

Plague

The **Plague** is caused by bacteria *Yersinia pestis*. In the Middle Ages it was known as **black death**. That is because, it often leads to gangrene and blackening of various parts of the body. Capillary fragility causes subcutaneous bleeding, which also leads to black spots.

Morphology and physiology

Yersinia pestis is a pleomorphic, Gram-negative, polar-staining, facultatively aerobic, immobile bacteria. The optimum temperature for this organism is **28°C**. It is a facultative intracellular parasite.

Epidemiology, transmission and symptoms

Three documented pandemic plagues have killed hundreds of millions of people. Even today, sporadic infections occur. The infection is endemic among rodents in remote agricultural areas. *Yersinia pestis* is transmitted between **rats** and humans by **fleas** (rat fleas or plague fleas, *Xenopsylla cheopis*). When a human is bitten by a flea-transmitting yersinia, these organisms get into the wound. Most are phagocytosed and neutralized neutrophils. However, some are carried away by histiocytes, which are unable to kill them, allowing them to form a capsule and multiply. Encapsulated organisms (after release from histiocytes) are resistant to phagocytosis and neutrophil destruction. The result is an infection that spreads to lymph nodes (they become warm, swollen, stiff and bloody). Inflamed lymph nodes acquire a characteristic black color, which gives the name of the disease: **black (bubonic) plague**. Within a few hours, the parasite spreads to the spleen, liver and lungs, resulting in pneumonia. Bacteria in the circulation causes diffuse intravascular coagulation, which is the cause thrombosis and purpuric lesions all over the body. Untreated infection has a high (up to 90%) mortality rate. Developed plague is transmissible by droplet infection during cough. Droplet infection leads to a **pulmonary form** of plague, which is very progressive and has up to 100% mortality rate.

Pathogenesis

In pathogenesis of *Y. pestis* many factors play a direct or indirect role:

- **Low calcium response (lcr):** It is a gene encoded by a plasmid that allows the bacteria to grow in a calcium-poor environment (ie, inside a cell). It also coordinates the production of several other factors virulence, such as V, W and so-called *yops* (*Yersinia outer proteins*).
- **V and W proteins:** These plasmid-encoded proteins are associated with rapid proliferation and septicemia.
- **Yops:** Group of 11 proteins encoded by plasmids. They are essential for rodent pathogenesis and are responsible for cytotoxicity, inhibition of phagocyte migration and aggregation of platelets.
- **Envelope (F-1) antigen:** It is a complex of proteins and polysaccharides that is expressed in a mammalian organism (not fleas) and has an anti-phagocytic effect.
- **Coagulase and plasminogen activator (PA):** coagulase is responsible for the formation of microthrombi. Plasminogen activator promotes hematogenous spread of infection.

Diagnosis and treatment

We clinically diagnose plague in areas of its endemic occurrence. The causative agent can be visualized by Gram staining or it can be cultured on blood agar. It is treated with tetracycline, chloramphenicol or aminoglycosides.

References

Related articles

- *Yersinia pestis*
- *Yersinia enterocolitica*
- *Yersinia pseudotuberculosis*

External links

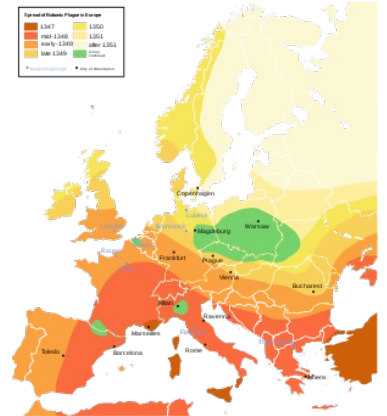
- Mor (česká wikipedie)
- Plague (disease) (anglická wikipedie)

Literature

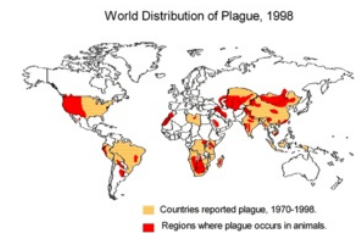
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Hand necrosis caused by *plague*



Spread of bubonic plague



World distribution of plague in 1998