Effect of commingling and dietary fiber interventions on select performance of suckling, weaned and nursery piglets

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Background: This multi-year study aims to evaluate whether commingling and/or dietary fiber can be used to mitigate the spread and persistence of antimicrobial resistance genes within the fecal microbial community after metaphylactic antibiotic use in production pigs. As part of this larger study, one objective was to understand whether commingling and dietary fiber would also impact on performance.

Materials and Methods: A total of 84 sows across three rooms in a single commercial sow facility were included in this 2x2 factorial design randomized control trial (commingled/Multi Suckle Common Creep (MSCC) vs. not-commingled/Conventional (CONV) and high- (HF) vs. low-fiber (LF) creep feed). Treatment groups were randomly assigned at the litter level. From each litter, ten piglets were randomly selected and enrolled as they were born, no more than 10 hours post-birth (hpb). At enrollment, each piglet was tagged with a unique ID, weighed, and then given a single dose of Excede (ceftiofur crystalline free acid at 100mg/mL, 0.5 mL intramuscularly/piglet, Zoetis Animal Health). At the same time, all enrolled piglets were sampled by inserting a sterile swab into the rectum at 0-12h hpb and then daily until 2-4 days post-birth (dpb). After processing, commingling was initiated to enrolled litters within a room, where piglets were allowed to move freely between the crates (i.e., four farrowing crates), while piglets in the CONV treatment group remained with their own sow until weaning. On days 17-18 of age, all enrolled piglets from both MSCC and CONV groups received Baytril (Enrofloxacin 100mg/mL, 0.35 mL given intramuscularly/piglet, Elanco US Inc), after which creep feed was initiated, either standard feed or supplemented with potato starch depending on pre-allocated treatment group. At 23dpb, all piglets were weaned and moved to the nursery facility, where they were weighed upon arrival and at end-of-nursery before being moved to finisher facility. Fecal swab samples were collected from all enrolled piglets daily 24-72h after birth, with additional seven different timepoints between 72 hpb to weaning and then 2 days post-weaning (dpw), 5dpw, 8dpw and prior to market. Each swab was placed into an individual sterile Whirl-Pak bag and stored at -80°C. The sampler's gloves were changed between sampling of each piglet, and equipment that touched the pigs was wiped down between litters.

Results: A total of 84 sows and 833 piglets were enrolled in the study. Sow parity was balanced across treatment groups (ANOVA $P>0.05$) and litter size were also similar across treatments. Average body weight of enrolled piglets was not significantly different between MSCC and CONV groups at birth (MSCC: 1.44±0.3 kg, CONV: 1.49±0.3 kg, $P=0.19$). However, statistically significant difference was found in average daily gain (ADG) at end of nursery for the piglets that were commingled and given the potato starch creep feed (the interaction of commingling and dietary fiber with ADG, $P=0.04$). The MSCC/HF group had the lowest mortality (~9%) while MSCC/LF and CONV/LF both had the highest mortality (both ~13%). Total DNA extraction from

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individual fecal samples is ongoing for metagenomic analysis of AMR genes within the fecal microbial community of these pigs from birth to market.

Conclusions: We observed significant interaction between commingling and diet in average daily gain at end of nursery. Further, piglet mortality was numerically different between treatments and this analysis is ongoing. Overall, for the larger study, we expect that our results will provide insight into whether commingling and creep diet can be used as potential interventions to minimize AMR spread and persistence within microbial communities after antibiotic exposures, while supporting overall performance in production pigs.

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