



RESEARCH FACTS

RESEARCH & TECHNOLOGY DEVELOPMENT FOR THE CANADIAN BEEF INDUSTRY

Do Distillers' Grains Increase E. coli Shedding?

Project Title:

Examining the Impact of Wheat Distillers Grains on the Shedding of E.coli O157:H7

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Background

The expansion of North America's ethanol industry has increased both feeding costs and the use of distillers' dried grains with solubles (DDGS) feedlot diets. Producing biofuel from grain converts the starch into ethanol, and concentrates the protein, fibre, oil and minerals in the DDGS by-product. Dietary starch, fibre and protein levels can affect the pH of the ruminant's digestive tract, which may in turn affect how well various microbes survive and compete in the animal's rumen, intestine, and manure. Research shows that high levels of dietary starch lead to a lower (more acidic) pH in the intestinal tract. This may inhibit the growth of E. coli. Similarly, some research shows that higher fibre levels lead to a higher (less acidic) pH in the digestive tract and encourage E. coli O157:H7 shedding. Dietary protein that bypasses ruminal digestion also raises intestinal pH. As a result, there are concerns that feedlot diets containing DDGS may increase the risk of E. coli O157:H7 shedding in feedlot cattle. U.S. researchers have compared E. coli O157:H7 shedding in cattle fed corn-based finishing diets supplemented with varying levels of corn DDGS. Some of these studies have found higher levels of E. coli O157:H7 shedding in diets containing corn DDGS. Others have not. More information is needed under Western Canadian conditions, where most finishing diets are based on barley rather than corn, and where both wheat DDGS and corn DDGS are available.

Objectives

1. Determine the relationship between incorporation of DDGS into feedlot diets and shedding of E. coli O157:H7 in naturally colonized commercial feedlot cattle, and
2. Determine the impact of fecal pH on levels and persistence of E. coli O157:H7 in the feedlot environment.

What they did

Yearling steers were fed three different finishing diets at a commercial feedlot in southern Alberta. The control diet consisted of 95% barley based concentrate and 5% silage (on a dry matter basis). The other two diets replaced 22.5% of the barley with wheat DDGS or corn DDGS. Each diet was fed to 10 pens of steers (227 head per pen) for 7 to 8 months in 2009-10. Three approaches were used to study whether feedlots containing DDGS affected the risk of E. coli O157:H7.

E. coli O157:H7 shedding was studied in manure samples collected from each pen (every week for the first five weeks, then every month thereafter). Manure pH was measured, samples were cultured and E. coli O157:H7 was counted.

E. coli O157:H7 survival in the pen environment was studied in manure samples collected from each diet early in the finishing period, and after cattle had spent at least two weeks on feed. Samples that contained no E. coli O157:H7 were inoculated with a five strain mixture of E. coli O157:H7, and the numbers of surviving E. coli O157:H7 were counted weekly for 25 weeks.

E. coli O157:H7 on cattle leaving the feedlot was counted on hide swabs collected and cultured from 90 cattle per diet before shipment to the packing plant at the end of the trial.

What they learned

E. coli O157:H7 shedding was not affected by diet. An average of 21% of the manure samples from the control diet were positive for E. coli O157:H7, compared to 33% for the corn DDGS and 29% for the wheat DDGS diets. These differences were not statistically significant. Some differences were observed at particular sampling periods, but there were no clear diet trends. For example, pens fed DDGS had more E. coli O157:H7-positive manure samples than pens fed the control diet in December-January, and pens fed corn DDGS had more E. coli O157:H7-positive manure samples than pens fed wheat DDGS or the control diet in March-April. Overall manure pH was slightly lower for the control diet (6.7) than for the corn DDGS (6.8) or wheat DDGS (7.1) diet.

E. coli O157:H7 survival in the pen environment was higher in manure samples collected early in the feeding period than in manure samples from cattle that had been on feed for longer than two weeks. Manure pH was also higher for samples collected in the first two weeks of the feeding period. E. coli O157:H7 survived for at least 25 weeks, but survival rates declined considerably over that period and the rate of decline in survival rates was unaffected by diet.

E. coli O157:H7 on cattle leaving the feedlot did not differ among the three diets. The numbers of cattle with hide swabs positive for E. coli O157:H7 was statistically similar for the diet containing no DDGS (25%), corn DDGS (28%) and wheat DDGS (18%).

What it means

Finishing diets containing no DDGS or 22.5% DDGS did not affect the numbers of E. coli O157:H7 shed in manure, surviving in manure, or found on cattle hides at the end of the feeding period. However, the fact that E. coli O157:H7 was still shed in manure and found on cattle hides near the end of the feeding period means that packing plant efforts to control potential pathogens are very important to avoid contaminating beef. The finding that E. coli O157:H7 shedding varied and survival declined over the course of the feeding period confirms that many factors other than diet influence the risk of E. coli O157:H7 in the beef industry.

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