

# Food palatability and its cognition

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Foods are generally characterized by having three categories of attributes regarding nutrition, sensation, and physiological body modulation; this line-up is in a historical order. The history of food science in Japan shows us some interesting episodes. In 1912, the outstanding biochemist, Dr. Umetaro Suzuki, Professor at the Imperial University of Tokyo, found the compound 'oryzanin' which was renamed vitamin B<sub>1</sub>. In the same days, Dr. Kikunae Ikeda, Professor of the same university, found monosodium glutamate as a palatable, umami substance for enhancement of food flavors. While both nutrition and flavor science had thus traced a major path of development for a long time, Dr. Soichi Arai, Professor at the University of Tokyo, emphasized the importance of physiological functions of foods and proposed the new terminology of 'functional foods' which have functionalities of reducing the risk of lifestyle-related diseases. The concept of functional food science has gained global interest and has been even put into practice.

Against this backdrop, we have thought it important to re-evaluate the significance of food palatability. We are particularly interested in basically understanding how food tastants interact with peripheral taste receptors and how the consequently expressed taste signals are transduced up to the brain.

Today, we would like to introduce two topics to you. The first is the development of a new taste sensor that simulates the peripheral sensing system in humans. Briefly, the human sweet taste receptor hT1R2 · hT1R3 was introduced, together with its coupling G protein, into human embryonic kidney (HEK) cells, with construction of a stable, sweetness-sensing cell line which semi-permanently responded to a series of sweet tastants almost in accordance with the conventional sensory evaluation data. The sensing device we thus developed is useful for objective quantification of sweetness. This study is also progressing with success in finding some new compounds that enhance or suppress the sweet intensity of sucrose.

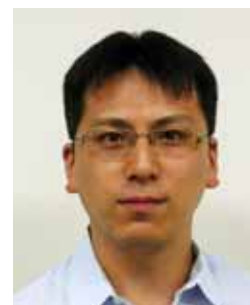
The second topic is on neoculin we found as a new taste-modifying protein occurring in the fruit of tropical plant, *Curculigo latifolia*. Neoculin, though it has weak sweetness of its own, can change the sourness of, for example, lemon into the taste of sweet orange; the resulting taste is almost 400 times the sweetness of sucrose on the weight basis. The use of X-ray crystallography and molecular dynamics simulation has revealed the mode of interaction between this intriguing protein and hT1R2-hT1R3. Some story on how the riddle is to be solved will also be introduced so that you can get idea on 'food palatability and its cognition' at molecular level.

## Keiko Abe



Dr. Keiko Abe was born in 1947 and graduated from Ochanomizu Women's University in 1969. In 1983, she was given the PhD degree from The University of Tokyo, with a help of her supervisor Professor Soichi Arai. After working as post-doctoral fellow at The University of Tokyo for seven years, she promoted to Lecture of Agriculture Biological Chemistry in 1992, to Associate Professor in 1994 and then to Professor in 1996. Retiring from the University in March this year, she was given the title of Professor Emeritus. Professor Abe's major is Food Biochemistry in general and Taste Molecular Biology in particular, which involves the molecular logic of taste chemoreception and taste signal transduction up to the brain. The study has been up-grading even to chemical biology and structural biology including X-ray crystal-structural determination. Hitherto, a number of the prizes were awarded to Professor Abe, which include the 2009 Highest Award (IFF Award) of the Association for Chemoreception Sciences. She is still working hard as the head of the National Research Project on the taste-modifying protein 'neoculin' which was found and characterized by her group. Professor Abe has published as many as 230 original papers and 160 reviews. She is keen on applying her basic studies to industry, recognizing the importance of academia-industry consortium. To realize this ideal, she is endeavoring as an executive membrane of a number of governmental committees.

## Takumi Misaka



Takumi Misaka was born in Itami (Japan) in 1971. He was a student at the University of Tokyo, and obtained his Ph.D. from the University of Tokyo in 1998 (supervisor: Prof. Keiko Abe). He worked in Nissin Food Products. Co. Ltd. for two years, and then became a postdoctoral fellow of the University of Tokyo. In 2001, he became a research fellow of the Japan Society for Promotion of Science, and then found a job as a Research Associate at the National Institute for Physiological Sciences in Okazaki. In 2005, Dr. Misaka moved to the University of Tokyo as a Lecture and promoted to an Associate Professor. Since then, he has been engaged in work on food science to study, the mechanism of taste reception by functional analysis of taste receptors. Just on March this year, the Japan Bioscience, Biotechnology and Agrochemistry Society presented Dr. Misaka with its famous award for the encouragement of young scientists. He has published 41 papers.