BCRC BEEF CATTLE RESEARCH COUNCIL
RESEARCH FACTS
RESEARCH & TECHNOLOGY DEVELOPMENT FOR THE CANADIAN BEEF INDUSTRY

Fluke of Nature

Project Title:	Project Code:	8.28
Transmission biology and zoonotic potential of an emerging parasite in beef cattle	Completed:	*May 2009*

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Background

The lancet liver fluke (Dicrocoelium dendriticum) entered eastern North America in the 1950's. It spread westward and arrived in Cypress Hills Park on the Alberta/Saskatchewan border sometime after 1985.

The fluke's lifecycle begins when fluke eggs are eaten by a snail. Fluke larvae migrate throughout the snail's digestive and respiratory systems and are eventually coughed up in a slime ball. Ants use these slime balls as a moisture source and consequently eat the cysts. Most of the larvae mature in the ant's abdomen, but others commandeer a cluster of nerves that controls the ant's movements. During warm weather, the ant behaves normally. When temperatures cool in the evening, the flukes hijack the ant, instruct it to climb to the top of tall grass, and force its jaws to lock onto the grass until temperatures rise again. Cattle tend to graze mostly during the cooler early evening and morning hours (especially in warm weather), so this increases the chance that the infected ants will be eaten by cattle. Once inside the cow's intestine, the flukes work their way to the bile duct and lay eggs. Fluke eggs are shed in the manure, and the cycle begins again.

Fluke infections are rarely fatal in cattle. Economic losses from fluke infections typically result from liver condemnations at the packing plant, although heavily infected animals can become anemic, emaciated and predisposed to other infections. Extra-label doses of albendazole or fenbendazole in fall and spring may help treat infections, but cattle do not appear to develop immunity, so annual treatment is necessary.

A better understanding of the factors influencing the risk of fluke infection transmission could help prevent further spread of this organism to cattle and wildlife.

Objectives

1. Learn how vegetation, moisture and season affect liver fluke transmission between ants and cattle.

2. Evaluate the prevalence of the lancet liver fluke in elk, deer and cattle.

3. Develop a diagnostic test to identify infected cattle based on blood and fecal tests.

What they did

Factors affecting liver fluke transmission between ants and animals: Monthly ant samples were collected from 100 sites ranging from wet to dry, and dominated by aspen, pine or grassland. Numbers of infected ants were counted in each sample.

Liver fluke prevalence: Deer, elk and cattle livers were obtained from hunters and abattoirs, and manure samples were collected from grazing areas. Numbers of infected samples, numbers of flukes per sample and relative population sizes were used to estimate how cattle, deer and elk contribute to fluke spread.

Diagnostic test to identify infected cattle: Infected cattle liver samples from the prevalence study were used to develop an ELISA test to identify fluke antibodies in cattle. The test was then used on 500 cattle from outside Cypress Hills region.

What they learned

Factors affecting liver fluke transmission: Fluke-infected ants were only found in aspen-dominated sites bordering on water, particularly in mid-June through August. No infected ants were found on fescue grassland or pine or spruce dominated sites.

Liver fluke prevalence was difficult to determine conclusively. Liver samples collected from 36 deer, 18 cattle and 70 elk suggested that 47% of deer, 83% of cattle and 68% of elk carried flukes. Manure samples from 68 deer, 59 cattle and 43 elk indicated that 62% of deer, 44% of cattle and 14% of elk were shedding fluke eggs.

A few factors, besides the small sample sizes, make it difficult to estimate how each animal species contributes to overall fluke transmission. Comparing prevalence rates from liver samples is challenging because hunters may select deer and elk based on different age, health and body condition preferences than beef cattle culling decisions. It is also difficult to get an accurate fluke egg count in manure samples. Finally, elk, deer and cattle have different preferences for grazing aspen, pine and open rangeland, and infected manure deposited in drier pine, spruce or fescue dominated areas is less likely to be consumed by snails than manure deposited in shady, moist areas preferred by snails. However, there are more cattle (4,000) than mule deer (316), whitetail deer (346) or elk (657) in the park, so cattle and grazing management likely play a key role in controlling the spread of this liver fluke.

The ELISA blood test is highly effective at detecting the liver fluke in cattle. The test correctly identified all 15 cattle with infected livers in the prevalence study. Of the 500 blood samples collected from throughout western Canada outside Cypress Hills Provincial Park, 499 were negative. The one “infected” sample was believed to be a false positive, since it originated from an extremely arid area that is a hostile habitat for snails.

What it means

The Cypress Hills appears to be the only location in Western Canada where the lancet liver fluke is found. Cattle and other grazing ruminants are most likely to become infected by liver flukes in mid-June through August, when grazing moist, shady areas. Cattle are not exposed to infection on drier grasslands or pine or spruce-dominated sites. Fencing cattle out of riparian areas could help to minimize the further spread of the lancet liver fluke.

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