Plague

National Park Service
U.S. Depatment of the Interior

Biological Resources Division
Wildlife Health Branch

Animals play essential roles in the environment and provide many important benefits to ecosystem health. One Health is this recognition that animal health, human health, and environmental health are all linked. Similar to people, wild and domestic animals can be victims of disease. The information presented here is intended to promote awareness and provide background for certain diseases that wildlife may get.

OneHealth

See the **Guidance for Park Visitors** section below for tips to safely enjoy your national park trip.

Disease Background:

- Plague is a non-native, bacterial disease caused by *Yersinia pestis* that infects mammals, including 200+ rodent species and can be highly fatal in both wildlife and humans.
- Plague was introduced into North America in 1900 and has spread throughout the western United States. It is currently found on every continent except Australia.
- In the U.S. plague is responsible for large die-offs of native species and the near-extinction of the endangered black-footed ferret (*Mustela nigripes*).
- Plague can also cause low-levels of mortality (death) in rodent populations in the absence of a large die-off.

Disease Ecology:

- Sporadic human and wildlife cases may occur at any time in areas with plague.
- Epidemics are outbreaks with mass mortality and can occur when environmental conditions favor high flea numbers and high concentrations of susceptible rodent species.

Transmission:

- Plague is typically transmitted through the bite of an infected flea but can also be transmitted by direct contact with or consumption of infected carcasses.
- *Y. pestis* is destroyed by heat and desiccation but may survive for longer periods of time in infected fleas, carcasses or other organic material (blood, tissue, and soil).

Wildlife Health Implications:

Species Affected:

- In the U.S., the most commonly affected hosts are rodents.
  - Prairie dogs (*Cynomys* spp.), ground squirrels (*Spermophilus* spp.), chipmunks (*Tamias* spp.), voles (*Microtus* spp.), mice (*Peromyscus* spp.), woodrat (*Neotoma* spp.), rock squirrels (*Otospermophilus variegatus*), and antelope ground squirrels (*Ammospermophilus* spp.) are common hosts.
  - Mortality in high-density populations of susceptible species (prairie dogs, ground squirrels, etc.) often approaches 100%.

- Wild canids are more resistant, while wild felids and some mustelids are highly susceptible.
  - Wild felids including the mountain lion (*Puma concolor*), bobcat (*Lynx rufus*), and Canadian lynx (*Lynx canadensis*) are susceptible to plague and may be found dead either with no obvious signs of disease or blood coming from the nostrils.
  - The black-footed ferret is highly susceptible to plague; nearly 100% of infected animals die from the disease.
  - Most other wild carnivores and omnivores (raccoon, skunk, coyote, foxes, and badgers) appear to be less susceptible to plague and rarely become sick but may carry infected fleas temporarily.

Prevention:

- An oral plague vaccine has been developed for prairie dogs and is undergoing field trials.
- An injectable vaccine, developed for domestic ferrets, is also used to help protect black-footed ferrets from plague.
- When an outbreak is observed or suspected, rodent burrows can be dusted with flea-targeted insecticides to reduce infectious flea populations.

Public Health Implications:

- Suspect or potential infection in humans should be taken very seriously.
- Infections in humans most commonly occur from the bite of an infectious wild rodent flea or direct contact with an infected animal. Free-roaming domestic pets may carry fleas to an owner or home if they contact rodents or rodent burrows; more commonly cats than dogs.
- Cases of human infection in the United States are uncommon with 2-20 cases/year between 2000-2014. Cases are seen most commonly in western states including Arizona, California, Colorado, and New Mexico. For an updated list of cases, visit CDC's website.[1]

Clinical Signs:

- Infection in humans results in serious and life-threatening disease with rapid, high mortality rates in untreated or unrecognized cases. Symptoms typically appear 1-6 days after infection.
- Plague can take on three different forms depending on the route of infection.
  - The bubonic form is most common in humans following a bite by an infected flea, which causes nearby lymph nodes to become swollen and painful.
  - The pneumonic form is rapidly fatal and occurs following inhalation of *Y. pestis* or spread to the lungs via the bloodstream.
  - The septicemic form occurs when *Y. pestis* spreads throughout the body via the bloodstream.
- Clinical signs include acute onset of flu-like signs (fever, chills, headache, and malaise) with progression to infection of the bloodstream and secondary pneumonia often within a few days. Once infection reaches the lungs and/or bloodstream the disease progresses rapidly to respiratory and circulatory system collapse.

Treatment:

- Plague is treatable and curable with antibiotics given within 24-48 hours of symptom onset.
- Without treatment, mortality of bubonic plague is 40-70% while the pneumonic form is almost always fatal.

[1] http://www.cdc.gov/plague/

If you or a pet becomes ill with any of the described symptoms within one week of being in an affected area, seek immediate medical attention and tell your physician or veterinarian that you or your pet may have been exposed to plague.

Guidance for Park Visitors:

The guidelines below can be followed to ensure you and your family safely enjoy the wonderful natural and cultural resources protected by the NPS.

- Notify a Park Service employee as soon as possible and avoid contact with the animal if you see any sick or dead wildlife.
  - Most wild animals in parks are healthy and thrive in their natural environment, but sometimes wildlife can get sick just like people.
  - Some disease-causing organisms can be passed between wild animals and people. Therefore, always avoid touching or handling sick or dead wild animals.
  - Park Service employees trained in wildlife health use specific protective measures to safely deal with a wild animal that may have died of disease.

- Protect yourself from bug bites:
  - Wear insect repellent containing 20-30% DEET or other EPA-approved repellent when spending time outdoors in flea and tick habitat.
  - Consider wearing permethrin treated clothing to provide additional protection.
  - Wear long pants and long-sleeved shirts when weather permits.

- Report observations of rodents displaying abnormal behavior and any sick or dead wildlife.
  - Avoid approaching wild animals and their carcasses.
  - Avoid contact with rodents and their fleas and burrows.
  - Do not pitch tents near rodent burrows.

- Keep dogs leashed, cats indoors, and all pets supervised to reduce risks of contact with wildlife. Pets should be kept up-to-date on flea/tick preventatives and vaccinations by a licensed veterinarian.

- Know the signs and symptoms of plague. If you develop fever, chills, swelling at the site of an insect bite or nearby lymph node, seek medical care immediately and inform you doctor you may have been exposed to plague.

- **When recognized early, plague is treatable and curable with appropriate antibiotics.**