

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Nebraska Beef Cattle Reports

Animal Science Department

January 2002

Longitudinal Patterns of Fecal Shedding of *Escherichia coli* O157:H7 by Feedlot Cattle

Spring Younts

University of Nebraska-Lincoln

David R. Smith

University of Nebraska-Lincoln, dsmith@cvm.msstate.edu

Jeffrey Folmer

University of Nebraska-Lincoln

Rodney A. Moxley

University of Nebraska-Lincoln, rmoxley1@unl.edu

Suzanne Hinkley

University of Nebraska-Lincoln

See next page for additional authors

Follow this and additional works at: <https://digitalcommons.unl.edu/animalscinbcr>



Part of the [Animal Sciences Commons](#)

Younts, Spring; Smith, David R.; Folmer, Jeffrey; Moxley, Rodney A.; Hinkley, Suzanne; Gray, Jeff; Hungerford, Laura; Khaita, Margaret; and Klopfenstein, Terry J., "Longitudinal Patterns of Fecal Shedding of *Escherichia coli* O157:H7 by Feedlot Cattle" (2002). *Nebraska Beef Cattle Reports*. 281.
<https://digitalcommons.unl.edu/animalscinbcr/281>

This Article is brought to you for free and open access by the Animal Science Department at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Nebraska Beef Cattle Reports by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Authors

Spring Younts, David R. Smith, Jeffrey Folmer, Rodney A. Moxley, Suzanne Hinkley, Jeff Gray, Laura Hungerford, Margaret Khaita, and Terry J. Klopfenstein

improved profits (\$5.79/head) compared to SLOW (\$-31.32/head).

Production costs for steers on the SLOW treatment were less than costs for steers on the FAST treatment (Table 2). However, steers on the FAST treatment had lower slaughter breakevens and increased profitability. Correlation coefficients were obtained which indicated that slaughter weight tended to be negatively correlated ($P = 0.0867$) with slaughter breakeven and positively correlated ($P = 0.1041$) to profit/loss. Slaughter weight accounted for 20% and 18% of the variation in slaughter

breakeven and profit/loss, respectively. In the absence of more compensatory gain and compounded by reduced feedlot performance, steers on the SLOW treatment were lighter at slaughter, and therefore contained less saleable weight in relation to the steers on the FAST gaining treatment.

Because compensation on grass is highly variable, calculations were made to determine how much compensation would be required to numerically equalize breakevens for the SLOW treatment compared to FAST. Because feedlot performance was similar for FAST and

SLOW cattle, it was assumed to be the same for the compensating animals regardless of percent compensation. Approximately 65% compensation would be required on grass for the SLOW treatment to have a similar breakeven compared to FAST.

¹D. J. Jordon, former graduate student; Dale Downs, former graduate student; Galen Erickson, assistant professor, Animal Science, Lincoln; Don Adams, professor, West Central Research and Extension Center, North Platte, Neb.; Terry Klopfenstein, professor, Animal Science, Lincoln.

Longitudinal Patterns of Fecal Shedding of *Escherichia coli* O157:H7 by Feedlot Cattle

Spring Younts
David Smith
Jeffrey Folmer
Rodney Moxley
Susanne Hinkley
Jeff Gray
Laura Hungerford
Margaret Khaita
Terry Klopfenstein¹

The percentage of cattle shedding *Escherichia coli* O157:H7 varied from 1% to 80% over the feeding period with every animal shedding the organism at least once.

Summary

To describe the prevalence, incidence, and duration of fecal shedding of E. coli O157:H7, 99 feedlot steers were individually tested each week of the feeding period for presence of E. coli O157:H7 in rectal feces. E. coli O157:H7 was recovered from each animal at least once during the study. Both the incidence and mean duration of shedding peaked during the middle of the feeding period. The percentage of cattle shedding E. coli O157:H7 ranged from 1% to 80% over the course of the feeding period

and was affected by both the incidence and the duration of shedding.

Introduction

Studies of *Escherichia coli* O157:H7 in feedlot cattle have demonstrated that the organism is common within groups of feedlot cattle (2001 *Beef Report*, pp. 81-84, Elder et al., 2000. *Proc Natl Acad Sci USA*, pp. 2999-3003). In studies conducted in commercial feedyards we found the percentage of cattle shedding *E. coli* O157:H7 did not differ between the feedyards, but within feedyards the percentage of cattle shedding *E. coli* O157:H7 within a pen varied greatly (2001 *Beef Report*, pp. 81-84). Since each pen of cattle in that study was tested only once we were unable to monitor changes in prevalence overtime. The objective of this study was to describe prevalence, incidence, and duration of fecal excretion of *E. coli* O157:H7 by a defined group of feedlot cattle over the course of the feeding period.

Procedure

The study was designed as a longitudinal study to monitor individual

cattle for the presence of *E. coli* O157:H7 in rectal feces. One hundred steers were randomly assigned to 10 pens (10 animals each) upon arrival to the research feedyard at the Agricultural Research and Development Center, University of Nebraska-Lincoln, Ithaca, Neb. The steers were fed a high concentrate finishing diet for 136 days starting in June 2000. One animal was removed from the study during the seventh week because of its behavior. The cattle were tested once each week for 19 weeks. Feces were collected from the rectum of each animal in each pen while they were restrained in a handling chute. The samples were immediately transported to the University of Nebraska-Lincoln and tested for the presence of *E. coli* O157:H7. Culture methods were specific for the detection of *E. coli* O157:H7 in fecal specimens and included selective enrichment, immunomagnetic separation and confirmation of suspect isolates by standard methods (2001 *Beef Report*, pp. 81-84).

Incidence was defined as the number of cattle shedding *E. coli* O157:H7 whose feces had been culture negative the previous week divided by the number of animals that were culture

(Continued on next page)

negative the previous week. The duration of shedding was defined as the number of consecutive weeks an individual animal was shedding a detectable level of the organism. Each animal could have more than one incident of shedding over the course of the feeding period, each with its own duration. Prevalence was defined as the proportion of cattle shedding a detectable level of *E. coli* O157:H7 on any given sampling date.

On two of the sampling dates, weeks 11 and 17, the shedding status of many cattle was not reliably determined because the culture media may have contained inappropriate concentrations of antibiotics inhibiting isolation of the organism. These cattle were assigned values for the missing observations based on the culture results from the week before and after. Animals were considered positive for fecal shedding of the organism on those dates if *E. coli* O157:H7 was isolated from their feces both the week before and the week following and otherwise considered negative.

Results

E. coli O157:H7 was recovered at least once from the feces of each animal that completed the study. The point-prevalence of cattle shedding the organism ranged from 1% (1 animal) on the first sampling date, three days following assignment to pens, to 80% (80 animals) during the tenth week of the study (Figure 1).

The first seven weeks of the feeding period were characterized by low incidence (<0.1 new cases/animal-week) of fecal excretion of *E. coli* O157:H7 with short mean duration of shedding the organism (≤ 2.5 weeks). Over the feeding period, the incidence increased dramatically in week nine (0.5 new cases/animal-week), reached the highest rate in week 14 (0.7 new cases/animal-week), and gradually decreased during the last five weeks of the study (Figure 2). Because new cases of shedding were not described for the proportion of samples affected by the media in weeks 11 and 17, incidence may have been underestimated for those two weeks. The mean duration of fecal shedding

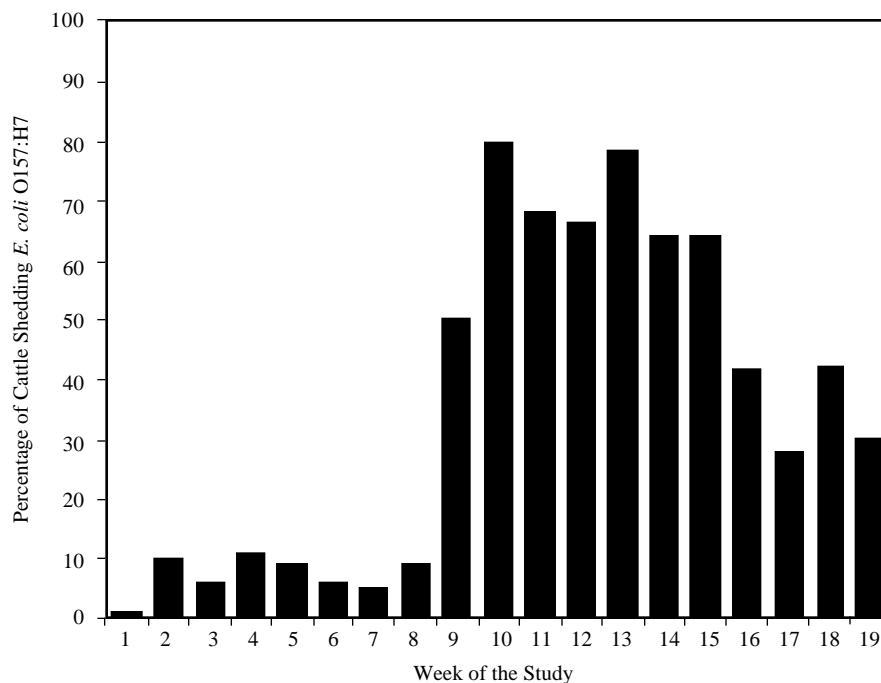


Figure 1. Percentage of cattle shedding a detectable level of *E. coli* O157:H7 during each week of the feeding period (June 2-Oct. 9, 2000).

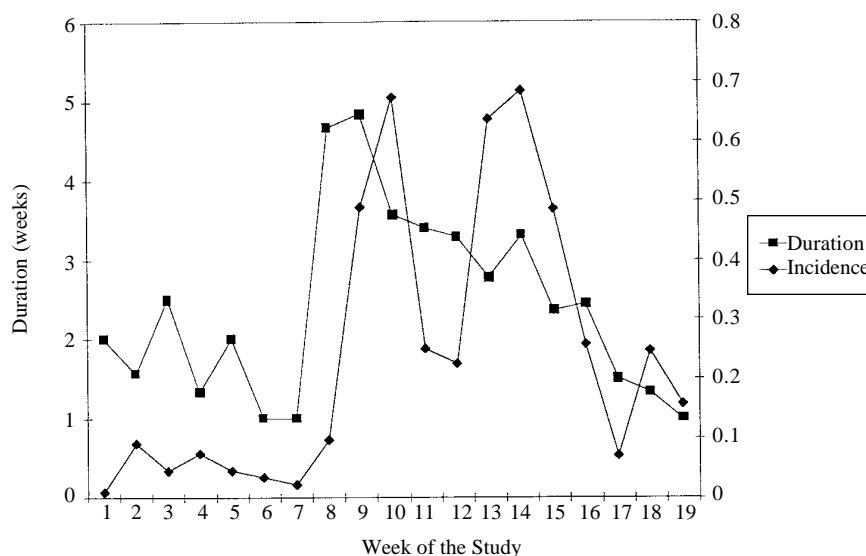


Figure 2. Incidence (new cases/animal-week) and duration (average number of consecutive weeks) of fecal shedding of *E. coli* O157:H7 by feedlot cattle for each week during the feeding period (June 2-Oct. 9, 2000).

was longest through the middle of the feeding period, with cases starting in weeks eight and nine lasting 4.7 and 4.8 weeks, respectively (Figure 2).

On the last sampling date, 30% of the steers were excreting a detectable level of *E. coli* O157:H7 in their feces and these animals had been shedding the organism for a mean of 3.4 weeks.

On this date, at least one animal was shedding the organism in nine out of the 10 pens. Ninety percent of the animals in one pen, 40% of the animals in three pens, 30% of the animals in one pen, 20% of the animals in two pens, and 10% of the animals in two pens were culture positive for *E. coli* O157:H7.

The prevalence of fecal shedding of a detectable level of *E. coli* O157:H7 within a given group of feedlot cattle varied widely over the feeding period and the variability in prevalence was a function of changes in both incidence and duration of fecal shedding.

E. coli O157:H7 appeared to be ubiquitous to this group of cattle since the organism was recovered at least once from each animal and the organism was detected from at least one animal every week of the study. It is interesting that the range of prevalence for cattle shed-

ding *E. coli* O157:H7 in this longitudinal study was nearly identical to the range of prevalence we previously observed in a cross-sectional study of commercial feedlot cattle (2001 *Beef Report*, pp. 81-84). Identifying the factors that explain the difference between groups of cattle with high or low prevalence may be useful for devising a control strategy on farms to enhance food safety. Some of those factors may vary with time just as the prevalence of shedding does. Additional studies are in progress to identify time-dependent factors that

explain fecal shedding of *E. coli* O157:H7 by feedlot cattle.

¹Spring Younts, graduate student; David Smith, assistant professor, Veterinary and Biomedical Sciences, Lincoln; Jeffrey Folmer, research technician, Animal Science, Lincoln; Rodney Moxley, professor, Susanne Hinkley, research assistant professor, Veterinary and Biomedical Sciences, Lincoln; Jeff Gray, USDA, ARS, ARRU, Athens, Ga.; Laura Hungerford, associate professor, Margaret Khaitisa, post-doctorate researcher, Veterinary and Biomedical Sciences, Lincoln; Terry Klopfenstein, professor, Animal Science, Lincoln.

Implant Programs for Feedlot Heifers using Synovex® Plus™, Revalor®-H, or Finaplix®-H with MGA

Casey Macken
Todd Milton
Bill Dicke¹

Implanting feedlot heifers with Synovex Plus increases ADG and hot carcass weight but decreases grade compared to heifers implanted with Revalor-H or Finaplix-H and fed MGA.

Summary

A commercial feedlot experiment was conducted using 1,558 heifers to evaluate the effects of implant programs on finishing heifers. Implanting with Synovex Plus increased ADG and hot carcass weight compared to heifers implanted with Revalor-H or Finaplix-H and fed MGA. Heifers implanted with either Synovex Plus or Revalor-H had increased DMI compared to heifers implanted with Finaplix-H. Marbling score was influenced by each of the implant treatments, being highest for Finaplix-H followed by Revalor-H and Synovex Plus.

Introduction

In finishing heifer implant programs, the final implant (administered approximately 100 days prior to harvest) generally contains trenbolone acetate (TBA) or a combination of estradiol (E_2) and TBA. Along with these implants melengestrol acetate (MGA) can be fed to enhance the activity of TBA. Implants commercially available that contain TBA or the combination of E_2 and TBA are Finaplix-H (200 mg of TBA), Revalor-H (14 mg of E_2 and 140 mg of TBA), and Synovex Plus (28 mg of estradiol benzoate (20 mg of E_2) and 200 mg of TBA). Within these implants, dosage, combination of hormones, and carrier of active ingredients differ and may alter growth promoting activity. Objectives of this trial were to compare performance, carcass characteristics, and feeding economics in heifers implanted with Finaplix-H, Revalor-H, or Synovex Plus and fed MGA.

Procedure

The experiment was conducted between the dates of Jan. 11, 2000 and

Aug. 3, 2000 using 1,558 heifers (761 lb) in a randomized block design. Heifers were kept separate by truckload following unloading and were weighed. Heifers from the separate truckloads were randomly assigned to one of three implant programs, one by one, using a gate sort into one of three arrival pens and then assigned to one of 18 home pens (six replications/treatment). Treatments were heifers terminally implanted with 1) Finaplix-H, 2) Revalor-H, or 3) Synovex Plus with all treatments receiving MGA supplementation. The finishing diet was formulated to provide 0.4 mg of MGA/head/d. Within a block, all heifers arrived at the feedyard at the same time. After sorting, pens were reweighed, processed, and moved to their home pen. During processing, heifers were vaccinated for viral diseases (BoviShield® 4, Pfizer Inc.), treated for internal and external parasites (Dectomax®, Pfizer Inc.), implanted with Ralgro®, and given a lot tag for identification.

Heifers were reimplanted with their respective treatment of Finaplix-H, Revalor-H, or Synovex Plus following

(Continued on next page)