

Lecturer 19: Brucella

Brucella : is a genus of Gram-negative bacteria, named after David Bruce (1855–1931). They are small (0.5 to 0.7 by 0.6 to 1.5 μm), nonencapsulated, nonmotile, facultatively intracellular coccobacilli. **Brucella is the cause of brucellosis, which is** a zoonosis transmitted by ingesting contaminated food (such as unpasteurized milk products), direct contact with an infected animal, or inhalation of aerosols.

Domain:	Bacteria
Phylum:	Proteobacteria
Class:	Alphaproteobacteria
Order:	Rhizobiales
Family:	Brucellaceae
Genus:	Brucella

Human brucellosis

The Italian doctor and pathologist Aldo Castellani, discovered evidence of Trypanosomas in the liquor cerebrospinalis of ill patients. Sir David Bruce isolated *B. melitensis* from British soldiers who died from Malta fever in Malta. After exposure to *Brucella*, humans generally have a two- to four-week latency period before exhibiting symptoms,

Human brucellosis is usually not transmitted from human to human; people become infected by contact with fluids from infected animals (sheep, cattle, or pigs) or derived food products, such as unpasteurized milk and cheese. Brucellosis is also considered an occupational disease because of a higher incidence in people working with animals (slaughterhouse cases). Globally, an estimated 500,000 cases of brucellosis occur each year.

Transmission

Zoonosis affecting domestic animals is caused by contact with milk, urine, and genital organs, which concentrate the causative organisms. Some reservoirs include buffalo and other animals, but mostly cattle. In humans, the disease is acquired from unpasteurised milk and products or undercooked meat (consumers), laboratory inhalation (lab workers)

Human disease

Brucellosis can affect any organ or organ system, and 90% of patients have a cyclical (undulant) fever. Though variable, symptoms can also include these clinical signs: headache, weakness, arthralgia, depression, weight loss, fatigue, and liver dysfunction. Foul-smelling perspiration is considered a classical sign. Between 20 and 60% of cases have osteoarticular complications - arthritis, spondylitis, or osteomyelitis. Hepatomegaly may occur, as can gastrointestinal complications.

Characteristics

Brucella species are small, Gram-negative, facultative coccobacilli, most lacking a capsule, endospores, or native plasmids. They are intracellular within the host organism, and show environmental persistence outside the host. The intracellular trafficking includes two to three main steps, starting with endosomal vacuoles, then endoplasmic reticulum-derived compartments and finally vacuoles having several markers of atypical autophagy. They survive extremes in temperature, pH, and humidity, and in frozen and aborted materials. They infect many species, but with some specificity.

Clinical manifestations

The gastrointestinal tract is affected in about 70% of cases, including: anorexia, abdominal pain, vomiting, diarrhea, constipation, hepatomegaly, and splenomegaly. The liver is involved in most cases, but function tests are normal or mildly abnormal. Granulomas (*B. abortus*), hepatitis (*B. melitensis*) and abscesses (*B. suis*) are seen.

Diagnosis

Brucella is isolated from a blood culture on Castaneda medium or from bone marrow. Prolonged incubation (up to six weeks) may be required, as they are slow-growing, but on modern automated machines, the cultures often show positive results within seven days. Differentiating Brucella from Salmonella is crucial, the latter could also be isolated from blood cultures and is Gram-negative. Testing for urease would successfully accomplish the task; it is positive for Brucella and negative for Salmonella. Brucella can also be seen in bone marrow biopsies.

Treatment

No clinical trials exist to be relied on as a guide for optimal treatment, but an at least six-week course of rifampicin or gentamicin and doxycycline twice daily is the combination most often used, and appears to be efficacious

Yersinia pestis : is a Gram-negative, rod-shaped coccobacillus, non-motile with no spores. It is a facultative anaerobic organism that can infect humans via the oriental rat flea. It causes the disease plague. *Y.pestis* was discovered in 1894 by Alexandre Yersin, a Swiss/French physician and bacteriologist from the Pasteur Institute.

Domain:	Bacteria
Kingdom:	Eubacteria
Phylum:	Proteobacteria
Class:	Gammaproteobacteria
Order:	Enterobacteriales
Family:	Yersiniaceae
Genus:	Yersinia
Species:	Y. pestis

General characteristics

Y. pestis is a non-motile, stick-shaped, facultative anaerobic bacterium with bipolar staining (giving it a safety pin appearance) that produces an anti-phagocytic slime layer. Similar to other *Yersinia* species, it tests negative for urease, lactose fermentation, and indole.

Pathogenesis and immunity

In the urban and sylvatic (forest) cycles of *Y. pestis*, most of the spreading occurs between rodents and fleas. In the sylvatic cycle, the rodent is wild, but in the urban cycle, the rodent is primarily

the brown rat. In addition, *Y. pestis* can spread from the urban environment and back. Transmission to humans is usually through the bite of infected fleas. If the disease has progressed to the pneumonic form, humans can spread the bacterium to others by coughing, vomiting, and possibly sneezing