

# I. Food Acceptability and Umami

When humans eat, they use all of their senses — sight, hearing, smell, touch and taste — to form general judgments about their food. But it is taste that is the most influential when determining how delicious a food is. Our sense of taste is comprised of five basic or primary tastes — tastes that cannot be replicated by combining any of the other primaries — sweet, sour, salty, bitter and umami.

Although there is no English word for it, umami is a savory taste imparted by glutamate and nucleotides such as inosinate and guanylate. The umami taste is subtle, so it blends well with the other four tastes to expand and round out flavors. Most people don't recognize umami when they encounter it, but it can be detected when eating foods such as fresh and sun-dried tomatoes, parmesan cheese, cured ham, mushrooms, meat and fish. As "umami" is a Japanese word, there are several ways to describe it in English.

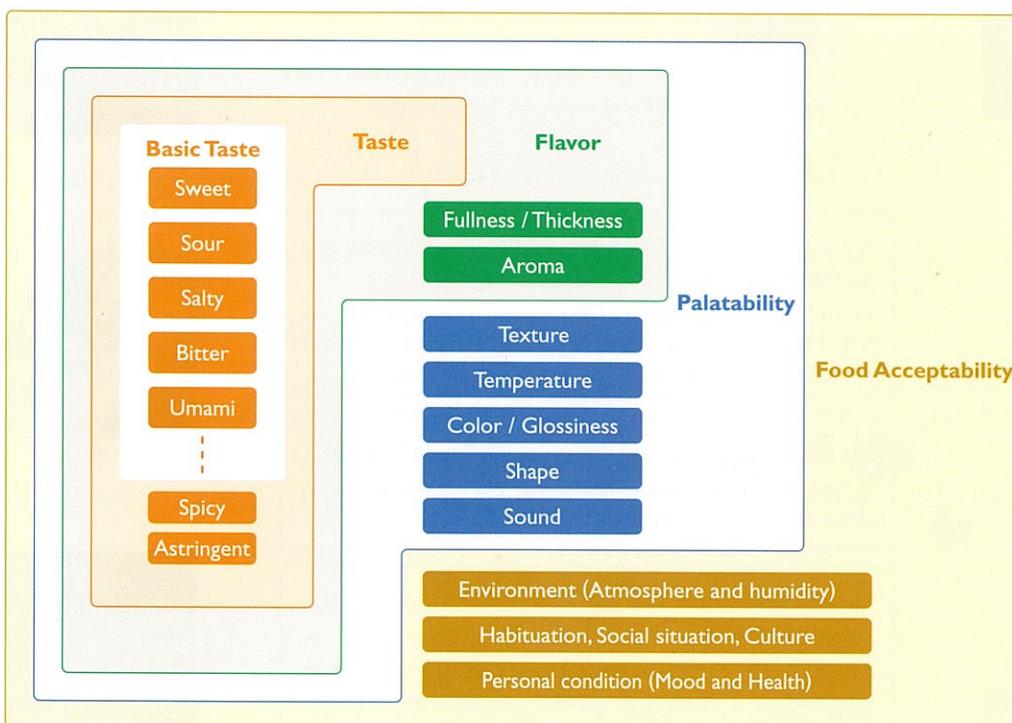
Recently, Western chefs have come to define it with words such as "mouthwatering," "pleasant aftertaste," "tongue-coating sensation," and "lingering." Please refer to Chapter 15 for definitions and references that help further to explain this concept.

To better understand what umami is, simply rinse your mouth with water; then chew a cherry tomato 30 times and swallow. You will notice a subtle and pleasant taste that lingers in your mouth. It is neither sweet nor sour. It is umami.

By paying attention to umami whenever you eat tomatoes and other umami-rich foods, you will come to better appreciate the important role that umami plays in food acceptability.

**Fig. I How Humans Experience Their Food**

What we find palatable is determined by a number of different things, and the umami taste is just one of them.



## 2. The Discovery of Umami

### The Birth of Umami Science

Ever since a German physiologist had proposed his theory at the beginning of the 19<sup>th</sup> century, it had long been believed without scientific evidence that there were four basic tastes — sweet, sour, salty and bitter. But in 1908, a scientist by the name of Professor Kikunae Ikeda of Tokyo Imperial University (now the University of Tokyo) discovered another characteristic taste that was quite distinct from these four tastes. With a strong determination to make the connection between chemistry and the senses, Dr. Ikeda went on to discover that glutamate was the key to the taste of the

Japanese seaweed soup stock kombu dashi. He named this taste “umami” and in his thesis concluded that umami was a basic taste. Professor Ikeda was born in Kyoto, Japan in 1864 and lived there for 17 years before leaving for Tokyo to attend university, so his ability to first detect umami can likely be attributed to his having been born and raised in a place where kombu dashi was very much part of the culture.



Dr. Kikunae Ikeda

“An attentive taster will find something common in the complicated tastes of asparagus, tomatoes, cheese and meat that is quite distinctive and does not fall into any of the traditional categories of taste.” (Dr. Ikeda in 1912 at a presentation at the 8<sup>th</sup> International Congress of Applied Chemistry)



30g (approximately 1 oz) of glutamate that Dr. Ikeda extracted from 12kg (approximately 26 lbs) of kombu.



Photographer: Yuki Sugura



#### Dr. Kikunae Ikeda (Tokyo Imperial University, now the University of Tokyo)

In 1908, Dr. Ikeda identified the amino acid glutamate — found in dried kombu — as the source of the fifth taste and named the taste “umami.”

#### Mr. Shintaro Kodama (a protégé of Dr. Ikeda)

In 1913, Mr. Kodama discovered that the umami source in dried bonito is the nucleotide inosinate.

#### Dr. Akira Kuninaka (Yamasa Corporation, a major soy sauce brewer)

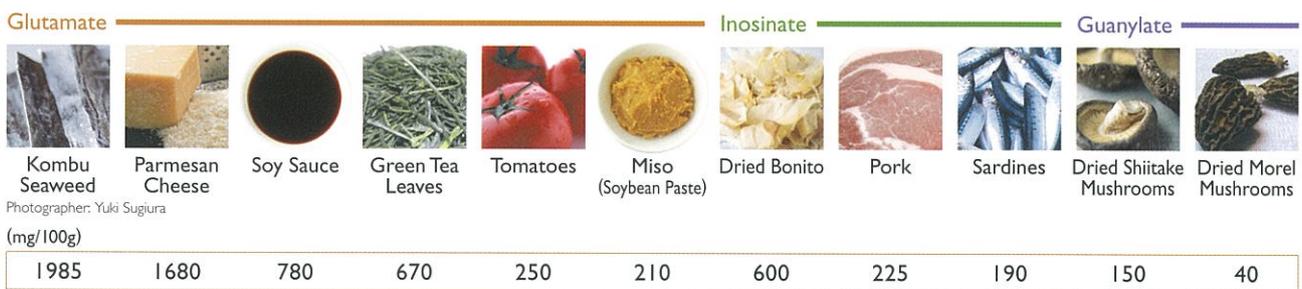
In 1957, Dr. Kuninaka discovered that the nucleotide guanylate is a source of umami, and then subsequently confirmed that guanylate is responsible for the umami taste of dried shiitake mushrooms. He then went on to discover the synergistic effect of combining the amino acid glutamate and the nucleotides inosinate and guanylate.

### 3. Umami-Rich Food

As noted earlier, umami is a savory taste imparted by substances such as glutamate, inosinate and guanylate. Glutamate is naturally present in many foods, inosinate is found in meats and fish such as dried bonito, and guanylate is more abundant in plant foods such as dried shiitake mushrooms and dried morel mushrooms.

The levels of umami increase significantly during the ripening process of food. Cheese and cured ham are good examples of this.

#### Umami- Rich Food



**Fig. 2 Free Glutamate Levels at Varying Stages of Tomato Ripeness**

As tomatoes ripen, glutamate levels increase significantly. Fully-ripened red tomatoes contain the most glutamate.

