The Fifth Taste: Umami

By Remen Okoruwa

Perhaps no other taste is so misunderstood by the public as that of umami. The often overlooked "fifth taste" has only recently gained popular attention and modern scientists have yet to illuminate fully its function and purpose. Indeed, it was only at the turn of the 20th Century when the taste was even discovered. In 1908, Japanese physiologist Kikunae Ikeda of Tokyo Imperial University was working with seaweed when he isolated the chemical compound which gave the protein-rich seaweed its hearty taste (1). He named the protein-taste umami, whose Japanese characters translate as "delicious flavor." He also identified the chemical stimulant for the umami receptor as monosodium glutamate (1).

Take-out Chinese food, among the most notorious sources of glutamate, the form of MSG.

It was not until 1968 that umami garnered any attention here in America. A Chinese-American physician submitted a letter to the *New England Journal of Medicine* detailing the numbness, palpitations, and weakness experienced after eating in Chinese restaurants and he speculated that monosodium glutamate (MSG) was the culprit. A near-hysteric reaction ensued and "Chinese restaurant syndrome" was born (2). What had once been a common preservative and flavor additive was quickly labeled a toxic chemical. It was only in 1995 that the Food and Drug Administration cleared glutamates as a health risk, but still the perception remains that MSG is the dirty secret behind Chinese takeout (2).

The misunderstanding behind the response to glutamates serves to illuminate how little we know about umami. In 2000, Nirupa Chaudhari of the University of Miami found a protein on the tongue of rats similar to the mGluR4 glutamate receptor proteins commonly found in neuronal cells (3). Then, in 2002, Greg Nelson of the University of California at San Diego published his discovery of the G-protein coupled receptors, T1R1 and T1R3, which work in conjunction to detect the umami taste in mice (4). These receptors are sensitive for all 20 of the amino acids commonly found in human proteins, but are most stimulated by monosodium glutamate.

This research suggests that the umami taste is an evolutionary adaptation that enables organisms to monitor protein intake as a means of diet regulation. This seems to be further supported by the fact that the receptors are selective for the levorotary conformation of amino acids (the predominant form in nature) as opposed to their dextrorotary counterparts (4).

Despite the ongoing research, it seems unlikely that the prevailing opinion will change regarding monosodium glutamate and its potentially nefarious effects. Nevertheless, glutamates remain a popular food additive worldwide in everything from Japanese mayonnaise to Australian Marmite. Even in America, glutamates have hardly disappeared, but instead have been driven underground. Food labels listing hydrolyzed proteins, yeast extracts, or protein concentrates hide the ignominious amino acid. Most chicken and vegetable broths, unless they list otherwise, contain glutamate as well. Doritos brand tortilla chips contain five different varieties of glutamate, hinting at the saturation of glutamates in popular food items (1). As umami celebrates its 100th birthday this year, do not forget to munch on some chips or seaweed, whichever you prefer. But regardless of your eating habits, you are probably enjoying the rich taste of glutamate somewhere in your diet, and that should not leave a bad taste in your mouth. ■

—Remen Okoruwa, '11, is prospective Engineering Sciences concentrator in Lowell House.

1 Random Samples. Science 287 (2000): 799

2 Moskin, Julia. "Yes, MSG, the Secret Behind the Savor." 5 March 2008. nytimes.com. 10 March 2008 <http://www.nytimes.com/2008/03/05/dining/05glute.html?_r=3&oref=slogin&pagewanted=print&oref=slogin&oref=slogin>.

3 Chaudhuri, N., Landin, A. M., Roper, S. D., A metabotropic glutamate receptor variant functions as a taste receptor. Nature Neurosci 3 (2000): 113-119

4 Nelson, G., Chandrashekar, J., Hoon, M. A., Feng, L., Zhao, G., Ryba, N., Zuker, C. S., An amino-acid taste receptor. Nature 416 (2002): 199-202

Anson, L. "Neurobiology: The Bitter-Sweet Taste of Amino Acid." Nature. 416 (2002): 136.