SUMMARY

The ban of antibiotics as a growth promoter in several countries has led scientists to investigate new alternatives. Today, based on extensive research, the search for antibiotic replacers, such as eubiotics has opened up new horizons in the management of gastrointestinal health. Eubiotics is referred to as a healthy balance of micro flora in the gastro intestinal tract. Several types of eubiotics, such as organic acids, essential oil compounds and probiotics have been shown to have a positive effect on gut health and overall animal performance. However, the extent of the positive effects is variable depending on the products used. Feeding trials were conducted by Dankook University, South Korea in order to evaluate the efficacy of different eubiotics in combination. Trials were conducted on 150 weanling pigs [(Landrace × Yorkshire) × Duroc], 21 ± 1 day of age with an average body weight (BW) of 8.86 ± 0.93 kg for a period of 42 days. This experiment demonstrated that dietary inclusion of Benzoic acid (BA) with a 0.01% blend of essential oil compounds could improve growth performance and nutrient digestibility, as well as decrease the fecal noxious gas emission and pathogenic bacteria counts in weanling pigs.

INTRODUCTION

As an organic acid, benzoic acid (BA) has been shown to have the strongest antimicrobial effect, which may be of interest in the reduction of the incidence of diarrhea in piglets after weaning (Knareborg et al., 2002; Walsh et al., 2007). Previous studies have confirmed that inclusion of 0.5 to 1.0% BA could improve growth performance (Torrallardona et al., 2007) and protein digestibility (Guggenbuhl et al., 2007) in weanling pigs.

RESEARCH WITH EUBIOTICS

Weanling pigs were fed basal corn soybean meal based diet as recommended by NRC as shown in Table 1. Dietary treatments consisted of i) CON, control diet ii) BE1, CON + 0.5% BA + 0.01% EO; iii) BEF1,CON + 0.5% BA + 7 × 10⁸ CFU/ kg E. faecium NCIMB 10415; iv) BE2, CON + 0.3% BA + 0.01% EO; v) BEF2, CON + 0.3% BA + 7 × 10⁸ CFU/ kg E. faecium NCIMB 10415. There were 6 replicate pens with 5 pigs (3 barrows and 2 gilts) per pen. The experimental substances, eubiotics (Cylactin® ME 10, CRINA® Piglets and VevoVital®) used in this study were provided by a commercial company (DSM Nutritional Products, LTD., Korea). The probiotic Cylactin® ME 10 is available as a micro-encapsulated product which contains 1 × 10⁹ CFU/g of E. faecium NCIMB 10415 on a carrier derived of cellulose and sucrose. CRINA® Piglets was obtained in powder form and contains a minimum 10% of essential oil compounds (including thymol, eugenol, and curcumin). VevoVital® consists of 99.9% benzoic acid in flake form. Growth performance, nutrient digestibility, fecal microbiota, fecal score and gas emission were assessed.
RESULTS

Combinations of eubiotics have a positive effect on growth performance
During d 8 to 21, pigs fed the BE1 and BEF1 diets showed greater (P<0.05) average daily gain (ADG) than those fed the CON and BEF2 diets. The gain to feed (G/F) was increased in BE1 and BEF1 compared with other treatments. Overall, pigs fed the BE1 diet had a higher (P<0.05) ADG than pigs fed the CON diet. BE1 and BEF1 treatments had higher (P<0.05) G/F than that in CON.

Apparent total tract nutrient digestibility
There was no difference in ATTD of dry matter (DM) and nitrogen (N) among treatments at d 7 and 42. Pigs fed the BE2 diet had a significantly higher (P<0.05) ATTD of DM compared with those fed the CON diet at d 21. The ATTD of N in BE1, BEF1 and BE2 treatments was increased (P<0.05) compared with CON treatment. No difference was observed in the ATTD of energy throughout the experimental period.

Eubiotics supplementation positively influenced fecal microbiota
The fecal Lactobacillus counts were highest and the number of fecal E. coli was lowest (P<0.01) in BE1 treatment amongst the dietary treatments, meanwhile the number of fecal E. coli was decreased (P<0.01) by BEF1 treatments compared with CON, BE2, and BEF2 treatments.
Eubiotic supplementation reduced fecal noxious gas emission

All the supplementation diets decreased (P<0.05) the fecal ammonia (NH₃), total mercaptans and hydrogen sulfide (H₂S) emission compared with CON treatment at the end of the experiment but no effect was observed on the fecal score by dietary treatments.

**DISCUSSION AND CONCLUSION**

It has been reported that benzoic acid is the most efficacious organic acid. Only a small dose of benzoic acid is required to suppress a large population of pathogenic organisms such as *E. coli* and *Salmonella* (Knarreborg et al., 2002; Walsh et al., 2007). This result is consistent with our findings. It is currently known that organic acid must first cross the bacterial cell wall of pathogens in order to reach the cytosol. There, they disrupt cellular function, causing cell death. Furthermore, it has been found that certain essential oil compounds, such as eugenol and thymol can increase the permeability of bacterial cell membranes, allowing the organic acid to work more efficiently (Hyldgaard et al., 2012). The efficacy of combinations of eubiotics has been clearly observed in the current study. In addition to this, our findings are also in agreement with Ng, et al., 2009, who found that when a probiotic preparation was added, there was maximal efficacy, as the eliminated pathogenic microorganisms were replaced by beneficial ones. In conclusion, the combination of benzoic acid, essential oil compounds and probiotics has been demonstrated by our experiment to have a positive effect on growth performance, nutrient digestibility, fecal microbiota and a reduction in fecal gas emission.

**REFERENCE**


