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Review Article

A REVIEW ON BOVINE TUBERCULOSIS: ZOONOTIC IMPORTANCE

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ABSTRACT

Mycobacterium bovis is a zoonotic organism that is present in animals in most developing countries where surveillance and control activities are often inadequate or unavailable and pasteurization is rarely practiced. It can also infect and cause disease in many other mammals including humans, deer, goats, pigs, cats, dogs and badgers. The disease causes military tubercles in lungs, chronic cough and enlargement of lymphnode. The standard method for detection of TB is the tuberculin test and slaughter. Disease eradication programs consisting of post mortem meat inspection, intensive surveillance including on-farm visits, systematic individual testing of cattle and removal of infected and in-contact animals as well as movement controls have been very successful in reducing or eliminating the disease.

Keywords: Mycobacterium-Bovine-Human-Zoonotic

INTRODUCTION

Bovine TB is a disease caused by bacteria called *M. bovis*, usually affects animals such as cattle, but it can affect practically all mammals causing a general state of illness, coughing and eventually death. The disease still puts a strain on public health, being only second to HIV/AIDS in causing high mortality rates. The disease is caused by non-motile bacillus that grows slowly and, under optimal conditions, multiplies every twenty-four to forty-eight hours.[1] Tuberculosis is communicable Mycobacterial disease caused by members of Mycobacterium tuberculosis complex (MTBC).[1-3] The most common form of disease, caused by *Mycobacterium tuberculosis,* is pulmonary tuberculosis. Within lungs, if the bacteria is not contained by the immune system, is able to grow uncontrollably, resulting in the subsequent development of tuberculosis disease. When a person with pulmonary disease coughs or speaks, there is release of aerosolized droplets can then be inhaled by those who are in close contact with the infectious case.[4] Infection with *M. bovis* was common due to ingestion of unpasteurized milk.

Etiology

The genus *Mycobacterium* is classified under the Order *Actinomycetales* and Family *Mycobacteriaceae*.[5] Mycobacterium tuberculosis complex (MTBC) include *M. tuberculosis, M. bovis, M. bovis BCG, M. africanum, M. microti, M. tuberculosis sbsp. canetti and M. bovis sbsp. caprae*.[6,7] These are non-motile, non-spore forming, pleomorphic bacilli or coccobacilli). The distinguishing features of pathogenic mycobacteria are the formation of characteristics cord.[8] Mycobacterial cell walls, is made of mycolic acids that are long branched chains of fatty acids. The mycolic acids are responsible for the acid fast staining reaction of mycobacteria cells.[9] Mycobacterium species grows on medium containing serum, potato and egg. The most commonly used media are Lowenstein-Jensen (LJ) that contains egg, glycerol, asparagines, mineral salt and malachite green and Stonebrink's medium. *M. bovis* grows more slowly than *M. tuberculosis,* which needs more than 8 weeks to appear on primary culture. The optimal growth temperature is 37^{0}C.[10,11]

Bovine tuberculosis (TB)

Bovine tuberculosis (TB) is caused by *Mycobacterium bovis*. Bovine tuberculosis is a chronic bacterial disease characterized by progressive development of tubercles in any tissue/organ of the body.[12-14] *M. bovis* has one of the broadest host ranges of all known pathogens and has been diagnosed worldwide which can affect most warm blooded animals, including human being.[15] Organisms are excreted in the exhaled air, in sputum, feaces (from both intestinal lesions and swallowed sputum from pulmonary lesions), milk, urine, vaginal and uterine discharges, and

discharges from open peripheral lymph nodes of infected animals. Currently, the disease in human is becoming increasingly important in developing countries, as humans and animals are sharing the same micro environment and dwelling premises, especially in rural areas, and susceptibility of AIDS patients to tuberculosis.[16]

Epidemiology of *Mycobacterium bovis* Infections

The disease is contagious and is spread by contact between infected domestic animals such as cattle, and wild animals and humans. The main reservoir of *M. bovis* is cattle, which can transmit the infection to many mammalian species including man.[17,18]

Transmission

Human infection due to *M. bovis* is thought to be mainly through drinking of contaminated or unpasteurized raw milk and under cooked meat. It is known that consumption of milk contaminated by *M. bovis* is regarded as the principal mode of TB transmission from animals to humans.[19] TB is the most frequent opportunistic disease associated with HIV infection.[35] The transmission of *M. bovis* between cattle is dependent on a number of factors, including frequency of excretion, route of infection, the infective dose, the period of communicability, and host susceptibility.

Diagnosis

A presumptive diagnosis of TB in cattle and other susceptible species is often made on history, clinical findings, tuberculin skin tests, necropsy findings and other methods.[20] Additionally, sputum for acid-fast bacteria smear and culture should be taken if symptoms are present or the chest X-ray is abnormal.[21] Mycobacterial culture and examination of smears of sputum are two important processes in the evaluation of pulmonary TB. Examination of sputum is a rapid test and the most widely used while mycobacterial cultures are considered to be the gold standard in pulmonary TB diagnosis.[22] In vitro lymphocyte assays, including an interferon gamma assay and enzyme linked immunosorbent assays have been developed for the detection of the disease in cattle and so other animals exposed to *M. bovis*.[23-27] Nucleic acid-based technology, notably polymerase chain reaction and related methods, may provide more rapid, sensitive, and specific diagnostic tools. Restriction fragment length polymorphism analysis (DNA fingerprinting) could be useful in epidemiologic studies that trace the spread of disease between cattle, other animals, and humans.

Tuberculin Tests

Tuberculin tests, which avail of a cell-mediated response to Mycobacteria, have now been used for the diagnosis of tuberculosis and preclinical infection in man and animals for more than 100 years. In cattle tuberculin tests are based on detection of the specific immunological response following exposure to *M. bovis.* Most common tuberculin tests in use today, namely, the caudal fold test (CFT) and the Single intradermal test (SIT) which both use only bovine tuberculin PPD and the Single intradermal comparative tuberculin test (SICTT), which uses bovine and avian tuberculin PPD in combination. To assess the efficacy of a particular tuberculin test methodology various parameters such as the test sensitivity, specificity, and predictive value are evaluated for the environment, the level of disease in the population, and the conditions in which the test is performed

Prevention

Tuberculosis needs to be prevented and controlled because it causes loss of productivity in animals infected; there is risk of infection to humans. However, because of financial constraints, scarcity of trained professionals, lack of political will, as well as the underestimation of the importance of zoonotic tuberculosis in both the animal and public health sectors by national governments and donor agencies, control measures are not applied or are applied inadequately in most developing countries. Cattle should not be treated at all and as such farm animals with tuberculosis must be slaughtered (culled).[28] Meat inspection system should be strengthened and designed to prevent the consumption of contaminated products by people. All animals entering the food chain should be subjected to ante-mortem and post- mortem inspection.[28] There is also need for medical and veterinary professionals should cooperate in cases of disease outbreak. Use of a spatially-defined habitat model for assisting the design of cost-effective control strategies.

Animal vaccination

Vaccination of animals against TB would be a viable strategy in two disease control situations: in domesticated animals in developing countries and in wildlife.

CONCLUSION

Milk pasteurization before human consumption is very important. Educational and technical assistance should be provided by developed countries to promote control of tuberculosis. The possibility of developing genetic lines of cattle with higher resistance to infection with *M. bovis* without impacting negatively on other desirable genetic traits is an exciting prospect.

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