

Evaluating the effects of an isotonic protein solution in nursery pigs

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Introduction

Within the first four weeks of life, a pig undergoes rapid gastrointestinal development that is critical for digestion, absorption, growth, and immunity.¹ Therefore, the stress of weaning can have lifelong effects on porcine growth and performance.² Enhanced feeding management practices around the time of weaning can be beneficial to ease nutritional stressors and negative impacts during this period.² The objective of this study was to investigate the effect of supplementation with an isotonic protein solution in the peri-weaning period, using growth parameters, feed efficiency, mortality, and antibiotic usage in the 6-week post-weaning period as the major outcomes.

Materials and methods

Pre-wean phase

Within a 5,000-head sow farm with a stable health status, 178 sows and gilts were randomly allocated and blocked by parity to control or treatment groups. Within 24 hours of farrowing, piglets within each litter were tagged and individually weighed. On days 2 and 3 pre-weaning, piglets in treatment litters were offered 500 mL/day of a 3% isotonic protein solution in a metal creep feeder. The day before weaning at ~20 days of age, treatment litters were offered 2 lbs of a gruel mixture made with 3% isotonic protein solution and dry, bagged creep feed. Every treatment litter was monitored for consumption by checking each metal creep feeder and recording any leftovers. Control litters did not receive any supplementation.

Post-wean phase

Upon arrival to nursery, weaned pigs were placed according to their treatment group to ~50 pigs/pen blocking by weight, gender, and location; totaling 949 control pigs and 936 treatment pigs within 38 pens. At the time of placement, pigs with critical health status that were recumbent, unable to walk, or chronically lame were separated to designated fallback pens and excluded from data collection and statistical analysis. Each treatment pen was given 2 plastic gruel pans and offered 0.25 lbs/pig of gruel mixture twice daily for the next 3 days. Gruel was prepared using

3% isotonic protein solution on the day of weaning, 1.5% solution the second day, and 0.75% solution the third day. The gruel mixture was made using the ratio of 1 gallon of solution to 6 lbs dry bin feed to create an 'oatmeal' consistency. Gruel pans within each treatment pen were monitored for consumption. Control pens were not offered a gruel pan nor gruel. All pens were provided dry bin feed and water according to standard practices and delivered using an automated FeedLogic system. Feed consumption per pen was recorded by the Feedlogic system. Individual pig weights were taken on the day of weaning and again at 6-weeks post-weaning. Pen weights were taken at 7, 12, 21, 34 and 42 days after weaning. After placement, pens were evaluated for scours and given a pen scour score twice weekly. Routine monitoring and evaluation for any evidence of disease or mortality was performed on a daily basis. Antimicrobial treatments (medications) were administered and recorded by barn staff according to standard operating protocols following veterinary direction and were not controlled by study protocol. The reasons for administration of antibiotics to individual pigs were judged and recorded by trained barn staff using a standardized list of causes for morbidity. A chi-square test was used to analyze the association of medications with frequency of antimicrobial treatments. Individual weights at 42 days post-wean were analyzed using a GLM using treatment, gender and wean weight as covariates. Pen weights, average daily gain and feed conversion ratio were analyzed using the pen as the experimental unit. All statistical analysis was performed using R software.†

Results

Consumption during pre-wean phase

88% of the litters consumed all of the 3% isotonic protein solution on days 2 and 3 pre-weaning. 30% of the litters consumed all of their gruel on the day before weaning; other litters consumed partial amounts.

Impact on antibiotic usage

The treatment group had decreased morbidity as evidenced by a 33% reduction ($P < 0.0001$) in individual antimicrobial

† R Core Team (2015). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.R-project.org>

treatments needed (Table 1). Significant differences were seen among treatment and control groups in number of pigs treated for being 'gaunt' ($P < 0.0001$), in addition to a tendency ($P = 0.075$) for the treatment group to have fewer pigs treated for respiratory signs (Table 1).

Impact on weight gain

The treatment group at 6-weeks post-weaning had significantly higher individual weights ($P < 0.001$) and higher average daily gain ($P < 0.001$) compared to the control group (Table 2). Data analysis of pen weights, pen average daily gain and pen feed conversion is pending at the time of publication.

Discussion

Supplemented pigs within treatment group exhibited a significant reduction in morbidity and improved growth. The effects of this protocol may have been due to a variety of factors, including

improved hydration or the provision of microenteral nutrients, or the substantial increased feed intake immediately post-wean. This study showed that using an isotonic protein solution in a combination of liquid and gruel in the peri-weaning phase presents a non-antibiotic option to help pigs transition through weaning, which may allow for both a reduction in overall antibiotic usage as well as decreases in antibiotic costs. Further production parameters of gain, feed intake, and feed efficiency are pending analysis and may show further benefit.

References

1. Pluske, J. R. 2016. Invited review: Aspects of gastrointestinal tract growth and maturation in the pre- and postweaning period of pigs. *J. Anim. Sci.* 94(Suppl3):399-411. doi:10.2527/jas.2015-9767
2. Kick AR, Tompkins MB, Flowers WL, Whisnant CS, Almond GW; Effects of stress associated with weaning on the adaptive immune system in pigs; *J Anim Sci.* 2012 Feb;90(2):649-56. Epub 2011 Sep 16.

Table 1: Effect of treatment group on medications administered

	Control	Treatment	P value
Total number of pigs medicated (all causes)	239 (25.2%)	163 (17.4%)	< 0.0001
Total number of individual medications given	348 (36.7%)	228 (24.4%)	< 0.0001
Number of pigs medicated for reason 'gaunt'	164 (17.26%)	110 (11.75%)	< 0.0001
Number of pigs medicated for reason 'respiratory'	24 (2.53%)	13 (1.39%)	0.075

Table 2: Effect of treatment group on individual pig weights

	Control	Treatment	P value
Average wean weight (lb)	12.1	11.7	0.1537
Average 6-week post-wean weight (lb)	42.6	44.0	< 0.001
Average daily gain (lb/d)	0.769	0.799	< 0.001

