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Popular Article

## Brucellosis: A Re-Emerging Zoonosis

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### Introduction

Brucellosis is an infectious and significant zoonotic bacterial disease of animals caused by *Brucella* species. It is characterized by late gestation abortion and the formation of granulomatous lesions in genital organs, joints, and fetal liver. The bacteria can be transmitted to humans through ingestion of contaminated food products, direct contact with infected animals, or inhalation of aerosols. The disease has been known by various names including Malta fever, Undulant fever, Mediterranean Fever, and gastric remittent fever. Humans are accidental hosts, but brucellosis remains a major global public health concern and is the most common zoonotic infection. Differentiation between species and biovars within a species is currently done using various tests based on phenotypic characterization of lipopolysaccharide (LPS) antigens, phage typing, dye sensitivity, CO<sub>2</sub> requirement, H<sub>2</sub>S production, and metabolic properties (Alton *et al.*, 1998, Corbel *et al.*, 2005). In Ethiopia, the routine serological tests for screening and confirmation are RBPT and CFT, respectively. Brucellosis continues to be one of the most prevalent zoonotic diseases worldwide, with over 50,000 human cases reported annually. It is highly contagious, zoonotic, and economically significant in the animal population, and it is recognized as one of the most widespread zoonoses by the Food and Agriculture Organisation (FAO), the World Health Organisation (WHO), and the Office International des Epizooties (OIE) (Schelling *et al.*, 2003).

In 1863, Marston first described brucellosis in the islands of Malta.

1506



In 1887, Sir Robert Bruce isolated the bacilli from the spleen of an infected soldier.

In 1897, Bange identified and named the organism *Brucella abortus* (Bang Disease) after isolating it from aborted cow fetuses and fetal membranes.

### Causative Agent

*Brucella* organisms, which are small aerobic intracellular coccobacilli, inhabit the reproductive organs of host animals, leading to abortion and sterility. The species include *Brucella abortus*, *Brucella ovis*, *Brucella melitensis*, *Brucella canis*, *Brucella suis*, and *Brucella neotomica*.

### Cultural Characteristics

*Brucella* bacteria are obligate aerobes, and *Brucella abortus* is capnophilic, with some strains requiring 5-10% CO<sub>2</sub> for optimal growth. The preferred temperature for growth is 37°C, and the pH range is 6.6-7.4. Commonly used media for culturing *Brucella* include serum dextrose agar, serum potato infusion agar, trypticase soya agar, or tryptose agar. It is worth noting that erythritol exhibits a particularly stimulating effect on the growth of *Brucella* bacteria.

### Host Range and Transmission

- *Brucella abortus*: Infects cattle and buffalo.
- *Brucella melitensis*: Affects sheep and goats.

The main sources of infection are the uterine discharge of infected animals, aborted fetuses, and infected semen.

- ❖ Ingestion: Primarily occurs through the consumption of raw milk or milk products (such as unpasteurized soft cheese) and meat from infected animals. It can also be transmitted by consuming water or eating raw vegetables contaminated with feces or urine from infected animals.
- ❖ Direct contact: Infection can be acquired through direct contact with infected animals. This includes inoculation through cuts and skin abrasions when handling carcasses, placentas, or coming into contact with vaginal secretions or urine from infected animals.
- ❖ Inhalation: Infection can be transmitted by inhaling dust from wool or other dried materials from infected animals. Inhalation-based infections are particularly important among veterinarians and laboratory workers.
- ❖ Accidental inoculation: Accidental needle stick punctures with the *Brucella* B19 vaccine can occur while vaccinating animals. This is also a serious risk for laboratory workers who handle cultures of the organism.



## Pathogenesis

### A. Virulent brucellae: -

*Brucella* organisms



Entry can occur through lesions or cuts, ingestion, or inhalation



Phagocytosed by macrophages



The virulent brucellae can survive and replicate within phagocytes and monocytes. Much of the pathogenesis of brucellosis is associated with their ability to survive intracellularly



Infected macrophages tend to localize in the reticuloendothelial system, including lymph nodes, liver, spleen, and bone marrow



This localization can lead to the formation of granulomas characterized by the presence of lymphocytes and epithelioid giant cells. In some cases, these granulomas can progress to form focal abscesses and caseation.

## Clinical Signs

### Cattle:

- Abortion typically occurs in the 7th or 8th month of gestation, accompanied by placental retention.

### Pigs:

- Transmission can occur through coitus in pigs.
- Abortion usually takes place in the 2nd and 3rd month of gestation.
- Infected boars may develop orchitis.
- Accumulation of fluid in the scrotum can also be observed.



### **Incubation period:**

- The incubation period ranges from 1 to 3 weeks, but it can extend to several months.

### **Common symptoms of brucellosis in humans include:**

- Undulant fever characterized by fluctuating body temperature, ranging from 37°C in the morning to 40°C in the afternoon.
- Night sweats with a distinct odor.
- Chills and weakness.
- Insomnia, anorexia, and headache.
- Joint pain (arthralgia), constipation, sexual impotence, nervousness, and depression.

Brucellosis in humans can lead to complications and affect various internal organs. Symptoms may vary depending on the site of infection and can include: Encephalitis, Meningitis, Spondylitis, Arthritis, Endocarditis, Orchitis, Prostatitis, Pregnant women infected with Brucella may experience spontaneous abortion, often occurring in the first and second trimesters of pregnancy.

Direct person-to-person transmission of brucellosis is extremely rare. However, transmission from infected mothers to their infants through breastfeeding has been reported. Sexual transmission has also been documented.

### **Acute brucellosis symptoms include:**

- Undulant fever, which typically peaks in the evening and gradually returns to normal by morning.
- Headache.
- Severe limb and back pain.
- Night sweats, fatigue, and marked weakness.
- Anorexia, weight loss, and depression.

### **Chronic brucellosis:**

- Usually, non-bacteremic.
- Symptoms include fatigue, sweating, and joint pain.
- Symptoms can persist for 3-6 months and occasionally last for a year or more.

### **Diagnosis**

- The "milk ring test" is a diagnostic method that detects brucellosis in dairy herds by testing milk from bulk tanks.



- Rapid latex agglutination and Rose Bengal tests are rapid diagnostic methods commonly used for diagnosing brucellosis in cattle production.
- Various serological tests can be employed, such as RBPT (Rose Bengal Plate Test), STAT (Serum Agglutination Test), and ELISA (Enzyme-Linked Immunosorbent Assay).
- Isolation of Brucella bacteria can be achieved from appropriate samples.
- Direct microscopy can be useful for examining impression smears obtained from affected placenta or fetal contents. Modified Ziehl-Neelsen staining can be utilized for this purpose.

## Prevention And Control

### Human:

- To reduce exposure to infected animals or byproducts, it is advised to consume only properly cooked meat and pasteurized or boiled milk and dairy products from cows, sheep, and goats.
- Practicing good hygiene is crucial for individuals who have daily contact with animals, including those working on farms, in the meat production chain, and in laboratories.
- Providing instructions on infection-control practices can help minimize the risk of exposure.
- If an individual is diagnosed with brucellosis, a prescribed course of antibiotics is typically recommended. In some cases, surgical intervention may be necessary, but full recovery is commonly achieved.

### Animals:

- Vaccination is a key preventive measure for animals. Cattle should be vaccinated with live attenuated strains such as Brucella abortus strain 19 or RB 51, administered intradermally.
- Rigorous measures should be taken to prevent brucellosis in animal herds. Newly purchased animals should always be isolated to ensure they are free from brucellosis.
- Laboratory techniques can be used to identify the cause of abortion and isolate infected animals.
- Proper disposal of placentas and non-viable fetuses is important to reduce the risk of contamination.
- Hygiene practices and precautionary measures play a vital role in prevention.
- Unimmunized infected animals should be culled (slaughtered) to prevent further spread of the disease.

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