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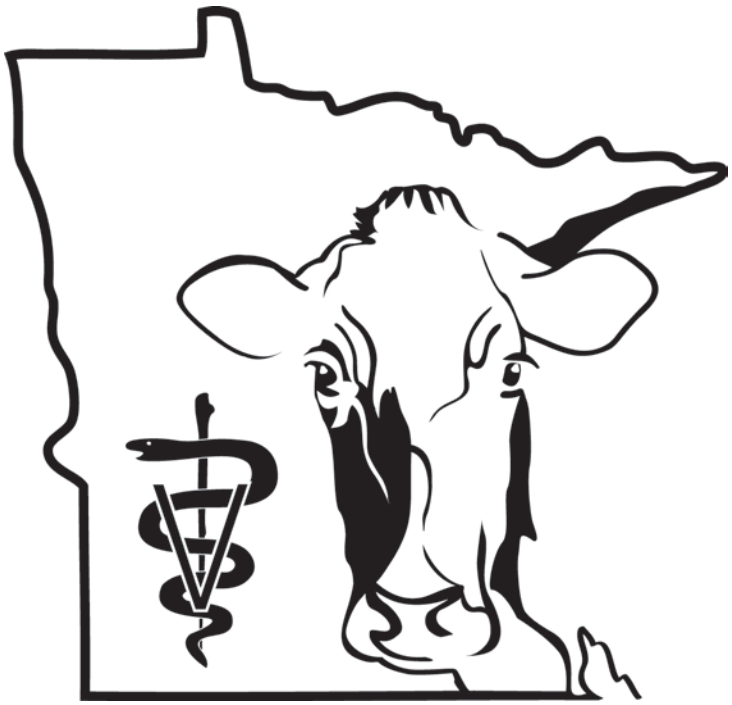

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LIVING WITHOUT Escherichia coli 0157:H7

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The primary purpose of this presentation is to help define the role of cattle as a source of *E. Coli* in food products. Although different modes of transmission from cattle to humans are discussed, concentration is on the vehicle most frequently implicated in human disease outbreaks, ground beef.

Future Directions

- Would a geographic pattern in the number of 0157 cases in humans tell something about 0157 prevalence in cattle?

It is unlikely that any geographic pattern of human disease would reflect a geographic variation in the source of the 0157 contaminated ground beef. In many cases the location of consumption of ground beef is not related to the original location of the sources of that ground beef nor to the potential sources of 0157 contamination. Cattle that go into ground beef production may be moved great distances in the hours prior to slaughter, lean and fat trimmings may be shipped some distance prior to final grinding and mixing, and the final product may in turn be widely distributed.

- How can we explain the seasonality of human cases and outbreaks associated with ground beef?

The seasonality of cases and outbreaks associated with ground beef might be a reflection of any one or a combination of factors. First, there may be greater shedding of 0157 by cattle during warmer months of the year, which may lead to increased contamination of ground beef during these months. Second, consumption of ground beef is higher during warmer months (summer barbecues, picnics, etc.). Third, there may be a greater likelihood of temperature abuse and/or less thorough cooking of ground beef during these months.

- Is there a particular channel in the ground beef production continuum that is associated with an increased risk of 0157 contamination?

Ground beef intended for both retail and HRI can pass through various channels which may include a number of different steps. Although additional handling creates more opportunities for cross-contamination, no one channel can be singled out at this time as posing a greater risk.

- Should the goal be to eradicate 0157 on the farm?

It does not currently appear feasible to target on-farm eradication of 0157 for the following reasons: the lack of knowledge about the ecology of 0157, the widespread geographic distribution of the organism, the fact that 0157 has been found in both beef and dairy cattle, and the difficulty of identifying infected animals because of the likelihood of sporadic shedding and the absence of clinical disease. Since the risk of 0157 illness cannot be eliminated at this time, it must be managed.

- How can the risk of 0157 illness best be managed?

A general approach to manage the risk of 1057 illness attributable to ground beef is: 1) to reduce the level of 0157 on the farm, and 2) to better understand different channels of the ground beef production system and use this knowledge to identify critical points at which intervention would be most effective. To gain a better understanding of the system, specific questions that need to be addressed include: a) how does the number of steps involved in the production of ground beef affect the risk of contamination?, b) how does the risk change as ground beef moves through the system?, and c) what is the volume of ground beef that flows through the various channels? If it is possible to identify one or two points along the continuum that can be associated with an increased risk of 0157 contamination, then research can be focused on those specific channels.

- Where should attention be focused?

Attention should be on what occurs just prior to slaughter. Because shedding of 0157 may be sporadic, cattle that test 0157 negative on the farm may test positive just prior to slaughter. This is especially plausible in light of the many stress factors to which cattle are subjected between leaving the farm or feedlot and slaughter. Although it is not known if cattle that are not shedding 0157 at the time of slaughter can be a source for ground beef contamination, animals which are shedding can be a factor in such contamination. Thus, individual cattle should be followed and sampled at various points after leaving the farm. Sampling at the auction barn, feedlot, after unloading at the slaughter plant, and immediately before slaughter may provide valuable information about shedding patterns. The cleanliness of animals entering the slaughter facility is also an important consideration. Contamination of the hide and haircoat with mud and feces may provide 0157 with an additional mode of entry into the slaughter facility via either culture-positive or culture-negative animals.

- What other types of preharvest research should be recommended?

Research should concentrate on the ecology of 1057 in the gastrointestinal tract of ruminants, specifically to assess the effects of stressors such as dietary changes and movement of animals. The ecology of 1057 in the farm environment also needs further research. Since previous studies of management factors, such as the use of ionophores, have not been definitive, further work is needed to address the effects of management factors on the prevalence of 0157. Competitive exclusion, the administration of protective intestinal microorganisms known as probiotics, should also be evaluated as an intervention strategy. Probiotics can protect poultry from colonization by

human enteropathogens, including 0157. Results of studies on the use of probiotics in cattle have been variable. None of the currently available probiotic feed supplements for cattle marketed in the U.S. has met the regulatory requirements for demonstration of prophylactic or therapeutic claims.

- What about postharvest research?

Emphasis should be placed on identifying and monitoring where and how contamination occurs. The Hazard Analysis and Critical Control Point (HACCP) system should continue to be developed and implemented as a preventative food safety assurance system. HACCP principles should be applied not only at slaughter and grinding facilities but also at other points along the continuum including shipment between locations and storage. The intent would be to ensure that a product leaving a certain phase of production or location is as safe or safer than when it entered.

- What about tracebacks?

Tracebacks have been proposed as an important component of a food safety agenda. In the case of 0157, tracebacks could provide valuable information about on-farm factors and production processes associated with the organism, as well as about the ecology of 0157. However, from an immediate disease prevention perspective, tracebacks would currently be of uncertain value. Not enough is known about the ecology of 0157 in cattle to implement prudent, on-farm measures to prevent future contamination. Tracebacks involving ground beef would be especially difficult to carry out to the farm level with a high degree of precision. Even given a highly dependable system of individual animal identification, the complexity of production and distribution channels for ground beef tends to make the determination of individual animal contributions to any given pound of product a difficult process.