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Dynamics of sensory perception of Holstein beef assessed by temporal dominance of sensations (#58)

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Introduction

The objective of this study was to assess the major sensory characteristics and dynamic sensory perception of Holstein beef. Holstein are widely produced as a beef cattle in Japan. "Wagyu" which is a typical breed of Japanese beef cattle is characterized by a large amount of intramuscular fat. Thus, visual appearance and sensory characteristics of Wagyu beef is different from lean type beef. On the other hand, Holstein beef is characterized as a lean type beef in Japan, and Japanese consumers generally consider that sensory characteristics of Holstein beef is not different from imported beef. To characterize the Holstein beef, it is necessary an understanding of major sensory attributes of Holstein beef. For this purpose, we focused on the "temporal dominance of sensations (TDS)". TDS is a dynamic sensory method that captures the "dominance of sensation" throughout food consumption, and it is possible to determine the priority of sensory attribute by "dominance rate" over time [1]. Our recent study demonstrated that the major sensory attributes of Wagyu beef by using of TDS [2]. Thus, TDS is expected as a useful method to determine the sensory characteristics of Holstein beef.

Methods

Strip loin was obtained from 3 Holstein steers. Each sample was aged at 4°C for 20 days after slaughtering, vacuum packed and stored at −30°C. The samples were thawed in a refrigerator for one day and formed into 4 mm thick disks (4 cm diameter). The meat disks were cooked on an electric griddle set at 180°C for 30 s for each side and kept warm in warm cabinet set at 70°C until just before the TDS test.

The 12 sensory attributes (Figure 1) were established for TDS during preliminary sensory sessions. The definition and reference of each sensory attribute were presented to assessors as described previously [3]. For the TDS test, 16 panelists were selected and trained as sensory panel members, as described previously [4]. The TDS computerized system designated by MagicSense (Taste Technology LLC., Tokyo, Japan) showed the entire list of attributes on a computer screen to the panelists. Panelists were instructed to click on the "START" button as soon as they put the sample in their mouth. They could then successively select the characteristics that most triggered their attention from the 12 attributes. The TDS test lasted for 60 s, and data were recorded every 0.2 s. The TDS session was conducted three times with muscles from different carcasses used in each session. Each panelist evaluated one piece of meat disk in each session. Finally, a total of 46 evaluations were conducted.

Collected data was analyzed as described by Pineau et al. (2009) [1]: 1) For each time point and each attribute, "Dominance rate", which is the rate of runs for assessed as dominant, was calculated. 2) The "chance level" is the dominance rate that a characteristic can obtain by chance considering all of the characteristics evaluated. Its value is equal to $1/p$, p being the number of sensory items. 3) The "significant level" was calculated from the confidence interval of a binomial proportion based on a normal approximation taking into account the chance level and the 46 evaluations performed, which resulted in 0.15.

Results

Dominance rates of "tough and/or hard," "dry," "umami," and "oily odor" were exceeded the significant level in Holstein beef (Figure 1). "Tough and/or hard" was dominant at the at the beginning of the eating process; "dry" had the longest duration of dominance (almost 3 to 55 s); "umami" was mainly dominant in almost 8 to 27 s; "oily odor" was dominant in almost 27 to 28 s (Figure 1).

Conclusion

The conventional descriptive sensory tests cannot evaluate the relative perception priority among sensory characteristics because each sensory characteristic was evaluated independently. In contrast to these tests, the TDS provided a good overall description of the major sensory characteristics of Holstein beef during the consumption process. In addition, dynamics of sensory perception of Holstein beef was revealed. Accordingly, the TDS revealed new information which makes it easy to understand the complex beef sensory characteristics. In further studies, the integrity of the TDS by comparing the TDS results with a conventional descriptive sensory test should be verified. In addition, a direct comparison with Wagyu beef are needed in order to clarify distinctive sensory traits of Holstein beef.

References

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