



Mycobacterium Avium Subspecies Paratuberculosis – Relevance to the Dairy Sector

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What is Mycobacterium avium subspecies paratuberculosis (MAP)?

M*ycobacterium avium ssp. paratuberculosis* (MAP) is a bacterium which causes Johne's disease, also known as Paratuberculosis, in ruminant animals including cattle, sheep, deer, goats and buffalo. Johne's disease is a chronic disease of adult ruminants which is invariably fatal once clinical signs appear.

Cattle usually become infected with MAP as calves less than 12 months of age while they are most at risk in the first 30 days of life. There is a long incubation period and generally no signs are seen (subclinical infection) until the animals are at least two to six years old. MAP causes thickening, corrugation and inflammation of the intestinal mucosa. The main presenting sign is profuse, watery diarrhoea that is unresponsive to treatment, accompanied by loss of milk production and body weight over several weeks. Affected milking animals may also have increased incidence of mastitis, higher somatic cell counts in milk and suffer from lameness and infertility. Infection is difficult to detect in the early stages of the disease. Diagnostic tests are more reliable in animals with advanced stages of infection.

MAP can be excreted in large numbers by infected animals, especially as the disease progresses. Consequently MAP, originating from faecal material, can be widespread in the farm environment and may contaminate pasture, areas where animals are held (housing), water run-off, colostrum and milk. Furthermore, MAP can become widely disseminated within the tissues of infected animals with advanced stages of the disease.

Why is MAP relevant to the dairy sector? Why are there control or eradication programmes in dairy herds?

MAP is usually spread from dam to young offspring following ingestion of faeces on contaminated

surfaces, and in contaminated milk, feed and water. In a limited number of cases transmission occurs in utero. Although MAP causes Johne's disease in dairy animals, it is not recognised as a human pathogen.



Dairy farmers implement Johne's disease control or eradication programmes for the following reasons:

- To improve animal health and welfare outcomes.
- To limit economic losses.
- As a precautionary measure with respect to consumer health. Some scientific studies have implicated MAP as an etiologic¹ agent of Crohn's disease in humans. However, despite considerable research by the medical community, the cause of Crohn's disease is still uncertain and there is no substantiated causal link between MAP and Crohn's disease. Furthermore, a correlation between the occurrence of Crohn's disease and particular occupations involving livestock that may carry MAP has not been shown, i.e. there is no evidence to suggest that farm workers or those who are exposed to ruminants are at a higher risk of developing Crohn's disease.

¹ Etiology is the study of causation, or origination

What do MAP control programmes focus on?

Preventing exposure of susceptible young offspring to infection, only introducing low-risk animals, appropriate testing and removal of animals shedding MAP, are the keys to managing the disease.

Applied strategies comprise:

- Management changes to protect young stock and reduce transmission between animals
- Biosecurity and sourcing replacement animals from low risk status herds
- Monitoring and detecting infected animals (testing alone is seldom recommended as currently available tests lack the sensitivity, and consequently the ability, to identify all infected animals)
- Culling affected animals
- Not breeding from affected animals, e.g. applying artificial insemination to produce replacement animals
- Potential use of vaccination in certain farm scenarios

What are individual countries doing?

Individual countries control MAP and reduce infection by using some, or all, of the strategies above. While infection may be eliminated on some dairy farms it must be emphasized that this is not always feasible.

What is being done to eliminate MAP in dairy products?

The many control programmes that are undertaken at the dairy farm level all over the world, have reduced the incidence of MAP in milking animals. Furthermore, dairy farmers use good milking hygiene practices to contribute towards the safety and quality of raw milk. In addition, correct commercial pasteurization, coupled with adhering to hygiene standards following pasteurization, contribute to the absence of MAP, and ensure the safety of retail milk and other dairy products.

Does MAP survive pasteurization?

Scientifically robust studies using conditions that closely mimic commercial pasteurization, conducted by research groups in several countries (New Zealand, Australia, the Netherlands, Ireland and the USA), have shown that MAP is effectively inactivated ($> 4 - 5 \log \text{CFU/ml}$ reduction, i.e. more than ten-thousand-fold reduction in microbial count) by commercial pasteurization.

