

Plague: What every nurse needs to know

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Abstract

Plague is not just a disease of the dark ages; it is still active and still infects people. All nurses need to be aware of this potentially deadly disease. Knowing how to care for a patient that presents with the plague is important to prevent panic and fear. Plague patients are like any other patient with a communicable disease, if you have proper precautions in place the risk of exposure is greatly reduced.

Plague: What every nurse needs to know

The plague is most often associated with the disastrous pandemic in Europe during the 8th through the 14th centuries (Veenema, 2007). The extent of the plague is nowhere near its height, but it is still prevalent in the world and the United States. As nurses we need to be informed of this deadly disease and how we should manage a patient diagnosed with the plague. This paper will describe what the plague is, how it is transmitted, and what precautions need to be taken to safely care for this type of patient.

Transmission

The transmission of plague or *Yersinia pestis* is well known. Plague is a bacterium that lives in the gut of fleas. These fleas often live on rodents, which bring the fleas into contact with humans. Rodents are not the only animals that carry these fleas. Animals such as prairie dogs, chipmunks, coyotes, rabbits, and even domestic cats have all tested positive for the fleas carrying the plague (Lowell et al., 2009). Infection of humans usually occurs when the flea leaves its host and bites a human, transmitting the plague to the human victim. Plague can also be transmitted from person to person through infected bodily fluids or in droplet form from the lungs.

The majority of cases in the United States are found in the western states. Eisen et al. (2007) evaluated the risk of exposure to plague in the four-corner region. In this study, it was found that the incidence of plague infected fleas is closely associated with certain regions within the four-corners. The regions affected are wooded areas that are away from population centers. They also found that the incidence decreased dramatically above 2300 meters elevation.

Isolation

The isolation of a patient with *Y. pestis* depends on the type they have. There are three main clinical presentations of plague: bubonic, pneumonic, and septicemic. With all of these, standard precautions is always recommended. Special precautions need to be taken with pneumonic plague. This form of plague requires that the patient be placed in droplet precautions. The patient needs to be in an individual room with their movement outside of the room restricted. All people entering the room must wear a mask and the patient needs to wear a mask whenever they leave the room (Dennis, Gage, Gratz, Poland, & Tikhomirov, nd).

Clinical Presentation

The signs of plague vary depending on the form of plague. The National Center for Biotechnology Information [NCBI] (2009) lists the following signs and symptoms for the three types of plague:

Bubonic plague symptoms appear suddenly, usually after 2 - 5 days of exposure to the bacteria. Symptoms include:

- Chills
- General ill feeling (malaise)
- High fever
- Muscle pain
- Severe headache
- Seizures
- Smooth, painful lymph gland swelling called a bubo
 - Commonly found in the groin, but may occur in the armpits or neck, most often at the site of the initial infection (bite or scratch)
 - Pain may occur in the area before the swelling appears

Pneumonic plague symptoms appear suddenly, typically 2 - 3 days after exposure. They include:

- Difficulty breathing
- Frothy, bloody sputum
- Severe cough
- Headaches
- Fevers

Septicemic plague may cause death even before its symptoms occur. Symptoms can include:

- Abdominal pain
- Bleeding due to blood clotting problems
- Diarrhea
- Fever
- Low blood pressure
- Nausea
- Organ failure
- Vomiting

When a patient presents to the hospital, it is important to fully assess a patient to determine if they have plague or one of many other conditions that look like plague. Conditions such as: adult respiratory distress syndrome, cat scratch disease, cellulitis, disseminated intravascular coagulation, pneumonia, empyema and lung abscess, gangrene, and necrotizing fasciitis all share signs and symptoms with plague (Veenema, 2007). The practitioner will also want to address any recent travel to infected areas or camping near prairie dogs or chipmunks (Veenema, 2007).

Diagnosis

Diagnosis is based on both clinical signs and symptoms along with cultures. It is important to obtain cultures from the affected body parts. Blood cultures should be taken in all cases, along with specimens from the bubo if bubonic plague is suspected. If pneumonic plague is suspected, then bronchial/tracheal washing needs to be obtained to better identify the bacteria (CDC, 2005). All of these cultures need to be taken before antibiotic therapy is initiated. After

cultures are obtained, a microscope slide is prepared to assist in the identification of *Y. pestis* (CDC, 2005). *Y. pestis* is a gram-negative bacillus.

Therapy

The historical treatment for plague is antibiotics, namely: streptomycin, gentamicin, chloramphenicol, tetracycline, and fluoroquinolones. Mwengee et al. (2006) studied the use of gentamicin or doxycycline in the treatment of plague. This study found that 94% of the patients improved with gentamicin and 97% with doxycycline. Veenema (2007) agrees with this study that both gentamicin and doxycycline are alternatives if streptomycin is not available. Beyond antibiotics, the patient might need advance life support to care for the multiple symptoms that plague can cause in the body.

Factors of a Plague Outbreak

There are several possible factors that can lead to an outbreak of plague. Durham & Casman (2009) studied that amount of infected fleas and rats that would be needed to tip the balance and create an epidemic. They created a system that compares rat population for a given area and the flea population for that same area to determine the possibility of the plague reaching the point to infect humans. This study found that several parts of Los Angeles is at risk of a plague outbreak, if the plague was introduced into the rat population.

Another scarier possibility is *Y. pestis* being used in a bio-terror attack. If untreated, plague has a 60% mortality rate (Dennis, Gage, Gratz, Poland, & Tikhomirov, nd). The high mortality rate is enticing to would be terrorists. Casman & Fischhoff (2008) examined multiple scenarios of a terrorist using plague as a weapon. Through this examination they were able to establish several ways plague could be delivered. They looked at spreading it among the native

rat population or aerosol delivery. This study found that the *Y. pestis* bacteria can survive up to 5 days if suspended in a nutrient broth. This is especially concerning because of the droplet transmission of pneumonic plague.

Applying All of This

There are several ways this knowledge can be applied to protect the public. The first way is that all people exposed need to receive prophylaxis antibiotic therapy (Dennis, Gage, Gratz, Poland, & Tikhomirov, nd). This is important to prevent the spread of the infection and to attack it when it is at its most vulnerable. If a person refuses the prophylactic antibiotics, then they need to be closely monitored for symptoms. It is also important to keep the public informed and encourage them to seek medical attention if they have symptoms during a plague outbreak (Dennis, Gage, Gratz, Poland, & Tikhomirov, nd). When the patient is in the hospital, droplet precautions are all that is needed to provide safe care. The public would be scared and look at the possibility of destroying the rodents that carry the fleas. This is an impractical option for rodents in their natural environment. However it is important to control rodents where people live and work (CDC, 2005).

Conclusion

The possibility of contracting the plague is rare but it can be deadly. As nurses we need to be aware of the possibility that a patient could enter our facility with plague. We need to be prepared for this patient and not become panicked. The possibility of caring for a plague patient can be scary but through proper assessment, diagnoses, precautions, and treatment we can minimize the threat.

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