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# Bovine Tuberculosis

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## Introduction

Bovine tuberculosis (BTB) is a chronic, contagious bacterial disease affecting humans and animals, causing caseous lesions primarily in the lungs, lymph nodes, liver, and other organs. It's a significant zoonotic threat, prevalent in many countries, with economic repercussions due to productivity loss, morbidity, and mortality in livestock. Mycobacterium bovis, the causative agent, affects various vertebrates, with cattle, goats, and pigs most susceptible, while sheep and horses show higher resistance. BTB necessitates ongoing research and control efforts to address its impact on animal and human health.

## Aetiology

Mammalian tuberculosis stems from Mycobacterium species, which are Gram-positive, non-motile, non-capsulated, non-spore forming, aerobic bacteria. They exhibit diverse lengths (ranging from 0.2–0.6 × 1.0–10.0 µm) and belong to the family Mycobacteriaceae. The primary agents responsible for tuberculosis are *Mycobacterium bovis* in cattle, *Mycobacterium tuberculosis* in humans, and Mycobacterium avium in poultry.

## Mode of transmission

Bovine tuberculosis (BTB) primarily affects cattle and spreads through direct contact with infected animals, ingestion of contaminated resources like pasture, water, or utensils, which can be prevalent in certain regions. Inhalation of infected aerosols is the typical route of infection within cattle herds, especially when the respiratory tract is affected or in the advanced stages of the disease. Rare transmission routes include skin contact, genital transmission during coitus, congenital transmission via placental or umbilical infection, and udder infections. In humans, consumption of unpasteurized milk from cows with mammary tuberculosis is the main mode of transmission, although airborne transmission has been reported among individuals closely working with diseased animals.

## Clinical signs and symptoms

Bovine tuberculosis typically manifests as a chronic, debilitating disease in cattle, although acute and rapidly progressive cases are possible. It often begins insidiously, with few or no initial signs of illness. In the early stages, clinical symptoms may not be apparent, and many affected animals appear normal. As the disease progresses, common signs include weight loss, emaciation, weakness, reduced appetite, a mild, intermittent fever, swollen lymph nodes, and respiratory issues marked by a moist cough, particularly in the morning, during cold weather, or after exercise. Dyspnea or rapid breathing may also occur, and gastrointestinal involvement can lead to sporadic diarrhea and constipation. Swollen head lymph nodes and obstruction-related symptoms may arise from internal lymph node involvement. Tuberculous metritis can lead to infertility or abortion, often accompanied by chronic vaginal discharge. Despite weakness and sluggishness, affected animals generally remain alert, maintain their appetite, and appear in good spirits.

## Gross and microscopic findings

Postmortem examination reveals distinct characteristics of Bovine tuberculosis. It is marked by the formation of granulomas (tubercles) that are commonly found in specific lymph nodes, including bronchial, mediastinal, retropharyngeal, and portal lymph nodes, as well as the affected tissues. These tuberculous

granulomas typically appear yellowish and can be caseous, caseo-calcareous, or calcified, often encapsulated. In cattle, tubercles are prevalent in lymph nodes, particularly those in the head and thorax. Internally, tubercles are commonly found in the lungs, spleen, liver, and on the surfaces of body cavities in affected animals. Disseminated cases may exhibit numerous small granulomas in multiple organs. While lesions on the female genitalia can occasionally occur, they are rare on male genitalia.

Microscopic examination classifies tuberculous lesions into four stages (Stage I, II, III, and IV). Stage I shows irregular epithelioid macrophages, scattered lymphocytes, and a few Langhans-type multinucleated giant cells. Stage II granulomas present limited necrosis with neutrophils, lymphocytes, macrophages, and a few fibroblasts and Langhans-type cells. Stage III granulomas display epithelioid and Langhans-type giant cells in the peripheral regions surrounding central caseous necrosis, often with central calcification. Near the fibrous capsule, the inflammatory cell composition includes macrophages, lymphocytes, and sporadic neutrophils. Stage IV granulomas predominantly feature necrosis and mineralization, accompanied by a prominent fibrous capsule that outlines an irregular area of substantial necrosis and mineralization.

**Diagnosis**

The clinical diagnosis of TB is typically reserved for advanced stages of the disease. For preliminary diagnosis, the widely recognized tuberculin skin test (TST) is commonly employed in bovine TB control programs. This test detects cell-mediated immune responses (CMI) and serves as the primary screening method in cattle and certain other species. It involves injecting tuberculin, a mixture of bacterial proteins, intradermally, and then examining the injection site for an inflammatory swelling (delayed hypersensitivity reaction) 48-96 hours later. Additional tests, such as the antibody enzyme-linked immunoassay (ELISA) and the gamma-interferon assay, are used as supplementary tools in eradication and control efforts.

**Prevention and control**

- Various projects are to be launched to know about the disease process and evolve measures to minimize it.
- A suspected case should be brought under intradermal test to screen it.
- A positive reactor should be segregated and slaughtered. The case should be burnt or buried and slaked lime should be poured over it.
- All the in contact animals above 3 month of age are to be placed under test.
- Doubtful cases are to be retested after a month and slaughtered if proved positive.
- All suspicious cases must be isolated until proved negative.
- All the animals prior to transportation from one place to the other should be brought under testing.
- Feeding trough, watering utensils and milking pans should be thoroughly scrubbed and disinfected.
- In pail fed calves, milk of tuberculosis free cows should be offered and milk should be sterilized prior to offering.

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