

Prevalence of EHEC-7 on hides of market beef cattle at slaughter

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Introduction

Cattle hides at slaughter are an important source of enterohemorrhagic *Escherichia coli* (EHEC) carcass contamination. The objective of this study was to estimate the probability for hide contamination with EHEC-7 among US market beef cows at slaughter, as well as test the effects of season and geographic region.

Materials and Methods

Hide samples (n=800) from cull beef cattle were swabbed at slaughter immediately after stunning and prior to hide removal. One hundred randomly selected cull beef cows were sampled from 2 geographically distinct beef packing plants during each season of 2015. Using a pre-moistened, sterile sponge (Speci-Sponge®; Nasco, Fort Atkinson, WI), a 1,000 cm² area over the brisket and short plate was swabbed. Back tag numbers were collected to determine state of origin, and in the analysis geographic region was dichotomized by north vs south (NvS). At sampling, 2 hide scores were assigned to assess hide cleanliness. "Hide-old" was an ordinal degree of dirtiness (1, 2, 3) and "Hide-fresh" was a binary (0, 1) score to determine whether the presence of fresh manure was visible on the hide. EHEC-7 testing was performed by the NeoSEEK™ STEC Detection and Identification test (Neogen® Corp., Lansing, MI). To measure the effects of region, season, and hide scores on EHEC-7 hide contamination, multilevel multivariable logistic regression was performed, accounting for clustering by plant.

Results

In total, EHEC O26 was detected in 16% of all swabs, EHEC O45 in 55%, EHEC O103 in 36%, EHEC O111 in 24%,

EHEC O121 in 17.5%, EHEC O145 in 21%, and EHEC O157 in 11% of the 800 hide swabs collected. Detecting EHEC O26 was significantly affected by season, where the highest odds were in fall followed by summer, spring and winter. NvS region approached significance (p=0.0511) for O26, where cattle from the north had increased odds for O26 compared to cattle from the south. The detection of EHEC O45, EHEC O103, and EHEC O111 were all significantly affected by the interaction effect of season and NvS region. EHEC O121 was significantly affected by the presence of fresh manure on the hide (p=0.0025) and season (p<0.0001). If fresh manure was present on the hide, the odds of that sample being positive for O121 were decreased (OR=0.83, p=0.0025). Odds for detecting EHEC O121 and EHEC O145 were significantly higher in the spring. Accounting for plant, the interaction effect of NvS region by season significantly affected odds for detecting O157 on hides. Cattle from the north had significantly greater odds for hide contamination by O157 in the summer compared to cattle from the south (OR=5.55, p=0.03); but in winter cattle from the south were significantly more likely to have O157 on the hides than cattle from the north (OR=30.3, p<0.0001). There were no significant differences with respect to O157 hide contamination in the spring or fall for cattle from the north or south.

Significance

These results indicated that season, region of origin, and the interaction of these factors have significant impacts on hide contamination of cull beef cattle at slaughter by EHEC.