

Regulation of meat quality by dietary lysine levels

Arisa Kiryu¹, Chisato Iida², Tsutomu Takizawa², Tomoko Hashimoto², Saki Shimamoto¹, Shinobu Fujimura¹

¹ Graduate School of Science and Technology, Niigata University, Niigata, Japan, ² Central Research Laboratory, Nippon Suisan Kaisha, Ltd., Japan

Introduction: Meat quality is an important quality attribute for consumers. For example, breeding technique, dietary antioxidants and colors were mainly used for improving the meat quality in the world. However, there are few reports about improving the taste active components of meat by diet. Previously, main taste component, free glutamate (Glu), content of meat was regulated by dietary crude protein (CP) and some amino acids. Dietary BCAA or Lys were available for the free Glu contents of chicken meat. In this study, we investigated the effect of dietary Lysine (Lys) on the Glu contents of meat in experiment 1. Then, in experiment 2, we examined the effect of the dietary Lys on sensory score of meat.

Materials And Methods: The 32 days old female Chunky strain broiler chickens were allocated to two groups. Dietary Lys contents were 100 and 150% of the NRC Lys requirement. Each diet was given to chickens of each group for 10 days. All chickens were allowed free access to feed and water. After the experiment, all chickens were slaughtered, and breast muscles and thigh muscle were taken for analyses. Free amino acids concentration in meat extract were measured by HPLC. Drip loss and cooking loss were also measured. A sensory evaluation was conducted for tastes of meat to determine whether differences in meat taste and texture reflected those in chemical compositions of meat. Fried chicken was used in the sensory evaluation. It was carried out with trained panelists using paired difference and comparison test.

Results And Discussion:

Effect of dietary Lys level on taste-active components of meat From measurements of free amino acid contents in muscles, there were significant differences in Lys and Glu. Free Lys content was increased in the Lys 150% group. Free Glu content also significantly increased by in the Lys 150% group compared to the Lys 100% group. As a result, it was clear that Lys addition diet induced an increase in free Glu content in muscles. Watanabe *et al.* (2014) reported that saccharopine pathway relates to the free Glu contents in the High Lys diet.

Sensory evaluation of meat A paired comparison test was carried out to evaluate the differences of meat tastes. As a result, all 10 panelists answered that there was a statistically significant difference between the two groups. Using a paired comparison test, flavor, juiciness, and elasticity scores for the 150% Lys group were significantly higher than those for the 100% Lys group. These results suggested that the meat taste of Lys 150% group was superior to that in the Lys 100% group.

Conclusion: In order to clarify that the meat taste is able to improve by dietary components, we measured free amino acids, and sensory scores by using Chunky strain female broilers. In our study, free Glu content, the main taste-active component of meat, was significantly increased by dietary Lys. Compared with the Lys 100% group, free Glu was significantly increased in the Lys 150% group. And this increasing of Glu could recognize from sensory evaluations of meat taste and texture. These results suggest that dietary Lys content is a regulating factor of free Glu in meat. Addition of dietary Lys induces an increase in free Glu content of meat and improves meat taste.

References:

- Fujimura, S., Muramoto, T., Do-Ura, I., Koga, H., Tone, N., Kadowaki, M. & Ishibashi, T. (1997) Effect of feeding area and feeding intake on meat composition and taste relating components of broiler chicken. *Japanese Poultry Science*, **34**, 373-381.
- Imanari, M., Kadowaki, M., Fujimura, S. (2007) Regulation of taste-active components of meat by dietary leucine. *British Poultry Science*, **48**, 167-176. National Research Council. (1994) Nutrient Requirements of Poultry, 9th ed. Washington, DC, National Academy Press.
- Stone, H. & Sidel, J.L. (2004) Discrimination testing, In Taylor, S.L. Sensory Evaluation Practices, 3rd ed., (pp. 145-200) San Diego, CA, Academic Press. Watanabe, G., Kobayashi, H., Shibata, M., Kubota, M., Kadowaki, M., & Fujimura, S., Regulation of free glutamate content in meat by dietary lysine in broilers. *Animal Science Journal*, **86**, 435-442, 2015.
- Watanabe, G., Kobayashi, H., Shibata, M., Kubota, M., Kadowaki, M., & Fujimura, S., Reduction in Dietary Lysine Increases Muscle Free Amino Acids through Changes in Protein Metabolism in Chickens, *Poultry Science*, **99**(6), 3102-3110, 2020.

Key words: Dietary lysine, Meat quality, Glutamic acid, Meat taste, Sensory evaluation