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RESEARCH FACTS

RESEARCH & TECHNOLOGY DEVELOPMENT FOR THE CANADIAN BEEF INDUSTRY



Detecting Johne's Disease in Cattle, Wildlife and the Environment

Project Title:

Mycobacterium avium paratuberculosis (Johne's Disease) Infections of Cow-Calf Herds: Environmental and Wildlife Reservoirs of Infection

Researchers:

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Background

Johne's disease is caused by a bacterium called *Mycobacterium avium* subspecies *paratuberculosis* (MAP). The intestinal tract of very young calves is believed to be particularly susceptible to MAP infection, but symptoms of Johne's disease often do not develop until cattle are mature. In the meantime, MAP hides and multiplies in the intestinal lining and damages the intestinal cells that absorb nutrients. Infected cows develop chronic diarrhea, lose weight and get thin. Infected cows shed MAP into milk and the environment when damaged intestinal cells rupture. This exposes susceptible calves to contaminated udders, colostrum, milk, straw, water and feed.

There is no effective vaccine, treatment or diagnostic tests for early stages of infection, which makes Johne's disease very difficult to eradicate from an infected herd. A better understanding of how to effectively diagnose MAP, factors that influence MAP transmission and the duration of MAP viability in the environment would help to control Johne's disease more effectively.

Objectives

1. Determine whether serum ELISA or environmental tests detect Johne's disease as effectively as fecal culture
2. If environmental, wildlife and water sources are likely reservoirs for MAP, and
3. How long MAP persists in the environment.

What they did

These researchers conducted two preliminary experiments in beef herds that were known to have active cases of Johne's disease in

the past two years, based on veterinary diagnosis and laboratory confirmation.

The first study examined six herds, each with at least 100 cattle two years of age or older. Pooled fecal samples were collected (manure samples from five animals in each pool) from the entire mature herd and cultured for MAP. Individual blood samples were collected for MAP ELISA tests. Samples from the environment (calving and feeding areas, as well as dugouts, livestock waterers, ditches and streams), and other livestock and wildlife (wild birds and poultry, rodents, snails, dogs, cats, horses, sheep, rabbits, deer, elk, and antelope) were collected on and around each farm every three months for one year.

In the second study, MAP positive sites on a separate Johne's infected farm were sampled and cultured every month to determine how long MAP survived in the environment.

What they learned

1. Alternative Johne's disease tests: The fecal, serum and environmental testing methods were not consistent in detecting Johne's disease in the six infected herds. Pooled fecal cultures detected only four of six MAP-positive herds, the blood ELISA detected two MAP-positive herds and environmental samples detected two MAP positive herds.

Only the herd with the highest prevalence of Johne's disease (over 50% positive fecal cultures) tested positive using all three test methods. Of the five herds with a lower prevalence, one herd tested positive with two test methods, three herds tested positive with one test method and one herd tested negative with all three test methods.

These inconsistent results emphasize how difficult it is to detect Johne's disease in herds that have a low prevalence of the disease. Pooled fecal culture is useful to identify infected herds but does not identify which individual animals are infected. The serum ELISA test was not sensitive enough for routine use in beef cattle. Environmental tests failed to detect most of the herds carrying a low level of Johne's disease.

2. Environmental and wildlife reservoirs of MAP: Sampling each farm four times over the course of the year resulted in 268 environmental samples from calving and feeding areas and 150 water samples. Of the 418 samples collected from the six farms, only two were positive for MAP. At present, environmental sampling is not sensitive enough to replace traditional herd testing methods to confirm presence of Johne's disease.

None of the 431 tissue or fecal samples collected from wildlife or other farm animals were positive for MAP. This does not prove that domestic animals and wildlife cannot spread Johne's disease in cow-calf herds but suggests that they are not primarily responsible.

3. No sites tested positive for MAP five months after the initial positive culture. This may help to explain why very few positive environmental samples were detected on the six farms.

What it means

Although none of the testing approaches used were able to correctly identify every Johne's disease infected herd in this preliminary study, pooled fecal culture was clearly superior to both individual serum ELISA and culturing of environmental samples. Presently, environmental contamination of MAP on Saskatchewan cow-calf farms appears to be limited. The prevalence of the disease tends to be low, even in infected beef herds and the more extensive rearing methods probably results in less environmental contamination. The cow-calf industry has an opportunity to control Johne's disease before its prevalence increases and environmental contamination becomes a greater challenge.

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