

Elucidation of Organoleptic Factors Contributing to Identification of Animal Species of Meat

Masanori Matsuishi, Shin Takeda and Akihiro Okitani

Department of Food Science and Technology, Nippon Veterinary and Animal Science University, Tokyo 180-8602, Japan

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Background The palatability of meat consists of three sensory factors such as taste, aroma and texture. Since we perceive taste and aroma (retronasal aroma¹⁾) simultaneously on chewing meat in our mouths, we usually call the complex sensation a flavor. Thus, in most cases it had been unknown which one between taste and aroma was a dominant contributor to the palatability of some meat which presented preferable flavor. However, in 45th ICoMST we indicated that aroma rather than taste contributed to the palatability of Japanese Wagyu beef by sensory evaluation using panelists with or without pinching their noses²⁾. We usually eat various animal species of meats, for example, beef, pork, chicken, lamb and aigamo (crossbreed of domestic duck and wild duck) meat. We can enjoy well the characteristics of meats, when we eat meats in the knowledge of those animal species. However, it has not been clarified which one of taste, aroma and texture enables us to identify the animal species of meats.

Objectives The aim of this work was to clarify which one of taste, aroma and texture is the dominant contributor to the identification of the animal species when we eat various meats.

Materials and methods Loins of beef, pork and lamb, chicken thigh and aigamo breast were purchased from retail shops. Only aigamo meat was obtained in a frozen state and used after thawing in tap water. Others were chilled meats. Adipose and connective tissues were removed from all species of meats and only lean meats were used. Meat pieces (ca. 2 x 2 x 0.3 cm) of each animal species were heated in a 1% NaCl solution at 80°C for 3 min and provided for an animal species-identifying test (ASIT). A meat block of each animal species was minced and meat patties (ca. 3 cm in diameter and 0.5 cm in thickness) were prepared from the minced meat. The meat patties were heated in a 1% NaCl solution at 80°C for 3 min and provided for ASIT. A 100 g of minced meat of each animal species was heated with 100 ml of a 0.5% NaCl solution in a boiling water bath for 30 min. The mixture was filtered with a gauze and a filter paper after cooling to remove suspended materials (involving fats) and used as a heated soup. The heated soup was incubated at 40°C and its portions of ca. 5 ml were provided for ASIT. ASIT was performed with each of meat pieces, meat patties and heated soups. In the first test, panelists wearing eye masks with pinching their noses ate five samples (beef, pork, chicken, lamb and aigamo) provided in random orders to identify those species and answered the identification results and those reasons. In the second test, panelists wearing eye masks without pinching their noses ate the five samples provided in random orders to identify those species and answered the identification results and those reasons.

Results and discussion Table 1 shows a percentage of panelists identifying each animal species correctly and the sensory traits which they described as the reason for the identification. On the test with pinching their noses the percentage of panelists identifying chicken correctly was the highest value of 72%, but percentages for all other animal species were lower than 50%. Many panelists indicated texture rather than taste as the reason for the correct identification of chicken. This is likely due to its unique texture that is elastic and tender. On the test without pinching their noses a percentage of panelists identifying each animal species correctly was higher than that on the test with pinching their noses. The largest number of panelists indicated aroma as the reason for the correct identification of each animal species. Relatively many panelists indicated taste and texture as the reason for the identification of chicken, but few indicated such properties for other species of meats.

Table 2 shows the result in the case of patties in which muscle structures were destroyed partially. On the test with pinching their noses a percentage of panelists identifying chicken correctly was the highest value of 61%, but percentages for all other animal species were lower than 40%. Many panelists indicated texture rather than taste as the reason for the correct identification of chicken. This is likely due to its texture that is elastic like a fish gel product (kamaboko). In all animal species percentages of panelists identifying animal species correctly decreased slightly in comparison with the case of meat pieces, indicating that the identification would become more difficult because of destruction of texture. On the test without pinching their noses a percentage of panelists identifying each animal species correctly was higher than that on the test with pinching their noses. The largest number of panelists indicated aroma as the reason for the correct identification of each animal species. The test without pinching noses showed that for all animal species percentages of the correct identification of meat patties were similar to those of meat pieces. This result

would indicate that panelists are able to identify animal species correctly by aroma, even if muscle structures are destroyed partially.

Table 3 shows the result in the case of heated soups which had no muscle structure. On the test with pinching noses percentages of the correct identification for all animal species were lower than 30%, which were markedly lower values than those in the case of meat pieces and patties. This indicates that it is quite difficult for panelists to identify animal species only by taste. On the test without pinching their noses a percentage of panelists identifying each animal species correctly was higher than that on the test with pinching their noses. Especially in the case of lamb a percentage of the correct identification was 66%, suggesting that mutton odor of the heated soup helped the identification.

Conclusions It is considered that aroma is the first dominant contributor to the identification of animal species of meat and texture is the second dominant one. The contribution rate of taste would be much smaller than that of aroma and texture.

- References** 1) Roberts, D. D. and Acree, T. E. *J. Agric. Food Chem.*, **43**, 2179-2186 (1995).
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Table 1. Percentages of the correct identification of animal species and reasons for the identification on the test of meat pieces *.

Species	Test with pinching noses				Test without pinching noses				
	Percentage of correct identification (%) †	Reason ††			Percentage of correct identification (%) †	Reason ††			
		Taste	Texture	Other		Taste	Aroma	Texture	Other
Beef	44	2	7	5	69	2	18	6	3
Pork	38	2	9	2	50	0	8	1	6
Chicken	72	5	23	0	84	8	14	13	1
Lamb	47	3	4	8	66	0	20	0	1
Aigamo	44	3	11	2	69	4	21	3	1

*: Four experiments were performed. In each experiment different lots of market meats were used for all animal species. Eight, 8, 9 and 7 panelists participated in the first, second, third and fourth experiment, respectively (32 panelists in total). †: This shows a percentage of panelists identifying each animal species correctly in four experiments. ††: This shows a number of panelists who identified animal species correctly and indicated each reason described in the table. Panelists were allowed to answer plural reasons.

Table 2. Percentages of the correct identification of animal species and reasons for the identification on the test of meat patties *.

Species	Test with pinching noses				Test without pinching noses				
	Percentage of correct identification (%) †	Reason ††			Percentage of correct identification (%) †	Reason ††			
		Taste	Texture	Other		Taste	Aroma	Texture	Other
Beef	36	2	7	3	64	4	15	3	0
Pork	36	3	4	6	61	4	7	1	7
Chicken	61	11	14	0	73	3	18	10	0
Lamb	33	2	3	5	67	1	21	0	0
Aigamo	27	4	5	3	52	1	16	2	1

*: Four experiments were performed similarly as the case of meat pieces in Table 1. Seven, 10, 8 and 8 panelists participated in the first, second, third and fourth experiment, respectively (33 panelists in total). †: the same as Table 1. ††: the same as Table 1.

Table 3. Percentages of the correct identification of animal species and reasons for the identification on the test of heated soups *.

Species	Test with pinching noses			Test without pinching noses			
	Percentage of correct identification (%) †	Reason ††		Percentage of correct identification (%) †	Reason ††		
		Taste	Other		Taste	Aroma	Other
Beef	14	4	1	29	4	4	2
Pork	17	5	1	29	3	7	2
Chicken	26	7	2	43	6	6	2
Lamb	11	2	3	66	2	22	1
Aigamo	22	5	2	34	3	8	2

*: Four experiments were performed similarly as the case of meat pieces in Table 1. Eight, 10, 10 and 7 panelists participated in the first, second, third and fourth experiment, respectively (35 panelists in total). †: the same as Table 1. ††: the same as Table 1.