

Finding a solution for Johne's Disease



Johne's disease, caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP), is a contagious and lifelong infection of cattle that eventually progresses to severe inflammation of the small intestine. It also infects sheep, goats, camels and bison. MAP causes a disproportionate economic loss to the dairy industry. Months to years before showing any signs of infection or disease, cattle shed MAP in their manure which can spread an undetected infection throughout the herd. This "silent infection" is associated with decreased milk production, lower body weight in adult cattle, and reduced wean weight in calves.

Currently, there is no reliable diagnostic test that detects MAP infections in the "silent" stages of disease, and no vaccines are currently licensed for use in Canada.

DISEASE TRANSMISSION

Infected cattle will shed MAP in their manure, colostrum and milk. Young calves are the most susceptible to infection primarily through ingestion of MAP through environmental contamination, feed or water sources. Additionally, ingestion of colostrum or milk from infected cows can lead to infection.

Limiting transmission between adult cattle and especially from adult to young animals is crucial in managing Johne's disease. A recent study from the Western College of Veterinary Medicine found 10-15% of Canadian cow-calf herds contain at least one MAP-infected animal (Waldner C, et al. Can Vet J. 2022). Researchers in Alberta and Ontario found that MAP prevalence is much greater among dairy cattle with estimates of up to 70% of Canadian dairy herds having MAP-infected animals (Wolf R, et al. J. Dairy Sci. 2015).

The Vaccine and Infectious Disease Organization (VIDO) is a world leader in infectious disease research and vaccine development. We are one of the world's largest and most advanced containment facilities and house a vaccine development centre for manufacturing vaccines.

We aim to improve animal health, protect Canadian livestock and ensure food safety and security by:

- Understanding how pathogens cause disease,
- Developing novel vaccines and therapeutics,
- Improving vaccine formulations and delivery methods, and
- Collaborating with world leading organizations.

Our work has resulted in 6 vaccines for cattle including for calf scours, pasteurellosis, haemophilosis and *E. coli* as well as several others for swine and poultry.

VIDO'S RESEARCH

Our research is focused on analyzing how the route of vaccine administration and timing impacts the ability of the vaccine to generate a protective immune response in the small intestine.

To do this, we are identifying which MAP proteins are involved in the protective immune response and selecting these proteins, as antigens, to begin formulating new vaccine candidates. This includes testing different vaccine formulations and routes of administration (oral or injectable) to determine which combination can generate the most effective vaccine.

These findings will outline how and when a vaccine should be administered within a herd to provide the greatest benefit.



WHAT'S NEXT

We will continue to identify new vaccine candidates that can reduce both MAP infection in the intestines and MAP shedding to aid in breaking the cycle of transmission within cattle herds and reducing the economic loss due to this disease.



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