



RESEARCH FACTS

RESEARCH & TECHNOLOGY DEVELOPMENT FOR THE CANADIAN BEEF INDUSTRY

Seeking a Solution to E. coli 0157:H7

Project Title:

Use of Bacteriophage to Control E.coli 0157:H7 in Beef Cattle and the Environment

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Bacteriophages (phages) are viruses that infect bacteria, frequently destroying the bacteria in the process. Phages were first discovered in 1915 and early researchers recognized that their bacteridestroying ability might be harnessed to attack bacteria that cause infectious diseases in humans and agriculturally important plants and animals. Although research into phage therapy was mostly dropped when antibiotics were discovered, there has been renewed interest in phage therapy as antibiotic resistance of bacteria has arisen.

E.coli bacteria are a type of bacteria commonly found in the intestines of all animals, including humans. The bacteria are shed in manure. E.coli 0157:H7 is one strain of the bacteria and is commonly found in farm animals, including cattle and wildlife. While E.coli 0157:H7 doesn't cause illness in the host animal, it can cause severe illness in humans, including bloody diarrhea and kidney failure. Water, vegetables and meat contaminated with manure have all been ways that E.coli 0157:H7 has been transmitted to humans. Finding a way to prevent cattle from shedding E.coli 0157:H7 could help protect human health.

In the project Use of Bacteriophage to Control E.coli 0157:H7 in Beef Cattle and the Environment, three phages known to infect E.coli bacteria were isolated for study, and a technique for multiplying them was developed. One of the phages destroyed significantly more E.coli bacteria than the others (92- 97 per cent vs. 33-38 per cent or fewer). The study also examined the safety of the phages and it was found that they did not carry the disease-causing factors that some E.coli strains such as 0157:H7 possess.

The strength of the phage solutions declined significantly under highly acidic conditions like those that are found in the true stomach of cattle. This indicates that to be effective, a means would have to be found to protect orally-administered phage therapy from stomach acids. There was no negative effect of the phage therapy on rumen fermentation.

Studies were conducted to test the E.coli-reducing impact of the phages both in the digestive tract of live animals (sheep) and in water, with mixed results. When sheep that were given the phage were compared to sheep that had not received the phage, total coliform and E.coli populates in the feces (manure) didn't change. In a second trial, sheep were inoculated with E.coli 0157:H7 and either received or didn't receive the phage. In this trial, E.coli 0157:H7 shedding was actually lower in the animals that didn't receive the phage. This was attributed to the phage being administered after the E.coli 0157:H7. A third trial was undertaken where multiple doses of the phage were administered both before and after the dosing with E.coli 0157:H7. In that trial the phage was

successful in reducing shedding of E.coli 0157:H7.

In water, phages reduced E.coli 0157:H7 when no fecal material was present in the water but had no effect when fecal material was present.

This project provided more information on phage therapy and indicated that it may have some potential for reducing shedding of E.coli 0157:H7 in ruminants such as cattle and sheep. Further research could one day lead to a practical application in cattle production.

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