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## A method for evaluating the texture of hamburger patties using an artificial bolus

**SUZUKI M. (1), NONOBE E. (2), AOKI H. (2), KATSUNO N. (3), IMAIZUMI T. (3), NISHIZU T. (3)**

<sup>1</sup> Graduate School of Natural Science and Technology, Gifu University, Gifu, Japan

<sup>2</sup> Nichirei Foods Inc, Tokyo, Japan

<sup>3</sup> Gifu University, Gifu, Japan

Tactile stimuli to the oral cavity during mastication cause the sensation of food texture. The intensity of the stimulus depends on the physical properties of the food bolus. It is highly likely that temporal changes in the stimulus intensity, i.e., the changes in the physical properties of the food bolus during mastication, influence the sensation of food texture. In the present study, we developed a masticatory apparatus which can program mastication speed and stroke and the flow rate of artificial saliva, and investigated the relationship between the temporal changes in the physical properties of the food bolus and the sensory evaluation of the hamburger patty.

The textural properties of nine commercially-produced hamburger patties (graininess, crumbliness, and juiciness) were evaluated by Quantitative Descriptive Analysis to select four products for measurement of the physical properties of their boluses. The particle size distributions (PSD) of the granular material in the boluses collected at mastication from human participants in the experiment or from the masticatory apparatus were measured by sieve analysis using mesh sieves from 0.212 to 31.5 mm. The average rates of saliva absorption by the bolus were determined for each of the four hamburger patties. Comparing the properties of the human bolus and the artificial bolus allowed the optimal values of the mastication speed/stroke, the optimal flow rate of artificial saliva, and the optimal shape of teeth to be determined.

The results from the human bolus and artificial bolus showed that the PSD with a 25% passing rate (D<sub>25</sub>) value became smaller for samples whose crumbliness score became higher at mastication periods of 10 s or more. The Temporal Dominance of Sensation results showed that as the scores of juiciness and crumbliness increased, the onset time when the bolus comes together occurred earlier. The patterns of temporal changes in the PSDs were different for each hamburger patty whose graininess, crumbliness, and juiciness also differed from each other. Such patterns are important and effective for developing hamburger patty products.