Survey for Verotoxic *Escherichia coli* in Preharvest Beef Production Environments in South Dakota

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**Summary**

Evaluation of fecal swabs from 140 slaughter beef animals in South Dakota in the months of July through September 1993 and 1994 did not yield any *Escherichia coli* O157:H7. In like manner, the evaluation of 126 ground beef samples was negative for this microorganism. Fecal swabs and ground beef samples were obtained from all sections of the state. The slaughter facilities were inspected by the South Dakota Department of Agriculture’s Animal Industries Board. There were 167 isolates of strains of *E. coli* with the gene for production of verotoxins. The significance of these organisms to cattlemen and consumers is not known.

**Key Words:** *Escherichia coli* O157:H7, Verotoxin, Beef

**Materials and Methods**

A survey was initiated in the summer of 1993 and finished in the summer of 1994 for the prevalence of *E. coli* O157:H7 and other verotoxigenic *E. coli* serotypes. Four quadrants of South Dakota were surveyed by obtaining at least 30 fecal swabs and 30 ground beef samples from each quadrant. The summer months were chosen because the literature indicates a higher incidence of human disease from *E. coli* O157:H7 during these months. Ground beef samples were either purchased at retail or were received from samples sent to the Animal Disease Research and Diagnostic Laboratory, South Dakota State University by the SD Animal Industries Board Inspectors in the Residue Monitoring program.

The procedures approved by the US Department of Agriculture (Revision 3 of Laboratory Communication #38-*Escherichia coli* O157:H7) were used for the isolation of *E. coli* from the fecal swabs and ground beef. The 3M™ Petrifilm™ Test Kit-HEC was the key analytical device used to select stains typical of *E. coli* O157:H7. Testing with specific antisera for the O157 somatic antigen and the H7 flagellar antigen was accomplished on suspect isolates.

Probes were constructed to detect the genes coding for the two Shiga-like toxins (SLT) SLT I and SLT II) commonly found in verotoxic *E. coli*. These were constructed by the ADRDL, SDSU.

Verotoxin production by the isolates carrying the SLT I or SLT II genes is currently being determined.

The statistical evaluation for the prevalence of *E. coli* O157:H7 in South Dakota slaughter cattle and ground beef was performed by evaluation of a binomial distribution at the 95% confidence level.

**Results and Discussion**

No *E. coli* O157:H7 were isolated from more than 2,700 organisms isolated in this survey.

There were 167 cultures of verotoxigenic *E. coli* strains isolated. There were 12 strains that had the SLT I gene and 155 strains that had the SLT II gene and 2 strains that had both SLT I and SLT II genes. Due to the selection of multiple cultures from each fecal swab and ground beef sample, there were four cattle

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positive for the SLT I genotype and 36 cattle
potentive for the SLT II genotype. For ground
beef, there were three samples positive for the
SLT I genotype and 32 positive for the SLT II
genotype.

Based on the lack of isolation of *E. coli*
O157:H7 from 140 slaughter beef animals, the
level of this organism in South Dakota beef
cattle is low at any point in time. If one positive
in the 140 head had been found, an infection
rate of 0% to 2.1% could be expected at the
95% confidence level. The projected low
infection rate of South Dakota beef cattle is in
line with studies being conducted in other parts
of the United States.

The level of contamination of ground beef
available to consumers in South Dakota is low
also. Even if one sample had been found
positive, a contamination level that is between 0
and 2.3%, with a 95% confidence level, can be
calculated.

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