Pre- and post-weaning gut microbial profiles of piglets administered *Bacillus* spp. spores and gentamicin

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Diarrhea is highly prevalent in neonatal piglets, and is often treated with antibiotics like gentamycin. Administrating antibiotics to newborn piglets may have short- and long-term consequences on gut microbiota and immune system development. We hypothesise that the consequences may be alleviated by concurrent probiotic administration. The objective was therefore to investigate the effect of administrating gentamicin and a mixture of *Bacillus licheniformis, B. subtilis* and *B. amyloliquefaeceans* spores on the gut microbiota of piglets pre-and post-weaning. Twenty-four sows and their litters were randomly allocated to four treatment groups and administered a) *Bacillus* spore mixture to sows and piglets (PRO), b) gentamicin to piglets day 4, 5 and 6 of age (AB), c) spore mixture to sows and piglets, and gentamicin to piglets (PRO+AB), or d) no probiotics or antibiotics (CTRL). The study included 12 piglets from each litter. Faecal samples were collected day 7, 14, 21, 28, 35 and 42. Piglets were sacrificed for intestinal digesta and tissue day 3, 28 and 42. Selected samples were subjected to amplicon sequencing of the 16S rRNA gene, culture counts, and organic acid, biogenic amine and tissue gene expression analysis (TNF-α, IL-10, COX-2, ZO-1, OCLN, CLDN-4 and CLDN-2). Treatment had a significant effect on composition of the faecal microbial community on day 28 (p_{adonis}=0.003) and 42 (p_{adonis}=0.008), and the colonic community on day 28 (p_{adonis}=0.017). Faecal ($p \leq 0.001$) and colonic ($p \leq 0.047$) species richness and diversity were higher for AB- than PRO-piglets on day 28, and were not significantly different from day 42. Species richness and diversity were numerically lower for CTRL-piglets compared to AB-piglets, and numerically higher compared to PRO-piglets. Significant differences in low abundant OTUs were observed between treatment groups. PRO piglets had the highest faecal concentration of iso-butyric acid on day 7 (p=0.04) and a higher butyric acid concentration compared to CTRL piglets (p=0.02); otherwise were no significant effects observed on organic acid and biogenic amine concentrations, gene expression or bacterial counts. The results show that administrating oral gentamicin to piglets shortly after birth may affect gut microbial composition and is counteracted by concurrent administration of *Bacillus* spores, suggestively due to spores competitively excluding early colonisers. We conclude that both gentamicin and *Bacillus* spores influence the microbial gut diversity of young piglets, although administration of the tested antibiotic did not result in severe dysbiosis. The importance of the microbiological findings in relation to gut and animal health needs further investigation.