

FOODBORNE ILLNESS

Consumers in the United States have the safest food, including meat, in the world. Even though many activities such as driving or swimming are much more life threatening than eating a meat product, modern consumers want zero possibility of becoming sick from their food. Consumers will buy food they believe to be safe. However, when an outbreak of foodborne illness occurs, consumers nation wide avoid the associated food product. Beef producers need to understand and be aware of the major food pathogens associated with beef. Several pathogenic bacteria live in the intestinal tract of healthy livestock. These include *Erscherichia coli*, *Campylobacter* and *Salmonella*.

E. coli 0157:H7

The *E. coli* family occur commonly in the gastro-intestinal system of man and animals and is used as a indicator organism for fecal contamination of food and water. In the early 1980's, *E. coli 0157:H7* emerged as a source of serious illness in humans who have eaten undercooked ground beef. *E. coli 0157:H7* causes acute bloody diarrhea, abdominal cramps and hemolytic uremic syndrome (HUS) which may develop into chronic kidney failure or neurological impairment. Death occurs in approximately 3-5% of the persons with HUS (1). *E. coli 0157:H7* is unique in that it requires very few bacteria to cause illness. In comparison, other pathogens require millions of bacteria to cause illness.

Product contamination occurs during the skinning and enviscerating part of the slaughter process. Reported *E. coli 0157:H7* outbreaks have increased in recent years. This doesn't necessarily mean that the problem has increased, but rather the ability to detect the disease in humans has improved, thus increasing the number of reported cases. Increased frequency of testing, improved slaughter processes, and stringent food safety programs provide consumers with the safest meat products to date. However, a serious pathogen outbreak can mean economic loss to the livestock and meat packing industries.

At this time it is unknown how livestock become carriers of *E. coli 0157:H7*. The bacteria can be spread from one animal to a whole herd, from wildlife (deer) to cattle or from cattle to deer (8). Sporadic in livestock, *0157:H7* ranges from 0-28% infection rates in individual herds and has the highest rates in the summer months. Animals carrying *E. coli* do not show any signs of illness (5). Manure application to forage crops has had little effect on the incidence of *E. coli*, yet *0157:H7* can survive for almost two years in manure which provides reason enough to manage manure properly (4, 6).

Salmonella

Salmonella has been recognized as a leading cause of gastroenteritis in humans for over 100 years. *Salmonella* is widely dispersed with humans and animals being the primary hosts. Although, the majority of illnesses have been linked to poultry and poultry products, livestock can harbor the bacteria which can contaminate meat products during processing. One study discovered that 45% of the rumen contents of healthy cattle were found to contain *Salmonella* (3). In addition, livestock feeds are high in *Salmonella* with an incident rate of 49% (2). Polluted water may also serve as source. The Food Safety Inspection Service has initiated a *Salmonella* testing program for cow and bull slaughter plants and for ground beef processing plants.

Campylobacter

Campylobacter are an important cause of foodborne illness and may be the greatest cause of acute bacterial diarrhea in humans. A high percent of meat animals carry the organism in their intestinal tracts. One study indicates that 80% of dairy operations and almost 40% of individual

livestock are positive with the organism (10). This bacteria contaminates many different types of raw meats and traditionally has not been well understood. Recent advances in technology have made it easier and more cost effective to test for *Campylobacter* in raw meat products. Control of this organism will become more important in the future.

CONTROL OF PATHOGENIC BACTERIA

Current control methods of pathogenic bacteria have been at either the processing facility or the consumer level. Many processors use top of the line technology such as hot water or steam pasteurization cabinets, steam vacuums, pre-evisceration wash with organic acids, organic acid rinse cabinets, antimicrobial additives and efficient chilling systems. The Food and Drug Administration's approval of irradiation of meat, should significantly decrease the incidence of foodborne illness if the irradiated meat is accepted by consumers.

A vaccine or feed additive is the most logical control method to prevent pathogenic bacteria at the farm or ranch level. A feed additive that looks promising for control of *E. coli* 0157:H7 and *Salmonella* is sodium chlorate. Sodium chlorate could be added directly into the drinking water shortly before slaughter. Recent research shows this would reduce pathogenic bacteria 150-fold, is inexpensive and causes no adverse effects to the animal (7).

Good sanitation practices are beneficial in preventing the spread of pathogenic bacteria. Regular cleaning of watering troughs, maintaining a clean water source, having a good pest (fly) control program, and protecting feed from rodents and birds will help prevent pathogen contamination at the farm



level. The greatest source of contamination is from the hide during the skinning process. Livestock producers have direct control over the cleanliness of their animals. Freezing, wet, muddy conditions for extended periods of time cause "tags" or manure clods to form on the hide. Tags can range in size between 1" to 6" in diameter depending upon the severity of the physical and weather conditions. Heavy tagging on the hide makes skinning the animal very difficult and causes increased contamination during the skinning process. Tagging can be minimized by maintaining the feeding area. Properly constructed mounds and controlled runoff ensure dry bedding areas for livestock. Winter snow removal prevents extreme muddy conditions and minimizes tag buildup. Good livestock husbandry practices equate to clean pens, clean hides, clean carcasses and clean food.

Educating the consumer about foodborne illness is important. Consumers know that they must cook chicken thoroughly or there is a high probability of contracting *Salmonellosis*. Yet, it is still a common practice to eat ground beef products rare. Educating the consumer to cook ground beef products to 165° F (well done) is a must and will be a continual process. The "Safe Handling Instructions" are helping to educate consumers. The following label must appear on all retail meat products:

Safe Handling Instructions

This product was prepared from inspected and passed meat and/or poultry. Some food products may contain bacteria that could cause illness if the product is mishandled or cooked improperly. For your protection follow these safe handling instructions. Keep refrigerated or frozen. Thaw in refrigerator or microwave. Keep raw meat and poultry separate from other foods. Wash working surfaces (including cutting boards), utensils and hand after touching raw meat or poultry. Cook thoroughly. Keep hot foods hot. Refrigerate left overs immediately or discard.

This statement is not intended to scare consumers away from meat products but to remind them to use sanitary practices while handling meat products, thus preventing foodborne illness.

CONCLUSION

Food safety efforts need to begin with the producer and extend through the processor to the retailer and the final preparation of the meat. All have a role to play in public health. Currently producers can use good management practices such as maintaining good pest control, cleaning water troughs regularly, maintaining a clean water source and minimizing mudding conditions..

REFERENCES

1. United States Food and Drug Administration's Center for Food Safety and Applied Nutrition. 2001. *The Bad Bug Book*. <http://vm.cfsan.fda.gov/~mow/intro.html>
2. Graber, G. 1991. Control of *Salmonella* in animal feeds. Division of Animal Feeds, Center for Veterinary Medicine, Food & Drug Administration. Report to the National Advisory Commission on Microbiological Criteria for Foods.
3. Grau, F. H., Brownlie, L. E., 1986. Effect of some pre-slaughter treatments on the *Salmonella* population in the bovine rumen and feces. *J. Appl. Bacteriol.* 31:157-163.
4. Hancock, D. D., Rice, D. H., Herriott, D. E., Besser, T. E., Ebel, E. D., Carpenter, L. V., 1997. Effects of farm manure handling practices on *Escherichia coli* 0157:H7 prevalence in cattle. *J Food Prot.* 60:4 p. 363-366.
5. Hancock, D. D., Besser, T. E., Rice, D. H., Herriott, D. E., 1997. A longitudinal study of *Escherichia coli* 0157 in fourteen cattle herds. *Epidemiol. Infect.* 118 p. 193-195.
6. Kudva, I. T., Blanch, K., Hovde, C. J. 1998. Analysis of *Escherichia coli* 0157:H7 survival in ovine or bovine manure and manure slurry. *Appl. Env. Mirco.* 64:9 p. 3166-3174.
7. Mcgraw, L. 2001. Reducing *Salmonella* and *E. coli* 0157:H7 at the farm. *ARS News and Information*.

8. Sargeant, J. M., Hafer, D. J., Gillespie, J. R., Oberst, R. D., Flood S. J. A., 1999. Prevalence of *Escherichia coli* 0157:H7 in white-tailed deer sharing rangeland with cattle. *JAVMA* 215:6 p. 792-794.
 9. Schroeder, T. C., Marsh T. L., Mintert J., 2000. Beef Demand Determinants. Report Prepared for the Joint Evaluation Advisory Committee. Kansas State University.
 10. Wesley I. V., Wells, S. J., Harmon, K. M., Green, A., Schoeder-Tucker, L., Glover, M., Siddique, I., 2000. Fecal shedding of *Campylobacter* and *Arcobacter spp.* in Dairy Cattle. *Appl. Env. Mirco.* 66:5 p.1994-2000.
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