

# Siderophore Receptor and Porin-Based Vaccine For Pre-Harvest Control of *Escherichia coli* O157:H7 in Feedlot Cattle

**A.B. Thornton**<sup>1</sup>, BS; **D.U. Thomson**<sup>1</sup>, MS, DVM, PhD; **K.L. Lechtenberg**<sup>2</sup>, MS, DVM, PhD;

**G.H. Loneragan**<sup>3</sup>, MS, BVSc, PhD; **T.G. Nagaraja**<sup>1</sup>, BVSc, MVSc, PhD

<sup>1</sup>College of Veterinary Medicine, Kansas State University, Manhattan, KS

<sup>2</sup>MVS Inc. Oakland, NE

<sup>3</sup>Division of Agriculture, West Texas A&M University, Canyon TX

## Introduction

*Escherichia coli* O157:H7, which is harbored in the intestines of cattle, is a major food borne pathogen that causes hemorrhagic enteritis and hemolytic uremic syndrome in humans. Recent data indicate that pre-harvest prevalence in groups of cattle is associated with the subsequent post-harvest contamination of carcasses. Because of this, efforts to reduce carriage of this organism in harvest-ready cattle will likely reduce the number of carcasses that are contaminated with *E. coli* O157:H7. A novel vaccine that contains siderophore receptors and porin proteins (SRP) was designed to block the passage of iron into the bacterial cell, essentially eliminating its nutrients and reducing further colonization of this pathogenic microorganism. Previous studies have shown that this vaccine significantly reduced fecal shedding and promoted an immune response in 4 month-old mixed breed calves that were orally inoculated with naladixic acid resistant strains of *E. coli* O157:H7. Further evaluation of the efficacy of this vaccine in feedlot cattle is necessary. Therefore, the purpose of this study was to examine the efficacy of the SRP vaccine on the prevalence and shedding of *E. coli* O157:H7 in feedlot cattle.

## Materials and Methods

Approximately 2,000 cattle from four feedlots in Nebraska were selected to test the vaccine. Cattle were randomly divided into 20 pens, approximately 100 cattle per pen, and were injected subcutaneously with the *E.*

*coli* O157 SRP vaccine or the placebo on days 0 and 21. Rectal fecal samples were collected on day zero, and pen floor samples were collected on days 21, 35, and 70 to determine the prevalence of *E. coli* O157:H7. On day 85, harvest was simulated and rectal fecal samples, recto-anal mucosal swab (RAMS) and hide swab samples were collected to determine the prevalence of *E. coli* O157:H7. Cattle were weighed on days 0, 21, and 85.

## Results

There was no treatment by day interaction when evaluating the LS means of proportions of cattle positive for *E. coli* O157 in both SRP vaccinates and placebo vaccinates. The fecal prevalence of *E. coli* O157:H7 averaged over time was lower ( $P=0.04$ ) in SRP vaccinated cattle (5.2%) than in control cattle (7.8%). Also, the prevalence on hides, feces, and on RAMS at harvest was higher ( $P<0.02$ ) in placebo vaccinated cattle than SRP vaccinated cattle. There was an overall 54% reduction in prevalence of *E. coli* O157:H7 in the SRP vaccinated cattle when compared to the controls. The SRP vaccination had no effect on the overall average daily weight gain of cattle.

## Significance

The SRP vaccine reduced fecal prevalence of *E. coli* O157:H7 in feedlot cattle and would be a beneficial pre-harvest control strategy to minimizing transmission of *E. coli* O157:H7.