

## Can *Mycobacterium avium* Subspecies *Pseudotuberculosis* be Considered as a Foodborne Pathogen?

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*Mycobacterium avium* subspecies *pseudotuberculosis* is an acid-fast bacterium that is the principal cause of paratuberculosis (Johne's disease) in animals; and is also associated with Crohn's disease of humans. The disease in animal was first time recorded in 1895 from Germany by Johne and Frothingham [1]. The first description of Crohn's disease was made by Dalziel in 1913 [1]. It is estimated that in Europe and in the USA, 2.2 million people and 1.4 million people are affected with Crohn's disease, respectively [1]. The isolation of *Mycobacterium avium* subsp. *pseudotuberculosis* (spheroplast form) was reported for the first time from the biopsy of Crohn's disease patient by Chiodini and co-investigators [2]. Later, the organism was isolated from the milk of lactating mothers [3] and blood of human patients [4].

*Mycobacterium avium* subsp. *pseudotuberculosis* (Map) has a wide host range as it is delineated in many species of animals, such as alpaca, antelope, bison, buffalo, camel, cattle, fox, deer, goat, horse, pig, rabbit. and sheep besides man [1]. The infection in animals and humans due to Map has been reported from many countries of the world including India [ 1,5].

Transmission of Map from animals to humans can occur through consumption of raw milk, milk products, meat. and water [6]. Map is reported to be present in the milk, meat, and faeces of the infected animals. Dairy animals shed the organisms in their faeces. It is pertinent to mention that raw milk may be contaminated with the faeces of dairy animals during the milking process [7]. The demonstration of Map in the milk of dairy animals indicated its significance from food safety point of view [8].

The affected persons exhibit the signs and symptoms of chronic diarrhoea, abdominal pain, constipation, reduced appetite, fever, rectal bleeding, anemia, weight loss, colorectal ulcer, deep ulceration, thickening of bowel, and fistula formation [1]. In addition, extra-intestinal manifestations can develop in about 25% of the patients [9].

Symptoms in animals include weight loss, weakness, diarrhoea, cachexia, and drop in milk production. The affected animal may succumb to death after a prolonged illness [1,8].

Laboratory help is imperative to make an unequivocal diagnosis of disease both in humans as well as in animals. Direct microscopical examination of faecal smear, intestinal mucosa or lymph nodes with Ziehl Neelsen stain, intradermal test with Johnin or avian purified protein derivative (PPD), cultural isolation, immunological (ELISA, CFT, AGID), histopathological and molecular (PCR, RFLP) techniques are employed for the diagnosis of Map infection [1,8].

Treatment in humans can be attempted with antibiotics, corticosteroids, aminosalicylic acid and budesonide. In addition, the surgical intervention like drainage of the abscesses and removal of section of bowel can also help [1].

Certain measures, such as proper boiling of milk, thorough cooking of meat, protection of water bodies from animal excreta, supply of safe and potable water, improvement in sanitation and hygiene both in animal and human environment, and surveillance of disease are suggested to control Map infections [1]. In addition, public education and awareness about the growing role of Map in human Crohn's disease and the importance of drinking boiled milk and ingestion of cooked meat is emphasized [1].

It is concluded that *Mycobacterium avium* subsp. *pseudotuberculosis* should be considered as an important foodborne of public health concern. Prospective studies on the emerging role of Map in various clinical disorders of humans may be rewarding.

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