

Effects of benzoic acid and Na benzoate on the performance and composition of the gastrointestinal microbiota of weaned piglets

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INTRODUCTION

Benzoic acid has been shown to modulate the microbial ecology of the gastrointestinal tract and to improve performance in piglets, and is accepted as an alternative to antimicrobial growth promoters.

OBJECTIVE

The aim was to compare the effects of benzoic acid (BA) and its sodium salt (SB) on the microbial ecology and performance of weaning pigs.

MATERIALS AND METHODS

Experimental design

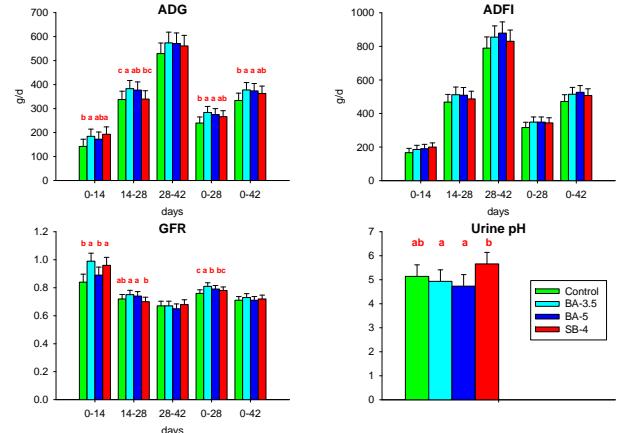
- 140 newly-weaned piglets (21 day-old; 6.3 ± 1.1 kg BW; [Duroc x Landrace] x Pietrain; entire males).
- Kept in 28 pens (5 piglets/pen) and offered 4 dietary treatments according to a randomised complete block design (7 blocks of initial BW).
- Treatments:
 - **NC**: Negative control
 - **BA-3.5**: 3.5 g/kg VevoVital®, (DSM Nutritional Products)
 - **BA-5**: 5 g/kg VevoVital®, (DSM Nutritional Products)
 - **SB-4**: 4 g/kg Purox S, (DSM Nutritional Products)
- Average daily weight gain (ADG), average daily feed intake (ADFI) and feed to gain ratio (GFR) for each pen were measured at d 0, 14, 28 and 42.
- At d 28, 1 piglet from each pen was euthanised and ileal and caecal digesta were sampled for microbiology determinations:
 - Traditional plate culture (CFU counting) for Lactobacilli spp. Enterococci spp., *Clostridium perfringens* and *E. coli*.
 - Quantitative PCR for total bacteria, *Clostridium perfringens*, Bacteroides spp, *E. coli*, and *E. coli* K88.
 - RFLP microbiota profiles to study biodiversity and similarity.
- Urine was also sampled directly from the bladder, and its pH was measured.

Statistical analysis

- Data were analysed as a randomised complete block design with 4 treatments and 7 blocks, using pen as the experimental unit.

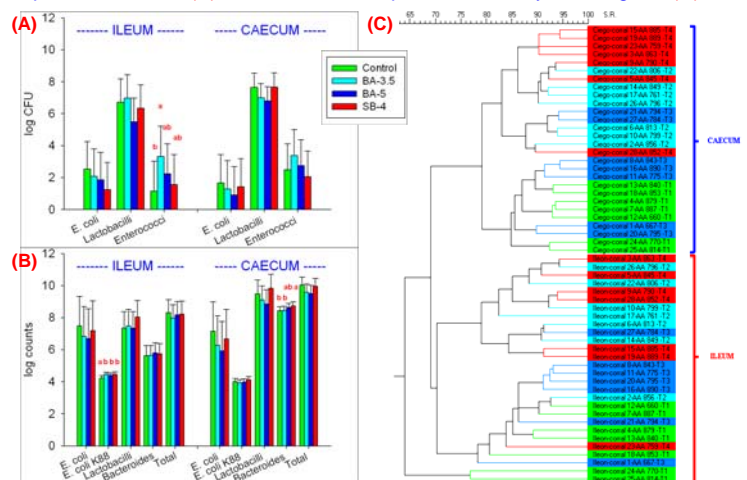
RESULTS AND DISCUSSION

Figure 1. Effect of benzoic acid (BA) and Na benzoate (SB) on the performance and urine pH of weaned piglets.



abc Values with different letters are significantly different (P<0.05).

Figure 2. Effect of benzoic acid (BA) and Na benzoate (SB) ileal and caecal microbiota of piglets after 28 d of experiment. Microbial composition quantified with traditional culture methods (A) and quantitative PCR (B). Microbiota RFLP profiles similarity dendrogram (C).



abc Values with different letters are significantly different (P<0.05).

- BA and SB improved performance, but BA appears to be more persistent in time.
- The 2 products may be metabolised differently, as urine's pH was reduced for BA but it increased for SB.
- Both products modulate the composition of the GIT microbiota. They increase the similarity of the microbiota's RFLP profiles in the ileum.
- The RFLP profiles for BA at 3.5 g/kg and SB have the highest similarity in ileum and caecum.

CONCLUSIONS

BA and SB are effective alternatives to antimicrobial growth promoters, and are able to modulate the GIT microbiota. The two products are metabolised differently and their modes of action may also differ.