Comparison of umami intensity in broiler edible meat and offal during aging

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Objectives: Taste-active compounds such as free amino acids or peptides in meat increase during the aging period after slaughter, and there have been many reports on the relationship between aging and umami in meat and meat products; however, edible chicken meat or offal such as diaphragm, gizzard, and cartilage have not been fully investigated. Yakitori is one of the most popular dishes in Japan, and its household consumption is twice that of hamburgers. Yakitori is made by stabbing chicken meat or offal on a bamboo skewer and grilling it over an open flame. In many cases, the only seasoning used for yakitori is salt, which is strongly influenced by umami derived from meat or offal. Therefore, it is important to investigate the most affected point of umami intensity during aging. The aim of this study was to clarify the changes in umami intensity during the aging period and to compare the differences between meat tissues.

Materials and Methods: Chunks of broiler meat and offal were obtained from the same chicken farm in a slaughterhouse in Japan. Each piece of meat and offal (breast, breast-fillet, thigh, middle joint wing, drumette, neck, gizzard, diaphragm, heart, liver, skin, rump, breast soft-bone, breast cartilage, knee soft bone, and knee cartilage) was packaged in plastic bags, and stored at 5 ℃ until analysis. The day of slaughter was defined as day 0. And the next day (day 1) was transported from the slaughterhouse to the re- search facility. Sampling was performed from days 2 to 6. Four times the amount of cooled distilled water was added to each part of the minced meat and homogenized at 10,000 rpm for 1 minute. Each homogenate was centrifuged (10,000 × g, 15 min, 4 ℃) and the supernatant was collected. The deproteinized supernatant with 1.5% 5-Sulfosalicylic acid was analyzed using an automatic amino acid analyzer to quantify the free amino acids. The same supernatant was subjected to HPLC using a gel filtration column, and the amount of inosinic acid was measured. The quantified glutamic acid (Glu) and inosinic acid (IMP) contents were substitut- ed into the following formula to calculate the umami intensity: Umami intensity = u + 1218uv (u = Glu concentration, %; v = IMP concentration, %) Aminopeptidase activity was determined as previously described. In brief, β-naphthylamide-conjugated substrate (Leu-, Lys- , or Glu) was added to each homogenate in 10 mM Tris buffer (pH 8.0), and the absorbance of hydrolyzed β-naphthylamide was measured at 580 nm.

Results and Discussion: No decrease in pH or microbial contamination in meat or offal was detected during the test period. The amount of glutamic acid in the breast, breast fillet, and thigh was increased by approximately twice from day 2 to day 6 (breast: 25 mg/100 g meat to 42 mg/100 g meat, breast fillet: 18 mg/100 g meat to 24 mg/100 g meat, thigh: 30 mg/100 g meat to 55 mg/100 g meat), while the amount of inosinic acid decreased to 60% on day 6 (breast and thigh: 160 mg/100 g meat to 100 mg/100 g meat). On the other hand, gizzards and heart meat showed glutamic acid content about three times higher than that of the breast and thigh on day 2, and little change was observed on day 6. Therefore, the umami intensity remains high during the aging period. The ami- nopeptidase activity in each tissue, except for the heart, showed little changes until day 6. The enzyme activity that hydrolyzes glu- tamic acid decreased to less than half of that on day 2 in the heart on day 6. Therefore, the umami intensity of the heart did not change during the aging period. From these results, it was clarified that the change in umami intensity with time differed depending on the meat tissue, and that the umami intensity could be maximized by setting the aging period according to the characteristics of each part of the meat.

Key words: Chicken meat, Umami intensity, Glutamic acid, Inosinic acid