

PLAGUE (Summary)

Introduction

Plague is a zoonotic infection caused by *Yersinia pestis*, a Gram-negative bacillus. Naturally occurring infections in humans are transmitted from rodents by fleas and are characterized by the abrupt onset of high fever, painful local lymphadenopathy draining the exposure site, and bacteremia. Three forms of plague are recognized:

- Bubonic plague – Characterized by the presence of buboes, the inflammatory swelling of one or more lymph nodes, usually in the groin;
- Septicemic plague – Plague sepsis which can ensue from either untreated bubonic plague or *de novo* from a flea bite;
- Pneumonic plague – Patients with bubonic plague can develop secondary pneumonic infection, which can then be spread from person-to-person without the need for transmission through a flea vector.

Epidemiology

A total of 18,739 cases of plague in humans in 20 countries (in Africa, Asia, and the Americas) were reported to the World Health Organization from 1980-1994. Between 1970 and 1995, 341 cases of plague in the US were reported to the Centers for Disease Control, with an average of 13 cases per year. Eighty percent of these cases occurred in the southwestern states of Arizona (14%), Colorado (10%) and New Mexico (56%). An additional 9 percent of cases were reported from California.

Clinical Manifestations of Bubonic Plague

I. Subjective Symptoms- all of the following are considered presenting symptoms:

Symptom	Time of onset
sudden fever/chills, headache	After 1-8 day incubation period
nausea/vomiting, prostration/severe malaise, altered mentation, cough, chest pain, abdominal pain	A few hours after appearance of fever, chills and/or headache.

II. Objective Symptoms:

Organ/System	Description	Period and Duration
Skin	Appearance of characteristic and intensely painful plague bubo (femoral site most common, followed by inguinal, axillary and cervical).	Manifestation: buboes appear after a 1-8 day incubation period and 6-8 hours after the onset of the symptoms described above.
Genitourinary	bladder distention oliguria and anuria	Manifestation: around the time that bubo appears.
Circulatory cardiac blood	Tachycardia Hypotension Leukocytosis	Manifestation: around the time that bubo appears.
Respiratory	5 to 15% of patients will develop secondary pneumonic plague	See objective symptoms of pneumonic plague.
Immune	pronounced septicemia	See objective symptoms of septicemic plague.

Clinical Manifestations of Septicemic Plague

I. Subjective Symptoms- all of the following are considered presenting symptoms and are generally the same as those for any other Gram-negative sepsis:

Symptom	Form of septicemic plague	Time of onset
fever/chills	usually primary only	Primary: after 1-8 day incubation period
nausea/vomiting	primary and secondary	Secondary: 2-6 days after appearance of plague
diarrhea	primary and secondary	bubo

II. Objective Symptoms: The only unique, objective symptoms of primary or secondary septicemic plague are purpuric lesions, disseminated intravascular coagulation and acral cyanosis and necrosis. These are seen at least 4-6 hours after the onset of symptoms.

Clinical Manifestations of Pneumonic Plague

Pneumonic plague occurs either primarily from aerosol inhalation or secondarily from hematogenous dissemination from bubonic plague. Subjective symptoms are the same as for bubonic plague. The objective clinical presentation of pneumonic plague is limited to a productive cough with blood-tinged sputum occurring 24 hours after onset of symptoms.

Antibiotic Treatment

Antibiotic treatment is essential for treating plague. Without treatment, mortality is 60% for bubonic plague and 100% for septicemic plague. Since time-to-death is relatively short, the earlier the treatment is initiated, the more favorable the outcome. Patients are not likely to survive primary pneumonic plague if a course of antibiotics is not initiated within the first 18 hours of symptom onset. Plague buboes will subside in 10-14 days if treated with antibiotics.

Since 1948, streptomycin has been the preferred choice for the treatment of bubonic, septicemic, and pneumonic plague, although clinical isolates with plasmid-mediated streptomycin resistance have been reported [Guiyoule A et al. EID 2001; 7(1):43-8]. Streptomycin should be administered intramuscularly. Although gentamycin has been used less frequently, it can be used as an alternative treatment to streptomycin. Alternate choices in a contained casualty setting include intravenous doxycycline, ciprofloxacin, or chloramphenicol. Treatment should always continue for at least 10 days or for 3-4 days after clinical recovery.

Post-exposure prophylaxis

Any individuals who have been exposed to aerosols should receive post-exposure prophylaxis for 7 days. Current recommendations from the Working Group on Civilian Biodefense are for doxycycline 100 mg twice daily for adults, including pregnant women, and children ≥ 45 kg. Children under 45 kg should receive 2.2 mg/kg orally twice daily. For further details, consult the abstract of the Working Group's paper¹ available from the CDC website at:

<http://www.bt.cdc.gov/agent/plague/index.asp>

¹ Inglesby TV, Dennis DT, Henderson DA, et al. Plague as a biological weapon: Medical and public health management. JAMA, May 3, 2000; vol. 283, no. 17: 2281-2290.

Immunization

No plague vaccine is currently available for use in the United States, although a killed vaccine was previously licensed. Animal and preliminary human studies have indicated that a killed plague vaccine is not effective for preventing pneumonic plague. A recombinant vaccine candidate for the prevention of pneumonic plague after inhalational challenge is currently being evaluated.

Reporting

All cases of plague must be reported to local public health authorities in all 50 states. The local authorities must notify the appropriate federal government officials and the World Health Organization, as international travelers suspected of plague infection may be quarantined for up to six days under international law. The extremely high level of contagion and high mortality and case-fatality rates associated with pneumonic and septicemic plague (the most likely outcomes in a biological attack) underscore the importance of swift and accurate reporting.

Extensive Information

Please refer to the extensive information link for more details regarding Plague.