

Effect of regulation dietary amino acid level (Lys) on growth performance, blood and muscle metabolism in broilers

Vladislav Rudik ¹, Nana Wada ¹, Genya Watanabe ², Saki Shimamoto ¹, Shinobu Fujimura ¹

¹ Graduate School of Science and Technology, Niigata University, Japan, ² Institute of Livestock and Grassland Science, National Agriculture and Food Research Organization, (NARO), Japan

Objectives: Amino acids have always played a significant role in broilers feeding, and many studies described the effect of dietary amino acids. Lysine (Lys), one of the most valuable limiting amino acid which increasing growth rate, feed conversion and breast meat yield in broilers. In some studies, it has been also proved that Lys increases the ultimate pH of breast meat and decrease drip loss and cooking loss. Furthermore, it is also used for protein synthesis. Recent studies have shown that short-term feeding of a low Lys diet increases the concentration of free amino acids in muscles by promoting protein degradation (Watanabe et al., 2017). The objective of this study was to investigate the effect of low Lys diet on growth performance, blood and muscle metabolism, and meat quality in broilers.

Materials and Methods: 14 - day-old broilers (Ross) were allocated for two groups: control group with 1.3% of Lys in diet and low Lys group with 1.2% (Requirement: Ross Nutrition Specification level is 1.3%). There were 6 birds in each group. Chickens were fed each diet for 10 days. All other nutrition levels fulfilled the requirements of the Ross Nutrition Specification (Aviagen, 2019). Measurements At the end of the experiment, feed intake, growth performance and free amino acid in muscles and plasma were measured.

Results and Discussion: The aim of this study was to investigate the effect of reduced dietary Lys level on growth performance, blood and muscle metabolism in broilers. Growth performance: Feed efficiency was higher in control group. Body weight gain and breast muscle weight were also higher in control group. The mass of abdominal fat to body weight mass in low Lys group was lower than that of Control group. As in starter and grower periods, Lys is critically important for the high yield of breast meat (Kidd et al., 2004). Therefore, there is a limit for Lys reduction during the different feeding phases. Free amino acids in plasma: The concentration of Lys in plasma was decreased in low Lys group. However, histidine in plasma was slightly increased in low Lys group compared to the control. There was no difference in other amino acids in plasma between two groups ($P < 0.05$). Free amino acids in muscle: In low Lys group glycine, glutamine, threonine, valine, glutamic acid and arginine increased significantly. Carnosine, imidazole dipeptide, is also increased in low Lys group. However, Lys, aspartic acid, methionine, tyrosine and ornithine was higher in control group ($P < 0.05$). Total muscle free amino acids noticeably increased in low Lys group. Muscle free amino acids increased significantly in low Lys group. Thus, Lys restriction during the grower phase may be beneficial for the meat taste especially by increasing free amino acids in muscle (Watanabe et al., 2017). In addition, Ahsan et al. (2020) has been reported that Lys restriction during the grower phase can reduce the incidence and severity of breast meat abnormalities such as White Striping (WS), Wooden Breast (WB) and Spaghetti Meat (SM) myopathies which has an economically negative impact on contemporary poultry industry. The effect of reduction in dietary Lys on meat quality, taste and growth-related breast meat abnormalities will be examined by the next step of research.

References:

- Watanabe G, et al., 2017. *Animal Science Journal* 88, 300-305.
Aviagen, 2019. Ross Nutrition Specifications.
https://en.aviagen.com/assets/Tech_Center/Ross_Broiler/RossBroilerNutrition-Specs2019-EN.pdf.
Kidd M, et al., 2004. *Journal of Applied Poultry Research* 13, 593-604.
Ahsan U, et al., 2020. *Animal Feed Science and Technology Journal* 270, 114705.

Key words: Lysine, Muscle metabolism, Broiler meat, Feed