

## Just the Facts...

Plague is a serious flea-borne disease that is caused by the bacteria *Yersinia pestis* (yer-SIN-ee-ah PEST-iss). It can occur in three forms: bubonic, septicemic, or pneumonic.

### How is plague transmitted?

Fleas become infected by feeding on rodents, such as chipmunks, prairie dogs, ground squirrels, mice, and rats, which are infected with *Y. pestis*. The bacteria are then transmitted from animal-to-animal and from animal-to-human by the bites of these infected fleas. Less frequently, the plague organisms enter through a break in the skin by direct contact with tissue or body fluids of a plague-infected animal, for instance, in the process of skinning a rabbit or other animal. Another means of transmission is by inhaling respiratory droplets that are expelled when an animal (especially a domestic cat) or human, infected with the pneumonic form of plague, coughs. Because *Y. pestis* is so infectious and deadly when spread by the aerosol route (pneumonic plague), it is considered a potential bioweapon.



Male *Xenopsylla cheopsis* (oriental rat flea) engorged with blood. This is a major vector of plague throughout Africa, Asia and South America. Both male and female fleas can transmit the infection. Photo: CDC

southwestern states of New Mexico, Arizona, and Colorado, and in California. Plague currently does not occur in Australia or Europe.

### How do outbreaks of plague occur?

Wild rodents in many areas around the world are infected with *Y. pestis*. It is believed that the plague bacterium circulates within these animal populations without causing extensive mortality. Periodically, however, a high death rate occurs, and hungry infected fleas that have lost their normal rodent hosts, seek other sources of blood. Humans living in proximity to areas where a die off of these hosts has occurred are then at increased risk, especially if the human population density is high and sanitary conditions are poor.

### What are the symptoms of plague?

The most common form of plague is known as **bubonic plague**. The typical symptom of bubonic plague is a swollen, painful lymph gland, called a "bubo." Bubbles most often appear in the groin, armpit or neck. A person

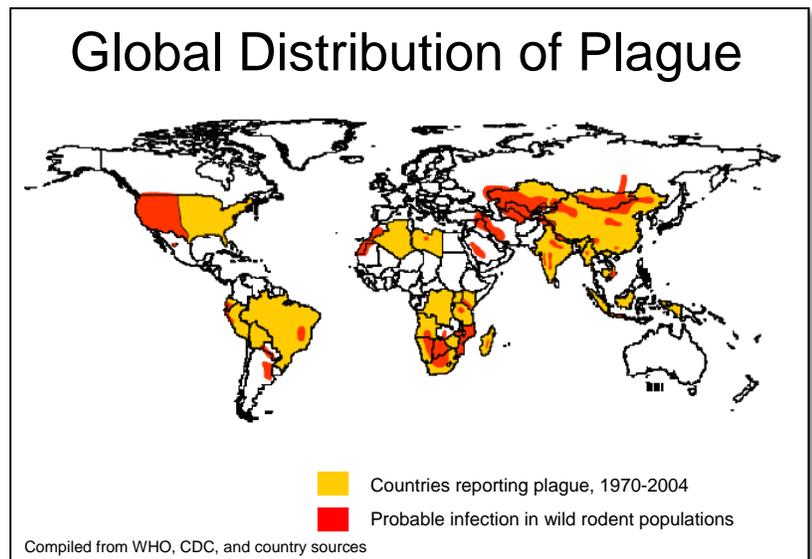


Ground squirrels are among the rodent species that can harbor fleas infected with the plague bacteria, *Y. pestis*. Photo: D. Draper, Utah DWR

### How common is plague?

During the Middle Ages, epidemics of plague were responsible for the death of hundreds of millions of people in Europe, Asia and Africa. Today, plague is much less

common, but outbreaks in people still occur in rural communities or in cities, usually in developing countries. These outbreaks are frequently associated with infected rats, and their fleas (especially the oriental rat flea, *Xenopsylla cheopsis*), that live in and around the home. Globally, the World Health Organization reports 1,000 to 3,000 cases of plague annually. Human plague in the U.S. occurs as mostly scattered cases (an average of 10 to 15 per year) in rural areas, particularly in the



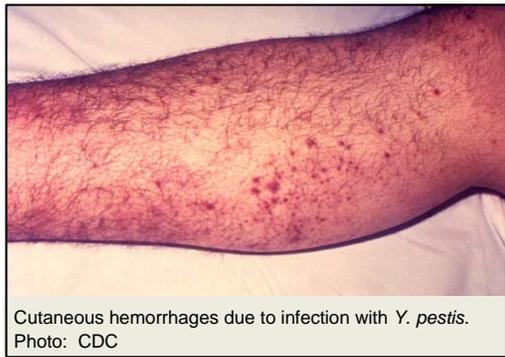
usually becomes ill with bubonic plague 2 to 6 days after being infected. Bubonic plague should be suspected when a person develops a swollen gland, accompanied by fever, chills, headache, and extreme exhaustion, and has a history of possible exposure to infected animals or fleas. If bubonic plague is left untreated, *Y. pestis* rapidly invades the bloodstream and quickly spreads throughout the body, causing a severe and often fatal condition called septicemic plague. Symptoms include abdominal pain, shock, and bleeding into the skin and other organs. Cutaneous hemorrhages, and tissue death known as gangrene, are likely. Pneumonic plague, a severe respiratory illness, occurs when *Y. pestis* infects the lungs. This form of plague is characterized by high fever, cough, bloody sputum and difficulty breathing. If not treated promptly, rapid shock and death can result. Although pneumonic plague may occur secondarily as a consequence of untreated bubonic or septicemic plague, it can also result directly from inhaling infectious respiratory droplets. The incubation period for pneumonic plague cases acquired by inhalation is usually about 2 days.



Swollen lymph glands, known as "buboes," are a common symptom of bubonic plague. Photo: CDC

### What is the mortality rate for plague?

About 14% of all plague cases in the United States are fatal. Deaths typically result from delays in seeking treatment or from misdiagnosis. Reportedly, 50-60% of bubonic plague patients who fail to receive any antibiotic treatment die. Untreated septicemic or pneumonic plague is almost always fatal. Recovery from plague confers relative immunity to re-infection; it may not protect against a large inoculum of *Y. pestis*.



Cutaneous hemorrhages due to infection with *Y. pestis*. Photo: CDC

### How is plague treated?

When a patient is diagnosed with suspected plague, the individual should be immediately hospitalized and isolated. Laboratory tests, including blood cultures for *Y. pestis* and microscopic examination of lymph gland, blood, and sputum samples, should be performed. Rapid administration of



Gangrene is one of the manifestations of plague, and is the origin of the term "Black Death" given to plague epidemics throughout the ages. Photo: CDC

antibiotics is critical; do not wait for laboratory confirmation of plague. Streptomycin is the antibiotic of choice. Gentamicin has similar efficacy. Doxycycline, the tetracyclines, and chloramphenicol are also effective. People who have been in close contact with a plague patient should be identified and evaluated.

### How can plague be prevented?

Currently, no plague vaccine is available. Therefore, preventive measures should include:

- Control rat and flea populations in both urban and rural areas by surveillance, trapping, sanitation, and the judicious use of rodenticides and insecticides. Rat control should always be preceded by measures to control fleas.
- Eliminate food and shelter for rodents around homes, work places, and recreation areas by removing brush, rock piles, debris, and food sources (such as pet food).
- Treat pets for fleas, as needed.
- Use the DoD Insect Repellent System to prevent flea bites:
  - Wear the proper clothing: long pants tucked into boots or socks; long sleeves; shirt tucked into pants; light-colored clothing makes it easier to spot fleas.
  - Treat clothing with permethrin repellent. For military uniforms, order the impregnation kit (IDA) (NSN 6840-01-345-0237, good through 50 washes), or aerosol spray (NSN 6840-01-278-1336, good through 5-6 washes).
  - Apply DEET repellent to all exposed skin. Military personnel should order NSN 6840-01-284-3982 (one application lasts up to 12 hours).
- During deployments, troops should avoid close contact with local human populations or domestic/wild animals.
- Wear a tight-fitting disposable surgical mask if direct contact with people suspected of being infected with plague is unavoidable. In emergency situations, makeshift face coverings made of layers of cloth may be helpful.
- Preventive antibiotic therapy may be advisable in the event of exposure to the bites, scratches, fluids, or other close contact with a person, pet, or animal with suspected plague.

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