

# Newsletter

March 2005

Welcome to the latest edition of the IGIS newsletter. This edition covers two aspects of taste - firstly, the role that glutamate plays in ensuring a good diet and nutrition for the elderly and secondly, how babies perceive different flavours. The newsletter also summarises the amino acids symposium held in Tokyo in November and a recent seminar on glutamate and food seasoning, which took place in Malaysia.

## **Pleasing the taste buds of the elderly**

Over the next two generations the number of the world's people older than 60 will nearly quadruple. There are currently approximately 606m people who are over 60; this is anticipated to reach two billion in 2050. This will mean that for the first time, the elderly will outnumber the children.

The United States Department of Agriculture has established a Healthy Eating Index (H.E.I). According to their index 13% of elderly Americans have poor diets and 67% need improvement. This prediction has led to rising concern for the elderly, with loss of appetite associated with increased rates of mortality due to several interrelated factors including significant changes in food intake, impaired nutritional status, weakened immune system,



weight loss and increased susceptibility to disease. The reason for this deterioration in diet is without doubt related to the combined loss or decline in taste and smell.

When we are born, we have about 10,000 taste buds. Studies show that this number is significantly reduced by the time we reach sixty. Just how many taste buds an individual loses due to aging, has been the subject of some debate. In 1977, Professor Susan Schiffman mentioned that three scientists found that the average number of taste buds declines drastically from 208 to 88 by the time a person reaches the age of 74. Schieber (1992) referred to several scientists who estimated that a person could lose 20 to 60% of their taste buds after the age of 60.

Recent research however, has shown that the sense of smell is more vulnerable to deterioration than the sense of taste. This is because olfaction depends on one nerve, while three nerves transmit taste. Additionally olfactory receptors are exposed to environmental toxins and other agents through breathing, while neurons within taste receptors are protected within the mouth. It has also been shown that conditions that impair swallowing, including tooth loss, gum disease or poor dentures can diminish the sense of smell.

At birth, humans can detect about 20,000 different odours, and approximately 10 different intensities. As with the sense of taste, the sense of smell alters with age. Studies have shown that about one quarter of people between 65 and 79, and more than 80% of those over the age of 80, have lost most of their sense of smell. Despite being the sense which is most easily stimulated, it is also the most fragile, with the sense declining steadily from the age of about 40.

In general, chemosensory losses - the loss of taste and smell - are irreversible. A number of suggestions have been made as to how to compensate for this loss and thereby help prevent malnutrition. One of the most effective and easy methods is to improve the flavour of the food. For centuries people have added herbs and spices to food to alter flavour, and flavour enhancement with the use of monosodium glutamate is no different. Several studies in this area have shown that a small amount of glutamate can improve food palatability and offset chemosensory losses.

In 1998, Professor Schiffman carried out a study with two groups of elderly people. The first group received glutamate-enhanced food and the second group was given unenhanced food. After four weeks the order was reversed. The results of the study show that the enhancement with glutamate significantly improved the acceptability of the food amongst the elderly, in addition to helping people enjoy food more.

Bellisle et al (1991) concluded that glutamate probably exerts its effect by adding another taste quality to the food, which is umami. A further study by Professor Schiffman (1998) found that the addition of a combination of flavours and glutamate to foods improved the food intake in 43 hospitalized patients, who had clinical manifestations of malnutrition and had suffered a recent weight loss of 6% or more and/or were below ideal weight. The main finding of this study was the fact that 40 of the 43 elderly patients improved their energy intake by at least 10% by adding a combination of glutamate and flavour to food.

In a later paper, Schiffman (2000) stated that the increase in ratings of satisfaction was due to both the taste of glutamate as well as the aroma of flavours.

#### **References:**

- Jacqueline B. Marcus (2003) *Pleasing the Aging Palate: What to do when taste changes*
- Bellisle, F. et al. (1991) *Monosodium glutamate as a palatability enhancer in the European diet. Physiological Behavior 49: 869-873.*
- Schieber, F. (1992) *Aging and the senses. In J. E. Birren, R. B. Sloane, & G. D. Cohen (Eds.), Handbook of mental health and aging. San Diego: Academic Press Inc.*
- Schiffman, S. (2000) *Intensification of Sensory Properties of Foods for the Elderly. Journal of Nutrition; 130:927S-930S*
- Schiffman, S. (1998) *Sensory enhancement of foods for the elderly with monosodium glutamate and flavors. Food Review International 14:321-333.*

Schiffman, S. (1977). *Food recognition by the elderly. Journal of Gerontology, 32 (5), 586-592.*

## **Baby's first taste**

Breastfeeding is a very common and natural biological function. Of the twenty free amino acids in human breast milk, glutamate is the most abundant. It accounts for more than 50% of the total free amino acid content. Researchers believe that the presence of glutamate in breast milk may influence the development of taste.

Studies have shown that newborn babies respond with a quiet and relaxed face when ingesting distilled or tap water. A sour taste always triggers nose-wrinkling and lip pursing, whereas bitter-tasting solutions induce head-shaking, frowning, tight closure of the eyes, depressed mouth-corners, wide mouth opening and tongue protrusion, and sometimes spitting and drooling. In contrast, a sweet taste always induces eager sucking, lip-smacking, and licking movements.

Interestingly, an unseasoned vegetable broth causes facial displays similar to those induced by sour tasting liquids. However, a vegetable broth seasoned with glutamate triggers facial expressions very similar to those induced by the sweet taste.



Nursing mothers are often told to consume certain foods and beverages and even herbs and spices. This is because there is a strong belief that a mother can optimize the quality and quantity of her milk, to meet the child's needs, through her own diet. The following foods are just some examples that are recommended for nursing mothers in various countries: juices, fenugreek tea and milk, green leafy vegetables, *halva* (a sesame-based sweet) and yoghurt in Egypt; special teas from so called 'hot' plants containing sesame seeds, absinthe and cotton seeds in North Mexico; soups made with pork and vegetables in Cambodia; soups containing marina leaves and papaya in the Philippines and steamed sticky rice in Japan.

Infants will experience some of these flavours in their mothers' milk. The flavour of human milk directly reflects the foods, spices and beverages eaten by the mother. The infant not only detects these flavours but they also serve to modulate feeding.

These results suggest that glutamate is a palatable taste stimulus for human infants. The presence of glutamate in breast milk suggests it might contribute to the taste acceptability of a soup that has the characteristic *umami* taste.

**Reference:**

Ninomiya K. (2003) *Flavor World of Infants - Glutamate and mother's milk IGIS fact sheet.*

## Amino Acid Symposium

In November 2004 a symposium on food and amino acids, sponsored by the newspaper The Daily Yomiuri, was held in Tokyo. The event, hosted by two professors and four internationally renowned chefs, sought to promote the importance of amino acids and umami and their association with taste. An audience of 1,500 food and health professionals attended the event. This newsletter summarises the content of the symposium.

Toshihide Nishimura, professor from Hiroshima University, discussed the role and importance of amino acids. Mr. Nishimura pointed out that taste is determined by a number of factors including temperature, external conditions and a person's likes or dislikes.

The most important factor however is the combination of the five basic tastes: sweet, bitter, salty, sour and umami. Umami is an essential contributor to the tastiness of a dish. Umami can be found in glutamic acids and inosinic acids (see table). Mr. Nishimura pointed out that there are 20 amino acids, which are the building blocks of protein. It is the combination of these amino acids that determines taste. An example of this is the difference between young and mature beef. As the meat matures it becomes tastier, this is due to the increase of amino acids in the meat. Similarly, when tomatoes ripen the amino acid content changes with a rise in the glutamic and aspartic acid. The result is an improvement in the taste of the tomato. Mr. Nishimura concluded that amino acids play an essential role in determining the flavour of foods.

### Umami Rich Food (milligrams per 100 grams)

Glutamic Acid	
Rishiri kombu	2,240
Cheese	1,200
Tea	668
Sardine	280
Broccoli	171
Tomato	140
Inosinic Acid	
Dried Sardine	862
Dried Bonito	687
Sea Bream	215
Pork	122
Beef	107

Uhei Naruse, Professor Emeritus of Kamakura Women's University discussed the benefits of washoku, a Kyoto-style cuisine with a history of 400 years. Three years ago Mr. Naruse launched a scientific study into this traditional style of cooking. The first theme of the study concentrated on the dashi, the kombu-based stock used in washoku. The team questioned the traditional method for making dashi and carried out experiments to determine whether this method was scientifically valid. They experimented by cooking kombu in water at different temperatures for varying periods of time and discovered that the most delicious dashi could be produced by preparing the stock at a temperature of 60°C for 30 minutes.

The dashi used in washoku is prepared using a combination of kombu and dried bonito. When used together the glutamic acid from the kombu and the inosinic acid from the bonito work together to dramatically enhance the flavour of the dish. This combination is known as the synergy of umami. Washoku is internationally recognized as a healthy cuisine. This is predominantly due to the use of dashi as a core ingredient. Mr. Naruse concluded with the hope that recognition of dashi and umami will continue to increase and be used on an international level.

The symposium included a panel discussion moderated by Miho Nakai and featuring four of Japan's leading chefs: Yoshiro Murata owner of the renowned Kikunoi restaurant in Kyoto, Nobuyuki Matsuhisa, owner of the international chain NOBU, Yasuhiro Sasajima, owner of the Italian-influenced restaurant Il Ghiottone also in Kyoto and Yuji Wakiya,

owner of the Chinese restaurant Ichi-emicharo in Tokyo. The chefs each discussed how they achieve umami in their cooking. Murata pointed out the main ingredients in Kyoto cuisine are vegetables that do not contain much umami, he therefore uses a dashi to make them tasty. Wakiya mentioned that in his Chinese cooking he often uses dried foods, such as shiitake mushrooms and dried shellfish to create an umami flavour. Sashajima's Italian recipes use raw ham and cheese to bring umami taste to his dishes. The panel discussion demonstrated that chefs, all specialising in different cuisines use very different methods to introduce umami to their dishes. Despite this, they all recognised the importance of umami and the enhancements that it brings to their cooking.



Yoshiro Murata



Nobuyuki Matsuhisa



Yasuhiro Sasajima

## Glutamate & Food Seasoning

A seminar entitled 'Glutamate and Food Seasoning: An Update', was held in Kuala Lumpur in December 2004. The event focused on the topics of umami, food seasonings and the role of glutamate in our bodies. The event included three speakers: Ms. Kumiko Ninomiya who works in the Public Relations department in Ajinomoto Co., in Tokyo, Mr. Goh Seng Aun, Technical / Business Advisor at Astramina and Dr. Ryosei Sakai, Chief Biochemist from the Institute of Life Sciences of Ajinomoto Co.

Ms. Ninomiya discussed the universal taste of umami and its relationship with glutamate. Her presentation highlighted the safety of glutamate and its use as a flavour enhancer. It also included a video presentation 'Umami - The World', a movie describing the discovery of umami and, more recently, its growing international recognition. The discussion on umami was concluded with a taste bud challenge. Mr. Goh Seng Aun discussed seasonings, focusing on how they are developed and the current market. Finally, Dr. Ryosei Sakai examined how glutamate is metabolized and the essential role that it plays in our bodies.

If you would like any further information please contact us at [enquiries@glutamate.org](mailto:enquiries@glutamate.org).