

Yersinia Pestis (Black Plague)

Yersinia pestis is a gram negative coccobacillus that can cause pneumonia, septicemia, and the bubonic plague. This organism is widely believed to be responsible for the death of approximately one third of the European population between 1347 and 1353. Today, the reservoir for this organism is several species of rodents including the black-tailed prairie dog, commonly found in the Southwest region, and transmitted via the flea vector. There have been several incidents of human transmission in people exposed to these animals. Pathogenesis includes several factors that allow the bacteria to suppress and avoid the normal immune response including an anti-phagocytic polysaccharide capsule and anti-phagocytic F1 and VW antigens that inhibit macrophages. *Yersinia pestis* is known to proliferate inside lymph nodes, causing lymphadenopathy and buboes, most frequently involving the inguinal lymph nodes. The term buboes gave rise to the name the bubonic plague. The organism could also get into the lungs causing a severe pneumonia with symptoms of chest pain, dyspnea, and hemoptysis. If the organism gets into the bloodstream, it can cause septicemic plague with complications of disseminated intravascular coagulation (DIC). Widespread DIC causes destruction of the blood vessels and results in black cutaneous hemorrhagic lesions on the skin. Many historians believe these lesions gave rise to the name "Black Death."



PLAY PICMONIC

Characteristics

Gram-Negative

[Graham-cracker Negative-devil](#)

This organism stains Gram-negative due to the relatively thin peptidoglycan layer in the cell wall.

Bacilli

[Rod](#)

These bacteria are small and sometimes described as resembling coccobacilli, but they are actually rods.

Oxidase-Negative

[Ox-daisy Negative](#)

The oxidase test is used to determine if a bacterium produces certain cytochrome c oxidases in order to use oxygen for energy production. *Yersinia pestis* is oxidase-negative, meaning it does not use the electron transport chain to make energy.

Non-lactose Fermenting

[Nun Milk-carton Ferns](#)

Yersinia pestis is characterized as a lactose nonfermenter because it cannot utilize lactose sugars in culture. The bacteria grows as white or colorless colonies on MacConkey agar, which is used to test for lactose fermenting capability.

Prairie Dogs

[Prairie Dog](#)

Today, the reservoir for this organism is several species of rodents, including the black-tailed prairie dog.

Fleas

Fleas

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Polysaccharide Capsule

Polly-sack Capsule

Yersinia pestis has a polysaccharide capsule as a virulence factor, which aids in evading phagocytosis.

Vw Antigen

VW-car with Ant-Gem

Vw antigen is an antiphagocytic virulence mechanism that aids in the pathogenesis of *Yersinia pestis*.

F1 Antigen

(F1) Formula 1 Car Ant-Gem

F1 antigen is an antiphagocytic virulence mechanism that aids in the pathogenesis of *Yersinia pestis*.

Inhibits Macrophages

Inhibiting-chains on Mac-men

This bacterium has several antiphagocytic mechanisms, including a polysaccharide capsule, F1 antigen, and Vw antigen that inhibit phagocytosis by macrophages.

Southwest Region

Southwest scenery and cacti

The rodents that act as a reservoir for this organism are commonly found in the Southwest region of the United States.

Signs and Symptoms

Lymphadenopathy

Lymph-lime-add (+)

Yersinia pestis is known to proliferate inside lymph nodes, causing lymphadenopathy.

Pneumonia

Nude-Mona

In the lungs, *Yersinia pestis* can cause a severe pneumonia, with symptoms of chest pain, dyspnea, and hemoptysis.

Black Cutaneous Hemorrhagic Lesions

Black Skin Lesions

If the organism gets into the bloodstream, it can cause septicemic plague with complications of disseminated intravascular coagulation (DIC). Widespread DIC causes destruction of the blood vessels, and results in black cutaneous hemorrhagic lesions on the skin. Many historians believe these lesions gave rise to the name "Black Death."

Buboes

Blue-bow

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Diagnosis

Bipolar Giemsa Staining

Pole with Gems

When tested with giemsa staining, *Yersinia pestis* has a bipolar staining pattern. This is due to the ends of the bacterium taking up more stain than the center of the organism.