

PLAGUE (Black Death)

REPORTING INFORMATION

- **Class A: Report immediately via telephone** the case or suspected case and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report immediately via telephone to the local public health department in which the reporting health care provider or laboratory is located. Local public health departments should report immediately via telephone the case or suspected case and/or a positive laboratory result to the Ohio Department of Health (ODH). Cases should also be entered into the Ohio Disease Reporting System (ODRS) within 24 hours of the initial telephone report to ODH.
- Reporting Form(s) and/or Mechanism:
 - Immediate telephone reporting is required.
 - For the local health department, the Ohio Disease Reporting System (ODRS) after the initial telephone report.
 - The Centers for Disease Control and Prevention (CDC) [Plague Case Investigation Report \(CDC 56.37, 02/2006\)](#) is required for completion by the local health department. Information collected from the form should be entered into ODRS **and** faxed to ODH, Outbreak Response & Bioterrorism Investigation team at 614-564-2456. The mailing address for this form is: ODH, Outbreak Response & Bioterrorism Investigation Team, ODH, 246 N. High St, Columbus, OH 43215.
- Key fields for ODRS reporting include: import status (whether the infection was travel-associated or Ohio-acquired), date of illness onset, and all the fields in the Epidemiology module.

AGENT

Yersinia pestis, the plague bacillus, gram-negative coccobacillus, enterobacteriaceae

Infectious Dose: a single bite of an infectious flea. Each bite releases several thousand plague bacilli from the gut of the flea. Inhalation of a droplet of infectious mucous from a pneumonic plague patient.

CASE DEFINITION

Clinical Description

Plague is transmitted to humans by fleas or by direct exposure to infected tissues or respiratory droplets; the disease is characterized by fever, chills, headache, malaise, prostration, and leukocytosis that manifests in one or more of the following principal clinical forms:

- Regional lymphadenitis (bubonic plague)
- Septicemia without an evident bubo (septicemic plague)
- Plague pneumonia, resulting from hematogenous spread in bubonic or septicemic cases (secondary pneumonic plague) or inhalation of infectious droplets (primary pneumonic plague)
- Pharyngitis and cervical lymphadenitis resulting from exposure to larger infectious droplets or ingestion of infected tissues (pharyngeal plague)

Laboratory criteria for diagnosis

Presumptive:

- Elevated serum antibody titer(s) to *Yersinia pestis* fraction 1 (F1) antigen (without documented fourfold or greater change) in a patient with no history of plague vaccination *or*
- Detection of F1 antigen in a clinical specimen by fluorescent assay.

Confirmatory:

- Isolation of *Yersinia pestis* from a clinical specimen *or*
- A fourfold or greater change in serum antibody to *Y. pestis* F1 antigen.

Case Classification

Suspect: A clinically compatible case without presumptive or confirmatory laboratory results.

Probable: A clinically compatible case with presumptive laboratory results.

Confirmed: A clinically compatible case with confirmatory laboratory results.

SIGNS AND SYMPTOMS

Bubonic plague accounts for 90% - 95% of cases. Lymphadenopathy and fever with malaise, nausea, vomiting, and diarrhea characterize bubonic plague. Involvement of the lungs results in the very rare but highly contagious pneumonic form. Untreated bubonic plague has a case fatality rate of 50% - 60%; for untreated pneumonic plague, the rate is nearly 100%.

DIAGNOSIS

Appropriate specimens should be examined for evidence of plague if a person resides in, or has a recent travel history to, plague-infected areas; has been bitten by fleas; and presents with symptoms suggestive of plague (fever, lymphadenopathy). Specimens should be obtained from appropriate sites for isolating the bacteria. The preferred specimen for microscopic examination and isolation from a bubonic case is material from the affected bubo, which should contain numerous organisms. Blood cultures should be taken whenever possible. Specimens intended for culture should be taken **before** initiation of antibiotic treatment.

Evaluation of clinical specimens (e.g. CSF, bubo aspirates) by FA, and antibody testing (Enzyme-linked immunosorbent assay [ELISA] serology) is available at the CDC. Proper protocol is to send the serum or other sample(s) to CDC through the ODH Laboratory (ODHL). Call ODHL, 1-888-ODH-LABS (888-634-5227) select option #2- Microbiology, to arrange for shipment of serum or other specimens to CDC.

For further details, see Clinical Specimen Collection and Transport Guideline, in the [Microbiology Client Services Manual, Section 4](#) of the Infectious Disease Control Manual.

EPIDEMIOLOGY

Source

Plague is a worldwide zoonosis involving mammals and their fleas. Endemic foci persist in Africa, Asia, South America, and the western United States.

Occurrence

Endemic plague has not been reported from Ohio. Human plague in the United States has occurred as mostly scattered cases in rural areas (an average of 10 to 15 persons each year). Approximately 90% of these are reported from New Mexico, Arizona, California, and Colorado.

Mode of Transmission

The pneumonic form is spread through airborne droplets. The bubonic form is transmitted through the bite of an infected flea and by handling infected tissues.

Period of Communicability

Bubonic plague is not transmitted person-to-person. The pneumonic form is highly contagious. There is no carrier state.

Incubation Period

Ranges from less than a day to 7 days.

PUBLIC HEALTH MANAGEMENT

Case

Investigation

Plague should be considered in the febrile patient who has a history of travel to endemic areas, especially during the summer months (June to September). Travel history and contacts should be determined for the two weeks prior to the onset of illness. Complete the [Plague Case Investigation Report \(CDC 56.37, 02/2006\)](#) and fax to ODH- ORBIT 614-564-2456.

Treatment

Parenteral forms of the antimicrobials streptomycin or gentamicin are recommended, but a number of other antimicrobials are also effective.

Isolation and Follow-up Specimens

The Ohio Administrative Code (OAC 3701-3-13, (S)) states that "a person with plague shall be placed in droplet isolation until completion of forty-eight hours of effective antimicrobial therapy". Cases of pneumonic plague should be held in strict respiratory isolation. Bubonic cases with no cough and a negative chest X-ray need only mask and gown isolation precautions. One serum specimen should be taken as early in the illness as possible to be followed by a second sample 1-4 months after antibiotic therapy has ceased.

Public Health Significance

High, especially for pneumonic plague, which is highly contagious. If bioterrorism is suspected, post-exposure prophylaxis may be recommended for persons who may have been exposed to the bacteria. Please note that there is an existing standing medical order issued by the Director of the Ohio Department of Health for Ohio local health departments in an emergency situation to dispense prophylactic antibiotics to persons with known or suspected exposure to *Yersinia pestis*. For further details, see <http://www.odh.ohio.gov/pdf/idcm/btstandorders.pdf>.

Contacts

Persons exposed to plague patients who have pneumonia or to *Yersinia pestis* aerosols in the laboratory should be given 7 to 10 days course of antimicrobial therapy regardless of vaccination history.

Prevention and Control

Travelers

Travelers to western states (especially New Mexico and Arizona) should be warned to

avoid handling living or dead wild animals and their fleas and to stay away from burrows. Gloves should be worn when skinning animals. Pets should be restrained and not allowed contact with wild rodents. Fleas should be controlled. Dogs and cats should not be fed raw rodents or rabbit meat. Rodent infestation should be discouraged around houses and yards. Insect repellents should be used to prevent flea bites; follow label instructions and avoid overuse.

Vaccination

Plague vaccine is no longer commercially available. Vaccination against plague is not required by any country as a condition for entry. Vaccine has not been available since the mid 1990's when the manufacturer stopped production due to the short period of effectiveness and many side effects.

Special Information

Plague is a candidate for acts of biological terrorism, especially due to the high contagious potential of the pneumonic form of the disease.

CDC Plague website: <http://www.cdc.gov/plague/>

CDC Plague Fact Sheet:

<http://www.cdc.gov/ncidod/dvbid/plague/resources/plagueFactSheet.pdf>

What is plague?

Plague is a bacterial disease that affects man and animals, especially rodents. Fleas pass the bacteria from animal to animal through their bites. Plague can exist in different forms and infected people may require strict isolation and disinfection procedures.

Millions of people in Europe died from plague in the Middle Ages, when human homes and places of work were inhabited by flea-infested rats. Today, the disease is relatively rare but can still be found in South America, Africa, Asia, and the southwestern United States. Globally, the World Health Organization receives reports of 1,000-3,000 cases of plague each year. The U.S. reports an average of 10-15 cases per year. There have been no reports of human plague acquired in Ohio.

How is plague spread?

The most common means of transmission is through the bite of infected fleas. Fleas become infected by feeding on rodents, such as the chipmunks, prairie dogs, ground squirrels, mice and rats. Cats have occasionally been diagnosed with plague.

Other important sources include the handling of tissues from infected animals (especially rabbits or rodents), airborne droplets from humans or household pets with plague pneumonia, and laboratory exposure.

Can anyone get plague?

Yes, but people living, working or visiting areas with infected rodents are at greater risk. Cats from endemic areas have also passed the disease to their owners and veterinarians.

What are the symptoms of plague?

The initial symptoms include inflamed and tender lymph glands in the body near where the infected flea bit the person, fever, chills, headache, and extreme exhaustion. The disease may progress to a generalized blood infection. Some cases also develop pneumonia. People with pneumonic plague may transmit the disease to other people when coughing. About 14% of all plague cases in the U.S. are fatal.

How soon do symptoms occur?

Symptoms usually begin within one to seven days after exposure to the plague bacteria.

How is plague diagnosed?

Laboratory tests can be performed on blood, sputum or fluid from a lymph node.

Does past infection with plague make a person immune?

Immunity after plague recovery is variable, and may not provide complete protection.

What is the treatment for plague?

Persons with plague should be hospitalized and medically isolated. Several antibiotics, including streptomycin, are effective in treating this disease.

See also:

CDC Plague website: <http://www.cdc.gov/plague/>