

Dairy Flavors: New Formulations for New Challenges

Flavorists Cindy Cosmos and Cristalle Keane discuss probiotics and other formulation challenges, floral flavors, prohibited ingredients, cost pressures, and more

Consumer demand for natural, low-fat and functional products presents ever-growing challenges to flavorists at the bench—notably in dairy applications that increasingly feature “low in,” functional and probiotic facets. For example, says Cindy Cosmos, senior flavor chemist with Bell Flavors & Fragrances, “Low fat is always a problem because there’s not the mouthfeel effect from a fat agent for the flavor to bond to. So you get spiking and off notes that develop.” Functional products also raise issues. “Any time you put a nutraceutical or functional [ingredient into a product] you always have a masking problem—not just with dairy flavors, but fruit, sweet, etc. in dairy products. You almost need to develop a two-flavor system. If you want a strawberry flavor and it’s going into a yogurt that has probiotics and vitamin E, which is really fishy, obviously you could have a great strawberry flavor, but what’s going to cover that fishy note? You essentially have to develop two flavors.”

Cosmos and colleague Cristalle Keane work with a number of dairy flavor applications, including yogurt, ice cream, cheese, milk, creamers and soy milk. Keane, too, sees challenges in the probiotic arena, particularly in yogurt and milk with varying fat percentages. “A lot of them are fruit flavors,” she says. “Those kinds of systems need acid to ‘burst’ the flavor; we have to balance the flavor in a certain way.” Cosmos adds, “We sometimes have to incorporate a sweetness enhancer because there may not be enough sweetness in the product. Any time you work with dairy products containing artificial sweeteners, especially aspartame, certain flavors (cherry, cinnamon and apple-cinnamon, for example) contain key chemicals that cleave the unchelated protein of aspartame, resulting in a lot of off notes, so you have to be aware of the reactivity of that.”

Keane adds, “When you work with low fat and low salt, that’s going to affect how your flavor is perceived in an end product; you have to either make a flavor that’s a little bit stronger or that comes through the base because of the low salt—salt enhances your flavor.” Low-fat also requires rethinking of flavor systems. To illustrate, Keane takes the example of creamers. “If you



Cindy Cosmos



Cristalle Keane

From the Bench: The Development Stage

Senior flavorist Cindy Cosmos notes that, in some cases, developing a flavor using something as simple as a sweetened water tasting medium is sufficient—not so with dairy applications. “The dairy category is so different,” she says. “For ice cream you use flavors at a certain level because cold increases flavor perception. In yogurt, you have a mouthfeel coating. For flavorists to evaluate their creations, a lot of times we really need to see the customer’s base. We need to start with their product because evaluating flavors in water as opposed to chocolate is night and day in the way it coats your mouth.” Of course there are exceptions, such as when the customer is working with a proprietary base. But even then, says Cosmos, it is important to work with the customer to develop an acceptable approximation. “It might be whole-fat milk,” she says. “We’re getting the mouthfeel, the intensity of fat, and can see how our flavor is going to come through—especially if it’s a fruit without acid. [Customers] are definitely able to get a better product in a shorter amount of time if you have some sort of base that simulates what the customer’s working with.”

take a flavor and have it in a full-fat creamer, as opposed to a low-fat creamer, your flavor is going to come through nicely. If you put that same flavor at the same usage level in a low-fat creamer it's almost always going to taste over-flavored because you don't have the synergy of the mouthfeel of the fat with the flavor. You definitely have to make those kinds of adjustments."

Expanding Palette, Regulatory Challenges

Cosmos began her career with Kraft in the late 1970s, a time when the palette of natural chemicals was negligible. "All we had to work with were essential oils," she says. "So, strawberry at that time did not smell like a strawberry. It was made to taste like a strawberry using juices and purees with a top note essential oil-based flavor for the impact. Over the years, as chemicals have become more available as naturals, we've been able to improve flavors—primarily for dairy and fruit flavors in yogurt and ice cream; we've been able to improve the profiles to be more 'true fruit.'"

While a flavorist for Kraft, Cosmos noticed the variety of applications in the cheese category increased exponentially. "We've gone from full-fat regular cheese to processed cheese to cheese [that is] non-dairy for consumers that can't have any dairy." The latter, she says, are made from vegetable products—vegetables or vegetable oils—in which flavor plays a key part. In such applications, the cheese flavor profiles, whether natural or artificial, are providing the majority of the organoleptic dairy-impression. "I didn't see that in the 1970s and 1980s," says Cosmos. "That just shows you that our taste—culturally, and experimentally in terms of what man can make—has changed drastically."

Yet, while the flavorist's toolbox is experiencing growth and increasing technical nuance, regulatory pressures continue to require adjustments. For instance, diacetyl, long an anchor of cream and butter

flavors, has received well-publicized negative attention in a possible connection to bronchiolitis obliterans, or "popcorn lung." In response to consumer and product development demands for diacetyl-free formulations, Bell launched diacetyl replacers—both natural and artificial—along with a line of no-added-diacetyl flavors. Diacetyl limitations affect non-dairy flavors, too, including caramel, toffee and butterscotch. "That's a challenge for a flavorist," says Cosmos. "How do you react to these limitations with a smaller toolbox?"

"It almost changes what people perceive as a butter flavor for microwaveable popcorn," says Keane. "If you don't have the characterizing chemical giving you the impact of butter, it changes. It almost changes what's going to be perceived as 'butter flavor.'" Meanwhile, as the US Occupational Safety and Health Administration's examination of related materials such as acetoin and acetaldehyde continues, further alternatives may be necessary.

Floral Flavors

Recently, some in the flavor industry have pursued floral flavors to add subtle aromatic effects to applications, particularly fruit flavors. Keane explains, “Floral, [combined] with a well-known fruit flavor—a strawberry, peach, something like that—tends to round out the floral character. The result is a subtle floral back note with the impact of fresh fruit.” Bell’s work in this area has produced flavor profiles including lavender, rose, hibiscus-strawberry and orange blossom. Mike Natale, Bell’s director of marketing, notes a growing demand for these profiles while conceding they provide challenges in managing the floral notes. Keane, whose father is Bell senior perfumer Vern Murawski, explains, “It’s very hard to make a floral flavor appealing in a food product; when you think floral, you think of perfumery. So when you have these types of floral flavors, you need to have a delicate balance so that it comes through nicely in your flavor without leaving a strong floral aftertaste, which might be considered undesirable.” She adds that floral flavors may work well in yogurt; to date, Bell’s floral flavor profiles have been highlighted in beverage and chocolate demos.

“Florals are a polarizing flavor,” says Keane. “People either like them or they don’t. It’s definitely a challenge to balance the perfumery notes of the floral character with something people are familiar with in their beverages, chocolates or dairy applications. Preference is key. For example, in the Hispanic market, hibiscus is a familiar flavor profile, especially in beverages. However, it is a relatively unknown flavor in the United States that has been introduced through flavor combinations such as strawberry hibiscus tea.” She adds, “Working with floral profiles you have to be creative with a variety of essential oils as opposed to your basic fruit or dairy flavors, where you’re using a lot of synthetic materials.”

The Future: Probiotics, Natural/Clean Labels and Cost Controls

“The big push I see is probiotics,” says Cosmos, looking to the dairy category’s future. “I think it will be big for ice cream and yogurt because you have your true probiotic yogurt [consumer] that only eats that, then you have those who will eat yogurt with sugar in it, and then you have your low-fat with sweetener added [consumers]. As soon as you take a product and begin going away from healthy ingredients to artificial or synthetic, people begin to question, ‘Is this good for me?’” Keane adds that probiotics are making a move beyond dairy. “I’m beginning to see a crossover into other products,” she says. “Now you see them in cereal bars. So maybe consumers who can’t have dairy can now enjoy the benefits of probiotics from a cereal bar.”

Meanwhile, Natale mentions Haagen-Dazs’ *five* line of ice cream—available in mint, ginger, coffee, passionfruit, vanilla bean, brown sugar and milk chocolate flavors—which highlights stripped-down ingredient lists. Mint, for instance lists the following ingredients on the

package front: milk, cream, sugar, eggs and mint. Haagen-Dazs’ tagline reads, “All-natural ice cream crafted with only five ingredients for incredibly pure, balanced flavor ... and surprisingly less fat!” The implication is that simplicity equals goodness/healthfulness. While such naturally flavored product launches present opportunities, Natale wonders what the limitations might be for product innovation within such tight constraints. Cosmos agrees, however, that natural is here to stay—with some caveats. “One challenge with natural flavors is the customers’ costs,” she says. “The other challenge is with current customers who purchase natural and artificial flavors and now want them [fully] natural. There is a limitation because not all chemicals can be made naturally. Sometimes we just can’t do it. We can be very creative, but if we can’t find replacers for something very distinctive, we’re stuck. The takeaway is it may not be exactly the same.” She notes that longtime consumers of products may say they want products to become all-natural, but they may not immediately embrace the organoleptic or cost results—a Catch-22 for product developers and flavor houses.

The cost considerations Cosmos raises are likely to continue affecting formulation realities, says Keane. “I think people are still watching what they’re spending and how they’re spending their money, but I also think they still want to have that little bit of indulgence. If they want an indulgent dessert, instead of ordering huge portions like they did before, you’re finding more and more smaller portions, possibly low-fat, low-sugar. This is where our challenge comes in, making the smaller, decadent desserts that are low in fat, low in sugar taste like the real thing. Customers still do want to indulge. The way in which they’re doing that is less.”

Natale adds that Bell has seen strong responses from customers for products such as cocoa extenders and honey replacers, which help meet project cost parameters. “Some of the projects we’re involved with are [focused on] cost savings,” says Cosmos, adding that today’s environment requires good taste while controlling overhead and ensuring profits. She notes that cost-saving projects require chemist, marketing and customer involvement and cooperation from the start to clearly set goals. “If you don’t do that at the onset, we as chemists may not even be able to accomplish it,” says Cosmos. “Before we spin our wheels, the key thing is to always start together, see what [the customer is] looking for, and decide, ‘Is it feasible?’—especially in the natural category. If for any reason the parameters are not realistic, she says, this early collaboration can quickly yield effective backup plans.

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