Physiology of Sweetness and Bitterness Perception

As we learn more about taste physiology, we will also learn more about how to optimize the taste of our products.

Joe Bell
Joseph Bell Consulting, Inc.

As producers of confectionery products, we want them to be enjoyed by everyone. We want them to taste good and to have a balanced flavor profile. Meanwhile, it is not uncommon for one person to consider that a product tastes great, while another person feels that it is unbalanced or has some type of off-taste. The purpose of this paper is to briefly describe the mechanisms by which we perceive taste and to review reasons why individuals taste foods differently.

FLAVOR PERCEPTION

First, we need to review some background. Flavors are perceived by a combination of taste (through the mouth) and olfaction (through the sinuses). As you may know, the five recognized basic tastes are sweet, bitter, salty, sour and umami (or savory). Due to the complexity of the topic, this paper will be limited to the mechanisms by which we perceive sweetness and bitterness.

Many years ago, some of us were taught that perceptions for taste come from receptors located in different areas of the tongue. We were taught that sweet taste came from the tip of the tongue, bitter taste from the back of the tongue, etc. However, this has since been shown to be wrong. The current state of the science is given in this paper.

Our tongues are covered with taste papillae (Figure 1). They are the little bumps that cover your tongue. The pattern of the papillae on the tongue is unique for each person, like our fingerprints are unique.

The circumvallate papillae (Figure 2) are located on the back of the tongue and may contain as many as 240 taste buds each. The foliate papillae in the middle and sides of the tongue may contain about 115 taste buds each. The smaller fungiform papillae are usually near the front of the tongue and contain from one to three taste buds.