

## Tuberculosis: An Overview in Animals

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### Introduction

Tuberculosis is an infectious zoonotic disease caused by certain organisms belonging to genus *Mycobacterium*. *Mycobacterium* are rod-shaped, acid-fast bacteria. *Mycobacterium tuberculosis* complex is common in human and mammalian tuberculosis and *Mycobacterium avium* is prevalent in avian tuberculosis. Tuberculosis is commonly defined as a chronic, debilitating disease but sometimes, it occasionally assumes an acute and progressive course. This disease affects many vertebrate hosts. There is a widespread occurrence of multidrug resistant strains of *Mycobacterium tuberculosis* which is a concern to veterinarians and also to public health officials.

Apart from cattle, pigs, monkeys and domestic fowls, this disease is not a common disease of animals. Tuberculosis is reported in wild animals including camels, deer, antelopes and llamas. Bovine tuberculosis is widespread throughout the world including India. In most countries significant reduction in prevalence of bovine tuberculosis is there due to the control measures. However, bovine tuberculosis is an important zoonotic disease in many countries without any effective control program.

### Etiology of tuberculosis

The genus *mycobacterium* comprises of more than 170 species.

- *Mycobacterium tuberculosis* - humans, monkeys, dogs and rarely other animals
- *Mycobacterium bovis* - humans, cattle, dogs, cats, sheeps, goats, pigs, horses, monkeys
- *Mycobacterium avium* - domestic and wild fowls, pigs, humans, monkeys, rarely other domestic animals
- *Mycobacterium intracellulare* - humans, monkeys, cattle, pigs
- *Mycobacterium kansasii* - humans, cattle (pulmonary disease and lymphadenitis)
- *Mycobacterium smegmatis* - cattle (it causes mastitis).

## Pathogenesis

Inhalation of infected droplets is the most common route of infection but bacteria can also be ingested via milk, water or feed. Pathogenesis of *Mycobacterium tuberculosis* is because of its ability to escape phagocytosis by macrophages and produce delayed type sensitivity. Factors present in its cell wall are responsible for its virulence and these includes cord factor, lipoarabinomannan (LAM), complement, and heat shock protein. Bacteria which are inhaled are either phagocytosed by alveolar macrophages or allow bacteria to proliferate. In later stages, dead and degenerated macrophages are surrounded by epitheloid cells, granulocytes, lymphocytes and multinucleated giant cells. Granulation is surrounded by a fibrous capsule and center may be caseous and calcified.

The primary complex can remain stable for long and dissemination of infection through vascular and lymphatic channels may be generalized. Nodular lesions may be found in many organs and sites including pleura, peritoneum, kidney, liver, spleen, mammary glands, reproductive tract, and CNS. In pigs, lesions are mainly present in the lymph nodes associated with gastrointestinal tract.

## Clinical findings in animals

Clinical signs may vary in different conditions like latent stage, subclinical or severe. Generalized clinical signs include weakness, anorexia, emaciation, diarrhea and fluctuating fever of low grade. In the bronchopneumonia form, the disease causes chronic, intermittent, moist cough with later signs of dyspnea. Upon auscultation and percussion, the destructive lesions of granulomatous bronchopneumonia may be detected.

Enlargement of superficial lymph nodes and draining of abscess. In case of presence of deeper lymph nodes, they cannot be palpated and may obstruct the airways, pharynx, and gut which may lead to tympany and dyspnea. Calcification of caseous center is common in many animals but absent in birds and rarely present in horses. In horses, alimentary infection is the usual form which may extend elsewhere. In avian tuberculosis, giant cells, necrosis, calcification, and fibroplasia are completely absent.

## Diagnosis of tuberculosis

- Presumptive diagnosis can be made based upon clinical signs and gross lesions.
- Demonstration of acid-fast organisms in smears of infected organs.
- Cultural examination for isolation (Lowenstein-Jensen medium) and identification of mycobacterium for definitive diagnosis.
- Cellular immune response: single intradermal tuberculin test (SIIT) with purified protein derivative (PPD) prepared from the culture of *M. bovis* or *M. avium*. The reaction is read after 24-72 hours post injection.
- Radiography for demonstration of nodules in the various affected organs.
- PCR assays of buffy coats or exudates.
- Molecular genotyping such as spoligotyping, variable number of tandem repeats.
- In vitro assays like gamma assays using WBCs stimulated with *M.bovis* antigen.



## **Conclusion**

All members of *Mycobacterium tuberculosis* complex have zoonotic potential to cause disease in humans. Since, many eradication programs are in run, there is substantial reduction in the zoonotic burden of tuberculosis. Since, it's a type of occupational zoonosis hence, dairy workers, herders, meat handlers, milk handlers are at a greater risk.

