THE SCIENCE WORLD
A Monthly e Magazine
ISSN:2583-2212
March, 2025 Vol.5(3), 6500−6504

Popular Article

An Overview: Brucellosis

Aarti Gupta[1], Pooja Gill[2] and Hina Ashraf Waiz[3]
[1]PG Scholar (LPM), [2]PG Scholar (Vet. Pathology),[3]Assistant Professor
Department of Livestock Production Management
CVAS, Navania, Udaipur, RAJUVAS
DOI:10.5281/ScienceWorld.15006980

Introduction

Brucellosis is a significant re-emerging zoonotic disease with a global distribution. It remains an uncontrolled and serious public health concern in many developing countries, including India. Despite being common, Brucellosis in India is often overlooked.

The disease has been closely linked to human civilization, particularly with the shift to agrarian societies, the practice of shepherding, and the expansion of animal husbandry. Historically, Brucellosis was prevalent in the Mediterranean region and has been associated with military campaigns. Its evolution as a disease dates back to the earliest domestication of animals.

Etiology

Brucella bacteria belong to the α-2 group of proteobacteria and are small, Gram-negative coccobacilli or short rods. They can survive both inside and outside cells and grow best in the presence of oxygen. These bacteria are positive for oxidase, catalase, nitrate reductase, and urease enzymes. Different species of Brucella prefer specific animals: *B. abortus* mainly infects cattle, *B. melitensis* infects sheep and goats, *B. suis* affects pigs, and *B. canis* targets dogs. Humans can also get infected, with *B. melitensis* being the most common cause of infection.

At pH, Brucella agents do not have potential to survive.

Transmission

Brucella can spread in two ways: from mother to baby (vertical transmission) or between animals (horizontal transmission). The bacteria are found in large numbers in the uterus of pregnant animals. When an infected animal has a miscarriage, the aborted fetus, placenta, and uterine fluids become major sources of infection. Brucella can also be passed to newborns through the mother's milk.

The bacteria can survive in the environment for months, especially in cold and damp conditions. Animals get infected by eating contaminated food and water or coming into contact with infected materials like aborted fetuses and placentas. Inhaling the bacteria is another way they can get sick. Infected bulls can spread the disease through mating or artificial insemination. Tukana and Gummow (2017) found that healthy animals drinking from the same water sources as infected ones is a key reason for brucellosis spreading.

In human: Consumption of unpasteurised milk and their products especially soft cheese, yoghurts and ice-cream, undercooked traditional delicacies such as liver and spleen are mainly responsible for human brucellosis. Camel milk is considered to be the most important source of infection in Middle East countries and Mongolia.

Epidemiology

The first species, *Brucella melitensis*, was discovered in 1887 by scientist Bruce in a patient who died from Malta fever. Later, *Brucella abortus* was identified in 1897 as the cause of cattle and sheep abortions. In 1914, *Brucella suis* was found in pigs. Other species include *Brucella ovis*, which affects rams, *Brucella neotome*, found in desert wood rats, and *Brucella canis*, which affects dogs. Humans are mainly infected by *Brucella melitensis*, causing severe fever, also known as Malta fever or Mediterranean fever. *Brucella abortus* is less harmful but more widespread. Some animals, such as horses and camels, are more resistant, while wild animals like deer and bison can also be affected.

Brucellosis exists worldwide but has been eradicated in some countries like Britain, Sweden, Denmark, Germany, and the Netherlands. However, it remains a major issue in developing countries with large livestock farms. Different *Brucella* types are found in various regions, with *Brucella abortus* common in cattle, *Brucella melitensis* affecting sheep and goats, and *Brucella suis* found in pigs in South America and Australia.

In India, *Brucella abortus* is widespread and considered a significant zoonotic disease, meaning it can spread from animals to humans. Around 20% of rural populations suffer from fever of unknown origin (PUO), with 1-2% of cases linked to brucellosis. The disease causes economic losses of approximately Rs 240 million annually, affecting 7.6% of cattle and 5.8% of buffaloes.

Brucellosis remains a global concern, especially in developing nations. Effective control measures, including livestock vaccination, hygiene, and regular screening, can help reduce its impact and protect both public health and the economy.

Pathogenesis

1. Entry Throughts

- **Ingestion** (contaminated food & water)
- **Inhalation** (airborne bacteria)
- **Conjunctival contact** (eyes)

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 11/03/2025

- **Skin abrasions/wounds**
- **Sexual transmission** (infected bulls via natural service/artificial insemination)

2. Entry & Multiplication in Host

- Brucella enters the body and infects **phagocytic cells** (e.g., macrophages, dendritic cells)
- Multiplies within these cells to evade immune defense

3. Infection in Pregnant Females

- **Brucella reaches placenta & mammary glands** via bloodstream
- High **erythritol levels** in the placenta promote bacterial growth
- Leads to **placental damage, ulcers, and abortion**
- Bacteria excreted in **uterine fluids, milk, and vaginal secretions**

4. Infection in Non-Pregnant Animals & Bulls

- Bacteria multiply and are **shed in body secretions** (urine, feces, saliva, milk)
- In bulls:
    - Infects **genital organs & lymph nodes**
    - **Large bacterial excretion in semen** (acute phase)
    - **Intermittent shedding** in chronic cases

5. Effects on Host (Cows & Humans)

- Reduced enzyme activity (adenosine deaminase, catalase)
- Increased oxidative stress markers
- Inflammation & immune system suppression

Clinical Signs:

Cattle:

- Abortion happens after the 5th month, mostly in the last three months of pregnancy.
- Swollen joints, retained placenta, and uterine infection (metritis).
- Grayish-white or pus-like discharge from the vagina.
- Placenta remains attached, decays, and produces a bad-smelling brown fluid.

Bulls:

- Swollen and inflamed testicles (orchitis) and sperm ducts (epididymitis).
- Infection can also affect seminal vesicles.

Sheep & Goats:

- Abortion and difficulty getting pregnant.
- Udder infection (mastitis), swollen joints (arthritis), spine infection, and inflamed testicles.

Pigs:

- Abortion or weak piglets.
- Some may develop infections like fistula of withers and poll evil (infected swellings).

Horses:

- No abortion, but may develop fistulous withers (infected swelling on the withers).

Humans (Caused by B. melitensis):

- Fever that comes and goes, usually higher in the afternoon or evening.
- Chills, nausea, weakness, headache, and joint pain.
- In some cases, swelling of the liver, spleen, and lymph nodes.

Necropsy Finding

The placenta is often swollen, and thick, leathery patches may appear on its outer layer. The placental attachments (cotyledons) usually decay. Additionally, the liver, spleen, and most of the visible lymph nodes become enlarged.

Diagnosis:

Base on clinical sings and confirmed by serological examinations

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 11/03/2025

Identification of Immunoglobulin Class by Various Serological Tests

Serological Test	Principal Immunoglobulin Class Identified	Remarks
Brucella milk ring test	IgM, IgG1, IgA	Test conducted on bulk milk from a herd
Plate agglutination test	IgG1, IgM	Useful screening test
Standard agglutination test	IgM, IgG2	Widely used but often IgG1 antibodies fail to agglutinate
Complement fixation test	IgG1, IgM	Very specific test
ELISA test	Able to detect all immunoglobulin classes	Reliable and specific test

Supplementary Tests

Test Name	Immunoglobulin Class Identified	Remarks
Heat inactivation	IgG	-
Rivanol precipitation	IgG	-
Mercaptoethanol treatment	IgG	To differentiate the non-specific reaction by destroying IgM, the antibody most commonly produced by adulthood vaccination

Differential Diagnosis

Many infections can cause abortion in animals, including brucellosis, vibriosis, leptospirosis, and infectious bovine rhinotracheitis (IBR).

If the placenta is swollen, thick, and has a leathery texture, it may be a sign of brucellosis, as other infections usually don't cause these changes.

Blood tests can help rule out other infections, but lab tests are needed for a final diagnosis.

Trichomoniasis and vibriosis can also cause fertility problems. Infected animals may have trouble getting pregnant, and their reproductive cycles may take longer than usual.

- **Trichomoniasis** is diagnosed by checking uterine fluids for tiny parasites.
- **Vibriosis** is detected through a blood test or a mucus sample from an aborted fetus.

Treatment

If these symptoms appear, consult a nearby veterinarian.

Prevention and Control:

Brucellosis is mainly controlled using the **test and slaughter** method, though its use may be restricted in some regions due to religious beliefs. Maintaining **proper hygiene** is essential to prevent the spread of infection. This includes disposing of contaminated materials safely, isolating sick

Official Website
www.thescienceworld.net
thescienceworldmagazine@gmail.com
Published 11/03/2025

animals, and quarantining new animals for **20 days** before introducing them to the herd. It is also recommended to avoid buying pregnant animals. **Vaccination** is a key preventive measure to build herd immunity. The **Strain 19 vaccine** is commonly used in cattle, particularly in calves and adults, though it may sometimes lead to abortion in pregnant cows. The **B. abortus killed 45/20 vaccine** has proven effective in tropical climates. While the **Strain 19 vaccine** has shown limited success in sheep and goats, the **Rev. 1 vaccine** is preferred for these animals. However, it may cause abortion in pregnant females and can be passed through milk, so it is best administered to lambs and kids between **3 to 6 months old**. For **rams infected with B. ovis**, a combination of **vaccination and the test-and-slaughter method** is recommended. The **Rev. 1 live vaccine** and **killed B. ovis vaccine** have been successfully implemented, particularly in New Zealand. Recently, **oral vaccines** have helped in reducing brucellosis cases in sheep and goats in China.

References

Khurana, S. K., Sehrawat, A., Tiwari, R., Prasad, M., Gulati, B., Shabbir, M. Z., ... & Chaicumpa, W. (2021). Bovine brucellosis–a comprehensive review. *Veterinary Quarterly*, *41*(1), 61-88.

Manish, K., Puran, C., Rajesh, C., Teena, R., & Sunil, K. (2013). Brucellosis: An updated review of the disease. *The Indian Journal of Animal Sciences*, *83*(1).

Mantur, B. G., & Amarnath, S. K. (2008). Brucellosis in India—a review. *Journal of biosciences*, *33*(4), 539-547.

Sharma, R. D., Kumar, M., & Sharma, M. C. (2010). *Textbook of Preventive Veterinary Medicine and Epidemiology*. Indian Council of Agricultural Research (ICAR).