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Canine Brucellosis: Prevention and Control Measures for Brucellosis

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Abstract

Canine brucellosis, primarily caused by *Brucella canis* is a zoonotic infection with significant implications for both animal and public health. The disease predominantly spreads through reproductive fluids, leading to persistent infections that complicate control efforts, particularly in kennels and breeding facilities. Diagnostic challenges arise from asymptomatic carriers and the bacterium's ability to evade the immune system. Current diagnostic approaches include serological, cultural and molecular methods, while treatment relies on prolonged antibiotic combinations, though relapses are common. Given its zoonotic nature, brucellosis demands a One Health approach, integrating veterinary and medical expertise to prevent transmission across species. In India, the government's efforts, such as the National Animal Disease Control Programme (NADCP), underscore the importance of vaccination, regular screening and public awareness in managing brucellosis. This review highlights the urgent need for sustained vigilance and improved control measures to mitigate brucellosis risks for animals and humans alike.

Keywords: *Brucella canis*, Zoonotic diseases, One Health approach, NADCP

Introduction

Canine brucellosis is an infectious disease affecting dogs caused by the *Brucella canis*. While *B. canis* specifically targets dogs, other *Brucella* species impact various animals, often with serious health and economic consequences. For example, *Brucella abortus* commonly

affects cattle, leading to reproductive issues and economic losses in the livestock industry. *Brucella melitensis* primarily infects sheep and goats, while *Brucella suis* targets pigs (Corbel, 2006). These bacteria can also infect humans, making brucellosis a zoonotic disease with implications for both animal and public health. Humans can contract brucellosis through direct contact with infected animals or by handling contaminated materials such as urine, saliva or placenta. Infections can cause chronic symptoms in humans, such as fever, joint pain and fatigue, underscoring the importance of preventive measures. Canine brucellosis is especially challenging because it spreads easily in kennels, breeding facilities and shelters, where dogs live in close quarters. The disease is difficult to manage due to asymptomatic carriers, limited treatment options and its chronic nature. This article delves into the transmission, symptoms and prevention of canine brucellosis, underscoring the importance of vigilance and preventive measures to protect both animal and human health.

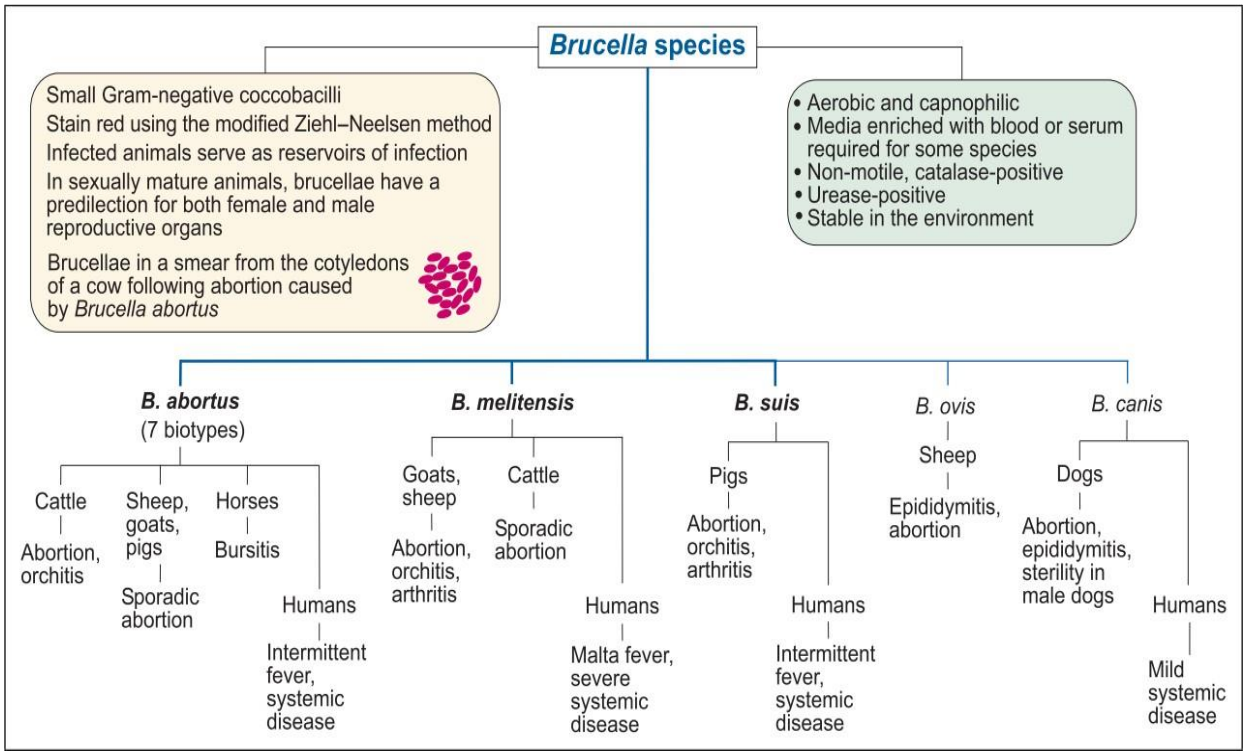

Figure:1- Different species of *Brucella* with staining characteristics and bio-chemical properties

Etiology

Canine brucellosis is caused by the bacterium *Brucella canis*, which primarily infects the reproductive organs in dogs. Unlike many other bacterial infections, *B. canis* can establish chronic infections that persist in the body, even when symptoms are mild or absent. The bacterium spreads most commonly through reproductive fluids, making mating the primary transmission route, though it can also spread through contact with other bodily fluids or contaminated surfaces. *B. canis* has a unique ability to evade the immune system, allowing it to persist undetected in some dogs and complicating efforts to fully eradicate the

infection. This resilience poses a challenge in controlling outbreaks, especially in multi-dog environments like kennels and breeding facilities.

Pathogenesis

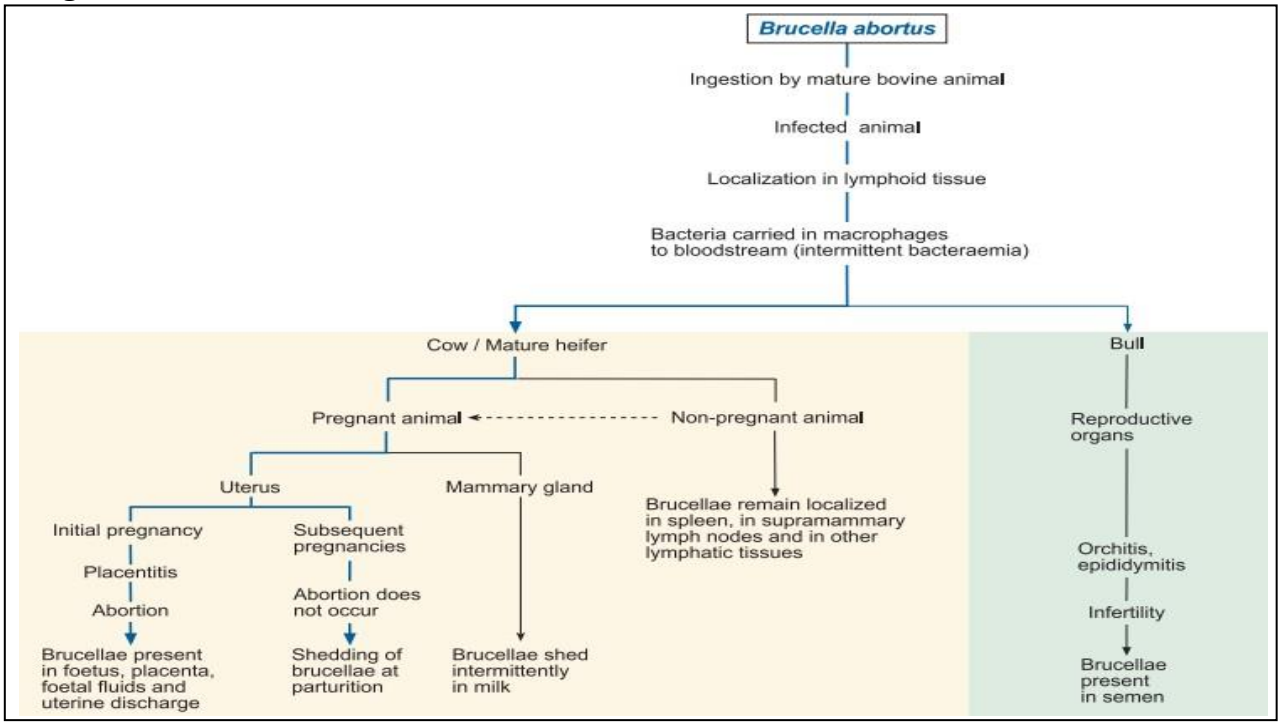

Figure:2- Pathogenesis of *B. abortus* in dairy cattle (Quinn *et al.*, 2011)

Symptoms

Brucellosis is an infectious disease caused by bacteria of the genus *Brucella*, which can affect various animals. The signs and symptoms can vary depending on the species affected. Here's an overview for some common animals:

1. **Cattle**
   - Abortion, particularly in late pregnancy
   - Retained placenta
   - Fever and depression
   - Decreased milk production
   - Lameness due to arthritis
2. **Sheep and Goats**
   - Abortion storms (many animals abort in the same season)
   - Weak offspring
   - Reduced fertility
   - Swollen joints
3. **Swine**
   - Abortions, especially in the later stages of pregnancy
   - Decreased reproductive performance
   - Lameness due to arthritis
   - General weakness or lethargy
4. **Dogs**
   - Fever
   - Weight loss
   - Lethargy
   - Swollen lymph nodes
   - Joint pain or stiffness

Diagnostic methods

Brucellosis diagnosis involves several laboratory tests to identify the presence of *Brucella* bacteria. Here are the most commonly used diagnostic tests:

1. Serological Tests:

a. Rose Bengal Plate Test **(RBPT):** A rapid slide agglutination test that detects antibodies against *Brucella* in serum. It's widely used for screening.

b. Complement Fixation Test **(CFT):** Measures the ability of serum antibodies to fix complement in the presence of the bacteria. It's more specific than RBT.

c. Enzyme-Linked Immunosorbent Assay **(ELISA):** Detects specific antibodies in serum and is often used for herd screening.

d. Indirect Fluorescent Antibody Test **(IFAT):** A more sensitive test that uses fluorescently labelled antibodies to detect *Brucella* antibodies.

2. Cultural Methods:

a. Bacterial Culture: Isolation of *Brucella* from blood, tissue, or other samples. This method is definitive but requires specialized laboratory conditions due to the fastidious nature of the bacteria.

b. Isolating *Brucella* species requires specialized media due to their fastidious growth needs. Commonly used media include Blood Agar, Brucella Agar, Tryptic Soya Agar and Chocolate Agar, which provide essential nutrients and support their growth. Enrichment broths like Brucella Broth and BHI Broth are also utilized before subculturing. Incubation typically occurs under anaerobic or microaerophilic conditions at 35-37°C for several days to weeks to optimize isolation success.

3. Molecular Methods:

a. Polymerase Chain Reaction **(PCR):** Detects *Brucella* DNA in various samples (blood, tissues). PCR is highly sensitive and specific and can provide rapid results.

b. **Real-Time PCR:** An advanced form of PCR that quantifies the DNA, providing quicker and more accurate results.

4. Blood Tests:

a. Blood Culture: Often used for diagnosing human brucellosis, involves culturing blood samples to detect the presence of the bacteria.

5. Other Tests:

a. Tissue Biopsy: In certain cases, biopsies from affected organs can be analyzed to identify *Brucella* infection.

b. Lymph Node Aspiration: Collecting and testing lymph node samples in suspected cases, especially in livestock.

Treatment Strategy for Canine Brucellosis

Treating canine brucellosis is challenging due to the bacterium's ability to evade the immune system and persist within host cells, leading to chronic infections. Antibiotic therapy is the primary approach, often involving a combination of drugs to improve effectiveness. The recommended treatment typically includes doxycycline paired with an aminoglycoside, such as streptomycin

or gentamicin, administered over several weeks. In some cases, doxycycline and rifampin may also be used in combination to enhance bacterial clearance (Merck Veterinary Manual, 2021). However, despite prolonged therapy, relapses are common and the infection may not be entirely eradicated. For infected breeding dogs, spaying or neutering is advised to minimize transmission risks and reduce hormone-driven bacterial spread. Due to the zoonotic potential of *Brucella canis*, infected dogs should be isolated during treatment and those handling these animals should use protective measures to prevent transmission. Given the high risk of recurrence and incomplete elimination, preventive measures, including regular screening in kennel and breeding facilities, are critical in managing canine brucellosis.

Brucellosis in Humans

Humans can become infected with several *Brucella* species, including *B. abortus*, *B. suis*, *B. melitensis* and less commonly, *B. canis*. Transmission typically occurs through direct contact with the bodily fluids of infected animals, such as secretions and excretions. The bacteria can enter the human body through skin abrasions, inhalation, or ingestion. Inhalation poses a high risk, as infection may occur with exposure to as few as 10 organisms. Consuming unpasteurized milk or dairy products made from raw milk is also a significant source of human infection (Pappas *et al.*, 2006). Human brucellosis, also known as undulant fever, is characterized by symptoms such as recurring fever, general malaise, fatigue and pain in muscles and joints. Unlike in animals, abortion is not a common feature of brucellosis in humans. Osteomyelitis, an infection of the bones, is the most frequent complication. *B. melitensis* (associated with Malta fever) and *B. suis* biovars 1 and 3 are linked to more severe cases, whereas infections with *B. abortus* are generally moderate in severity. Cases due to *B. canis* tend to be milder in humans (Young, 2005).

One Health Approach for Mitigation of Brucellosis

A One Health approach is essential for effectively controlling and mitigating brucellosis, as the disease affects both animals and humans. This integrated strategy brings together veterinarians, medical professionals, public health authorities and environmental scientists to address brucellosis from multiple angles. Preventing the spread of *Brucella* species requires coordinated efforts in animal testing, vaccination and hygiene practices in both livestock and pet populations (Godfroid *et al.*, 2013). Routine screening of animals, especially in high-risk environments like kennels and farms, is crucial for early detection. Education and outreach programs also play a significant role, informing pet owners, farmers and the public about safe handling practices and potential risks. In addition, monitoring wildlife populations that can act as reservoirs for *Brucella* bacteria is essential to prevent cross-species transmission.

By fostering collaboration across animal, human and environmental health sectors, the One Health approach provides a comprehensive framework to reduce brucellosis cases and minimize its impact on both human and animal populations.

Government of India's Approach and Programs for Brucellosis Control

The Government of India has implemented several programs to control and mitigate brucellosis in both livestock and humans, recognizing the zoonotic and economic impact of the disease. One of the major initiatives is the National Animal Disease Control Programme (NADCP), which aims to control brucellosis alongside other livestock diseases like foot-and- mouth disease (DAHD, 2020). Under NADCP, brucellosis vaccination for female calves aged 4–8 months is prioritized to reduce transmission within cattle populations and minimize economic losses in dairy and livestock farming (Government of India, 2020). The government also focuses on enhancing diagnostic capabilities by establishing brucellosis testing facilities across the country, especially in high-risk states (Shome *et al.*, 2021). Additionally, public awareness campaigns are conducted to educate farmers and livestock handlers about the importance of vaccination, hygiene practices and the zoonotic risk associated with brucellosis. Through these measures, the Government of India aims to achieve long-term control of brucellosis, safeguarding both animal health and public health.

Programs for Brucellosis Control

I. **Government of Gujarat - Animal Husbandry Department**
- This site provides information about various animal health programs, including disease control initiatives.

II. **National Animal Disease Control Program (NADCP)**
- The official Department of Animal Husbandry and Dairying website has details on national schemes, including those focused on brucellosis.

III. **Integrated Livestock Development Project Reports**
- Various reports and publications available through the Gujarat government portals or local agriculture universities provide insights into ongoing projects.

IV. **Research Articles and Journals**
- Look for articles in journals like the *Indian Journal of Animal Sciences* or publications from local veterinary colleges for research studies on brucellosis in Gujarat.

V. **World Organisation for Animal Health (OIE)**
- OIE - Brucellosis Information
- Offers global perspectives and guidelines on managing brucellosis, which can relate to local efforts in Gujarat.

VI. **International Fund for Agricultural Development (IFAD)**
- Reports on livestock development programs often include information on disease control strategies in India, including Gujarat.

Summary

Canine brucellosis, caused primarily by Brucella canis, poses significant challenges to animal and public health due to its zoonotic potential and persistence in asymptomatic carriers. The disease spreads mainly through reproductive fluids and is prevalent in kennels and breeding facilities. Diagnosis relies on a combination of serological, cultural, and molecular techniques, while treatment involves prolonged antibiotic regimens, often with incomplete eradication. Effective control demands a One Health approach, integrating veterinary and human healthcare efforts to prevent cross-species transmission. Initiatives such as the National Animal Disease Control Programme (NADCP) in India emphasize vaccination, regular screening, and public awareness to mitigate the impact of this disease.

Conclusion

Addressing canine brucellosis requires sustained vigilance, robust diagnostic capabilities, and coordinated control measures to curb its transmission. Strengthening public awareness and implementing preventive strategies, including vaccination and regular testing, are pivotal to reducing the disease burden. Collaborative efforts through the One Health framework are essential to protect both animal and human populations from the far-reaching consequences of this zoonotic infection.

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