

Yersinia pestis

Yersinia pestis is G- bacteria and a major pathogen causing **plague pandemics**. It was first isolated by Alexander Yersin in 1894 in Hong Kong. Plague is associated with high mortality without antibacterial therapy. In the wild, *Yersinia pestis* was found in several rodent species. However, *Yersinia pestis* circulates through flea bites, in humans it is a **rat flea** bite. Bacteria get into the wound. **Human-to-human** transmission can occur via **aerosol particles** or droplet infection and a primary plague infection arise. Plague is **rare** at this time, occurring in Africa, India, Southeast Asia, Mexico, and the western United States.^[1]

Morphology

Yersinia pestis is a pleomorphic **rod-shaped bacterium with a capsule**. It is a **stationary** stick. Other yersinias are mobile. A common feature of *Y. pseudotuberculosis* and *Y. enterocolitica* is that it **stains polar**. This rod, like all Enterobacteriaceae, is characterized by the ability to grow on simple laboratory soils. Their undemanding growth ranges from 0 to 40°C with a temperature optimum around 30°C.^[2]

Antigenic structure

On its surface is a localized **F1 protein complex**, which is a protective antigen. O-specific side chains are not present. Virulent strains form **V** and **W proteins**, the production of which is linked to plasmids.

Pathogenicity

The pathogenicity of *Yersinia pestis* is determined by a complex of chromosome and plasmid-linked factors. Surface factors that **block phagocytosis** are important. **Virulent strains** of this bacterium are **facultatively intracellular parasites** that multiply in macrophages. During infection, *Yersinia pestis*, an facultative intracellular bacterium, exhibits the ability to first invade cells and then thwart phagocytosis of the host cell. During these two distinct phases, the **invasion phase** and the **anti-phagocytic factor phase**, the bacteria in manipulating the host cell help to complete each of these functions, but the mechanism by which *Yersinia* regulates these functions during each step remains unclear. In addition to macrophages, the bacterium is also able to penetrate **epithelial cells**. During the invasion at the site of injury, a **hemorrhagic pustule** is formed, from where the infection is further distributed to the descending **lymph nodes**, in which the subsequent enlargement produces **swellings** (bubonic form of the plague). Later, **bacteremia** and sepsis develop. A secondary disease, Pneumonia, may develop, causing *Yersinia pestis* to spread to the surrounding area by coughing up, and the infected person will develop primary pneumonia – a **pulmonary form of the plague**. When a patient manages to overcome the disease, he develops good immunity.

Diagnosis and therapy

Bacteria are diagnosed from the contents of the pustules, lymph nodes, **blood culture**, bone marrow, and **sputum**. Cultivation is possible on blood agar. Bacteria stain according to Gram negative. When testing *Yersinia pestis* for antibiotic susceptibility, the bacteria were found to be **susceptible** to chloramphenicol, streptomycin, kanamycin, tetracycline, quinolones. However, plague vaccines produced by *Yersinia pestis* are in clinical development. Streptomycin can be used in endemic areas. We can induce **short-term immunity** when a **dead vaccine** with a protective antigen is given. A **live vaccine** with live attenuated strains is **more effective**, but the use of this vaccine is only approved in some parts of the world. There is currently **no licensed vaccine** to prevent plague in Western Europe.

Links

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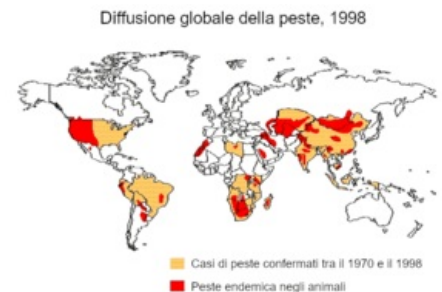
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- Biological weapons

External links

- Mor (Czech wikipedia) (<https://www.wikipedia.org/wiki/cs:Mor>)



Yersinia pestis on blood agar



The spread of the plague in the world in 1998

- Plague (disease) (English wikipedia) ([https://www.wikipedia.org/wiki/en:Plague%20\(disease\)\)](https://www.wikipedia.org/wiki/en:Plague%20(disease))))

References

- JULÁK, Jaroslav. *Úvod do lékařské bakteriologie*. 1. edition. 2006. ISBN 8024612704.

Reference

1. GOERING, Richard V – DOCKRELL, Hazel M. *Mimsova lékařská mikrobiologie*. 5. edition. 2016. ISBN 978-80-7387-928-0.
2. BEDNÁŘ, Marek – SOUČEK, Andrej – FRAŇKOVÁ, Věra. *Lékařská mikrobiologie : Bakteriologie, virologie, parazitologie.*. 1. edition. 1999. . ISBN 8023802976.