



RESEARCH FACTS

RESEARCH & TECHNOLOGY DEVELOPMENT FOR THE CANADIAN BEEF INDUSTRY



Investigating the impact of E. coli 0157:H7 in soil on water quality

Project Title:

Prevalence and Transport of Escherichia coli 0157:H7 in Saskatchewan Soils Exposed to Cattle Manure

Researchers:

Dr. Darren Korber darren.korber@usask.ca
Jim Germida, Bing Si and Jeff Schoenau, 1.68

Project Code:

1.68

Completed:

*August
2004*

In May 2000, the community of Walkerton, Ontario suffered a major catastrophe when its town's water supply became contaminated with E.coli 0157:H7, a bacteria commonly found in cattle manure which can cause serious illness in humans. The subsequent investigation determined that the contamination was caused by a lack of chlorination in the water combined with cattle manure that had been deposited, by flood water, into one of the wells that supplied the town's water.

The Walkerton incident heightened attention around the effect of manure on water supplies. To examine how E.coli 0157:H7 performs in soil and to determine whether spreading manure as a fertilizer poses a risk for groundwater contamination, the project Prevalence and Transport of Escherichia coli 0157:H7 in Saskatchewan Soils Exposed to Cattle Manure was undertaken. The study also analyzed the movement path of E.coli 0157:H7 in soil.

To analyze how E.coli 0157:H7 performs in soil, it was studied under both laboratory and field conditions in both soil rich in organic matter and soil poor in organic matter to determine how it survives in both environments. In addition, the study examined the prevalence of E.coli 0157:H7 in 20 Saskatchewan feedlots, and in the soil associated with those feedlots (e.g. soil where manure from the feedlots had been spread).

E.coli 0157:H7 was measured and applied to containers of soil rich in organic matter and containers of soil poor in organic matter which were then held at various temperatures and studied for over a year. A key finding was that when there were no competing microorganisms, E.coli 0157:H7 could survive in soil for over a year. Soil high in organic matter enhanced survival. When competing microorganisms were present, survival of the E.coli bacteria decreased.

Upon studying the movement path of E.coli 0157:H7 applied to soil, it was determined that bacteria applied to the soil did not migrate more than 50 centimetres and the number of recoverable bacteria was less than 10 per cent, suggesting soil had a high sieving capacity for bacteria. It was therefore concluded that surface runoff posed a far greater hazard than migration into groundwater.

Sampling of manure from 20 feedlots showed that an average of 22.5 per cent of cattle housed in Saskatchewan feedlots were positive for E.coli 0157:H7. Prevalence of the bacteria increased depending on how crowded pens were, with positive rates of up to 57.5 per cent for cattle housed under the most crowded conditions. There was also evidence that animal movement within a herd or

between herds results in the spread of the bacteria. It is important to note that all manure samples were collected during the summer, which may have increased rates of prevalence.

Very little contamination of soil in the vicinity of feedlots was observed, including those that were shown to have E.coli 0157:H7 present in manure. This is consistent with the observation that soil is effective in filtering the bacteria.

E.coli 0157:H7 is a major concern for the beef cattle industry. Research like this helps industry focus resources on practices that will most effectively reduce cases of human illness caused by this bacteria.

Proudly Funded By:



The Beef Cattle Research Council, a division of the Canadian Cattlemen's Association, sponsors research and technology development and adoption in support of the Canadian beef industry's vision to be recognized as a preferred supplier of healthy, high quality beef, cattle and genetics.

For More Information Contact:

Beef Cattle Research Council
#180, 6815 - 8th St. NE
Calgary, AB T2E 7H7
Tel: (403) 275-8558 Fax: (403) 274-5686
info@beefresearch.ca

For More Information Visit:

www.beefresearch.ca