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Intervention Strategies for Reduction of *E. coli* O157:H7 in Feedlot Steers

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Beef producers may be able to reduce shedding of *E. coli* O157:H7 in feedlot cattle with intervention strategies.

**Summary**

Two experiments were conducted to evaluate the effects of three intervention strategies on the prevalence of *E. coli* O157:H7 in feedlot steers. In both experiments, 432 steers were assigned to one of 54 pens. Intervention strategies were two competitive exclusion products, monthly pen cleaning. In Experiment 2 a diet change treatment was imposed prior to slaughter. No differences in performance or carcass yield were observed for the competitive exclusion products or the pen cleaning treatments, compared to the control. However, changing the finishing diet prior to slaughter decreased steer performance. We also observed a non-significant decrease in the prevalence of *E. coli* O157:H7 with inclusion of the competitive exclusion products.

**Introduction**

*E. coli* O157:H7 has been implicated in many outbreaks of food-borne illnesses and deaths. Many of these outbreaks have been traced back to beef products or manure from bovine animals spread on crops consumed by humans. Preliminary Nebraska research has indicated that inclusion of competitive exclusion products (*Lactobacillus acidophilus* organisms that out compete other microorganisms) fed in the diet of beef animals, may reduce the numbers of *E. coli* O157:H7 shed in the feces (Moxley, unpublished data). Also, previous research has indicated increased mud and manure in feedlot pens is associated with a higher prevalence of cattle shedding *E. coli* O157:H7. In addition, removal of starch from the diet by either hay feeding or elimination of starch feedstuffs has been found to increase fecal pH, decrease fecal VFA and decrease acid-resistant *E. coli*, and *E. coli* O157:H7 (2001 Nebraska Beef Report pp 86-88). Therefore, an experiment was conducted to evaluate the effect of inclusion of competitive exclusion products, pen cleaning, and diet change intervention strategies on the prevalence and shedding of *E. coli* O157:H7.

**Procedure**

**Experiment 1**

Four hundred thirty-two medium framed steer calves (737 lb) were used in two experiments covering a 140-day feedlot finishing period. Experiment 1 steers were blocked into three weight groups and stratified within block and assigned randomly to one of 54 pens (8 steers/pen). Pens were assigned randomly to a 3 x 2 factorial treatment design; either one of two *Lactobacillus acidophilus* competitive exclusion products (NPC 747), or (NPC 750), or a negative control; and monthly pen cleaning or pen cleaning at the end of the experiment. Competitive exclusion products were mixed with water and applied to the feed truck mixing box and fed at a rate of 1x109 colony forming units/steer/day. Steers were fed once daily with the control steers fed first and a load of non-experiment feed was fed between loads of experiment feed to minimize cross contamination of competitive exclusion products. Steer weights were taken for two consecutive days at the start of the experiment after a 3-day period of limit-feeding to equalize gut fill. In Experiment 1, four rectal fecal samples were obtained from each steer over a period of 3 months. Also, weekly water and composite fecal samples were collected from each pen throughout the experiment.

**Experiment 2**

Experiment 2 was initiated immediately after the end of Experiment 1 using the same pens and animals. Again, a 3 x 2 factorial treatment design was used continuing the competitive exclusion product treatments, and implementing a 14-day diet change versus no diet change treatments at the end of the feeding period. Rectal fecal samples were collected on days 0, 7 and 14 of Experiment 2. Concentrate type and finishing diet formulation was changed from a 33% high moisture corn, 15% dry rolled corn, 40% wet corn gluten feed diet to a 44% corn bran and 44% wet corn gluten feed diet in a two-day change period (Table 1). Alfalfa hay and supplement were included in both diets at rates of 7% and 5% respectively. Steers were slaughtered on day 14 after rectal fecal sampling.

All samples were taken immediately to the UNL *E. coli* lab and analyzed for presence of *E. coli* O157:H7. A pen was considered positive if at least one animal in the pen was positive during the period of the study. Performance
In Experiment 1 there were no significant (P = 0.3) effects of pen cleaning on the prevalence of E. coli O157:H7 (Table 2). However, E. coli O157:H7 was detected in 3 of 18 (16.7%) pens treated with NPC 747, 1 of 18 (5.6%) pens treated with NPC 750, and 4 of 18 (22.2%) of the control pens.

In Experiment 2 there were no significant effects of diet change on the prevalence of E. coli O157:H7. On marketing day we observed fewer (P = 0.1) pens fed the competitive exclusion products shedding E. coli O157:H7 (Table 2). The organism was detected in 3 of 18 (16.7%) pens treated with NPC 747, 3 of 18 (16.7%) pens treated with NPC 750, and 8 of 18 (44.4%) of the control pens. The odds ratio for each competitive exclusion product compared to the control was 0.25 (P = 0.1). Therefore, we observed that the odds for detecting E. coli O157:H7 in control pens at marketing time was four times greater than in the treated pens (P = 0.1).

**Finishing Performance**

Finishing performance is summarized in Table 3. There were no effects of competitive exclusion product or pen cleaning on any aspect of steer finishing performance or carcass merit. However, changing the concentrate in our finishing diet from 33% high moisture corn, 15% dry rolled corn, 40% wet corn gluten feed diet to 44% corn bran, and 44% wet corn gluten feed had large negative effects on steer performance. The 14-day diet change at the end of the feeding period significantly (P < 0.01) decreased average daily gain by 5.6% from 3.95 to 3.73 lb/day, decreased hot carcass weight by 2.3% from 812 to 793 lb, decreased feed conversion by 5.1% from 6.4 to 6.7 lb of feed /lb of gain, and decreased diet change period dry matter intake by 10% from 28.2 to 25.4 lb/day. Also, the diet change tended (P = 0.07) to decrease marbling score from 513 to 502.

Addition of a competitive exclusion product tended to decrease the prevalence of E. coli O157:H7 in cattle feces. Even though no significant effects were noted, we did observe a lower E. coli O157:H7 recovery from pens treated with the competitive exclusion products and especially from NPC 750. Also, the magnitude of response we observed was large enough to be important and thus deserve further investigation. Manipulation of finishing diets and pen cleaning had no effect on prevalence of E. coli O157:H7. Finally, changing the finishing diet had a large negative effect on steer performance.

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