TREATMENT

- Early treatment and prophylaxis with streptomycin, gentamicin, or the tetracycline or fluoroquinolone classes of antimicrobials is advised.
- Oxygen, intravenous fluids, and respiratory support are additional treatments.
- Patients with pneumonic plague are strictly isolated from other patients.
- Persons having household, hospital, or other close contact with persons with untreated pneumonic plague should receive post-exposure antibiotic treatment for 7 days. (Close contact is defined as contact with a patient at less than 2 meters.)
- In a community experiencing a pneumonic plague epidemic, all persons who develop a fever or new cough should promptly begin antibiotic treatment.
- The use of disposable surgical masks is recommended to prevent the transmission of pneumonic plague to persons in close contact with cases.

BIOTERRORISM

- A weapon designed to aerosolize the plague bacterium could cause a rapidly severe and fatal disease in exposed persons.
- *Y. pestis* can be cultured in large quantities and disseminated by aerosol transmission. This could produce an epidemic of the pneumonic plague with the potential for secondary infection in others.
- A bioterrorism attack would be characterized by pneumonic plague cases occurring simultaneously in persons 1 to 6 days following a common exposure, and in a secondary wave in unprotected case contacts.
- There are no effective environmental warning systems to detect an aerosol of plague bacilli. However, *Y. pestis* is a relatively fragile organism and can only remain viable for about 1 hour after an aerosol release.
- Standard hospital disinfectants (i.e. chlorine or phenolic solutions) are adequate for decontamination.

RESOURCES

The World Health Organization
525, 23rd Street, N.W.
Washington D.C. 20037
202.974.3000 (Telephone)
202.974.3663 (Facsimile)

http://www.who.int/en/

The Centers for Disease Control and Prevention

1600 Clifton Road
Atlanta, GA 30333
800.311.3435 (Public Inquiries)
404.639.3311 (Telephone)

http://www.bt.cdc.gov/agent/plague/

Infectious Diseases Society of America
66 Canal Center Plaza, Suite 600
Alexandria, VA 22314
Phone: (703) 299-0200
Fax: (703) 299-0204

http://www.who.int/inf-fs/en/fact267.html

Occupational Safety & Health Administration
200 Constitution Ave, NW
Washington, DC 20210
800.321.OSHA (Toll Free)

http://www.osha.gov/

University of New Hampshire
Office of Environmental, Health and Safety
Perpetuity Hall, 11 Leavitt Lane
Durham, NH 03824
603.862.4041 (Telephone)
603.862.0047 (Facsimile)

http://www.unh.edu/ehs

UNIVERSITY of NEW HAMPSHIRE

Created by David R. Gillum.
Office of Environmental Health and Safety. 2003.

Yersinia Pestis: Safety Pamphlet

The University of New Hampshire's Office of Environmental Health and Safety has produced this pamphlet on *Yersinia pestis* to increase awareness and prevention. This document is a guide and should not replace the expertise of your health care provider.

BACKGROUND

- *Y. pestis* is a non-motile, non-sporulating, Gram negative *cocco-bacillus* measuring 1.5 by 0.75 µm.
- Plague occurs in urban or wild rodent populations: humans acquire disease primarily via infected fleas.
- During 6th century A.D., the plague, also known as "black death," ravaged the world over a 50-year period causing 50 million deaths. In the 14th century, the plague devastated Europe over a 5-year time span resulting in 25 million deaths (25% of the European population).
- In 1999, 14 countries reported 2,603 cases to the WHO (including 212 deaths). These figures are comparable with the annual average figures (2,547 cases, 181 deaths) for the previous 10 years (1988-1997). Over the past decade, 76.2% of the cases and 81.8% of the deaths were reported from Africa.
- Worldwide, there are 1,000 to 3,000 plague cases each year. There are 10 to 20 plague cases reported annually in the United States.
- Approximately 14% (1 in 7) of all plague cases in the United States are fatal.
- *Y. pestis* infection in humans occurs in one of three primary clinical forms: **bubonic, septicemic** and **pneumonic plague**.

TRANSMISSION

- **Bubonic plague** is characterized by enlarged lymph nodes resulting from cutaneous or mucous membrane exposure. **Septicemic plague** is an overwhelming incidence of bacteria in the bloodstream usually following cutaneous exposure. **Pneumonic plague** generally follows inhalation of aerosolized droplets containing *Y. pestis.*

- Bubonic plague results from flea bite or direct contamination of an open skin lesion by plague-infected material.

- Septicemic plague is a bloodstream infection of *Y. pestis* that is generally a result of bubonic plague infection.

- Pneumonic plague occurs in two distinct forms.

  - Secondary pneumonic plague results from the spread of *Y. pestis* to the lungs via the circulatory system after a bubonic/septicemic exposure.

  - Primary pneumonic plague occurs in crowded conditions when another person directly inhales contaminated respiratory droplets expelled by infected persons.

- Wild rodents (rats) are natural reservoirs for *Y. pestis.* Lagomorphs (rabbits, hares) and carnivores are additional sources of infection to humans.

- The oriental rat flea (*Xenopsylla cheopis*) is the primary vector. Human fleas (*Pulex irritans*) can also be a vector. Fleas may remain infective for months.

- Plague tranmission can occur from the following:

  - Handling infected tissues;
  - Careless manipulation of laboratory cultures;
  - Scratches or bites from infected animals or people;
  - Airborne droplets from animals or humans with pneumonic plague;
  - Animal or human fleas; and
  - Unprotected sex.

SYMPTOMS

- The incubation period for **bubonic plague** is approximately 2 to 6 days. Patients typically experience a sudden onset of illness including:

  - Headache;
  - Shaking;
  - Chills,
  - Fever;
  - Malaise; and
  - Pain in the affected regional lymph nodes (nodes may not be clinically enlarged at this stage).

There is a 50-60% case fatality rate associated with untreated bubonic plague. Up to 80% of patients with bubonic plague will also develop septicemic plague; 5-15% will develop pneumonia; and a small proportion will develop meningitis.

- With the progression of bubonic plague to **septicemic plague** comes:

  - Fever;
  - Chills;
  - Prostration;
  - Abdominal pain;
  - Shock; and
  - Bleeding into skin and other organs.

The initial symptoms of septicemic plague can mimic gastroenteritis (nausea, vomiting, diarrhea, abdominal pain). The true nature of the illness is apparent when the patient develops severe bleeding problems.

- The incubation period for **pneumonic plague** is 1 to 3 days. Symptoms include:

  - Chills;
  - Fever;
  - Headache;
  - Body pains;
  - Chest discomfort;
  - Difficulty breathing;
  - Cough and sputum production; and
  - Coughing blood.

Death usually ensues if specific antibiotic therapy is not begun within 18-24 hours of disease onset. The case fatality rate for pneumonic plague is 100% if left untreated.

PREVENTION

- The best way to prevent plague is to control rodents and fleas around places where people live, work, and play.

- Avoid contact with sick or dead animals (especially rodents) and reporting these animals to local health authorities.

- Avoid contact with the nests and burrows of squirrels, chipmunks and other wild rodents.

- Insect repellant containing permethrin or 30% N,N-diethyl-metatoluamide (DEET) for adults and 10% DEET for children should be applied to exposed skin and to clothing during summer months or when entering flea infested areas.

- Use veterinarian-approved flea collars and other flea repellents on cats and dogs.

- Follow your veterinarian's guidelines when handling a severely ill cat or dog (especially a sick pet cat), who should always be examined promptly by your veterinarian.

- If you are a hunter, use gloves when handling any dead animal.

- If your home is in a high-risk area, check with local health authorities about effective rodent-proofing strategies and keeping your property free from brush, rocks, garbage and food waste that can attract rodents.

- The plague vaccine is no longer available in the United States due to its limited effectiveness.

- Routine bacteriologic work involving plague can be performed in biosafety level 2 laboratories. Standard precautions (e.g., the use of a biological safety cabinet to contain aerosols that are generated unintentionally) are sufficient to prevent clinical laboratory workers from being infected with *Y. pestis*.

- Sunlight, high temperatures and desiccation have a destructive effect, and ordinary disinfectants such as Lysol™ and preparations containing chlorine kill *Y. pestis* within 1 to 10 minutes.