



RESEARCH FACTS

RESEARCH & TECHNOLOGY DEVELOPMENT FOR THE CANADIAN BEEF INDUSTRY

Beef Science Cluster



An improved diagnostic test for Johne's disease

Project Title:

Enhanced Sensitivity of Detection of MAP in Bovine Feces by Integration of Bacteriophage-Based Capture with Loop-Mediated Isothermal Amplification

Project Code:

ANH.01.09

Completed:

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Researchers:

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Background:

Johne's disease is caused by *Mycobacterium avium* subspecies *paratuberculosis* (MAP), and results in economic losses due to reduced feed efficiency, early culling, and depressed milk production. Presently, Johne's disease control measures are based on management measures to avoid infection.

Although the incidence of Johne's disease is believed to be low in beef cattle (estimates range from 0.8 to 1.7% of cattle), incidence is considerably higher in dairy cattle. Since dairy cows enter the food chain at the end of their productive lives, any concerns regarding similarities between Johne's disease in cattle and Crohn's disease in humans makes it a beef issue. The major challenge with Johne's disease is the detection of early shedders of the bacteria. Current diagnostic tests have poor sensitivity, which means that infected animals are often not detected. For a few years after they were initially infected. During this period they can periodically shed MAP at low levels, allowing other cattle in the herd to become infected. This makes efforts to eliminate the disease through test-and-cull strategies in herds ineffective.

Using a modified version of the tuberculosis assay that included a PCR-based identification method for MAP, viable MAP cells have been detected in milk in just 48 hours. To be useful in beef cattle, the test must be modified to use manure samples instead of milk.

Objective:

To improve MAP detection sensitivity without slowing test speed.

What They Learned:

For the first time, a phage capable of infecting MAP was isolated directly from the cattle feces. Proof-of-concept studies confirmed that the phage could detect MAP, as well as a technique to amplify and detect phage DNA within 2 hours.

What it Means:

This is the first step in helping to build a diagnostic test that is able to rapidly detect the presence of MAP, hopefully leading to an easy and cost effective way to test for Johnes diseases in beef cattle.

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