

Effects of betaine supplementation on growth performance, tissue weights and mrna expressions relating to protein metabolism in broiler chicks (#222)

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Introduction

Betaine has been used as a methionine alternative in animal nutrition for more than 50 years. Because, it improves growth performance, increases muscle weight and reduces body fat in pigs and chicks. However, the results in the literatures are not essentially consistent (1, 2). These contradiction may be partially explained by the difference of nutrient contents in the diet. This experiment was conducted to clarify the nutritional mechanism of betaine for broiler chicks, especially focused on protein metabolism.

Methods

Twenty-seven 10-day-old male chicks (ROSS 308 strain) were assigned to one of the three treatment groups: corn-soybean meal based control diet, control diet + 0.1 % betaine, and control diet + 0.1 % methionine. The control diet was formulated to meet or exceeded nutrient recommendations for Ross broiler chicks. Experimental period was 2 weeks. Broilers were individually housed in battery cages with wire-mesh floor and had free access to diet and water. At the end of experiment, birds were killed and plasma, liver, breast and thigh muscles were obtained for the after analysis.

Results

Body weight gain, feed intake and feed efficiency in the betaine and methionine groups were significantly higher than that in the control group (Table 1.). The breast and thigh muscle weights in the betaine and methionine groups were significantly heavier than that in the control group (FIGURE 1). Plasma free histidine and alanine concentrations were higher than that in the control group. Liver IGF-1 mRNA expression in betaine group, which is relating to protein synthesis, tended to be higher than that in the control group. Liver CPT-1 mRNA expression in methionine group, which is a rate-limiting enzyme of fatty acid degradation, was significantly lower than that in the control group. Breast and thigh muscle atrogen-1 mRNA expressions in betaine group, which is relating to muscle protein degradation, was significantly lower than that in the control group (FIGURE 2).

Conclusion

These results indicate that betaine affects mRNA expressions of protein metabolism relating factors as well as growth performance in chicks. Furthermore, the nutritional mechanism of betaine may be partially independent of methionine.

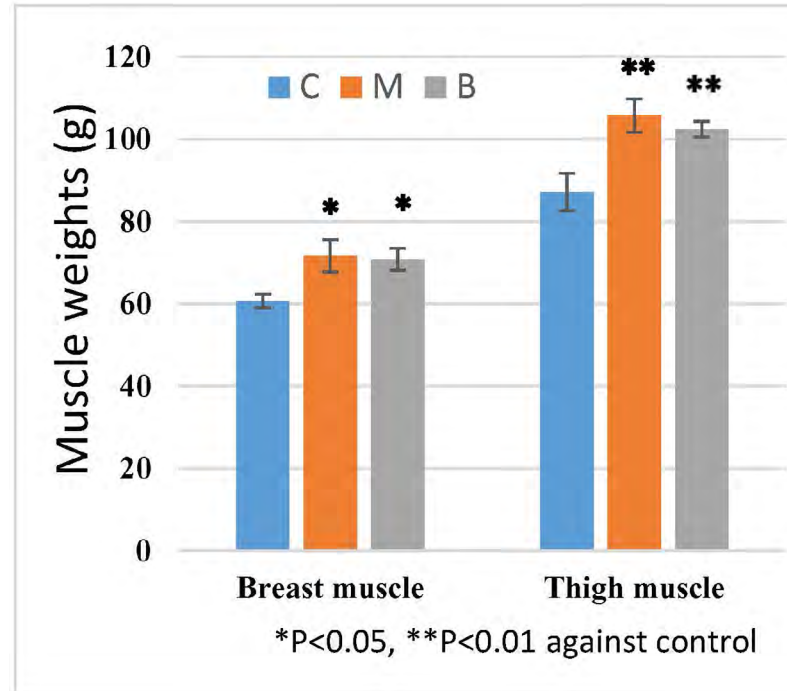


FIGURE 1 Muscle weights of chicks fed methionine and betaine supplemented diets

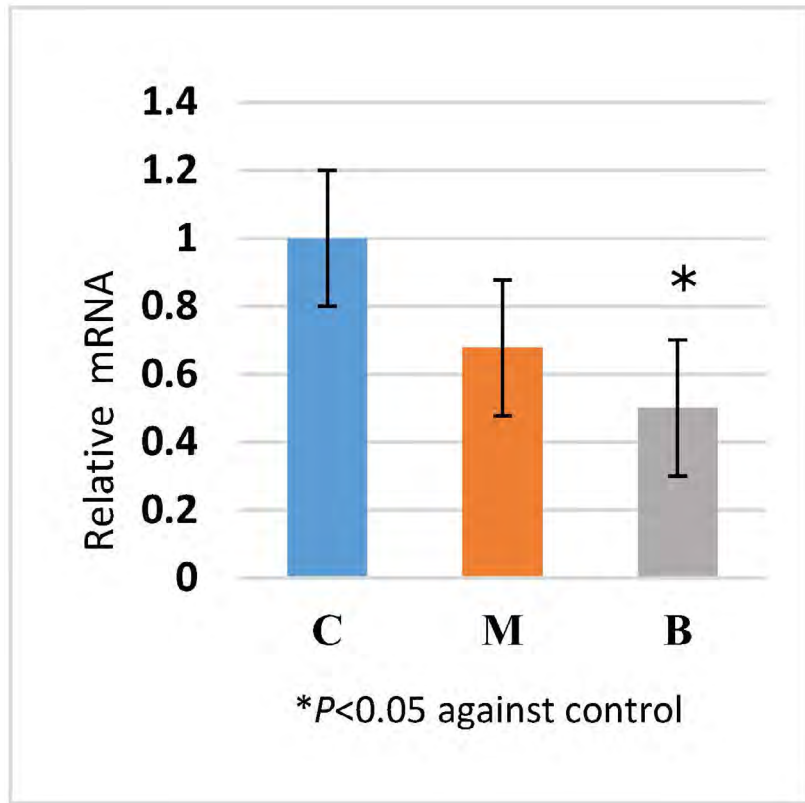


FIGURE 2 Relative Atrogin 1 mRNA expression in the thigh muscle of chicks fed methionine and betaine supplemented diets

Notes