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S K. Linneen

Robert D. Goodband

Michael D. Tokach

*See next page for additional authors*

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# The effects of frequent out-of-feed events on growth performance of nursery, growing, and finishing pigs

## Authors

S K. Linneen, Robert D. Goodband, Michael D. Tokach, Joel M. DeRouchey, Jim L. Nelssen, and Steven S. Dritz

## THE EFFECTS OF FREQUENT OUT-OF-FEED EVENTS ON GROWTH PERFORMANCE OF NURSERY, GROWING, AND FINISHING PIGS

*S. K. Linneen, R. D. Goodband, S. S. Dritz<sup>1</sup>, M. D. Tokach, J. M. DeRouchey, and J. L. Nelssen*

### Summary

An “out-of-feed” event is defined as a period of time that pigs do not have access to feed as a result of late feed delivery (feeders running empty) or bridging of bulk bins, feed lines, or feeders. To determine the effects of these out-of-feed events on pig growth performance, nursery and growing-finishing pig studies were conducted. In Exp. 1, 190 pigs (initial wt 14.0 lb) were allotted to one of four experimental treatments. Treatments included a 20-hour feed withdrawal for 1, 2, or 3 randomly selected times during the 35-d trial or a control treatment in which feeders were never withdrawn. Feeders were withdrawn on d 11 for pigs with 1 out-of-feed event, d 8 and 23 for pigs with 2 out-of-feed events, and d 9, 14, and 20 for pigs with 3 out-of-feed events. Throughout the study, the week in which an out-of-feed event occurred, ADG and ADFI were decreased ( $P < 0.06$ ), compared with those of control pigs. In some instances, if the out-of-feed event occurred early in the week, pig growth performance was intermediate to that of control pigs and the other pigs with an out-of-feed event later in the week. In the following week, however, pigs that had an out-of-feed event in the previous week had improved ADG and F/G, compared with performance of the others. For the overall study, there were no differences in growth perform-

ance among pigs with 0, 1, 2, or 3 out-of-feed events. In Exp. 2, 479 growing-finishing pigs were used in an 85-d trial in a commercial finishing barn to determine the effects of frequency and timing of out-of-feed events on pig performance. Treatments included feed withdrawal (20 h) weekly for the duration of the trial, feed withdrawn weekly from d 45 to 85 (market wt), or a control treatment in which pigs had access to feed for the duration of the trial. Feed withdrawal occurred on a randomly selected day, with the exception of Saturday, Sunday, or a day before a weigh day (usually a Wednesday every other week). There were no differences ( $P > 0.13$ ) in growth performance throughout the 85-d trial. With weekly out-of-feed events in the finishing phase, there is a possibility that pigs may quickly learn to adjust their feed intake for the out-of-feed event. In this study, however, results suggest that out-of-feed events (20 h or less) will have no long-term effects on growth performance in nursery or growing-finishing pigs.

(Key Words: Finishing Pigs, Feed Management, Out-of-feed Events, Starter Pig.)

### Introduction

Out-of-feed events, when pigs do not have access to feed, can be caused by delayed feed

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<sup>1</sup>Food Animal Health and Management Center, College of Veterinary Medicine.

delivery or feed bridging in bulk bins, feed lines, or feeders. Recent research conducted by the University of Nebraska observed that, in finishing pigs, when feeders were withdrawn (20 h) on a randomly selected day, weekly for 16 weeks, pigs with weekly out-of-feed events had decreased ADG and ADFI. The reduction in performance was a result of decreased ADG and ADFI in the first 8 weeks of the study. The authors suggested that, with weekly out-of-feed events, it seemed that pigs adjusted their feed intake to account for the days without feed.

Many dietary recommendations, such as fine grinding and adding fat, increase the potential for feed bridging in bulk bins and feeders, resulting in an out-of-feed event. In addition, there are times when feed orders and/or deliveries are late, again resulting in an out-of-feed event. The objective of these experiments was to evaluate the effect on growth performance when out-of-feed events take place randomly in both nursery and growing-finishing phases.

## Procedures

**Experiment 1.** A total of 190 pigs (initially 14.0 lb) were used in a 35-d trial. Pigs were blocked by weight and randomly allotted to one of four treatments with 6 pigs/pen and 8 pens/treatment. The trial was conducted at the Kansas State Swine Teaching and Research Center in an environmentally controlled nursery. Pigs were assigned to 5 × 5 ft pens with one self-feeder and one nipple waterer to allow *ad libitum* access to water and feed (except during the 20 h feed withdrawal).

Pigs were fed standard starter diets based on a feed budget with 1 lb/pig of a SEW diet, 5 lb/pig of a transition diet, 15 lb/pig of the phase 2 diet and a Phase 3 diet fed for the rest of the trial. Treatments included a control in which pigs had continual access to feed, or 1, 2, or 3 out-of-feed events over the 35-d study. Feeders were removed from pens for 20 h

(12:00 noon to 8:00 a.m. the following morning). The out-of-feed events occurred on d 11 for the pigs with 1 event, d 8 and 23 for pigs with 2 events, and d 9, 14, and 20 for pigs with 3 out-of-feed events. The withdrawal days were chosen at random, with exclusion of the first week after the pigs were weaned to allow for acclimation to the nursery. Pigs and feeders were weighed on d 0, 7, 14, 21, 28, and 35 to determine ADG, ADFI, and F/G.

**Experiment 2.** A total of 479 pigs (BW of 91.7 lb) were used in an 85-d study. Pigs were allocated to pens based on sex, then were blocked by weight, and were randomly allotted to one of three treatments. Each pen contained 20 pigs, with 8 pens/treatment with the exception of 1 pen that contained 19 pigs. Pigs were housed at a commercial research finishing barn in southern Minnesota. Facilities included 8 × 18 ft pens with totally slatted floors and provided 7.2 sq ft per pig. Pens were equipped with a cup waterer and 4-hole self feeder. Pen gating was adjusted to provide the same square footage per pig for the pen that contained 19 pigs or when a pig died.

Diets were typical grower-finisher diets with minimal amounts of added crystalline lysine to maintain recommended amino acid ratios. Pigs were fed on the basis of a feed budget, with pigs in the first three phases allocated 150 lb/pig, and the fourth phase fed until market weight (no Paylean® was fed in this trial). Treatments included a control with no out-of-feed events for the duration of the trial, out-of-feed events occurring each week for the duration of the trial, and out-of-feed events occurring each week beginning on d 45 of the study. Feed withdrawal occurred on a randomly selected day each week, with the exception of Saturday, Sunday, or the day before a weigh day (usually a Wednesday every other week). Pigs were weighed, and feed measurements were recorded, on d 0, 16, 29, 45, 59, 73, and 85 to determine ADG, ADFI, and F/G.

Growth data in Exp. 1 were analyzed as a randomized complete-block design, with pen as the experimental unit. In Exp. 2, data were analyzed as a completely random block, with pen as the experimental unit. For both studies, the MIXED procedure of SAS and least squares means were used to determine treatment differences.

## Results

**Experiment 1.** The first out-of-feed event for the three treatment groups occurred between d 7 and 14 of the study (Table 1). During this time, ADG and ADFI were decreased ( $P < 0.07$ ) for pigs with an out-of-feed event on d 11 (1 out-of-feed event), compared with performance of control pigs. Performance of pigs with an out-of-feed event on d 8 or 9 (2 and 3 out-of-feed events, respectively) was intermediate. From d 14 to 21, pigs that previously had an out-of-feed event during d 7 to 14, (1 and 2 out-of-feed events) had similar ADG, ADFI, and F/G, compared with those of the control pigs. Pigs with 3 out-of-feed events had an out-of-feed event on d 20, the 20 h immediately before they were weighed. Thus their ADG, ADFI, and F/G were dramatically poorer ( $P < 0.05$ ) than those of pigs on all other treatments, which did not have an out-of-feed event. From d 21 to 28, the pigs with an out-of-feed event on d 20 had increased ADG and improved F/G, compared with those of the other treatment groups. Despite having feed withdrawn on d 23, pigs with 2 out-of-feed events had similar ADG, ADFI, and F/G to those of control pigs or pigs with only 1 previous out-of-feed event. From d 28 to 35, there were no out-of-feed events and no differences ( $P = 0.15$ ) among the four treatment groups. Likewise, for the overall experimental period (d 0 to 35), there were no differences ( $P > 0.87$ ) in ADG, ADFI, F/G, or final pig weight among pigs with 0, 1, 2, or 3 out-of-feed events.

**Experiment 2.** From d 0 to 45, 45 to 85, or the overall d 0 to 85 period, there were no

differences in ADG, ADFI, F/G, or average final weight among pigs with weekly out-of-feed events from d 0 to 85 or d 45 to 85, compared with the control pigs that did not have an out-of-feed event.

## Discussion

In nursery pigs, an out-of-feed event resulted in decreased ADG for the week in which it occurred, but pigs quickly compensated in the following week. This might suggest that the weight loss in a 20-h out-of-feed event is primarily from contents of the gastrointestinal system, and likely is not tissue loss. Once pigs had access to feed again, their weight returned to similar values to those of pigs without an out-of-feed event, and there were no differences for overall ADG or final weight.

In the growing-finishing trial, because the earlier data from the University of Nebraska reported differences, we were surprised that multiple out-of-feed events had no effects on growth or final weight. In the Nebraska study, a weekly out-of-feed event decreased ADG and ADFI as a result of poorer growth in the first half of the study (50 to 150 lb). The authors suggested that, with weekly out-of-feed events, despite occurring on randomly selected days of each week, that pigs adjusted their feed intake to account for the out-of-feed event. Perhaps with a weekly out-of-feed event, despite occurring on randomly selected days of the week, pigs will quickly compensate for any decrease in performance that occurred during the 20 h without feed. In our study, pigs were able to compensate as early as the nursery phase and throughout the growing-finishing phase, unlike the Nebraska study, in which growing pigs (50 lb) were not able to compensate. Future research might examine the effects of fewer out-of-feed events spaced out randomly over longer periods of time. Under the conditions of our studies, however, out-of-feed events did not effect overall pig growth performance.

**Table 1. Effects of Feeder Withdrawal on Nursery Pig Performance<sup>a</sup>**

| Item               | Feeder Withdrawal on Day <sup>b</sup> |                   |                   |                   | SED   | P <  |
|--------------------|---------------------------------------|-------------------|-------------------|-------------------|-------|------|
|                    | 0                                     | 11                | 8 and 23          | 9, 14, and 20     |       |      |
| Initial weight, lb | 14.02                                 | 14.01             | 14.00             | 14.00             | 0.635 | 0.47 |
| d 0 to 7           |                                       |                   |                   |                   |       |      |
| ADG, lb            | 0.35                                  | 0.40              | 0.40              | 0.39              | 0.029 | 0.42 |
| ADFI, lb           | 0.31                                  | 0.33              | 0.33              | 0.35              | 0.021 | 0.42 |
| F/G                | 0.90                                  | 0.82              | 0.82              | 0.93              | 0.045 | 0.28 |
| d 7 to 14          |                                       |                   |                   |                   |       |      |
| ADG, lb            | 0.96 <sup>c</sup>                     | 0.85 <sup>d</sup> | 0.90 <sup>d</sup> | 0.88 <sup>d</sup> | 0.033 | 0.06 |
| ADFI, lb           | 1.02 <sup>c</sup>                     | 0.92 <sup>d</sup> | 0.93 <sup>d</sup> | 0.93 <sup>d</sup> | 0.044 | 0.07 |
| F/G                | 1.06                                  | 1.09              | 1.04              | 1.05              | 0.045 | 0.28 |
| d 14 to 21         |                                       |                   |                   |                   |       |      |
| ADG, lb            | 1.03 <sup>c</sup>                     | 1.07 <sup>c</sup> | 1.09 <sup>c</sup> | 0.53 <sup>d</sup> | 0.049 | 0.01 |
| ADFI, lb           | 1.45                                  | 1.56              | 1.51              | 1.26 <sup>d</sup> | 0.072 | 0.02 |
| F/G                | 1.43 <sup>c</sup>                     | 1.47 <sup>c</sup> | 1.40 <sup>c</sup> | 2.44 <sup>d</sup> | 0.098 | 0.01 |
| d 21 to 28         |                                       |                   |                   |                   |       |      |
| ADG, lb            | 1.47 <sup>c</sup>                     | 1.37 <sup>c</sup> | 1.36 <sup>c</sup> | 1.85 <sup>d</sup> | 0.059 | 0.01 |
| ADFI, lb           | 2.08                                  | 2.01              | 2.03              | 2.23              | 0.094 | 0.35 |
| F/G                | 1.41 <sup>c</sup>                     | 1.47 <sup>c</sup> | 1.49 <sup>c</sup> | 1.20 <sup>d</sup> | 0.035 | 0.01 |
| d 28 to 35         |                                       |                   |                   |                   |       |      |
| ADG, lb            | 1.61                                  | 1.66              | 1.71              | 1.72              | 0.042 | 0.15 |
| ADFI, lb           | 2.51                                  | 2.55              | 2.61              | 2.54              | 0.071 | 0.68 |
| F/G                | 1.57                                  | 1.53              | 1.53              | 1.48              | 0.033 | 0.20 |
| d 0 to 35          |                                       |                   |                   |                   |       |      |
| ADG, lb            | 1.08                                  | 1.07              | 1.09              | 1.07              | 0.032 | 0.94 |
| ADFI, lb           | 1.48                                  | 1.47              | 1.48              | 1.46              | 0.046 | 0.96 |
| F/G                | 1.37                                  | 1.38              | 1.36              | 1.36              | 0.015 | 0.87 |
| Final weight, lb   | 51.93                                 | 51.49             | 52.12             | 51.57             | 1.592 | 0.94 |

<sup>a</sup>A total of 192 pigs, initially 14.0 lb, were used, with 6 pigs per pen and 8 pens per treatment.

<sup>b</sup>Feeders withdrawn on random days for 20 hours each from 12:00 noon to 8:00 a.m.

<sup>c,d</sup>Means in the same row with different superscripts differ (P<0.05).

**Table 2. Effects of Feeder Withdrawal on Finishing Pig Performance (Exp. 2)<sup>a</sup>**

| Item       | Weekly Feed Removal Period <sup>b</sup> |           |            | SE    | Sex    |       | SE    | Probability, P < |      |
|------------|---|-----------|------------|-------|--------|-------|-------|------------------|------|
|            | None                                    | d 0 to 85 | d 45 to 85 |       | Barrow | Gilt  |       | Treatment        | Sex  |
| d 0 to 45  |   |           |            |       |        |       |       |                  |      |
| ADG, lb    | 2.10                                    | 2.04      | 2.08       | 0.026 | 2.19   | 1.96  | 0.021 | 0.34             | 0.01 |
| ADFI, lb   | 5.16                                    | 5.15      | 5.11       | 0.058 | 5.47   | 4.81  | 0.047 | 0.86             | 0.01 |
| F/G        | 2.46                                    | 2.52      | 2.46       | 0.027 | 2.50   | 2.45  | 0.022 | 0.22             | 0.13 |
| d 45 to 85 |   |           |            |       |        |       |       |                  |      |
| ADG, lb    | 2.14                                    | 2.19      | 2.21       | 0.026 | 2.19   | 2.17  | 0.022 | 0.16             | 0.59 |
| ADFI, lb   | 6.71                                    | 6.91      | 6.78       | 0.069 | 7.11   | 6.49  | 0.057 | 0.15             | 0.01 |
| F/G        | 3.14                                    | 3.15      | 3.07       | 0.030 | 3.25   | 3.00  | 0.024 | 0.15             | 0.01 |
| d 0 to 85  |   |           |            |       |        |       |       |                  |      |
| ADG, lb    | 2.12                                    | 2.11      | 2.14       | 0.022 | 2.19   | 2.06  | 0.018 | 0.64             | 0.01 |
| ADFI, lb   | 5.88                                    | 5.98      | 5.89       | 0.056 | 6.24   | 5.60  | 0.046 | 0.46             | 0.01 |
| F/G        | 2.78                                    | 2.83      | 2.75       | 0.024 | 2.85   | 2.72  | 0.020 | 0.13             | 0.01 |
| Weight, lb |   |           |            |       |        |       |       |                  |      |
| d 0        | 91.3                                    | 91.4      | 92.4       | 1.5   | 93.6   | 89.8  | 1.3   | 0.87             | 0.05 |
| d 45       | 185.8                                   | 183.6     | 186.4      | 2.2   | 192.2  | 178.4 | 1.8   | 0.64             | 0.01 |
| d 86       | 271.4                                   | 271.2     | 274.8      | 2.7   | 280.0  | 264.9 | 2.2   | 0.59             | 0.01 |

<sup>a</sup>A total of 479 pigs, initially 91.7 lb, were used, in this study, with 8 replications per treatment.

<sup>b</sup>Feed removal was simulated by feeders being closed, or by running the feeder empty. Out-of-feed events were weekly for the specified period for 20-h periods on random days.