

Effect of withdrawing feed from hogs prior to slaughter on the prevalence of gastrointestinal lacerations at slaughter.

Morrow WEM¹, Davies PR², See T¹, Eisemann J¹, Zering K³.

¹Department of Animal Science, North Carolina State University, Raleigh, NC, USA

²College of Veterinary Medicine, North Carolina State University, Raleigh, NC, USA

³Department of Department of Agriculture and Resource Economics, North Carolina State University, Raleigh, NC, USA

Abstract

To help producers decide whether they should withdraw feed prior to slaughter, we designed a study that examined the effect of feed withdrawal on the proportion of gastrointestinal tract lacerations, prevalence of *Salmonella spp.* in cecal contents at slaughter, prevalence and severity of gastric ulcers, and meat quality as measured by ultimate pH, color, and water holding capacity. Finally, we analyzed the economic impact of the treatments. This report focuses on the prevalence of lacerations of the gastrointestinal tract found at slaughter. We followed to slaughter, in 3 marketing groups, 900 National Pig Development barrows that we had assigned to treatment. Each marketing group (feed withdrawn once, first group; twice, second group; or three times, third group) had an equal number of pigs that had feed withdrawn for 0 (control) 12, or 24 hours. Overall, 15.7% of gastrointestinal tracts were lacerated in one or more sections including the stomach (8.4%), colon (5.7%), small intestine (2.1%), and ceca (0.9%). The withdrawal of feed before slaughter decreased the weight of the gastrointestinal tract. The proportion of lacerations in this study (15.5%) is higher than previously reported (4.5%). The difference may be due to the higher rate of evisceration (18 pigs per minute), or our more detailed examination of the gastrointestinal tracts.

Introduction

To compete in today's global markets the USA pork industry is rapidly changing from treating pork as a commodity product to one focused on quality. The outbreak of *E. coli* O157:H7 in 1993 increased government and industry focus on enhancing the safety of meat and led to the adoption of HACCP principles to improve pork quality. To decrease the proportion of PSE pork, Eikelenboom (1991) recommends producers withdraw feed from hogs 12-24 hours prior to slaughter (1). Because producers are penalized for selling hogs outside a narrow weight range, most who have all-in/all-out facilities will send their hogs to slaughter over 3-4 weeks. In most cases, they withdraw feed from the last load but earlier loads are usually on full feed until they are shipped. Withdrawing feed from hogs

before slaughter decreases the weight (2, 3) and presumably solid contents of the gastrointestinal tracts. Consequently, because they are lighter, slaughtermen are less likely to lacerate them during evisceration resulting in decreased carcass contamination (3). This study investigated the effect of 0, 12, or 24 hours feed withdrawal before slaughter on the weight of the gastrointestinal tract and the number and location of lacerations to the tract.

Materials and Methods

Subjects: In March 1998, 1133 National Pig Development (NPD) barrows from a nursery site were weighed, individually identified and assigned, blocked by weight, to 36 pens. The barn had 40 pens—the other 4 pens held the cull pigs and the extreme lightest and heaviest pigs that were excluded from the study. Each pen of 29-32 pigs had pigs of similar minimum and maximum weight with similar variation between pens. Maximum variation within a pen, rather than minimum, allowed us to progressively select the heaviest third of pigs for slaughter from each pen and simulate the slaughter close-out of a barn of pigs where on about three occasions the heaviest third in the barn are taken to slaughter. By design, this procedure confounds the effects of repeated feed withdrawal with pig weight because the lighter weight (presumably slower growing) pigs are excluded from the first marketing group. All pigs were presumed homozygous stress negative because they came from lines that had been DNA tested and found negative for the HAL 1843 gene. In June, 1999, before treatments were applied, the 6 pens with the fewest pigs (attrition from death and culling) were deleted from the study because they exceeded our needs, leaving 900 pigs.

Experimental design: A 3 by 3 factorial.

Treatments: Treatments included feed withdrawal of 0, 12, and 24 hours and marketing group (1, 2, and 3) selected on weight and having feed withdrawn once, twice, or three times prior to shipment. Feeders to the pens on 12 or 24 hour withdrawal treatment and containing hogs scheduled for slaughter were shut off and any feed in the feeding troughs was returned to the pens' feeders.

Shipments: For the first and second marketing groups, the 10 heaviest pigs in each pen were visually identified and shipped (feed withdrawn once or twice). The third marketing group and consisted of all pigs remaining in all the test pens (barn close out). In the second marketing group, an accident at the packing plant resulted in the loss of all data on all the pigs (60) for that day. Pigs were individually tattooed with a unique 4 digit identifying number coded to describe the day and treatment. Time in transport and lairage were recorded by the person accompanying the pigs. In lairage, pigs had free access to water but not feed.

Gastrointestinal tracts (GIT): Standard evisceration procedure at the plant was as follows: the head was removed, the brisket cut open, the abdominal cavity opened, the anus (bung) dropped, then the gastrointestinal tract and thoracic cavity contents (pluck) were cut from the carcass and placed on a tray. On the tray, the esophagus was cut from the stomach and the pluck removed and placed on a hook for further processing.

Immediately the abdomens were opened we tagged the gastrointestinal tracts with temporary paper numbered tags which we correlated to the carcass tattoos. The gastrointestinal tracts were then removed from the viscera trays, placed in plastic bags and taken off-line for us to examine. Tracts were trimmed to remove viscera and muscle and then weighed. Each tract was examined in detail, section by section, and noted which sections (stomach, small intestine, cecum, and colon) were lacerated.

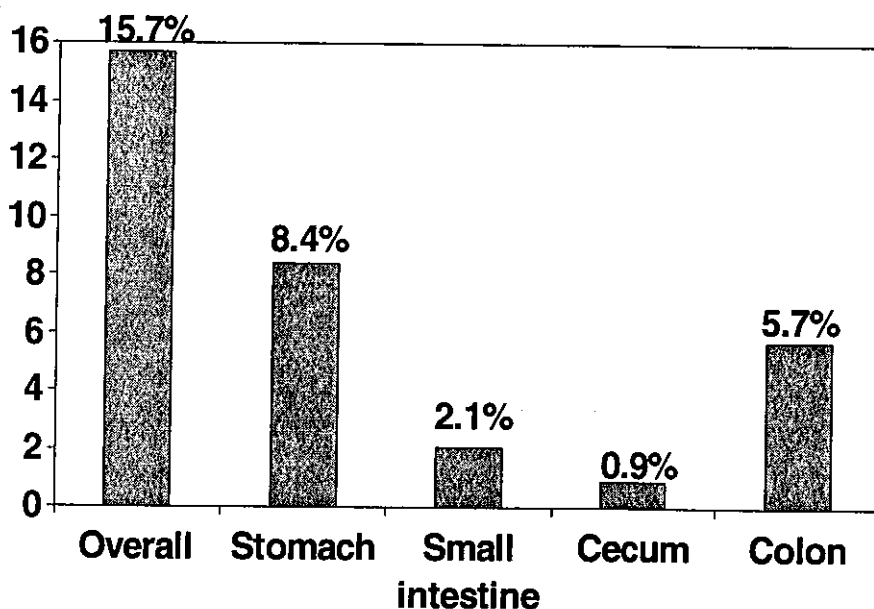
Statistical Analyses: All data were analyzed in SAS. Categorical data were examined initially in the PROC FREQ and then GENMOD procedure. The following tests were adopted: where cell frequency was less than 5 for one or more cells, Fisher's Exact test; where data were ordinal, Mantel-Haenzel Chi-Squared; otherwise, Pearson's Chi-Squared. Continuous data were analyzed in GLM. Models were reduced as appropriate to include only treatments and those effects with important ($P < .20$) contributions to the model.

Results

Pigs were loaded and left the farm between 2-5am, traveled for 1hr 15 min (range: 48 min to 1 hr 45 min) and held in lairage for 3hr 50 min (range: 1 hr 58 min to 4 hr 47 min). Overall, 15.7% of the 773 gastrointestinal tracts examined were lacerated in one or more sections (Table 1).

Withdrawal of feed before slaughter decreased the weight of the gastrointestinal tract. The least-squares means weights (\pm se) of the gastrointestinal tracts of pigs with no feed withdrawal (7.7kg \pm 0.06) were greater ($P = 0.0001$) than the pigs with 12 hr feed withdrawal (6.6kg \pm 0.06) and they were greater ($P = 0.07$) than the pigs with 24 hr feed withdrawal (6.4kg \pm 0.06). The proportion of gastrointestinal tract lacerations ranged by day from 8.3% to 23.9%, but the differences were not significant ($P = 0.32$). Also, gastrointestinal tract weight increased ($P = 0.0001$) as carcass weight increased.

Table 1: Percentage of lacerations overall and by section.



Discussion

The proportion of lacerations in this study (15.5%) was higher than previously reported (4-5%)(3). The difference may be due in our study to the high processing speed for evisceration (18 pigs per minute) and/or a more detailed examination of the gastrointestinal tracts in this study which may have decreased under-reporting. As expected, the weight of the gastrointestinal tracts decreased with increasing duration of feed withdrawal.

If the reduced weight of the gastrointestinal tract is due to reduced feed content in the gastrointestinal tracts of pigs withheld from feed, and not an increase in water content for the control pigs, then the slaughter enterprise could have substantial benefit by having a reduced amount of feed waste to process.

From the perspective of bacterial contamination, an important finding is the low prevalence of cecal lacerations and lack of association of cecal lacerations to treatment or carcass weight.

This is important because most contamination occurs after evisceration (5) and the ceca is the second highest site for recovery of Salmonella (71%) after the palatine tonsils (93.5%) (6). In addition, the cecum usually has a very fluid content which could readily spill and potentially grossly contaminate of the carcass. The association of lacerations to particular sections of the gastrointestinal tract may arise because of the effect of feed withdrawal (stomach and colon) and carcass weight (small intestine), on the rhythm of the evisceration process.

References

1. Eikelenboom, G., A. H. Bolink, W. Sybesma, (1991). Effects of feed withdrawal before delivery on pork quality and carcass yield. *Meat Science* 29: (1) 25-30.
2. Kephart, K. B., D. S. Bailey, J. R. Bollinger, M. P. Fournier, D. W. Hartman, E. W. Mills, C. A. B. Meyers, and P. Pitcher. (1996). Effect of feed withdrawal prior to slaughter on carcass weight and gut fill in market hogs. *J. Anim. Sci.* 74 (Suppl. 1)
3. Miller M.F., M. A. Carr, D. B. Bawcom, C. B. Ramsey, and L. D. Thompson. 1997. Microbiology of pork carcasses from pigs with differing origins and feed withdrawal times. *J. Food Protection.* 60:242-245.
4. Statistical Analysis System. 1996. SAS User's Guide: Statistics. SAS Inst. Inc., Cary, NC. 1996.
5. Gerats G.E.C., 1990. Working towards quality. Aspects of quality control and hygiene in the meat industry. Thesis, Utrecht University, the Netherlands.
6. Wood R.L., A. Pospischil, and R. Rose. 1989. Distribution of persistent Salmonella typhimurium infection in internal organs of swine. *Am. J. Vet. Res.* 50: 1015-1021.