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Plague

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Introduction

Plague is a zoonotic infection with a spectrum of clinical manifestations caused by the Gram-negative bacterium *Yersinia pestis*. The disease is most commonly transmitted by fleas, with several species of wild rodent being the natural hosts, although other mammals such as cats and dogs can become infected.

Plague is still reported consistently from several countries in Africa, Asia, South America and rural parts of the south western USA.

Epidemiology

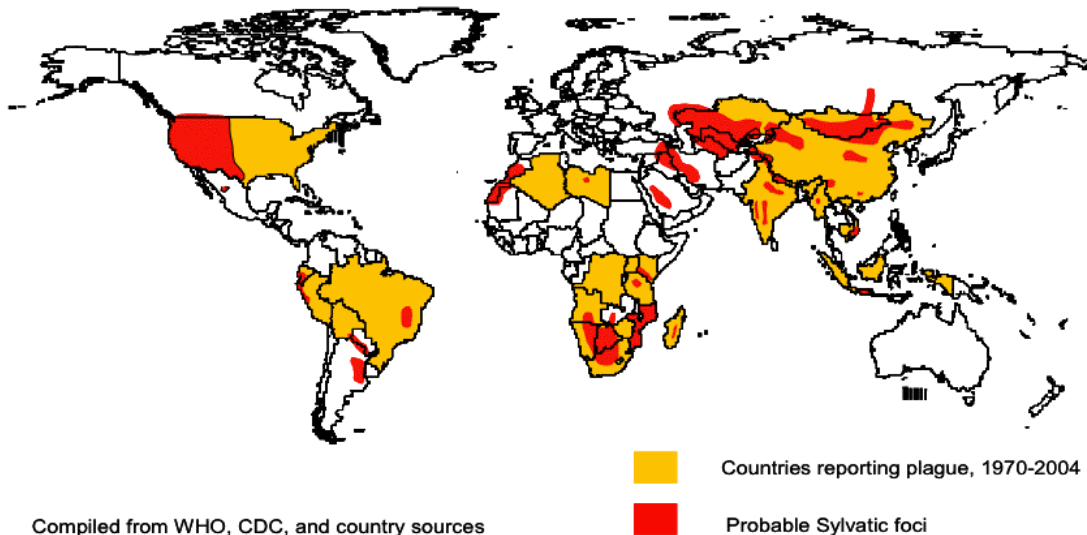
Global Epidemiology

History

Plague can occur as worldwide pandemics and there have been three major pandemics recorded historically. The first, the *Plague of Justinian* in 542-6 AD spread across Africa, Asia and Europe, killing millions (although exact details of this pandemic are unknown). The second pandemic was recorded in the fourteenth century; it originated from central Asia and lasted seven years killing an estimated 25 million people "during and the Black Death". The third pandemic began at the end of the nineteenth century in southern China eventually killing 10 million by the 1920s.

Current picture

Plague naturally occurs in rodents, lagomorphs (rabbits and hares), and squirrels in many countries within tropical and sub-tropical areas of the world. In particular, northern and southern Africa, rural parts of south western USA, and central, south and southeast Asia have reported cases of plague between 1970 and 2003 [1]. The total number of cases of plague reported to the World Health Organization between 1989 and 2003, was 38,310 including 2845 deaths from 25 countries [2]. In 2002, the total number of reported plague cases in 13 countries was 1,925, of which 177 **Countries Reporting Plague, 1970-2004**. Map courtesy US Centers for Disease Control and Prevention [1].



were fatal. In 2003, nine countries reported 2,118 cases including 182 deaths, with more than 95% of cases reported from Africa [3]. These figures represent a decrease when compared with the annual average figures (2,895 cases, 206 deaths) for the previous ten years (1992–2001), when 28,956 cases with 2064 deaths were reported from 22 countries. During that decade, 80.3% of cases and 84.5% of deaths were reported from Africa. Cases of plague have been reported nearly every year from eight countries: Democratic Republic of the Congo, Madagascar, United Republic of Tanzania, Peru, United States, China, Mongolia, and Viet Nam.

Since 1994, there have been three outbreaks of human plague that occurred in three countries 30-50 years after no cases being reported. The first was in India in 1994; where over 5,000 cases were reported resulting in disruption to travel



and international trade, with devastating economic effects [4]. An outbreak of bubonic plague involving six cases occurred in Indonesia in 1997 [5]. The third was an outbreak in Algeria in 2003, where ten confirmed cases and one probable case were reported [6].

A review of plague in 2006 [7] reported that outbreaks continued to occur in natural foci in Africa, Central Asia, the Americas and India. Silent periods when few cases are reported do occur, but are often followed by a new outbreak due to contact between wild and peridomestic rodents. Oriental Province in the Democratic Republic of the Congo is known to be the most active focus of the disease worldwide; an outbreak was reported from the region in June 2006 with further outbreaks during the remainder of the year [8].

Plague Risk in UK Travellers

Plague in travellers from England and Wales

Plague does not occur in the UK. The last outbreak of indigenous plague in the UK was recorded in 1918 [9]. No cases are known to have been reported in the UK since then, neither indigenous nor imported.

Risk for Travellers

Plague is a rare disease in travellers. In the 1994 epidemic in India several states were involved but no travellers were affected. The risk is highest in those who may have contact with rodents such as field workers.

Transmission

Plague bacteria are carried in the gullet of fleas. The gullet becomes blocked by replicating bacteria, which forces the fleas to regurgitate bacteria while feeding on mammals.

The most important hosts for transmission of plague to man are the domestic black rat and the brown sewer rat. The disease is maintained in rural areas by hosts that include gerbils, squirrels and prairie dogs. Transmission between animals and humans is by the bite of infected fleas, direct contact, inhalation and rarely, ingestion of contaminated material [10].

Direct spread between humans is possible in pneumonic forms of the disease by droplet infection.



Signs and Symptoms [10]

Plague can have several clinical manifestations; bubonic plague is the most common. Other manifestations include septicaemic plague without bubo, pneumonic plague (primary or secondary to bacteraemia), and meningitis.

Following an incubation period of two to six days, plague has a sudden onset of fever, chills, headache, malaise, myalgia and nausea.

In bubonic plague, bacteria move from the site of inoculation to regional lymph nodes that enlarge and become painful swellings known as bubos. The most commonly affected areas are in the groin; other areas include the axillary, cervical and submaxillary regions.

Bacteria can spread via the bloodstream resulting in septicaemia that if untreated, can lead to a rapid deterioration and death.

In primary pneumonic plague the bacteria are inhaled following close contact with an infected person. Secondary pneumonia occurs after bacteraemic spread in bubonic plague. Pneumonic plague causes severe shortness of breath and cough with blood stained sputum, leading to respiratory failure. Pneumonic plague is rapidly fatal if untreated.

Treatment [10]

Diagnosis of plague is made by detection of the bacillus in an aspirate of a bubo, sputum or blood. Untreated bubonic plague has mortality that exceeds 50%, and untreated septicaemic or pulmonary plague is nearly always fatal. Therefore, prompt treatment is important and antibiotics are usually commenced on clinical diagnosis. The drugs of choice are streptomycin or gentamicin if streptomycin is not available. Other agents that have been successfully used are a tetracycline, chloramphenicol or a fluoroquinolone.

Prevention [10]

Plague vaccine is no longer available.

Travellers should take steps to avoid contact with rodents by appropriate disposal of rubbish. [Insect bite avoidance](#) measures should be employed such as the use of repellent on skin and insecticide on clothing, to discourage flea bites.



Tetracycline, doxycycline or trimethoprim-sulphamethoxazole can be used as chemoprophylaxis in persons who will be in close contact with plague pneumonia.

References

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Reading List

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Smith MD. Plague. In: Cook GC, Zumla A (editors.) *Manson's Tropical Diseases* 21st edition. 2003 Elsevier Science Ltd Edinburgh: Elsevier Science Ltd; 2003

Links



Health Protection Agency www.hpa.org.uk/infections/topics_az/plague/menu.htm

WHO www.who.int/topics/plague/en/

World Health Organization. Report on Global Surveillance of Epidemic-Prone Infectious Diseases. 2000.

<http://www.who.int/csr/resources/publications/surveillance/plague.pdf>

Picture of infected rat flea:

<http://www.cdc.gov/ncidod/dvbid/plague/cheob6x4.htm>