HEALTH CARE PROVIDER FACT SHEET

PLAGUE

Information for Health Care Providers

Physicians • Nurses • Laboratory Personnel • Infection Control Practitioners

Plague

- Caused by *Yersinia pestis*, a rod shaped, gram-negative coccobacillus.
- Transmission to humans usually occurs through the bites of infected rodent fleas, by handling infected animal carcasses, or by respiratory droplets from animals to humans and from humans to humans.
- Naturally occurring plague in humans occurs in three principal clinical forms, bubonic, pneumonic and septicemic.
- Plague is endemic in the western regions of the United States.
- **Pneumonic plague would be the most likely outcome of an intentional (bioterrorist) aerosol dissemination. The bubonic form would arise if the plague bacillus were inoculated through the skin. Septicemic plague can arise secondarily either from pneumonic or bubonic forms of the disease or as the primary manifestation of infection**
- Person-to-person transmission CAN occur with primary pneumonic plague.

Any confirmed or suspected case of plague (*Yersinia pestis*) must be reported IMMEDIATELY to the Clark County Health District at 383-1378. Alert your laboratory personnel.

Pneumonic Plague

Incubation: 2-3 days

Clinical Presentation: Typically a fulminant presentation.

- Presenting symptoms include: malaise, high fever, chills, headache, myalgia, cough with production of bloody sputum and toxemia.
- Rapidly progressing pneumonia results in dypsnea, stridor and cyanosis.
- Terminal illness is characterized by respiratory failure, circulatory collapse, and a bleeding diathesis
- Mortality rate for untreated pneumonic plague is approximately 100%

CXR: **Patchy or consolidated bronchopneumonia, mediastinitis, and/or pleural effusions may be seen.** (There are no specific CXR findings for plague.)

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Laboratory Clues to *Y. pestis*

- **Gram stain and Wayson's stain:** "Safety pin" bipolar staining of the gram-negative coccobacillus in smears obtained from tracheobronchial wash, sputum, lymph node needle aspirate, or cerebrospinal fluid sample.
- **Microbiology:** Definitive diagnosis is made by culturing *Y. pestis* from blood, sputum or bubo aspirates. The organism grows slowly at normal incubation temperatures and may be misidentified by automated readers.

Laboratory Confirmation of Diagnosis

- Should be performed by the Nevada State Public Health Laboratory (NSPHL)
- Appropriate clinical samples for testing at NSPHL include: blood, sputum or tracheal washings, needle aspirate(s) from swollen lymph nodes, and CSF.
- Transport and packaging of clinical specimens must be coordinated with the Clark County Health District and the NSPHL.

Bubonic Plague

Incubation: 2-10 days.

- Bacteria are transmitted through the bite of an infected flea or by direct inoculation of contaminated material through the skin.

Clinical presentation:

- Presenting signs and symptoms include: malaise, high fever and one or more tender lymph nodes. The liver and spleen may be palpable.
- A pustule or ulcer may develop at the site of inoculation as well as large, tender regional lymph nodes called "buboes."
- Buboes most often occur in inguinal or axillary lymph nodes in naturally occurring Bubonic Plague, as extremities are the most common areas bitten by fleas.
- Bacteremia is common, with greater than 80% of blood cultures being positive for the organism in bubonic plague.
- Mortality of untreated bubonic plague is approximately 50 %.

Septicemic Plague

- Most often occurs due to dissemination from bubonic or pneumonic plague infections though may occur as primary presentation of the disease.
- Blood cultures are positive for the organism.
- May occur without lymphadenopathy.
- May spread to lungs causing secondary pneumonic plague. Mediastinitis or pleural effusion may develop.
- Bloodstream dissemination of the organism may infect various parts of the body including the meninges, causing meningitis.
- Endotoxic shock and disseminated intravascular coagulation may occur without localizing signs of infection.

Treatment of Plague

- Treatment of all forms of the disease is most effective when started within 24 hours of initial symptoms.
- Plague pneumonia is often fatal if treatment is not initiated within 24 hours of the onset of symptoms.
- Physicians may be asked to obtain informed consent for administration of certain medications supplied by the Strategic National Stockpile (SNS).

Recommendations[1] for the treatment of patients with pneumonic plague in the contained and mass casualty settings and for postexposure prophylaxis[2]

(indicates medications which will be supplied as part of the SNS maintained at the CDC)**

Contained Casualty Setting	
Patient Category	**Recommendation**
Adults	Preferred Choices **Gentamicin, 5mg/kg IM or IV once daily or 2 mg/kg loading dose followed by 1.7 mg/kg IM or IV 3 times daily[3] Streptomycin, 1 g IM twice daily
	Alternative choices **Doxycycline, 100 mg IV twice daily **Ciprofloxacin, 400 mg IV twice daily[4] Chloramphenicol, 25 mg/kg IV 4 times daily[5]
Children[6]	Preferred choices **Gentamicin, 2.5mg/kg IM or IV 3 times daily[3] Streptomycin, 15 mg/kg IM twice daily (maximum daily dose, 2 g)
	Alternative choices **Doxycycline, If ≥ 45 kg, give adult dosage If < 45 kg, give 2.2 mg/kg IV twice daily (maximum, 200 mg daily) **Ciprofloxacin, 15 mg/kg IV twice daily[4] Chloramphenicol, 25 mg/kg IV 4 times daily[5]
Pregnant women[7]	Preferred choice **Gentamicin, 5mg/kg IM or IV once daily or 2 mg/kg loading dose followed by 1.7 mg/kg IM or IV 3 times daily[3]
	Alternative choices **Doxycycline, 100 mg IV twice daily **Ciprofloxacin, 400 mg IV twice daily[4]
Mass Casualty Setting and Postexposure Prophylaxis[8]	
Patient Category	**Recommendation**
Adults	Preferred choices **Doxycycline, 100 mg orally twice daily[9] **Ciprofloxacin, 500 mg orally twice daily[4]
	Alternative choice Chloramphenicol, 25 mg/kg orally 4 times daily[5]
Children[6]	Preferred choices **Doxycycline[9], If ≥ 45 kg, give adult dosage If < 45 kg, give 2.2 mg/kg orally twice daily **Ciprofloxacin, 20 mg/kg orally twice daily[4]
	Alternative choice Chloramphenicol, 25 mg/kg orally 4 times daily[5]
Pregnant women[7]	Preferred choices **Doxycycline, 100 mg orally twice daily[9] **Ciprofloxacin, 500 mg orally twice daily[4]
	Alternative choice Chloramphenicol, 25 mg/kg orally 4 times daily[5]

1. These are adapted from consensus recommendations of the Working Group on Civilian Biodefense and are not necessarily approved by the Food and Drug Administration. In non-bioterrorism response situations, routine treatment guidelines should be followed. Please refer to original publication (Ingelsby TV, Dennis DT, Henderson, DA, et al. Plague as a biological weapon: Medical and public health management. JAMA. 2000;283:2281-2290) for explanations and further discussion.
2. One antimicrobial agent should be selected. Therapy with streptomycin, gentamicin or ciprofloxacin should be continued for 10 days; treatment with doxycycline or chloramphenicol should be continued for 14-21 days. Persons beginning treatment with parenteral doxycycline, ciprofloxacin, or chloramphenicol can be switched to PO when clinically indicated.
3. Aminoglycosides must be adjusted according to renal function. Evidence suggests that gentamicin, 5 mg/kg IM or IV once daily, would be efficacious in children, although this is not yet widely accepted in clinical practice. Neonates up to 1 week of age and premature infants should receive gentamicin, 2.5 mg/kg IV twice daily.
4. Other fluoroquinolones can be substituted at doses appropriate for age. Ciprofloxacin dosage should not exceed 1 g daily in children.
5. Concentration should be maintained between 5 and 20 μ g/mL. Concentrations greater than 25 μ g/mL can cause reversible bone marrow suppression. Children younger than 2 years should not receive chloramphenicol.
6. In children, ciprofloxacin dose should not exceed 1 g daily, chloramphenicol should not exceed 4 g daily. Children younger than 2 years should not receive chloramphenicol. In neonates, gentamicin loading dose of 4 mg/kg should be given initially.
7. Alternatives to breastfeeding may be required while mother is taking certain antibiotics, see specific antibiotic package insert for information on breastfeeding
8. Duration of treatment of plague in mass casualty settings is 10 days. Duration of postexposure prophylaxis to prevent plague infection is 7 days.
9. Tetracycline may be substituted for doxycycline.

Post-Exposure Prophylaxis

- An exposed person is defined as a person who has been exposed to aerosolized *Y. pestis* or has been in close contact with a confirmed pneumonic plague patient.
    - Close contact with a case patient is defined as less than 2 meters during a period when a case was symptomatic and before the case had received 48-72 hours of antibiotics.
    - Household contacts and healthcare worker contacts should be considered exposed and should receive prophylaxis.
- All antibiotic therapy should continue for 7 days after the last exposure to the case.
- Decisions on antibiotic therapy should be guided by susceptibility testing.
- Physicians may be asked to obtain informed consent for administration of certain medications supplied by the Strategic National Stockpile (SNS).

Infection Control

Pneumonic plague can be spread from person-to-person by respiratory droplet transmission. Patients with pneumonic plague should be placed on strict respiratory isolation with droplet precautions until 48 hours after appropriate antibiotics have been administered, sputum cultures become negative, and clinical improvement is seen.

- Multiple patients with pneumonic plague may be isolated together as long as all patients are receiving appropriate therapy.
- Droplet precautions require that persons entering the patient's room wear a surgical mask, especially within two meters of the patient and that the patient be placed in a private room (if possible).
    - Negative pressure rooms are not indicated.
- Transmission can occur from plague skin lesions (such as draining buboes or abscesses).
    - Wound and skin precautions should be followed if skin lesions are present.
- Use Standard (Universal) Precautions for care and transport of patients and during post-mortem care.

The following extra precautions are advised:

- After an invasive procedure, instruments and the area used should be autoclaved or thoroughly cleaned with a germicidal agent, such as 0.5% hypochlorite (a 1:10 dilution of household bleach)
- Surfaces contaminated during post-mortem procedures should be decontaminated with an appropriate chemical germicide such as 0.5% hypochlorite (a 1:10 dilution of household bleach)or 5% phenol (Also carbolic acid, 70% ethanol, 2% glutaraldehyde, iodines, formaldehyde).
- Rinse off the concentrated bleach to avoid its caustic effects
- Spills of potentially infected body fluid or tissue:
- Allow aerosols to settle.
    - Gently cover with towels, then liberally apply 0.5% hypochlorite (a 1:10 dilution of household bleach)
    - Let sit for at least 30 minutes before cleaning up (work from perimeter to center).
- Contamination of personnel
    - Remove outer clothing where spill occurred and place in a labeled, plastic bag for later incineration or steam sterilization.
    - Remove rest of clothing in the locker room and place in a labeled, plastic bag for later incineration or steam sterilization.
    - Shower thoroughly with soap and water.
- If exposure to contaminated sharps occurs:
    - Follow standard reporting procedures for sharps exposures
    - Notify the Local and State Department of Health.
    - Bubonic or septicemic plague would be the risks associated with a sharps exposure.
- Decontamination of environment
    - Use a decontamination solution 0.5% hypochlorite (a 1:10 dilution of household bleach) for surfaces.
- Cremation should be considered because of potential risk associated with embalming.

Plague Vaccine

A plague vaccine is no longer manufactured or available in the United States

References

1. 2000 Red Book, Report of Committee on Infectious Diseases, 25th Edition, American Academy of Pediatricians
2. Mandell, Douglas, and Bennett's, Principles and Practices of Infectious Diseases, 5th Edition
3. Benenson AS. Control of Communicable Diseases Manual, American Public Health Association, Washington, DC 16th Edition, 1995. Update to 17th edition.
4. Inglesby TV, Dennis DT, Henderson DA, et al. Plague as a biological weapon. Medical and Public Health Management. JAMA 2000. 283(17):2281-2290.

When You See Unusual, Think Outbreak!

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