

PORK SAFETY

Title: Impacts of growth promoting antibiotics on growth performance, economics, and the development and persistence of antibiotic resistance in nursery and finishing pigs – NPB #05-195

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Scientific Abstract A 20-week study was conducted using gilts from a commercial source (n=200; initial BW = 6.2 ± 0.003 kg) to determine the effects of growth-promoting levels of antibiotics on growth performance of nursery and finishing pigs, as well as development and persistence of antibiotic resistant *E. coli* and *Enterococcus* isolated from fecal samples and groundwater samples after a simulated rainfall. Pigs were allotted by BW to one of four treatments in a 2 x 2 randomized complete factorial block design. A three phase nursery diet program (1.6, 1.4, and 1.24 % lysine) was used, with treatments consisting of feeding no antibiotics (CON) or chlortetracycline (ANTI). Pigs were weighed at the phase changes on week 1, 3, and 5. At the end of the nursery phase, one-half of the pigs receiving CON were switched to a diet containing antibiotic (Virginiamycin) and one-half of the pigs receiving ANTI were switched to CON for the remainder of the trial. Pigs were fed a four phase finishing diet program (1.05, 0.95, 0.85, and 0.75 % lysine) and were weighed at 4 week intervals at the phase changes. At the end of the trial, backfat and LMA were measured. Fecal samples were collected at phase changes in the nursery, two weeks after the nursery phase, and at phase changes in the finisher. Simulated water runoff trials were performed at the ends of the nursery and finishing phases. After one week, CON pigs weighed less and had lower ADG and ADFI than ANTI pigs ($P < 0.05$). No performance differences were found at weeks 3 and 5 of the nursery, or for the overall nursery period. During the finishing period, no differences were found in ADG, ADFI or GF between pigs receiving CON or ANTI, respectively ($P > 0.05$). Backfat and LMA measurements were not different between treatments ($P > 0.05$). No carry-over effects of antibiotics in the nursery were apparent in the finishing period, and antibiotic supplementation did not affect performance during the finisher or overall growth trial. A significant time effect ($P < 0.05$) and time x treatment interaction was noted for fecal coliform and *Enterococcus* resistance to CTC and VIR. Resistance decreased in the first week of the trial, then increased from week 1 to 5, when the antibiotic used in the diet was switched. Resistance to CTC and VIR then decreased in the two-week interval after the nursery, and increased throughout the remainder of the trial. Pigs fed CON had a lower percentage of *E. coli* resistant to CTC compared to ANTI fed pigs during the initial water sampling ($P < 0.05$), but as the runoff event progressed, *E. coli* resistance from pigs fed CON increased while resistance from pigs fed ANTI decreased. A time x treatment interaction ($P < 0.05$) was found for *E. coli* resistant to CTC and VIR isolated from water samples after the finishing phase, however, resistance neared 100 percent for both antibiotics. Antibiotic growth-promoters have little impact on growth performance in clean, isolated facilities with high labor inputs. Antibiotic resistance bacteria can develop and proliferate regardless of the usage of antibiotic growth promoters. Resistant bacteria from swine facilities have the capacity to persist in the environment. Economic analysis based on weight gain, mortality, and feed consumption during the trials showed that relatively small differences in performance can produce economically important differences in cost of production.

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