

# INCREASE IN LACTOBACILLUS DECREASES THE LEVEL OF ODOROUS COMPOUNDS IN PIG INTESTINE

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**Abstract – This study was performed to investigate the effect of formulated diets well balanced in amino acid ratio (BAA) on the level of odorous compounds and changes in the microbial population in feces of growing pigs. Pigs fed BAA diets showed decrease in odorous compounds including cresol, skatole and phenols with lower pH level in feces. In accordance with this result, lactobacillus among the microbial genus was significantly increased in feces from pigs fed BAA diet when compared with those in control group. In conclusion, balanced amino acid level in pig diet may help reduce odor by improving fermentation environment pig intestine.**

**Key Words – microbes, porcine, fermentation, lactobacillus**

## I. INTRODUCTION

Increased feed cost and concerns about the environmental pollution triggers a tremendous attention on the livestock, especially pig production and research. To this end, concept of ideal protein was recently introduced highlighting the importance of the balance in all kinds AA, not just Lys, Met, Thr, and Trp [1]. Excessive AA can cause both the waste of expensive feed ingredients and malodor by undesirable fermentation of undigested N residues in pig manure [2]. On the basis of this principle, we hypothesized that administration of diets well-balanced in AA ratio (BAA) may improve the fermentation environment in pig intestine, thereby can reduce the production of odorous compounds. Therefore, this study was performed to investigate the effect of BAA diet on GI tract fermentation, level of odorous compounds, and changes in the fecal bacterial society.

## II. MATERIALS AND METHODS

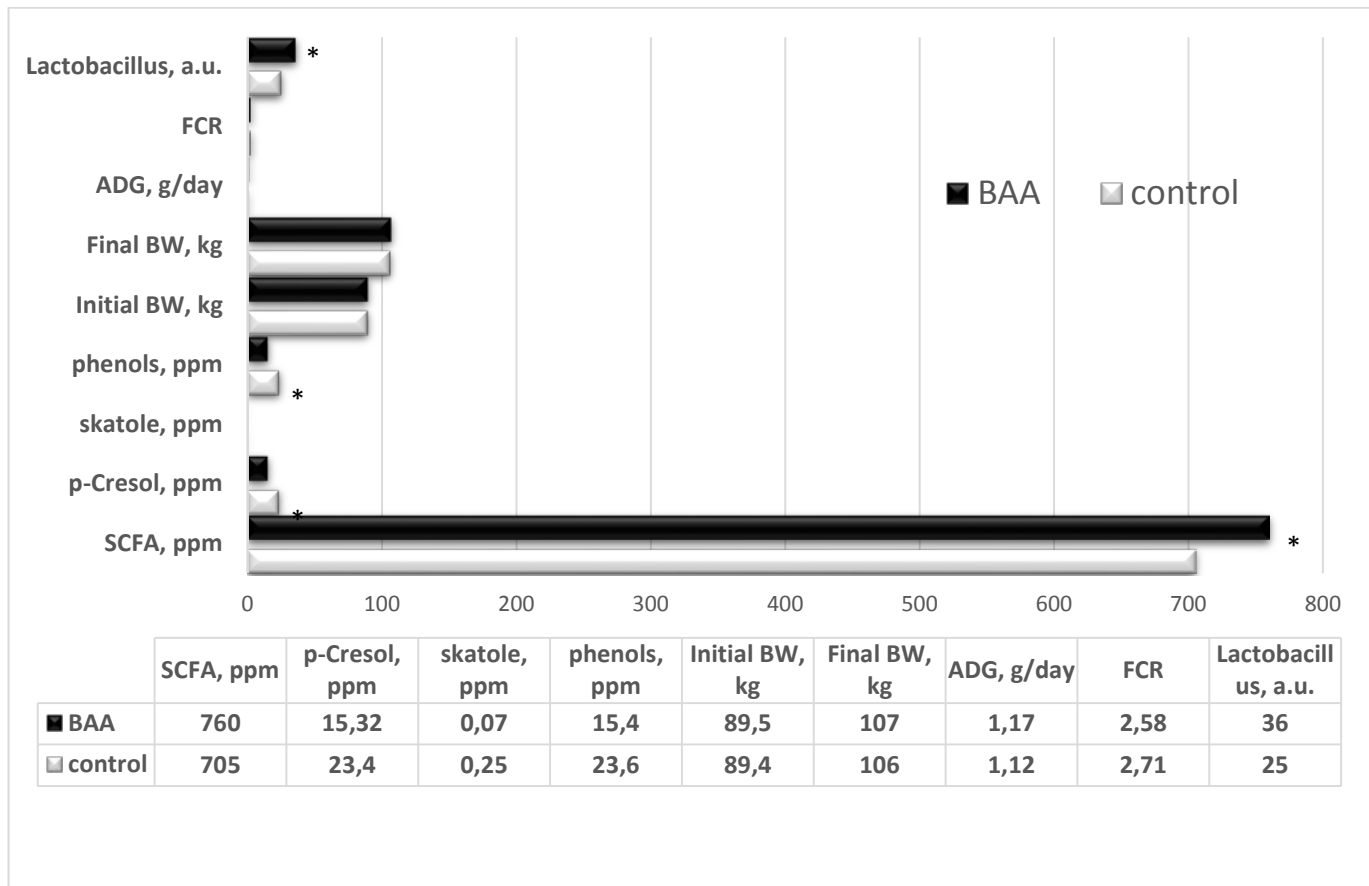
Each experimental group, including control and BAA, contain 4 barrows ( $\{\text{Landrace} \times \text{Yorkshire}\} \times \text{Duroc}$ ) with an average BW of 90 kg. Pigs were housed individually in metabolism cages and fed either control diet, which was formulated by Korean Feeding Standard for Swine 2007 [3], or BAA diet, which contain 0.76% Lys, 0.23% Met, 0.32% Arg, 0.24% His, 0.46% Ile, 0.76% Leu, 0.38% Phe, 0.5% Thr, 0.14% Trp, and 0.53% Val. Feed in ground form was fed to each pig about 1.5kg twice/d. After 2wk of adaptation, sample of feces and urine were collected, weighed, and stored in a refrigerator for analysis. Blood sample was collected from the vein into EDTA treated tube for hematology analysis. Analysis of volatile fatty acid and odorous chemicals was performed by gas chromatograph (6890N, Agilent, Santa Clara, CA, USA). Bacterial communities of pig slurry were analyzed by PCR amplification based on 16S rRNA gene sequence and pyrosequencing analysis was performed by using the 454 FLX Titanium System (Roche, Pleasanton, CA, USA) in Chunlab Korea.

## III. RESULTS AND DISCUSSION

When compared with control, BAA group showed greater levels of short-chain fatty acids (SCFA; Fig. 1). Odorous compounds, including phenols, skatole, and p-cresol, were decreased ( $P < 0.05$ ) by BAA treatment (Fig. 1), but levels of indoles, pH, ammonia were not different between experimental groups (data not shown). Growth performance, including feed conversion rate (FCR), average daily gain (ADG), body weight change, was not affected by administration of BAA in growing pigs. Changes in the bacterial community structure during feeding trial in the current study were analyzed by the multiplex bar-coded pyrosequencing technique based on 16S rRNA gene sequence. After removal of low quality reads from the sequencing data, the total numbers of reads were 14018 for control and

13264 for BAA treatment group, respectively (data not shown). Concomitant to the level of SCFA, *Lactobacillus* of the phylum *Firmicutes*, which have a positive influence on the production of SCFA [4], was drastically increased ( $P < 0.05$ ) in feces from pig fed BAA diet (Fig. 1).

Figure 1 The effect of balanced amino acid diet on growth performance, concentration of fatty acids and odorous compound, and changes in the microbial genus level.



#### IV. CONCLUSION

Results from the current study demonstrate that precise formulation of pig diet is very important to performance as well as environmental impact. Furthermore, the ideal amino acid profile can reduce the odorous compounds by improving the gut fermentation. Therefore, more study is necessary to identify the requirements for other essential amino acids than the famous ones including Lys, Met, Thr, and Trp. Our data provide a possible mechanism by which amino acid metabolism affects gut fermentation, thereby change the level of odorous compounds with related microbial society in pig intestine.

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