

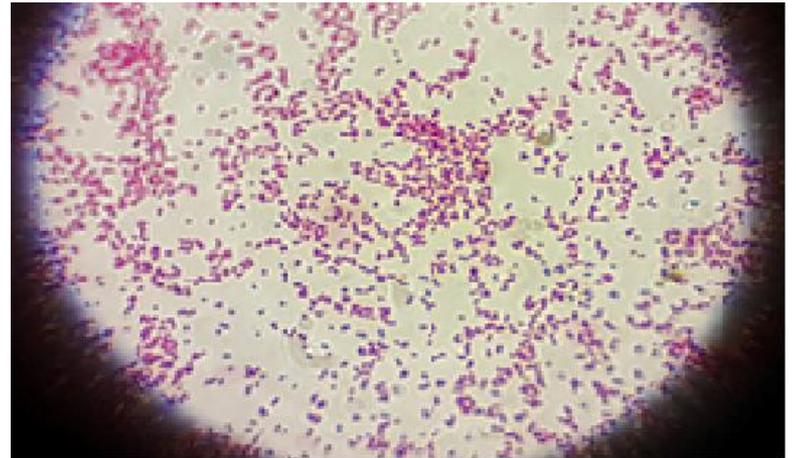
# BRUCELLA



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# General characteristics

- *Brucella* species are small, nonmotile,, Gram-negative coccobacilli.
- They are MZN-positive.
- In MZN-stained smears they characteristically appear as clusters of red coccobacilli
- *They are intracellular parasites.*
- *Grow poorly on ordinary media.*
- *They are non-hemolytic on blood agar.*



# Important species

- *Brucella abortus*- affects cattle
  - *Brucella melitensis*- affects sheep and goats
  - *Brucella suis*- affects pigs
  - *Brucella ovis*- affects sheep
  - *Brucella canis*- affect dogs
  - *Brucella neotomae*- affect desert wood rat
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- *B. abortus* is most prevalent *Brucella* spp
  - *B. melitensis* is most virulent *Brucella* spp.

# General characteristics

- Aerobic, capnophilic and catalase-positive.
- Except *B. ovis* and *B. neotomae*, others are oxidase-positive.
- All *Brucella* species are urease-positive except *B. ovis*.
- Growth of other *Brucella* species is enhanced in an atmosphere of CO<sub>2</sub>.
- *B. abortus*, *B. melitensis* and *B. suis* occur in smooth forms
- *B. ovis* and *B. canis* always occur in rough forms.

# Differentiation of *Brucella* species

- Two important surface antigens are *abortus* **antigen A** and *melitensis* **antigen M**.

- The proportion of A : M antigen

Brucella abortus- 20:1

Brucella melitensis:1:20

Brucella suis- 11:9

- *B. abortus* are lysed by a specific bacteriophage (*Tbilisi phage*) at routine test dilution.
- *B. abortus* grows in presence of basic fuchsin but not in presence of thionin.
- *B. suis* grows in presence of thionin but not in presence of basic fuchsin.

# Cultural requirement

- Do not grow on ordinary media.
- Addition of blood or serum supports growth
- Tryptose agar or Liver infusion agar gives satisfactory growth.
- *B. abortus* and *B. ovis* requires 10% CO<sub>2</sub>.

# Usual habitat

- Brucellae have a predilection for both female and male reproductive organs in sexually mature animals.
- Each *Brucella* species tends to infect a particular animal species.
- Infected animals serve as reservoirs of infection which often persists indefinitely.
- Organisms, shed by infected animals, can remain viable in a moist environment for many months.

# Pathogenesis

- Rough colonies and are less virulent than smooth colonies.
- Organism can gain entry in the host even through the mucous membrane, abraded skin and conjunctiva.
- Inhibition of phagosome-lysosome function intracellular survival
- Superoxide dismutase and Catalase - resistance to oxidative killing
- Brucellae persist within macrophages but not within neutrophils

# Pathogenesis

- Bacteraemia - spread and localization in the reproductive organs
- Associated glands in sexually mature animals
- *Erythritol* is 4 carbon sugar alcohol that stimulates growth of Brucella organism
- High concentrations - placentae of cattle, sheep, goats and pigs
- Also found in other organs -mammary gland and epididymis
- In chronic brucellosis, organisms may localize in joints or inter-vertebral discs.

# Brucellosis in cattle

- Brucellosis in cattle due to *B. abortus* is called ***Bangs disease***.
- Brucella organism are obligate parasite and have predilection for genital tract and joints.
- Cows may be infected by:
  - Ingestion
  - Inhalation
  - AI or natural service
- Infected cows secrete brucella organism in:
  - vaginal discharge
  - placenta
  - aborted foetus
  - milk

# Brucellosis in cattle

- Usually abortion is seen in *third trimester*.
- “*Abortion storm*” is observed in herd with large number of susceptible pregnant animals.
- Cows abort only once.

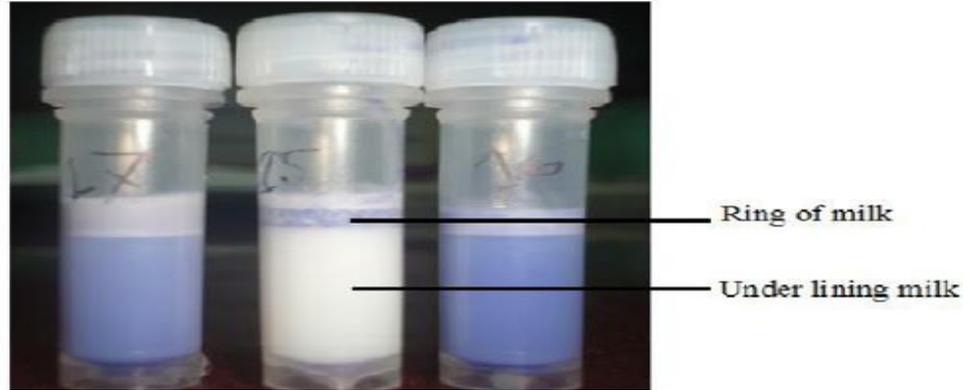
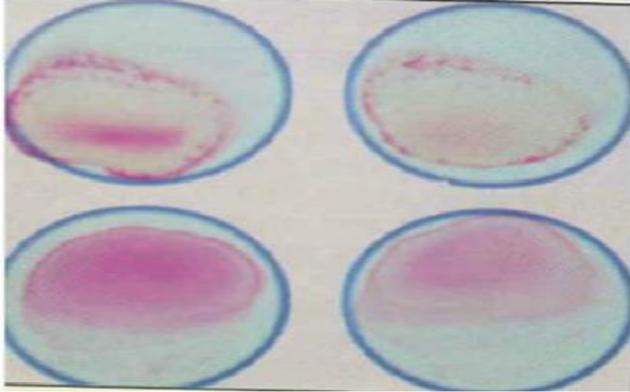
Symptoms in cattle are:

- Abortion;
- Stillborn.
- Weak calf born.
- Retention of fetal membranes;
- Signs of infection in the membranes;
  
- In bull- *Epididymitis* is observed

# Diagnostic procedures

- Specimens should be processed in a *biohazard cabinet*.
- The diagnosis of brucellosis depends on serological testing.
  - MRT
  - RBPT
  - STAT
- Isolation and identification of the *Brucella* species.

# Serological test



- **Milk ring test (MRT) or Abortus Bang's ring (ABR) test:**
  - This test is performed to identify brucella in herds.
  - It is based on detection of antibodies in milk against stained antigen
- **Rose Bengal Plate test (RBPT):** Qualitative test for screening.
- **Standard Tube Agglutination Test (STAT):** Quantitative test- Confirmatory

## Serological tests:

SI No	Name of the test	Antigen	Sample to be tested	Nature	Purpose
1.	Milk ring test Or Abortus bang ring test.	Killed brucella organism stained with _____	Milk	Qualitative	This test is carried out to detect brucellosis in herd.
2.	Rose Bengal Plate test (RBPT)	Killed brucella organism stained with "Rose Bengal" dye	Serum	Qualitative	This test is carried out in field condition to detect affected animals from MRT positive herd.
3.	Standard Tube agglutination test (STAT / SAT)	Killed Brucella organism unstained	Serum	Quantitative	A titre of 1:40 is considered positive whereas 1:20 is doubtful.

# Diagnostic procedures

- *Specimen:* cotyledons, foetal abomasal contents and uterine discharges
- *MZN-stained smears* often reveal MZN-positive coccobacilli.
- In specimens containing cells, the organisms appear in clusters.
- The polymerase chain reaction can be used to detect brucellae in tissues.
- **Strauss reaction:** Development of orchitis in *G. pig* after intraperitoneal injection of infective material.

# Treatment and control

- Treatment of cattle with brucellosis is not practical.
- Immunity in brucellosis is predominantly cell mediated.
- Three vaccines are in use
  - strain 19 (S19) (*Cotton strain 19*)
  - adjuvanted 45/20 vaccine ,and
  - RB51 vaccine

# Brucella -Vaccine

- *S19 vaccine* is administered to female calves up to 5 months of age (Calf hood vaccination).  
(Vaccination of *mature animals leads to persistent antibody titres*)
- *45/20 bacterin* - Even when administered to adult animals, this vaccine does not induce persistent antibody titres.
- *RB51 strain* is a *stable, rough mutant* which induces good protection against abortion and does not result in serological responses detectable in tests.

# Brucellosis in humans

- Humans are susceptible to ***B. abortus***, ***B. suis***, ***B. melitensis*** and, rarely, with ***B. canis***.
- Severe infections occur with ***B. melitensis*** (Malta fever) and ***B. suis*** biotypes 1 and 2. Human infections due to ***B. abortus*** are moderately severe whereas those caused by ***B. canis*** are usually mild.
- Transmission to humans occurs through contact with secretions or excretions of infected animals.
- Routes of entry include ***skin abrasions***, ***inhalation*** and ***ingestion***.
- ***Raw milk and dairy produce*** made with unpasteurized milk are important sources of infection.

# Brucellosis in humans

- Brucellosis in humans, known as undulant fever, presents as:
  - *Chill*
  - *fluctuating pyrexia,*
  - *perspiration*
  - *malaise,*
  - *fatigue and*
  - *muscle and joint pains*
- **Abortion is not a feature of human infection.**
- *Osteomyelitis* is the most common complication.
- Antimicrobial therapy should be administered early in an infection.

**THANKS**