 21 of these were collected from coyotes. Other notable groups of animals with multiple seropositive individuals were wolves and red foxes.

Coyote

Positive samples were detected in nine different states (Table 2): Colorado, Idaho, Illinois, Missouri, Montana, Nebraska, New Jersey, Nevada, and Utah.

Detectable antibody responses are typically first observed one to two weeks post exposure but may persist for months or more. Interestingly, positive samples were collected in every month except November and a majority occurred between June-August (53%), which coincides with the period when most human infections are reported in the United States. Additional samples collected in 2010 are still being analyzed. When completed, this dataset will provide a rare opportunity to better understand tularemia in wildlife.

Table 1: Most Common Species Tested for Tularemia in 2010

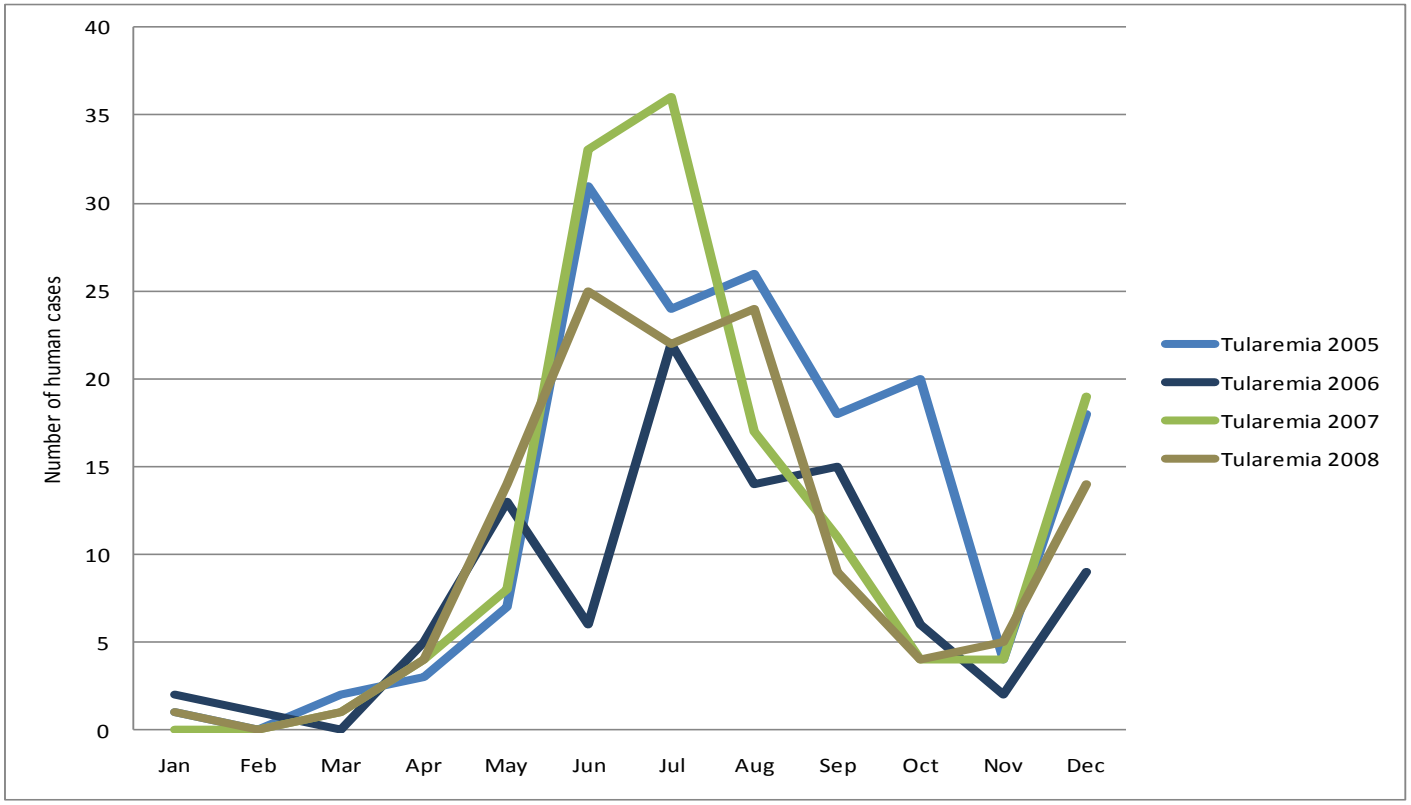
Species	Common Name	Total Collected	Negative	Positive	Seroprevalence
Canis latrans	coyote	3759	3738	21	0.56%
Procyon lotor	raccoon	1186	1185	1	0.08%
Castor canadensis	beaver	660	658	2	0.30%
Sus scrofa	feral swine	472	471	1	0.21%
Vulpes vulpes	red fox	298	297	1	0.34%
Ondatra zibethicus	muskrat	156	156	0	0.00%
Mephitis mephitis	striped skunk	146	146	0	0.00%
Canis lupus	gray wolf	124	122	2	1.61%

TABLE 2: STATE RESULTS FOR TULAREMIA SEROLOGY IN WILDLIFE — 2010

State	Samples Collected	Negative	Positive	Seropositive
Alaska	88	88	0	0.00%
Alabama	381	381	0	0.00%
Arkansas	70	70	0	0.00%
Arizona	416	416	0	0.00%
California	1	1	0	0.00%
Colorado	359	358	1	0.28%
Connecticut	1	1	0	0.00%
Florida	91	91	0	0.00%
Hawaii	72	72	0	0.00%
Iowa	66	66	0	0.00%
Idaho	164	161	3	1.83%
Illinois	44	42	2	4.55%
Indiana	101	101	0	0.00%
Kansas	27	27	0	0.00%
Kentucky	68	68	0	0.00%
Louisiana	76	76	0	0.00%
Massachusetts	61	61	0	0.00%
Maryland	66	66	0	0.00%
Maine	297	297	0	0.00%
Michigan	59	59	0	0.00%
Minnesota	109	109	0	0.00%
Missouri	161	160	1	0.62%
Mississippi	1	1	0	0.00%
Montana	842	831	11	1.31%
North Carolina	50	50	0	0.00%
Nebraska	142	140	2	1.41%
New Hampshire	37	37	0	0.00%
New Jersey	60	59	1	1.67%
New Mexico	951	951	0	0.00%
Nevada	297	292	5	1.68%
New York	149	149	0	0.00%
Ohio	159	159	0	0.00%
Oklahoma	71	71	0	0.00%
Pennsylvania	533	533	0	0.00%
Rhode Island	3	3	0	0.00%
Tennessee	198	198	0	0.00%
Texas	475	475	0	0.00%
Utah	311	309	2	0.64%
Virginia	123	123	0	0.00%
Vermont	52	52	0	0.00%
Washington	1	1	0	0.00%
Wisconsin	47	47	0	0.00%
West Virginia	121	121	0	0.00%
Wyoming	110	110	0	0.00%

Seasonality Associated with Human Tularemia Cases in the United States: 2005-2008

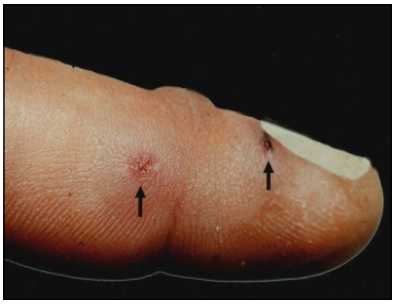
Data compiled from the Centers for Disease Control and Prevention



Human Tularemia Cases in the United States

Tularemia is a highly infectious zoonotic disease caused by the bacterium *Francisella tularensis*. First described in the early 1900's and initially isolated in Tulare County, CA (Francis 1925), *F. tularensis* has now been separated into four subspecies based on geographic occurrence and ecological associations. Tularemia is considered to be one of the most infectious pathogens ever studied. Its ability to readily aerosolize and potential use as a bioterrorism agent require mandatory reporting of any confirmed human tularemia infections as part of the Nationally Notifiable Disease Network (NNDN).

Tularemia infection in humans can be fatal and while fever is the characteristic initial symptom, other symptoms can vary widely based on route of exposure and individual immune response. It is also thought that some human tularemia infections in the U.S. go unreported, because general symptoms are treated with antibiotics with confirmatory diagnoses.



Small tularemia lesions

From 2005-2008, there were 509 human tularemia cases diagnosed in the United States. A majority of these cases occurred in Arkansas (51), Oklahoma (48), and Missouri (97). Centers for Disease Control and Prevention (CDC) data from 2009 and 2010 have not yet been compiled on a national level.

While it is often difficult to identify the source of infection, most people diagnosed with tularemia are exposed by tick bite. A recent CDC overview of tularemia cases in the U.S. found that 72% were associated with tick bites. This is in contrast to the historical route of exposure in the U.S., which is rabbit skinning. The decrease in rabbit hunting over time has led to fewer tularemia cases compared to what was seen in the early 1900s, and also produced the shift from tularemia exposure through contact with rabbits, to tularemia exposure through tick bites.

Tularemia cases are mainly seen in the summer months, June-August, which coincides with people, especially children, spending an increased amount of time outdoors; however, cases occur in all months of the year and there is often a small spike in cases from November-December. It has been suggested that this smaller, second peak in winter is associated with small-game hunting seasons and the associated increase in exposure to ticks and wildlife. Exposure to domestic rabbits also has been associated with tularemia infections.

TULAREMIA SURVEILLANCE FOR 2011 — THE FUTURE

The NWDP has partnered with the Centers for Disease Control and Prevention (CDC) for the last six years to monitor wildlife for exposure to the tularemia bacteria *Francisella tularensis*. The CDC has tested nearly 8,000 Nobuto strips collected from wildlife across the country in 2010, and even more results are expected from samples submitted later in the year; however, the CDC will only test a limited sample number in 2011.

Testing in 2011 will be limited to regions with substantial human tularemia activity, as well as regions where tularemia activity is currently unknown because of limited surveillance during previous years; however, sample collection can continue at previous levels or whenever opportunity arises. Samples that are not initially tested by the CDC will be stored in the National Nobuto Storage Archive.

Despite the number of human cases in the U.S., tularemia exposure in wildlife is often difficult to detect and suggests highly clustered occurrence or very low, sustained levels of transmission. It is also possible that *F. tularensis* bacteria reside primarily in arthropod vectors and that mammalian hosts may not develop detectable antibody titers even when fed on by an infected arthropod, as recent research has suggested. Such a scenario may help explain low wildlife seroprevalence levels, but research is needed to elucidate the ecology of tularemia.

The presence of tularemia in both wildlife and in the environment, combined with multiple transmission routes, leads to a surprisingly low incidence of tularemia infections in people, although it's possible that some people with mild initial symptoms are prescribed antibiotics without identification of the etiologic agent. Wildlife serosurveillance will continue to provide useful information on this disease. For more information, please contact NWDP staff listed below.

INTERESTED IN ADDITIONAL TULAREMIA SURVEILLANCE DATA FOR YOUR STATE?

We will be happy to put you in touch with the wildlife disease biologist in your state. Each wildlife disease biologist works closely with state, county, city and tribal entities to improve disease surveillance with the ultimate goal of improving and safeguarding local wildlife, livestock, and human health.

For more information on the Wildlife Services National Wildlife Disease Program in your state, please call 866-4 USDA WS, or contact the following staff:

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Coyote

Biologist sampling a striped skunk

American Beaver

This report was developed in collaboration with the U.S. Centers for Disease Control and Prevention