RESEARCH REPORT
PORK SAFETY

Title: "Effect of probiotics in the health and performance of nursery pigs raised in conventional or antibiotic/growth promoter free farms" – **NPB #02-197**

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Abstract: Probiotics are live cultures of nonpathogenic bacteria or yeast species that equilibrate intestinal microflora to the benefit of the animal. To investigate the potential and economic benefits of the use of probiotics in weaned pigs in high health status farms a trial was designed. Pigs receiving low doses of antibiotics throughout the nursery period were compared with pigs receiving probiotics (but no antibiotics/ growth promoters) at the same time with regard to their health status and performance. The product BioPlus 2B (Chr Hansen Inc., Denmark) containing *Bacillus licheniformis* and *B. subtilis* was included at the dose of 1 lb/T of complete feed. A total of 4,381 pigs allocated in 9 probiotic-groups and a total of 4,054 pigs allocated in 8 antibiotic groups participated in the trial. The average initial and end bodyweight of pigs was 13.13 lbs and 56.3 lbs for antibiotic-group, and 13.22 lbs and 55.3 lbs for probiotic-group, respectively ($p>0.05$). The average time in the nurseries was the same for both groups (43.5 days). The average daily gain, average daily feed intake and feed conversion ratio were 0.96 lbs, 1.40 lbs and 1.39 for antibiotic-group, and 0.93 lbs 1.33 lbs and 1.50 for probiotic-group, respectively ($p>0.05$). Feed cost per pig was US$ 7.84 and 8.07, and feed cost per lb of bodyweight was US$ 0.185 and 0.194 for antibiotic and probiotic groups, respectively ($p>0.05$). Mortality rate was 1.81% for antibiotic-group and 1.55% in probiotic group ($p=0.244$). It was concluded that in high health status farms, probiotics may substitute for antibiotics given for prevention of diseases.

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Introduction: The balance of young pig's intestinal flora is crucial for effective digestion and maximal absorption of nutrients, as well as for adequate body's resistance against infectious diseases. During periods of stress, such as weaning, this balance can be altered, generally resulting in reduced lactobacilli population in the gastrointestinal tract, which may concomitantly allow the multiplication of microorganisms e.g. enterotoxigenic E. coli strains (ETEC) and rotavirus; and cause the postweaning diarrhoea syndrome. In that situation, pigs get stunted or have increased death loss.

Antibiotics and antimicrobials have customarily been used in starter pig diets for their health and growth-promoting properties. Nevertheless, an emerging concern for the potential transfer of antibiotic resistance has arisen by such administration. For these reasons, alternative solutions such as probiotics, aiming at both public health and the profitability of the farmer, are being explored.

Probiotics are live cultures of nonpathogenic bacteria or yeast species that equilibrate intestinal microflora to the benefit of the animal. They may have a growth promoting activity by competing with harmful gut flora, and by stimulating the immune system of the animal and thereby increasing resistance to infectious agents. The positive effect of probiotics on the control of certain pathogens has been shown in a few studies where they appear to control enteric diseases associated with *E. coli* or other enteric pathogens, one of which is post-weaning diarrhoea syndrome in pigs. It was further shown that probiotics may exhibit growth promoting properties in weaning and fattening pigs.

Objectives: To investigate the potential economic and health benefits by the use of probiotics in weaned pigs in conventional farms using antibiotics/growth promoter in the feed of weaned animals.

Procedures: Two farms were enrolled in the study. Farm 1 performed the study on two groups of pigs but withdrew due to a health challenge.

Farm 2 had 1,600 sows producing 500-550 pigs per week. Weaning was taking place at 21 days in two weekly batches (Wednesday and Friday) of 265 pigs each. Pigs were transferred to off-site nurseries, each with 6 rooms, 4 rooms of 350 pigs and 2 of 700 pigs each. Each room had a separate feed bin. A common outer corridor connected rooms. Feed containing low doses of antibiotics (Neomycin for the first 5-7 days; Neo-Terramycin for the next 7 days and thereafter feed with Tylan up to the age of exit 70 days of age). Postweaning mortality in the nursery the farm was historically low (<2%).

The product BioPlus 2B (Chr Hansen Inc., Denmark) containing 10^{12} CFU total Bacillus content (*B. licheniformis, B. subtilis*)/lb of product was used. The product was included at the dose of 1 lb/T of complete feed. The performance in nursery rooms using antibiotics /growth promoter was compared at the same time with the performance in nursery rooms of the same farm using probiotics (but no antibiotics/ growth promoters). (e.g. antibiotic[+]/probiotic[-] versus antibiotic[-]/ probiotic[+])

At weaning, piglets were moved from the farrowing house to the nursery unit. The piglets were weighed, and randomly allocated according to their bodyweight and sex into pens. Two trial groups, a probiotic group and an antibiotic group, were used. The average bodyweight of the pigs between the groups did not differ significantly at the beginning of the trial ($P>0.05$). The first group received its normal feed (that contained low doses of antibiotics) while the other received the same feed containing the probiotic but no antibiotics or growth promoters.

All trial pigs were monitored daily for signs of disease, and particularly for the appearance of diarrhea. Mortality, morbidity and all treatments were recorded for each

group of pigs up to the end of the nursery period. At that time, the piglets were weighed again.

Feed consumption per group was also recorded during this period, and the average daily gain (ADG), the average daily feed intake (ADFI) and the feed conversion ratio (FCR) were calculated.

Each room received alternately one treatment e.g. the pigs of one room were fed with probiotic only and those of the other room fed with antibiotics only throughout the entire nursery period. A total of 8 treated and 8 control groups was calculated to detect .75% difference in mortality (α=0.05, power 80%, sd 0.5%). Each parameter was recorded and analyzed with room as the experimental unit by one-way analysis of variance using the General Linear Models procedure. Duncan's multiple range test was used to compare means and chi-square test to compare percentages of morbidity and mortality.

Results: A total of 4,381 pigs allocated in 9 probiotic-groups and 4,054 pigs allocated in 8 antibiotic groups participated in the trial. The average initial and end bodyweight of pigs was 13.13 lbs and 56.3 lbs for antibiotic-group, and 13.22 lbs and 55.3 lbs for probiotic-group, respectively ($p>0.05$). The average time in the nurseries was the same for both groups (43.5 days). The average daily gain, average daily feed intake and feed conversion ratio were 0.96 lbs, 1.40 lbs and 1.39 for antibiotic-group, and 0.93 lbs 1.33 lbs and 1.50 for probiotic-group, respectively ($p>0.05$). Feed cost per pig was US$ 7.84 and 8.07, and feed cost per lb of bodyweight was US$ 0.185 and 0.194 for antibiotic and probiotic groups, respectively ($p>0.05$). Mortality rate was 1.81% for antibiotic-group and 1.55% in probiotic group ($p=0.244$).

	No. groups	Weight in	Weight out	ADG	ADFI	F:G	Mortality	$ feed / lb gain
Probiotic	9	13.2	55.3	0.93	1.33	1.5	1.55%	$0.194
Control	8	13.1	56.3	0.96	1.4	1.39	1.81%	$0.185

Discussion: These results were encouraging and showed that probiotics can perform similarly to antibiotics in weaned pigs in high health status farms. Thus, farmers may be able to maintain the performance of their nursery pigs while reserving antibiotics administered through the feed for therapy or prevention of more serious health conditions.

It is important to note that the numerical differences in performance were not statistically significant and therefore, should not be assumed to be repeatable. For example, the probiotic groups averaged 0.26% lower mortality than the antibiotic groups. However, the probability of finding such a difference by chance, given the observed variability was 0.59, or very high. Similarly, feed conversion was numerically better in the antibiotic groups. However, while economically interesting, it was not close to statistical significance ($p=0.19$), and would take over 50 groups in each treatment to find such a small difference to be statistically significant, given the relatively large amount of variability observed within each treatment.

It is possible that the probiotics had no effect in this study and may be adding cost with no return. Although, they are thought to be most beneficial in weaned pigs, the literature is somewhat mixed on the beneficial effects. However, we did not have a negative control group that received no antibiotic or probiotic and this would be needed to prove a benefit.

We believe that producers sometimes use antibiotics at prevention levels when they are not needed. In high health herds such as this herd, endemic disease is low and performance is high. Therefore, need for preventive antibiotics is low. This trial should be repeated at other high health herds to assure that our results are repeatable.

Lay interpretation: We compared the health and performance of weaned pigs in a high health herd between groups receiving low level antibiotics in the feed to groups receiving probiotic in the feed and no antibiotics. Performance and health were similar between the two treatments. This study indicates that some high health status nurseries may be able to reduce antibiotic use and reserve them for disease challenges of more significance.

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