

# Characteristics and Intracellular Life of Brucella Organism

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## INTRODUCTION

Brucella which are obligate, intracellular, gram negative coccobacillary forms, non-motile, non sporing bacteria. Some of these variants of Brucella are capsulated. Brucella's are aerobic and grown on mediums like brucella agar, albumin agar, trypticase soy agar media at 37°C. On *B.abortus* requires 5-10% CO<sub>2</sub>. On biochemical reactions, carbohydrates are fermented without acids and gaseous. Some strains produce oxidases, catalases, H<sub>2</sub>S. Brucella are members of the  $\alpha$ -proteobacteria.

The genomes of the organisms are distinctive in that members of *B.abortus*, *B.melitensis* and some biological types of *B.suis* contain two distinct chromosomes, there appears *B.suis* biotype has a single larger chromosome. In strains with two chromosomes, these appears as some duplication in the genetic content of housekeeping genes among the chromosomes.

Another interesting feature of the organism is the lack of most of the traditional virulence factors seen in other pathogens, including many toxins and typical secretion systems. The lipopolysaccharide layer of pathogenic Brucella is less immunogenic than that of most Gram-negative organisms, thus limiting the activation of the alternative complement pathway and the production of certain cytokines. This mild immune response likely allows for the persistence of the organism in a host.

The transmission of Brucella on humans primarily through direct contact with or contaminated animal products by ingestion, or aerosolized particles by inhalation containing brucellae. Although, the classical definition explains that, Brucella species describe these bacteria's as a facultative intracellular parasite, this definition does not prominently resemble their true characteristics and identity, which is better understood as a facultatively extracellular intracellular parasites.

The above para states that the Brucella preferred niche is that the intracellular nativity of host cells. This environment sustains extensive replication, allowing bacterial expansion and thus the next transmission to new host cells, frequently achieved through the heavily infected aborted foetus.

In contrast with other pathogenic bacteria, no classical harmfulness of a disease factors, such as capsules, cytotoxins, flagella, fimbria, resistant forms, lysogenic phage, antigenic variation,

plasmids, toxins like exotoxins and endotoxic lipopolysaccharide (LPS) or apoptotic inducers.

Occupational exposure and infection of veterinarians, animal workers, and laboratory personnel have also been reported.

The most common source of infection in the United States of America is associated with the unpasteurized dairy products consumption. To cause human infection, the organisms penetrate the nasal, oral, or pharyngeal mucosa, and are engulfed by lymphocytes and transferred to regional lymph nodes. The organisms that survive phagocytosis are able to persist in the phagosomes and multiplies in endoplasmic reticulum of macrophages.

Approximately 2 to 4 weeks post-infection, the organism may be released and disseminated throughout the body and infect localized tissues. This leads to the development of conditions such as endocarditis, meningitis, spondylitis, arthritis, and potential reproductive system problems such as epididymo-orchitis and spontaneous abortion if brucellosis is contracted during pregnancy.

The most effective way to limit the effects of brucellosis is to prevent human infections by preventing infection in livestock. Currently there are effective vaccines against *Brucella melitensis* and *B. abortus* that have helped in limiting the number of human infections in the US. Many current cases in the US occur in the Southwest and are likely accompanying with the unpasteurized dairy products consumption from Mexico, where brucellosis in animals remains a problem.

The World Health Organization (WHO) recommends that treatment of brucellosis involve a multi-drug approach with doxycycline and either rifampin or streptomycin. Other agents with efficacy against Brucella include gentamicin, trimethoprim/sulfamethoxazole, and the fluoroquinolones. Human infection is commonly by ingestion of infected milk or by skin or mucous membrane.

Brucella advances from the portal of entry through lymphatic's, blood stream and are implanted into various organs (spleen and liver), leads to cholecystitis, osteomyelitis, orchitis, meningitis, etc may occur. Blood, lymph nodes biopsy for culture and serum for serology are used. Blood is often cultured in diphasic trypticase soy agar medium in 10% CO<sub>2</sub>. Serology tube blood test 80 International units (IU) and above is constructive and sensitive.

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