— Current Topics —

Taste and Health: New Frontiers in Oral Physiology and Rehabilitation

Possible Applications of Umami Taste to Improve Eating Disorders

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The pleasant sensory qualities of the traditional Western cuisine derives mainly from animal fat, whereas traditional Japanese cuisine contains less fat and relies more on "dashi" (Japanese broth) to enhance food palatability. At the beginning of the 20th century, Dr. Kikunae Ikeda noticed that an unidentified taste quality, distinct from the four basic tastes (sweetness, saltiness, sourness and bitterness), was present in palatable foods. He found this taste most clearly in soups rich in "dashi" prepared from Japanese sea tangle (*kombu*), which has been traditionally used in Japanese cooking. In 1908, he succeeded in isolating salts of the amino acid glutamate as umami taste substances.[1] The year after his discovery, the monosodium salt of glutamic acid (monosodium glutamate: MSG) became commercially available as an umami seasoning for the first time. In 1913, his colleague, Shintaro Kodama examined the constituents of *katsuo-bushi* (bonito flakes), and reported that 5′-inosinate was also involved in umami taste.[2] Many years later, during a study of ribonucleotide production through biochemical degradation of yeast RNA, Dr. Akira Kuninaka identified 5′-guanylate to be another important umami substance.[3] This nucleotide is naturally present in "dashi" stuff and comes from dried Japanese shiitake mushroom. Now, these glutamate and 5′-ribonucleotides are considered typical umami substances (Fig. 1).

In the field of taste physiology, umami taste is thought to be a sensory marker for protein intake,[4] especially free dietary glutamate. Free glutamate is sensed by the umami taste receptors on the tongue and the umami sensation becomes a reference for the existence of proteins in meals, leading the appetite for protein to maintain the homeostasis of protein (amino acid) in the body. At the same time, like in other four basic tastants, glutamate induces taste reflexes, such as the secretion of saliva to facilitate mastication and swallowing of meals, and cephalic phase responses to prepare the gut for protein digestion. There are some animal and clinical researches to support the contribution of glutamate in those functions. In rodents, oral glutamate sensation leads to stimulate the swallowing neural input from the pharynx,[5] and digestive fluid secretions such as gastric and pancreatic fluids.[6, 7] In healthy volunteers, it has been estimated that oral stimulation of free Glu induced salivary secretions.[8]

Saliva has many essential functions. As the first digestive fluid in the alimentary canal, saliva is secreted in response to food, assisting intake and initiating the digestion of starch and lipids. During this process, saliva acts as a solvent of taste substances and affects tasting. Clinically, the most important role of saliva is the maintenance of oral health, including the protection of teeth and mucosa from infections, maintenance of the milieu of taste receptors, and communication ability through speech. The elderly usually suffers from hyposali-

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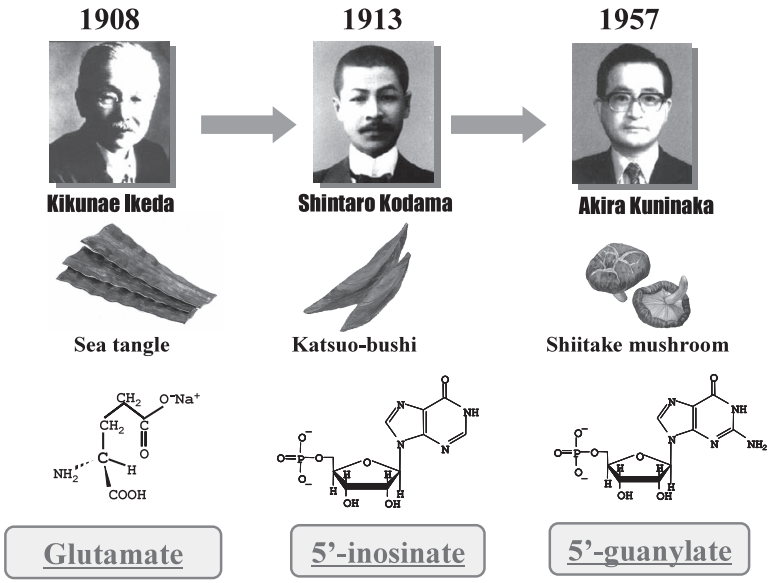

Fig. 1. Timeline of Discovery of Major Three Umami Taste Substances

The amino acid glutamate is the major umami taste component in Konbu (Japanese sea kelp). 5′-nucloeotides, 5′-inosinate and 5′-guanylate are major umami taste in Katsuo-bushi (dried bonito) and shiitake (dried Japanese mushroom), respectively. Those umami substances can be commercially available as MSG, 5′-inosine monophosphate (IMP) and 5′-guanosine monophosphate (GMP).

vation due to a reduction of sensory perception such as taste and smell. Shiffman reported that supplementation of MSG in soups improved salivary flow and increased total IgA secretion in the elderly.[9] For the nutritional management of the bedridden elderly, to improve appetite, mastication, and swallowing, is very important to encourage the ingestion of normal food. We believe that recent knowledge on umami taste physiology might help develop new methods or new medications to treat eating-related disorders such as disgeusia, dysphagia, dry mouth, and anorexia.

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