

## How E. Coli in cows can turn lethal

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by Cameron Smith

Why did cattle in the Walkerton area produce the deadly E. coli bacteria that killed seven people? In all the endless coverage I've read, no one seems to have asked the question. And I must admit, until I attended the annual organic conference a week ago at the University of Guelph, I hadn't asked the question either. I simply assumed that cattle manure naturally contained pathogenic E. coli O157:H7, which in humans can cause internal bleeding and kidney failure.

At the conference, I sat in on a speech by the university's Ann Clark, associate professor of crop science. "The Walkerton tragedy was not caused by pathogenic E. coli," she said, "and certainly not by the unfortunate farmer (whose cattle produced it), nor even by the regrettable mismanagement of the water treatment system.

It was caused, she said, by the "pervasive practice" of feeding grain to beef and dairy cattle to augment their growth.

She based her comments on a study undertaken at Cornell University in upstate New York that is reported on the university's website on Sept. 10, 1998 at [www.news.cornell.edu/U\\_Search.html](http://www.news.cornell.edu/U_Search.html).

The report says most types of E. coli bacteria won't harm humans because they are killed by human stomach acids. But E. coli O157:H7 has developed an immunity to such acids, and the immunity was acquired in the colons of grain-fed cattle.

According to James Russell, the lead researcher and a microbiologist with the U.S. Department of Agriculture as well as an adjunct professor of microbiology at Cornell, grain ferments in the colons of cattle because they can't digest starch very well. The fermenting creates acetic, propionic, and butyric acids, and the E. coli bacteria that reproduce and grow in that acidic environment develop an acid resistance that allows them to survive human stomach acids.

"The carbohydrates of hay are not so easily fermented, and hay does not promote either the growth, or the acid resistance of E. coli," the report says.

The Cornell studies found that "beef cattle (that were) fed grain-based rations typical of commercial feed lots had one million acid-resistant E. coli per gram of feces." Cattle fed hay or grass had E. coli bacteria, but none of them were the acid resistant strain, and all of them were killed "by an acid shock" that mimicked the human stomach," the report says.

Cattle have been fed high-grain, growth-promoting diets for more than 40 years, Russell points out in the report, and that has given E. coli O157:H7 ample opportunity to evolve into its deadly form.

Dairy cattle are generally fed a mixture of hay and corn silage. They need the fibre from hay to remain healthy and productive. But the studies also found that when the grain content of their feed was 60 per cent, "they also had high numbers of acid-resistant bacteria."

When beef cattle were fed hay for five days before they were slaughtered, "acid-resistant E. coli could no longer be detected," the report says. That would make them safe for consumption. But what about the acid-resistant E. coli left in manure while the cattle were being fed grain? Will those bacteria find their way into ground water? And into drinking water? The Cornell report provides the answer. "Recent work indicates that swimming pools and water parks can be contaminated," it says. And when fruit and vegetable fields are fertilized with manure, "E. coli O157:H7 can enter the human food supply."

The Cornell studies are one more example of what Clark calls linear thinking -- seeing problems and solutions as one-dimensional. But in a world where everything is linked to everything else, nothing is one-dimensional, and so-called solutions have ripple effects that are impossible to predict.

It's something to bear in mind as biotech firms and corporate food giants keep proclaiming the safety of genetically modified food. Just as happened with grain-fed cattle, they can't possibly know all consequences. What they're proposing is an experiment to be conducted on humanity and on the environment.