

Effect of Piglet Birth Weight and Weaning Weight on Nursery Off-Test Weight

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Summary and Implications

Management of lightweight pigs is a challenge that many swine producers face. The number and actual weight of lightweight market hogs can directly impact production and marketing decisions as well as disrupt pig flow on a time-sensitive management system. Pigs that have lower birth weights frequently have lower weaning weights and remain a problem through the grow/finish phases of production. The objective of this study was to evaluate the effect of piglet birth weight and weaning weight on nursery off-test weight and to evaluate the linearity of these relationships. These data could be used by commercial producers to determine if it is effective to maintain lightweight piglets at birth or whether euthanasia might be a better option for pigs with low birth weights.

Introduction

It has been previously reported that lighter pigs at weaning had slower post-weaning growth rates and thus required a greater number of days to reach a common slaughter weight (Wolter et al. 2002). Multisite swine production has become a widely used practice in commercial pig production. How pigs flow through this system is extremely critical and slow growing or substandard pigs can have great annual financial impact on the operation. Piglet birth weight has a significant effect on weaning weight and also nursery off-test weight. As with birth weight, there is a relationship of weaning weight to subsequent growth performance. Pigs weighing less than 10 lbs. at weaning (21 days) require 12 additional days to reach market weight when compared to pigs weighing greater than 15 lbs (Azain et. al). The present study focuses on the initial 42 days after weaning because improvements in growth and mortality largely occur in these initial days after weaning (Main et al, 2004). The objective of this study was to assess the effect of piglet birth weight and weaning weight on nursery growth performance.

Materials and Methods

This study was conducted at a commercial farrow-to-finish farm using Danbred maternal line pigs. Data were

from 1,438 crossbred (Yorkshire x Landrace) barrows and gilts from 645 Landrace sows. Pigs were fed a four-phase diet that contained 23.0% CP, 20.2% CP, 17.7% CP, and 18% CP, respectively.

In the trial, each pig was tattooed with individual identification in the right ear, sexed and weighed within 24h of birth. At day 7, all pigs received a litter tattoo in the left ear. All pigs were weighed and recorded on weaning day (weaning age ranged from 14d to 21d). At weaning, pigs were individually allotted to nursery pens. Each pen contained a random number of barrows and gilts and litters were divided across all pens (28 pigs per pen). Nursery pens were 8 x 10 ft, with plastic slatted flooring and two nipple waterers. Each pen contained a single-sided feeder with 30 inches of feeding space. Pigs were removed from test pens due to death or if a condition occurred in which the pig did not respond to medical treatment. At 42 d post-weaning, individual pig weights and identifications were recorded.

All statistical analysis was conducted using PROC MIXED of SAS and significant differences between levels of fixed effects were analyzed using the PDIF option of SAS. Individual birth weights and weaning weights were partitioned into nine categories scaled by one-half standard deviation (SD) (0.32 kg for birth weight and 1.35 kg for weaning weight). Birth weight categories were:

Birth Weight category	Minimum weight (lbs.)	Maximum weight (lbs.)
1	<=2.07	
2	2.07	2.42
3	2.42	2.78
4	2.78	3.13
5	3.13	3.48
6	3.48	3.84
7	3.84	4.19
8	4.19	4.54
9	>=4.54	

Weaning weight categories were developed using the following criteria:

Weaning Weight category	Minimum weight (lbs.)	Maximum weight (lbs.)
1	<=6.79	
2	6.79	9.77
3	9.77	11.24
4	11.24	12.74
5	12.74	14.24
6	14.24	15.72
7	15.72	17.22
8	17.22	18.52
9	>=18.52	

Fixed effects of birth weight (or weaning weight) category, and parity, and linear, quadratic, and cubic covariates of weaning age were included in all statistical models for weaning weight. The linear regression of nursery off-test age was included in the statistical model for off-test weight and a linear covariate for weaning age was included for nursery off-test weight as well as the fixed effect of weaning weight category.

Results and Discussion

Birth weight category was a significant source of variation in the analyses of weaning and off-test weights ($P < 0.0001$). Without exception, weaning weights significantly ($P < 0.05$) increased with birth weight category. Nursery off-test weights significantly ($P < 0.05$) increased with increasing birth weight category as well. Similarly, nursery off-test weights significantly ($P < 0.05$) increased with increasing weaning weight category. However, weaning weight is a better predictor of nursery off-test weight, as the effect of one-half SD of weaning weight on nursery off-test weight is greater when compared to the effect of one-half SD of birth weight. The relationship of birth weight and weaning weight

categories appear to be linearly related to pig weight at the end of the nursery phase of production.

References

- Azain, M.J., Tomkins, T., Sowinski, J.S., Arentson, R.A., and Jewell, D.E. Effect of Supplemental milk replacer on litter performance: Seasonal Variation in Response. *J. Anim. Sci.* 1996. 74: 2195-2202.
- Main, R.G., Dritz, S.S. Tokach, M.D., Goodband, R.D., Nelssen, J.L. (2004) Increasing weaning age improves pig performance in a multisite production system. *J. Anim. Sci.* 2004. 82: 1499-1507.
- Schinckel, A. P., Ferrell, J., Einstein, M.E., Pearce, S.A., and Boyd, R.D. Analysis of Pig Growth from Birth to Sixty Days of Age. Purdue University 2003 Swine Research Report.
- Wolter B.F., Ellis M., Corrigan, B.P. and DeDecker, J.M. (2002) The effect of birth weight and feeding of supplemental milk replacer to piglets during lactation on preweaning and postweaning growth performance and carcass characteristics. *J. Anim. Sci.* 2002. 80:301-308

Table 1. Weaning weights (lbs) across birth weight categories

Birth Weight Category	Number of Piglets in category (n=1,438)	Mean Weight, lbs.	Standard Deviation, lbs.	Minimum Weight, lbs.	Maximum Weight, lbs.
1	29	4.04	0.79	2.77	6.01
2	68	4.57	0.94	2.88	6.50
3	142	5.08	1.00	3.06	7.95
4	217	5.28	1.00	3.35	8.14
5	285	5.63	1.13	3.19	8.79
6	275	5.96	1.26	3.27	9.13
7	189	6.33	1.32	3.34	9.19
8	146	6.61	1.29	3.82	9.77
9	87	7.15	1.36	4.02	10.48

Table 2. Nursery off-test weights (lbs) across birth weight categories

Birth Weight Category	Number of Piglets in category (n=1,438)	Mean Weight, lbs.	Standard Deviation, lbs.	Minimum Weight, lbs.	Maximum Weight, lbs.
1	27	15.39	2.94	10.16	21.14
2	64	16.90	2.78	10.71	22.91
3	137	18.10	3.23	4.76	26.94
4	212	18.82	2.99	7.26	27.44
5	278	19.44	3.45	7.71	27.22
6	267	20.54	3.23	10.34	28.80
7	185	21.51	3.37	11.88	30.07
8	144	22.65	3.52	13.70	31.07
9	86	23.20	3.59	11.20	31.89

**Difference in number of piglets off-test is a result of piglet death or pigs removed because they did not respond to medical treatment in the nursery.