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Bovine tuberculosis

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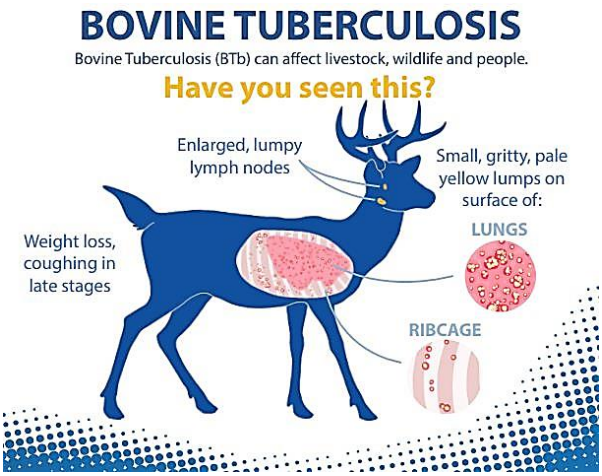
Abstract

Bovine tuberculosis (TB), caused by Mycobacterium bovis, poses significant challenges to both human and animal health worldwide. This article examines various aspects of bovine TB, including its etiology, clinical symptoms in humans and animals, laboratory diagnosis, and vaccination strategies. In humans, bovine TB can manifest with symptoms such as persistent coughing, chest pain, weakness, and fever, while in animals, clinical signs may include progressive emaciation, fever, and respiratory distress. Laboratory diagnosis involves tuberculin skin tests, acid-fast staining, PCR, and isolation on selective media. Bacillus Calmette-Guérin (BCG) vaccine, derived from attenuated M. bovis, is effective in humans but less so in animals. While BCG vaccination remains an important tool for tuberculosis control in both populations, ongoing research efforts are focused on improving vaccine efficacy and implementing integrated control measures for comprehensive disease management.

Synonyms: Bovine tuberculosis, Mycobacterium bovis, Clinical symptoms, Vaccination



Bovine Tuberculosis (TB) is a chronic infectious disease affecting animals, primarily caused by the bacterium Mycobacterium bovis. This pathogen is closely related to the bacteria responsible for tuberculosis in humans and avian species. Bovine TB can afflict a wide range of mammals, inducing a general state of illness, characterized by symptoms such as coughing,

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weight loss, and, ultimately, mortality. Importantly, the disease is transmissible between animals and humans, as well as to other animal species. Unlike the strain of tuberculosis typically found in humans, M. bovis presents unique challenges due to its distinct characteristics. The prevalence of bovine TB is notably higher in several regions, including many parts of Africa, Asia, and the Americas.

Etiology: The causative agent of bovine tuberculosis is the bacterium Mycobacterium bovis, which is a gram-positive, acid-fast microorganism. This bacterium possesses unique cell wall components that contribute to its resilience and ability to evade host immune responses.

Transmission: Bovine tuberculosis can be transmitted through various routes, including inhalation of aerosols containing M. bovis, ingestion of contaminated feed or water, or through breaks in the skin barrier. Close contact with infected animals, particularly in intensive farming settings, increases the risk of transmission. Additionally, vertical transmission from mother to offspring via congenital infection can occur, perpetuating the spread of the disease within herds.

Incubation Period: Following exposure to M. bovis, the development of bovine tuberculosis typically occurs over a prolonged period, often taking months to manifest clinically. However, the disease can remain dormant within the host for extended periods, sometimes years, before reactivating under conditions of stress or advancing age. This dormancy and reactivation dynamic presents challenges for disease control and eradication efforts, as latent infections may go undetected and contribute to ongoing transmission within animal populations.

Action of physical and chemical agent:

- Mycobacterium killed at 60^0C in 15-20 min.
- Sensitive towards Formaldehyde or glutaraldehyde
- Relatively resistance to the 5% phenol
- Ethanol is suitable for surface cleaning

Clinical Symptoms of Bovine Tuberculosis in Humans:

- Persistent coughing for an extended duration
- Chest pain
- Hemoptysis (blood in cough)
- Generalized weakness and fatigue
- Unintentional weight loss
- Chills and fever
- Night sweats
- Loss of appetite

Clinical Symptoms of Bovine Tuberculosis in Animals:

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- Progressive emaciation (loss of body condition)
- Occasional fever
- Weakness
- Decreased appetite
- Dyspnea (difficulty breathing)
- Acute respiratory distress
- Enlarged lymph nodes, which may rupture
- If the digestive tract is involved, intermittent diarrhea or constipation may occur

Laboratory Diagnosis for Bovine Tuberculosis:

- Tuberculin skin test: Injection of tuberculin (extract from Mycobacterium tuberculosis) into the skin, followed by observation for a delayed hypersensitivity reaction indicating previous exposure to TB bacteria.
- Acid-fast staining: Microscopic examination of sputum or tissue samples stained with a special dye to visualize acid-fast bacilli characteristic of Mycobacterium tuberculosis.
- Microscopic examination: Direct visualization of M. bovis in tissue samples or body fluids under a microscope.
- Polymerase chain reaction (PCR): Molecular technique used to amplify and detect specific DNA sequences of M. bovis, providing a rapid and sensitive diagnostic tool.
- Isolation on selective media: Culturing of M. bovis from clinical specimens on specialized media designed to promote its growth and differentiation from other bacteria.

Prevention and Control

- The most commonly reported source of M. bovis infection in people is the consumption of unpasteurized dairy products.
- Unpasteurized dairy products, such as milk or cheese, should not be consumed
- To make sure that dairy products are pasteurized, check the label and ingredients list and make sure that the word “pasteurized” is listed
- People at risk for contact with body fluids or tissue from wild animals such as hunters, should promptly seek medical attention and inform their healthcare providers about the exposure to a wild animal that might carry M. bovis.
- People who spend extended periods in close contact with cattle or other animals that might carry M. bovis, such as dairy workers, should promptly seek medical attention for any illness with symptoms of TB disease
- Sanitation at farms and good ventilation
- Proper hygiene and management of waste

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- Isolation of seek and weak animals
- Tuberculin test at farm
- Segregation of test positive animals
- Test and slaughter policy in tuberculin positive animals other than cows
- Rodent control programme
- Extension awareness programme for tuberculosis at village level

Bovine Tuberculosis Vaccine:

The primary vaccine used for tuberculosis in humans is Bacillus Calmette-Guérin (BCG), which is an attenuated strain derived from Mycobacterium bovis, the causative agent of bovine tuberculosis. BCG vaccination has been widely implemented in human populations and has shown efficacy in reducing the incidence and severity of tuberculosis in many parts of the world. However, its effectiveness in preventing bovine tuberculosis in animals, particularly cattle, is limited.

While BCG vaccination has demonstrated some level of protection against tuberculosis in cattle, its efficacy in animals is generally lower compared to its effectiveness in humans. Several factors contribute to this reduced efficacy, including differences in host immune responses between humans and animals, variations in vaccine administration protocols, and challenges associated with achieving consistent and widespread vaccination coverage in animal populations.

Despite its limitations, BCG vaccination remains an important tool for tuberculosis control in both humans and animals. Ongoing research efforts seek to optimize BCG vaccination strategies for animals and develop novel vaccine formulations that offer enhanced protection against bovine tuberculosis. Additionally, integrated approaches combining vaccination with other control measures, such as improved diagnostics, biosecurity measures, and disease surveillance, are essential for comprehensive tuberculosis control programs in animal populations.

Conclusion

Bovine tuberculosis (TB), caused by Mycobacterium bovis, presents significant challenges for both human and animal health. The disease manifests with distinct clinical symptoms in humans and animals, and laboratory diagnosis involves various techniques such as tuberculin skin tests and PCR. Bacillus Calmette-Guérin (BCG) vaccine, derived from attenuated M. bovis, is effective in humans but less so in animals. While BCG vaccination remains an important tool for tuberculosis control in both populations, efforts to improve vaccine efficacy and implement integrated control measures are essential for comprehensive disease management. Collaborative approaches involving public health and veterinary sectors are crucial for controlling the spread of bovine TB and minimizing its impact on human and

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animal populations.

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