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## Opportunities for Reduction of *Escherichia coli* O157:H7 in Dairy Cattle

Ground beef is the most consumed beef product in the world. In the United States, the annual per person consumption is estimated to be 67 pounds. If we multiply 67 pounds by 314,000,000 million people in the country that means 21 billion pounds of ground beef consumed per year. Recent data from the USDA indicates that almost 25% of the U.S. beef supply comes from the dairy industry. Beef provides the primary market for culled dairy cows and heifers. It is important for the dairy industry to recognize that milk is the primary product but that we need to pay attention to the management of dairy cows that will go into the food chain.

Food borne illnesses are a serious, justifiable concern to consumers. Ground beef normally gets the most attention due to the increased publicity and volume of product recall. The primary organism behind the recall is *Escherichia coli* O157:H7. This organism can be deadly for some individuals and the meat processing industry has taken the threat seriously. Processors have developed numerous methods to reduce the incidence of *Escherichia coli* O157:H7 in beef products and these methods have been successful (Table 1). Until recently, the focus has been to prevent contamination at the processor level. The conditions for organism proliferation can be affected in the living animal which has resulted in more attention to opportunities for the dairy to reduce the incidence of *Escherichia coli* O157:H7 in the live animal. Less *Escherichia coli* O157:H7 in the live animal means less opportunity for product contamination.

Elimination of *Escherichia coli* O157:H7 has been suggested by some researchers as a possibility in animals. While this is a worthy goal, the organism and where it can live presents significant challenges that make eradication impossible. The organism is present in a variety of animals not just cattle and has even been identified in wildlife. The organism is also able to survive in environmental sources that provide a constant source of contamination. A more achievable goal would be to reduce both magnitude and prevalence of fecal excretion or shedding by the animal. This goal would be addressed primarily by management practices of the live animal in the production environment.

*Escherichia coli* O157:H7 can often be found on farms in manure, soil, water sources, bedding, and certain areas in barns. All of these sources can be opportunities of infection. If producers can eliminate or significantly reduce the presence of *Escherichia coli* O157:H7 in these areas then the likelihood of exposure is reduced. This can most often be accomplished through on farm cleanliness and sanitation procedures. Bedding should be removed and replaced regularly. Freestalls can be significant sources of contamination. Attention to cleanliness in all areas of animal contact should be a priority. The organism has been shown to be more prevalent in areas that are heavily contaminated with manure and have the opportunity to remain wet. The goal is to routinely clean areas where conditions are favorable for organism growth and make efforts to keep open lots and loafing areas as dry as possible.

Water sources are one of the most common areas of contamination. Multiple research articles document a correlation between water contamination and the presence of the organism in animals that have been drinking from the water source. Some of the same studies have examined a variety of water treatment options to eliminate the organism with only limited success. The most reasonable option is still to maintain cleanliness of water sources as much as possible. This objective is much easier in dairy facilities where receptacles are accessible and can be cleaned regularly. Dairy farms are primarily confinement operations where the waters are routinely cleaned. Attention to this detail is significant in reducing the opportunity for bacterial growth which can have a detrimental effect on production in dairy cows.

Feed and feed components have been suggested as a source of *Escherichia coli* O157:H7 contamination and subsequent animal infestation. Some feeds even though not contaminated act as modifiers of the digestive system that can result in increased microbial population. The reasoning has been that some feeds will modify the gastrointestinal tract to favor the growth of *Escherichia coli* O157:H7. Feeding trials have realized controversial results. Some older studies suggested that the feeding of cottonseed and clover reduced fecal excretion of *Escherichia coli* O157:H7. Subsequent studies then reported that cottonseed in the diet actually increased shedding of the organism. One controversial study that appeared in *Science* in 1998 (Diez-Gonzalez et al.) compared high concentrate diets to high forage diets. The authors claimed that switching from high concentrate to high forage shortly before slaughter would reduce the incidence of *Escherichia coli* O157:H7 excretion in the feces. This study is the most often quoted by those that promote a grass fed beef product. Subsequent studies have not been able to produce repeatable results of that study.

*Lactobacillus acidophilus* culture has repeatedly been shown to be effective at reducing *Escherichia coli* O157:H7 in feedlot cattle in some cases as high as 50%. This is a commercially available product and is currently fed in most large cattle feedlots in the U.S. *Lactobacillus acidophilus* is classified as a probiotic. A probiotic is a product that contains defined microorganisms in sufficient numbers that alter the microflora in a compartment of the host and exert beneficial health effects. Probiotics are often used after a significant antimicrobial treatment regime to replace the beneficial microflora of the gastrointestinal system.

*Escherichia coli* O157:H7 is a significant health concern for producers and consumers. Reduction in incidence must be a team effort throughout the production chain. The dairy can and should implement farm practices that reduce infestation opportunities for cows and heifers. The packing industry can continue to implement proven multiple hurdle methodologies to reduce final product contamination. However, it is impossible to remove the organism completely which means there is still the opportunity for product contamination. The consumer has the final responsibility, which is to handle and cook the product correctly to an internal temperature of at least 165 degrees Fahrenheit. If all segments work together, the threat of *Escherichia coli* O157:H7 contaminated meat will be minimal. The dairy industry must be part of the solution in order to maintain the opportunity to market animals to the beef industry in order to continue to improve the bottom line.