



# *Rickettsia prowazekii* (Epidemic Typhus)

Fact Sheet

Unless otherwise noted, all information presented in this article is derived from the following two sources:

- 1) Raoult D, Walker DH. *Rickettsia prowazekii* (Epidemic or Louse-Borne Typhus). Principles and Practice of Infectious Diseases. Churchill Livingstone, 2004. Chapter 187.
- 2) Mooty M, Lutwick LI. Epidemic Typhus Fever. Beyond Anthrax. Humana Press, 2009. Chapter 8.

## Background

Epidemic typhus is caused by infection with *Rickettsia prowazekii*, which is carried and transmitted by body lice. Thus, it is a disease typically associated with war, famine, and other such events that cause personal hygiene to suffer and lice infestation to become prevalent. Historic reports of the disease date back to the Peloponnesian War, but more accurate descriptions begin in 1489 with the Spanish siege of Granada. The infection is also thought to have thwarted Napoleon's invasion of Russia by creating a burden of disease among the troops so high as prevent them from mounting a successful campaign. The disease is still responsible for modern outbreaks: it killed 100,000 people during the civil war in Burundi (1993-2005).

## Epidemic Typhus as a Biological Weapon

Although never employed as a bioweapon to date, *R. prowazekii* was studied as a candidate for airborne dissemination by Japan during World War II and by the former Soviet Union during the 1970s because of its potential lethality and its ability to spread between humans via lice. Typhus has the potential to produce fatal disease and has been identified by the Centers for Disease Control and Prevention (CDC) as a Category B biological agent; the Department of Health and Human Services (HHS) has identified it as a top priority for development of medical countermeasures.

## Transmission

Epidemic typhus is contracted through the bite of lice, chiefly the human body louse. The disease is not transmissible from person-to-person, although the vector louse can be transmitted. During the louse's blood meal, it defecates highly infectious feces at the site. Through microabrasions, the pathogen-laden feces are introduced into the skin. Aerosol transmission can

occur when infected body louse feces are deposited in clothing that is then disturbed; it also has been demonstrated in the lab. Flying squirrels also serve as reservoirs.

## Infection Control Measures

Eradication of body lice is the chief means of halting the spread of disease; consequently, insecticides are the mainstay of prevention. Chemoprophylaxis with doxycycline or chloramphenicol can also be employed. Contacts of infected patients should be observed for 2 weeks. Laboratory workers should employ standard precautions.



*Image of lice. Source: CDC Public Image Library (ID #9219).*

## Signs and Symptoms

After infection via louse bite, an incubation period of 8 to 16 days ensues. Fever, anorexia, malaise, and headache herald the onset of illness. Fevers may reach 104° Fahrenheit and above. Rash, often sparing the face, begins around day 4 and has been described as measles-like. Cough is frequent, and pneumonia may also be present.

Mental status changes and clouding, from which the disease gets its name—typhus is the Greek word for cloud—portend a poor prognosis. These symptoms may include restlessness, delirium, twitching, and hallucinations.

Gangrene of the distal extremities can occur in severe cases.

Mortality occurs most often in the second week of illness and ranges as high as 20% without antibiotics; mortality rates are higher in older adults.

A recrudescent form of the infection, Brill-Zinsser disease, can occur years after the initial bout of infection. It is much milder, with minimal mortality.

### **Diagnosis and Countermeasures**

As no rapid test is available, serological testing is employed for diagnosis. Culture can also be employed, and molecular diagnostic tests are in development.

The treatment of choice for epidemic typhus is doxycycline administered for 7 to 10 days. Chloramphenicol can also be used, but most other antimicrobial agents are ineffective, have high failure rates, or have not been tested in vivo.

Prophylactic treatment with doxycycline can be used in exposed individuals. A vaccine is not currently available, though many have been tested in the past without much reduction in incidence of disease. DNA vaccination strategies are also being investigated.