Escherichia Coli O157 Prevalence in Animals

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Abstract: evidence to date suggests that dairy animals may be the primary reservoir of E. coli serotype 0157:H7. Further investigations of infected herds are necessary to understand the ecology of this organism in dairy and beef herds, the mechanisms by which meat and milk become contaminated, and the potential for herd-based control measures to prevent this growing public health problem.

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Introduction

Enterohemorrhagic Escherichia coli O157:H7yNM (EHEC O157) may cause severe disease and death in humans (1, 2). Human infection and outbreaks from EHEC O157:H7 have been attributed to the consumption of undercooked beef food products as well as various other foods, such as unpasteurized apple cider (3–5). Since 1982, more than 100 outbreaks of EHEC O157 have been documented (6). Of those outbreaks, 52% have been attributed or linked to foods derived from cattle (6). Cattle have been implicated as the primary reservoir of EHEC O157 (7, 8). Prevalence surveys conducted on fed cattle estimated the overall fecal prevalence of EHEC O157 to be very low (7, 9). The largest survey of fed cattle conducted to date found only 1.8% of fecal samples to contain EHEC O157 (10). However, it was noted in this study that 63 of 100 feedlots had at least one positive fecal sample, indicating widespread distribution of EHEC O157. Recent studies using improved enrichment and isolation procedures have indicated that the overall prevalence of EHEC O157 infection in cattle may be significantly higher than originally estimated (8, 11, 12). These studies found that peak EHEC O157 fecal shedding rates occur during summer and early fall, and they vary from a low of 0% to as high as 61% on some farms. To date, no factors have been identified, other than season, that consistently affect the EHEC O157 shedding rates of cattle. Studies have been completed to determine the prevalence of EHEC O157 in cattle feces and on carcasses during slaughter processes (7, 13). From cattle presented for slaughter in the United Kingdom, 0.83% of 6,495 bovine fecal samples were positive for EHEC O157 (13). A study at an abattoir in South Yorkshire found 4% of rectal fecal swabs positive for EHEC O157 (7). Of 23 animals with positive rectal swabs, 30% also tested positive for EHEC O157 on carcasses by sampling neck trimmings and swabbing an adjacent area. Another 8% of adjacent carcasses from fecal negative cattle also tested positive, suggesting another source of carcass contamination (7). A study conducted by the U.S. Department of Agriculture Food Safety and Inspection Service reported only 4 of 2,081 (0.2%) randomly sampled postprocessing beef carcasses contaminated with EHEC O157 (14). Fecal, hide, and carcass prevalence at and during processing may have been underestimated in the past, because of a lack of highly sensitive and specific methods for the isolation EHEC O157 from those matrices. The origins and subsequent rate at which EHEC O157 carcass contamination occurs have not been well established. Hazard Analysis–Critical Control Point plans can and are being used to decrease the risk of food-borne illness by intervening at stages of processing that pose a plausible risk of carcass contamination. However, these plans require adequate microbiological data if they are to allow confident conclusions regarding the effectiveness of control programs for food-borne pathogens. This study was designed to address the following question: Is the EHEC O157 infection status of beef cattle presented for slaughter reflected in levels of carcass contamination detected after slaughter on a population basis? Specific goals of this study were to (i) estimate EHEC O157 frequency in feces and on hides from beef cattle presented for slaughter in the U.S., (ii) identify the relative rates of EHEC O157 contamination of beef carcasses during processing, and (iii) determine whether a relationship exists between EHEC O157 prevalence in feces andyor on hides to carcass contamination during slaughter processes.

Escherichia coli serotype 0157:H7, which produces Shiga-like toxin (SLT), also known as verocytotoxin, is a known cause of hemorrhagic colitis and hemolytic uremic syndrome (HUS). It is capable of causing the full spectrum of disease, ranging from

asymptomatic carriage to HUS and thrombotic thrombocytopenic purpura (11). Consumption of raw milk and ground beef has been linked epidemiologically with several outbreaks of disease caused by E. coli 0157:H7 (3, 12,), and the outbreak strain has been recovered from implicated beef products in two outbreaks (12,). In 1986, we isolated E. coli 0157:H7 from the feces of young cattle on dairy farms associated with two cases of HUS associated with raw milk consumption (18). During a milkborne outbreak of gastroenteritis and HUS caused by E. coli 0157:H7 in Canada, the organism was recovered from the feces of patients and from the feces of young cattle in dairy herds associated with the outbreak (3). Other SLT-producing E. coli (SLTEC) isolates have also been associated with dairy cattle (5a,). Although E. coli 0157:H7 has been cultured from a variety of retail meat products (7), dairy cattle, a source of both raw milk and beef products, are a likely reservoir. We explored the possible role of dairy cattle in SLTEC-associated disease during the epidemic investigation of an outbreak of hemorrhagic colitis, HUS, and thrombotic thrombocytopenic purpura associated with beef consumption in Washington State and a more detailed investigation conducted of the dairy farms associated with the two sporadic cases of HUS associated with raw milk consumption in Wisconsin.

Infection with *E. c o l i* 0157:H7 presents with a wide spectrum of clinical manifestations, including severe abdominal cramps with little or *no* fever and watery diarrhea that often progresses to grossly bloody diarrhea [1].

Infection can be asymptomatic or can present with only nonbloody diarrhea [2]. Extra intestinal involvement, including cardiac and neurologic manifestations, has been reported, and infection can be associated with the hemolytic-uremic syndrom and thrombotic thrombocy-topenic purpura. The disease can be fatal [3].

Esherichia coli comprises a group of bacteria found in the intestines of humans, animals and birds, *E. coli* 0157:H7 strain produces potent toxins and can cause food born pisones to person transmitted disease after ingestion of very low numbers of microorganism *E. coli* 0157:H7 was first identified as a human pathogen in 1982 [4].

Griffin and Tauxe, [5], a recorded reported that strain of *E. coli* infection is more often reported in the young, illness signs are bloody diarhreae, severe abdominal pain, low grade of fever and vomiting. The major source of food born *E. coli* 0157:H7 cited disease is undercooked grand beef. Roast beef, roast ducks, raw milk and water an out break of the disease in persons who had eaten fast food in these restaurant chain. Marks and Robert, [6], reported that the cytotoxins of *E. coli* 0157:H7 production seems to be important factors in the pathogenesis of disease. These cytotoxins are among the most potent bacterial toxins. These toxins in active host cell ribosomes disrupting protein synthesis and causing cell death [7].

Conclusion

Prevention of illness is especially critical in addition to strategies designed to prevent food born illness. Controlled production of live animal, meat processing relatively little information is available on clinicopathological changes in experimental animals with this disease.

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