

Factors affecting *Escherichia coli* O157:H7 hide contamination of feedlot cattle

L.G. Schneider, BS¹; G.E. Erickson, PhD²; R.A. Moxley, DVM, PhD³; D.R. Smith, DVM, PhD¹

¹College of Veterinary Medicine, Mississippi State University, Mississippi State, MS 39672

²Department of Animal Science, University of Nebraska-Lincoln, Lincoln, NE 68583

³School of Veterinary Medicine and Biomedical Sciences, University of Nebraska-Lincoln, Lincoln, NE 68583

Introduction

Shiga-toxin producing *Escherichia coli* O157:H7 (STEC O157) is an enteric bacterium that can cause severe illness in humans. Cattle are important asymptomatic reservoirs for direct or indirect human exposure to STEC O157. The STEC O157 colonize the terminal rectum mucosa (TRM) of cattle, and colonized cattle have been defined as super-shedders because while colonized they are an important source of STEC O157 to other cattle in the population. At harvest, hide-to-carcass transfer of STEC O157 presents an important risk for beef contamination and human foodborne exposure. Our objective was to determine factors that increase prevalence of hide contamination.

Materials and Methods

We analyzed a dataset with culture results of feces, TRM cells, and swabs of the hide collected during a randomized controlled study to test the effect of vaccination on STEC O157 carriage by feedlot cattle. In that study, steers (n = 504) were assigned to 63 pens (8 animals/pen) in 3 vaccination treatment regions of the feedlot. The treatments were assigned to pens within each region as follows: (1) 2 doses of vaccine (ALLVAC), (2) 2 doses of adjuvant placebo (NOVAC), or (3) commingled vaccination where 4 of the 8 steers received 2 doses of vaccine and the others were given placebo (HALFVAC). Colonization of the TRM and hide contamination with STEC O157 was measured by culture of samples collected at the abattoir 85 days post vaccination (dpv).

Fecal shedding of STEC O157 was measured by culture of feces collected from the rectum on the last day in the feedyard (84 dpv). Data were analyzed using a multilevel multivariable logistic regression in a generalized linear mixed model with random effects of pen and time block as appropriate for the level of analysis.

Results

Pen vaccination treatment was significant in both individual and pen-level analyses ($p < 0.05$). At the individual-level, neither fecal shedding nor TRM colonization with STEC O157 were significant in predicting whether steers had STEC O157 contaminated hides, (OR 1.83, $p = 0.06$) and (OR 1.36, $p = 0.40$) respectively. However, at the pen-level, each additional 10% of TRM colonized cattle in the pen significantly increased the odds for hide contamination (OR 1.17, 95% CI: 1.01-1.36, $p = 0.038$), although prevalence of fecal shedding in the pen was not associated with odds for hide contamination ($p = 0.60$).

Significance

Although fecal shedding of individual cattle might increase the risk for the organism to contaminate the hide of the same animal, this relationship did not hold up at the pen-level. These findings suggest that group-based strategies to reduce prevalence of hide contamination with STEC O157 should focus on methods that reduce prevalence of TRM colonization more so than fecal shedding.