



Western Beef Resource Committee

Cattle Producer's Library

Quality Assurance Section

CL213

Food Safety and Quality Assurance From the Farm to the Table

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Food safety has become an important issue in today's society. Lives have been lost, companies have gone bankrupt, and employees have lost their jobs because of foodborne illness outbreaks. In order to ensure the safety of meat products, the Federal Meat Inspection Service has initiated such programs as Hazard Analysis Critical Control Point (Sanitation Standard Operating Procedures) and Zero Tolerance in all slaughter and processing plants. Realizing this is not enough, researchers and government agencies are trying to find ways to implement these programs from the farm to the table.

Most food safety outbreaks are traceable to the processing or slaughterhouse but cannot be traced to individual feedlots or ranches. Outbreaks of foodborne illness become headlines in every form of media. There is a correlation between the numbers of outbreaks linked to ground beef and the demand for beef. Therefore, livestock producers should be interested in finding methods to prevent pathogenic bacteria at the farm level and be aware and supportive of advances in technology that ensure safe food. However, producers should realize that the only payback would be fewer illnesses, increased consumer confidence, and increased demand for beef.

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 chance of becoming sick from their food.

Consumers will buy food they believe to be safe. However, when an outbreak of foodborne illness occurs, consumers nationwide will avoid the associated food product. As beef producers we must understand and be aware of the major food pathogens that our healthy livestock could be harboring. Several patho-

genic bacteria live in the intestinal tract of healthy livestock including *Erscherichia Campylobacter* sp. and *Salmonella* sp.

***Erscherichia coli* 0157:H7**

Since the early 1980s, *E. coli* 0157:H7 has caused serious illness in humans who have eaten undercooked ground beef. *E. coli* 0157:H7, a gram negative rod that produces shiga-like toxin(s), causes acute bloody diarrhea, abdominal cramps, and hemolytic uremic syndrome (which may develop into chronic kidney failure or neurological impairment). Death occurs in approximately 3 to 5 percent of the persons with *E. coli* 0157:H7 (Center for Disease Control and Prevention 2000).

Product contamination occurs during the skinning and eviscerating part of the slaughter process. Interestingly enough, *E. coli* 0157:H7 outbreaks have increased in recent years. This doesn't necessarily mean that the problem has increased, but rather that the technology to detect the disease in humans has improved, thus increasing the number of reported cases. In actuality, 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 meatpacking industries.

At this time it is unknown how livestock become carriers of *E. coli* 0157:H7. Bacteria can be spread from one animal to a whole herd, from wildlife (deer) to cattle, or from cattle to deer (Sargeant et al. 1999). Sporadic in-livestock *E. coli* 0157:H7 ranges from 0 to 28 percent infection rates in individual herds, has the highest rates in the summer months, and has not been linked to sick or injured animals (Hancock et al. 1997a). Manure application to forage crops has had little effect on the incidence of *E. coli* 0157:H7. It can survive for almost two years in manure, which provides reason enough to manage manure properly (Hancock et al. 1997b; Kudva et al. 1998).

Salmonella sp.

The infamous *Salmonella* sp. are small, gram negative, non-sporing rods, which have 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 percent of the rumen contents of healthy cattle were found to have *Salmonella* (Grau and Brownlie 1986). In addition, livestock feeds are high in *Salmonella* sp., with an incident rate of 49 percent (Graber 1991). 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 sp. are an important cause of foodborne illness and may be the greatest cause of acute bacterial diarrhea in humans. A major percentage of meat animals have been known to carry the organism in their intestinal tracts. One study indicates that 80 percent of dairy operations and almost 40 percent of individual livestock are positive with the organism (Wesley et al. 2000). 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 *Campylobacter* sp. 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 decrease the incidence of foodborne illness.

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* sp. 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 (McGraw 2001).

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 foodborne illness at the farm level.

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 hands after touching raw meat or poultry. Cook thoroughly. Keep hot foods hot. Refrigerate leftovers immediately or discard.

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

Foreign Objects Contamination

Foreign objects enter beef products during livestock processing, accidents, neglect, and poor management. Although very low incidence occurs, most foreign object contamination can be prevented or corrected with immediate response by removing the foreign object from the animal. Objects should be removed by veterinarians or other trained personnel. Buck-shot, injection needles, implant needles, scalpel blades, tranquilizer darts, archery broad heads, and .22 caliber and other bullets have been found inside meat during processing and consumption (Figs. 1, 2, and 3).

Buck-shot, bullets, and archery broadhead arrows can enter the animal from hunters or from cowboys who use pistols loaded with buck-shot to round up wild cattle in rough country. Accidents, such as breaking a needle



Fig. 1. A tranquilizer dart found imbedded next to the pelvis. Apparently, the animal was shot through the rectum.



Fig. 2. Four .22 caliber bullets, a broken scalpel, buckshot, an implant needle, and an unidentified object were all recovered from beef carcasses during processing.

while vaccinating livestock, are not uncommon. It is important that broken needles are removed from the animal.

Processing facilities have metal detectors that prevent larger objects from reaching the consumers. Small objects, such as buckshot, or nonmetallic objects, are difficult to prevent from reaching the consumers. Foreign objects cost processing companies millions of dollars in claims, condemned product, and downtime. Consumers lose confidence in beef products, and these costs are carried on to the producer indirectly through lower demand.

Conclusion

In comparison to other meats and raw meat products, ground beef and beef products typically have lower bacteria numbers. *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. Producers should be concerned about food safety issues and be supportive of research and technology that will help find solutions to the problems. Currently, producers can use good management practices, such as maintaining good pest control, cleaning water troughs regularly, and maintaining a clean water source. Also, producers should support new technology and food safety education efforts.



Fig. 3. Two injection needles found in beef carcasses.

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