# Modulating Taste with Odor & Other Sensory Insights

Flavor perceptions—or flavor "objects" (ex: banana)—result from the binding of taste, somatosensation and olfaction. This binding results from a complex time line of sensory interactions that evolve throughout the food/beverage consumption process. Insights into these interactions can be applied by flavor formulators to achieve a range of enhancing and suppressing effects. During a presentation at the Society of Flavor Chemists' (SFC) winter meeting in Philadelphia, Paul Wise, associate member at the Monell Chemical Senses Center, discussed the ways in which taste and odor interactions can be leveraged to modulate overall flavor impressions.[a]

The binding of sensory perceptions is not is not fusion, Wise stressed, because it is more than the sum of its parts. An illustration of this binding effect is the boosting of sucrose sweetness perception via the presence of fruity ester odorants. Conversely, if peanut odorants are combined with sucrose, no enhancement is witnessed. As a result, Wise explained, odor-taste congruency can be seen as crucial in sensory binding.

This emphasis on odor-taste congruency is known in the sensory sciences as "what fires together wires together," according to Wise. Harmonious sensations are readily associated; as a result, qualitatively similar taste-odor components can act as a predictive tool: if something smells sweet, it will "taste" sweet. In some cases, odor-taste pairings will trigger specific neurons in tandem.

What does it mean for something to smell sweet or salty? Wise noted that fruity odors are closely associated with sweetness, while burnt notes are highly associated with bitter and, to some extent, umami.

This effect can sometimes be induced via learned associations, said Wise. As a result, it can be said that congruency reflects the frequent co-occurrence of a particular taste-odor pairing. Thus, perceptual similarity may reflect the outcome of learning, rather than an inherent perception.

Salty odors such as bacon, sardine, anchovy, peanuts, ham, chicken, Roquefort cheese and tuna enhance the salt impression intensity of NaCl (sodium chloride), Wise explained. These represent complex blends of aromas, but in some instances single aromatic chemicals can have such an enhancing effect. Smoky odors can trigger salty and umami taste expectations, enhancing the impact of both NaCl and MSG.

*Taste-odor congruency can be a powerful tool: if something smells sweet, it will "taste" sweet.*

Meanwhile, sucrose perception can be boosted by the addition of strawberry odor, not only increasing the perception, but actually speeding up the sweet response time. Sweet odors can also have a converse effect, suppressing sour tastes, a mirror of classic taste-taste interactions. Sweet odor enhances sweet taste intensity, which grows with a clear dose-response curve, said Wise. (He added that bitterness functions similarly: increased bitter odor enhanced bitter taste as the odorant concentration rose.) By crossing sweet odor with bitter taste and vice versa, a suppressive effect can be achieved. Bitter odor reduces sweet intensity, yet, on the other hand, sweet odors have a marginal effect on bitterness.

Wise acknowledged that while results might vary by regionality or by generation, all populations possess learned associations that can be leveraged for odor-taste effects.

The event also included a tour of Monell and its SFC flavor library, as well as talks by Monell's Carol Christensen, Robert Margolskee (president and director), Joel Mainland and Danielle Reed, who discussed the latest sensory research, including the creation of "olfactory white," a combination of odorants that achieves sensory neutrality. Monell's researchers have also worked to understand whether masking or blocking of undesirable tastes is more effective, why reb A (stevia) intensity declines after several sips of a beverage, why KCl tastes salty despite its lack of salt-receptor engagement, metabolic sensors on the tongue for sweet compound detection, the individual differences in taste and smell perception, and more.

Finally, Monell's emeritus director and president, Gary Beauchamp, was installed as an honorary member of the SFC in recognition of a career devoted to taste and chemosensory perception and preference, the genetics of olfaction and insights into adult human flavor perception.

For information on future meetings, visit *www.perfumerflavorist.com/events/calendar/*.

p&f

[a]Wise's presentation comprised summaries of some research work conducted by Tomoyuki Isogai, Russell Keast, Paul Breslin, Jan Kroeze and Linda Bartoshuk, among others.