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Zoonotic diseases: Tularemia and the Plague: a terrorist threat

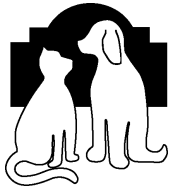
The plague...the Black Death. From our history classes in school we learned that this disease killed thousands of people in Europe. Since the advent of antibiotics, the plague has reduced in notoriety...to the point where few realize that it even exists. But it has always been around...lurking in our local wildlife. And now the plague and its more communicable friend Tularemia are back...as a threat via bioterrorism.

What is bioterrorism? Bioterrorism is using, or threatening to use a biologic (or chemical) agent to cause mass destruction. Because these agents are communicable, which means catching, viruses and bacteria such as plague, tularemia, ebola, smallpox, and anthrax are causes of great anxiety in the general populace, government, and the medical profession. Some agents can be spread in the air, others in the water supply. The two diseases discussed in this article are of particular note because they can affect our pets as well, and they are endemic diseases, (which means they are naturally occurring in our area.)

Tularemia

Tularemia (also caused rabbit fever and deerfly fever) is caused by a bacterium called *Francisella tularensis*. It was first discovered in Tulare, California in 1911 and heavily researched by Edward Francis (how the disease got its name). The bacterium has many subspecies and occurs in the US (not Hawaii), Japan, Russia, China, Northern and Central Europe, and Korea. In 1939 there were 2,291 cases. Between 1900-2000 124 cases were reported, which means the number of cases has decreased dramatically.

This disease is found in over 100 species in the wild, including rodents, rabbits, birds, amphibians, and reptiles. Transmission to people has been reported from squirrels, sheep, pheasants, voles, beavers, muskrats, prairie dogs, marmosets, mink, fox, raptors, quail, and non-human primates. Transmission occurs from tick bites (most common), handling/eating infected carcasses, water contamination, and bite wounds. The bacteria are extremely hardy and can live in unfrozen water/mud for 2 weeks, tap water for 3 months and dry straw litter for 6 months. It takes very few organisms to cause diseases, especially if inhaled or injected into the skin. The animal does not need to be sick in order to spread disease. Cutting grass in an endemic area can even cause disease. The disease is found most commonly among laboratory workers inadvertently opening an infected culture plate. Because of the low numbers of organisms to cause infection, its hardiness, and its ease of spread, the disease is classified as an agent of bioterrorism. The Johns Hopkins University Working Group on Civilian Biodefense believes that the greatest medical and public health consequences would be from an intentional release of aerosolized tularemia.



Clinical Signs: In humans, symptoms start about 3-5 days after infection. They include

- malaise (not feeling well)
- chills
- headache
- myalgia (muscle ache)

These symptoms are indistinguishable from influenza (flu). After these signs, other symptoms start, depending on how the disease was contracted

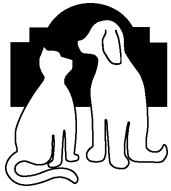
- Ulcer where inoculation (skin exposure) occurred accompanied by local lymph node enlargement (most common symptom-usually from a tick or animal bite)
- Enlarged lymph node in the area of inoculation without the ulcer
- Oral lesions including tonsillar enlargement and lymph nodes enlarged on the head and neck (from eating/drinking infected food/water)
- Eye lesions (from eye contact)
- Pneumonia (from inhalation)-rarest but most severe form

Without treatment, the disease can last from weeks to months. Mortality in humans generally is 5-15% (up to 60% for pneumonic form) among untreated individuals and less than 2% for treated. The disease is easily treated with antibiotics such as doxycycline and many others (streptomycin or gentamicin are most often used in people). Ciprofloxacin is now most recommended, as the disease can mimic other diseases such as Anthrax. It is resistant to penicillin-type drugs. The disease is a reportable disease, meaning that it reporting it to the government is required.

What about our pets? There is little data on small exotic pets. Dogs can be carriers but rarely become sick. Cats get infection by tick bites or ingesting infected rodents. Cats once infection can show the symptoms of:

- enlarged/swollen lymph nodes
- Abscesses in the liver or spleen causing anorexia, jaundice, fever, depression, and death

In cats, the disease is tested for via special antibody serology (blood test). Although little organism is secreted into bodily fluids, contact should be avoided. Like people, if caught early enough, many antibiotics are effective.



Due to the fact that it takes only 10-50 bacteria to cause disease, it is a potent threat by airborne delivery, and can be fatal if left untreated. The bacteria are found in nature, so it would be easy to locate and grow in a lab. Although fatalities would likely be low if warning was given, if no warning were given, most people would delay in seeking medical attention, thinking the symptoms were that of a cold or flu at first. The disease is not readily contagious person to person.

To prevent tularemia:

- Prevent tick bites while hiking/camping
- Do not handle deceased rodents/wildlife
- Report suspicious activity to local/state/federal authorities
- A vaccine is under review by the Food and Drug Administration

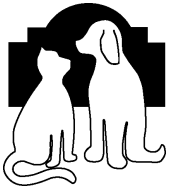
The Plague

The plague is caused by the bacterium *Yersinia pestis* and it affects animals and people. It is endemic (found in) many areas of the world including the United States. Most of us have heard or read out outbreaks of the plague ("black death") that devastated Europe, killing millions of people. What most don't know that there was a major outbreak in Los Angeles in 1924 and outbreaks are still occurring to this day in areas of Asia, Africa, and South America. Most cases in the United States occur in New Mexico, northern Arizona, southern Colorado, southern Oregon, western Nevada, and California. In the US, there are 10-15 cases a year, in the rest of the world 1000-3000 cases per year according to the World Health Organization.

The bacteria is spread through contact (bites) of infected fleas which are the vector. These fleas prefer rats to feed on, so the fleas are found where rodents are found. The cat flea (found on dogs and cats here in the United States) has also been implicated. Contact with contaminated fluids or tissues are also a common source. Unlike Tularemia, the bacteria have very high levels in bodily fluids. The bacteria is destroyed by sunlight and drying, but can survive for 1 hour when exposed to air.

There are several forms of plague, depending on what body system is affected.

- Bubonic plague is the most common form. This occurs via contact from a break in the skin (such as a fleabite). People infected develop swollen, painful lymph nodes (buboes), fever, headache, chills, and weakness. It is transmissible person to person.



- Pneumonic plague is when the bacteria infect the lungs. It is caused by inhaling the bacteria and is contagious from person to person. The bacteria useful come from respiratory droplets from an animal or person infected or spread from another form of untreated plague. The symptoms are similar to pneumonia, respiratory difficulty, coughing, fever, malaise, lethargy, and death. Early symptoms are fever, headache, weakness, and shortness of breath; chest pain, cough, and bloody sputum soon follow.

- The septicemic form of plague is from infection of the blood. It can be from a complication of another form of plague or an entity unto itself. It can be caused by the same causes as the previous forms. The symptoms are fever, chills, prostration, abdominal pain, shock, and bleeding into the skin or other organs. Unless the pneumonic form is also present it does not spread person to person.

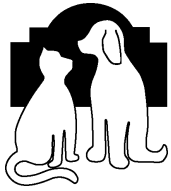
Early treatment is imperative. Antibiotics need to be started within 24 hours of first symptoms. Antibiotics such as streptomycin, gentamicin, and tetracyclines are effective. These are generally inexpensive antibiotics. Antibiotics can also be protective against those exposed before symptoms occur. There is no vaccine available.

Data on exotic pets is not well documented, but rodents are frequent carriers. The disease occurs in dogs, especially in free-roaming dogs. It is generally mild causing fever and enlarged lymph nodes. In cats, the disease is much more severe. All three forms that can develop in humans can also develop in cats. Buboes (lymph node swelling) under the jaw and in the neck are common presentations, as are fever, malaise, and weakness. Pneumonic plague is luckily rare in cats, but can cause direct transmission of the disease to people. Cats can get an acute form, in which they recover or die within 7 days, or a chronic form, which can last 2-4 weeks. Unlike Tularemia, the discharge from the buboes contains large quantities of the bacteria. Diagnosis is based on symptoms, culture results and increasing antibody levels.

With natural occurring disease, strict flea control and prompt veterinary (for your pets) and medical (for you) treatment is essential. Rodent control and staying always from the wildlife that spread the disease is essential. With prompt medical attention, the diseases are curable in most cases.

As a bioterrorist threat, both diseases can be disseminated as an airborne agent. Now that you know the symptoms, you can seek early intervention. Medical professionals, as part of the increased homeland defense, have been trained to recognize these diseases. Veterinarians have been trained to recognize there diseases as well, as they occur in our pets and they can act as early warning signals of the disease.

If you wish for further information about these diseases or other diseases that are a bioterrorist threat, please go to www.cdc.gov.



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Information for this article was researched from: www.cdc.gov, "Feline Zoonotic Diseases" by Michael Lappin, DVM, Ph.D. Veterinary Clinics of North America January 1993. "Zoonotic Diseases: From Dogs to Humans" by Bruno. B. Chomel DVM, Ph.D. From Zoonotic Disease Lectures 1999.