

WHY DO SOME CATTLE shed more *E. coli* O157:H7?

PROJECT TITLE

Adherence to *Escherichia coli* O157:H7 to different sections of the intestinal tract from shedding and non-shedding cattle in vitro. (4.20)



PROJECT LEADER

Danica Baines, Agriculture and Agri-Food Canada Research Center, Lethbridge, AB

Background

The digestive systems of cattle and humans are home to billions of bacteria, including *E. coli*. Most *E. coli* strains are harmless to both cattle and humans. However, some strains, like *E. coli* O157:H7, can cause severe illness in humans but not cattle.

Many of the details regarding how *E. coli* O157:H7 attaches to the human gut and causes food poisoning have been determined, but there is limited information about how and where *E. coli* O157:H7 colonizes the digestive tract of cattle. This is important to know in order to understand why some feeder cattle are much more likely to shed *E. coli* O157:H7 in their manure than others. Some infected cattle shed *E. coli* O157:H7 for less than a week (non-persistent), some shed for up to a month (moderately persistent), and some shed for up to a year (persistent shedders). Cattle that are shedding *E. coli* O157:H7 at the time of processing are more likely to contribute to beef contamination and human illness.

The likelihood of an infected animal becoming a persistent *E. coli* O157:H7 shedder may depend on what region of the digestive tract is colonized, and/or how the organism attaches to the wall of the digestive tract. A more thorough understanding of *E. coli* colonization and attachment mechanisms will help develop ways to combat *E. coli* O157:H7 in cattle.

Objectives

To determine whether the region of the digestive tract colonized by *E. coli* O157:H7 and the way that *E. coli* O157:H7 attaches to the gut influences whether cattle become persistent or intermittent *E. coli* O157:H7 shedders.

What they did

In a controlled research environment, calves were tubed with known numbers of *E. coli* O157:H7. Manure samples were collected over an 11 week period and monitored for the organism. Cattle were then classed as persistent, moderately persistent or non-persistent shedders based on the duration of *E. coli* O157:H7 shedding. At the end of the trial, tissue samples were collected throughout the digestive tract and examined for signs of *E. coli* O157:H7 infection and tissue damage.



WHY DO SOME CATTLE shed more *E. Coli* O157:H7? continued

What they learned

Persistent shedders were colonized by greater numbers of *E. coli* O157:H7 than non-persistent shedders. *E. coli* O157:H7 could infect any region of the intestinal tract, but four specific regions (the jejunum and ileum in the small intestine, and the colon and rectum in the large intestine) were less able to eliminate the infection. Intermittent shedders were typically only infected in the large intestine, whereas persistent shedders were also colonized in the small intestine. This indicates that colonization of the small intestine, upstream from the large intestine, is critical in determining whether an animal becomes a persistent or an intermittent shedder.

scale studies would be necessary to determine whether this damage impacts feed efficiency.

What it means

New interventions targeting *E. coli* O157:H7 at the farm cost \$10-12 per head. Food safety interventions at meat plants across Canada that target numerous pathogens cost approximately \$5-6/head. Investing in research is important to reduce both the incidence rate and costs associated with infectious diseases in both cattle and humans.

Larger scale studies would be necessary to determine whether *E. coli* O157:H7 infections impact feed efficiency.

The mechanism by which *E. coli* O157:H7 attaches to the intestine appeared to be the same in both persistent and intermittent shedders. However, persistent shedders were often colonized by *E. coli* O157:H7 strains that produce large amounts of toxin. Cattle that were colonized by high-toxin producing strains were also more likely to be co-infected by other strains of *E. coli* O157:H7.

Damage to the intestinal lining was seen in some infected cattle. More damage was seen in persistent shedders that were heavily colonized with *E. coli* O157:H7. This damage began to heal once the animal had stopped shedding. No signs of animal illness were reported. Larger

Proudly funded by:



The Beef Cattle Research Council (BCRC), a division of the Canadian Cattlemen's Association, sponsors research and technology development and adoption in support of the vision of the Canadian beef industry to have high quality Canadian beef products recognized as the most outstanding by Canadian and world customers.

FOR MORE INFORMATION VISIT:
www.cattle.ca/research

or contact

CANADIAN CATTLEMEN'S ASSOCIATION

#310, 6715 - 8th St. NE, Calgary, AB T2E 7H7

Tel: (403) 275-8558 Fax: (403) 274-5686