

by Donald E. Pszczola

## How Aromas Can Translate Into Dollars and Scents

**H**old your nose while you're eating and you miss a lot. That's because the flavor experience is not limited to what we taste on the tongue. While our taste buds do detect the five sensations—sweet, sour, salty, bitter, and umami—there's something else going on. And that's aroma.

In fact, most of what we call taste is really an olfactory experience. Beyond the five taste sensations, all other tastes are the result of the sense of smell, via orthonasal (outside of the mouth) and retronasal (inside the mouth) olfaction.

Although many of the flavors we "taste" are actually aromas, it is ironic that throughout much of history, the sense of smell has remained the most enigmatic of senses and subsequently not that well understood. In 2004, that lack of understanding may have changed when two U.S. researchers, Richard Axel and Linda B. Buck, received the Nobel Prize in Science for their discoveries of "odorant receptors and the organization of the olfactory system."

To put it briefly, the scientists discovered a large gene family, consisting of some 1,000 different genes that give rise to an equivalent number of olfactory receptor types. These

importance, information from several olfactory receptors can be combined, forming a pattern. This is why we can consciously experience the smell of a lilac flower in the spring and recall this olfactory memory at other times.

As can be seen (or rather smelled), the sensations evoked by the foods and beverages we put in our mouth are complex and involve much more than taste. When something tastes really good, it is primarily activation of the olfactory system that helps us detect the qualities we regard as positive. Furthermore, a special odor can trigger distinct memories from our childhood or from emotional moments—positive or negative—later in life.

Taste and smell are so intertwined in our flavor experience that perhaps we have taken for granted some of the potential opportunities that aromas can create for the manufacturer. If so, then this is certainly a good time to explore the directions that aromas are taking in food formulating, and what these opportunities are.

In this "aroma" exploration, I feel sort of like that woman in a recent *Glade* commercial who is sneaking around the house to find out

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receptors are located on the olfactory receptor cells, which occupy a small area in the upper part of the nasal epithelium and detect the inhaled odorant molecules. Each olfactory receptor cell possesses only one type of odorant receptor, and each receptor can detect a limited number of odorant substances. The cells send thin nerve processes directly to the olfactory bulb, the primary olfactory area of the brain. Of particular

if her air freshener is still working. In this article, I'm looking here and there to see how aromas are working in food and beverage applications, the kinds of challenges they can help address, and how they can possibly "refresh" perspectives and approaches toward future product development.

Developing foods and beverages that are sodium reduced, that elicit or trigger a certain mood, that present more-authentic



*Aromas play an important—if sometimes overlooked—role in food formulating. Floral aromas, for example, are no longer confined to the garden, but are increasingly moving into food and beverage applications, where they are creating new opportunities.*

Photo courtesy of Virginia Dare

## How Aromas Can Translate Into Dollars and Scents continued...



**A sparkling soda prototype** combines floral flavors with other flavors to create an aromatic product. The sparkling soda is available in two versions, *Natural Vanilla Orchid Flavor* and *Natural Jamaica Hibiscus Flavor*.

Photo courtesy of Wild Flavors

fruit flavors, that can help with weight management, or that add floral aromas to “connect” with consumers, are just a few examples of emerging applications where aroma can play an important part.

Some of these aromas may really find themselves on the cutting edge. Let’s take floral ingredients, for example. Some salads incorporate flowers that can be eaten. That idea may at first seem somewhat outlandish, and some of us judgmental types might even scoff. I know I’m reminded of the movie “Little Shop of Horrors,” where a man walks into a flower shop and orders a bunch of flowers. The store owner observes that he must really like flowers. He answers that he loves them. He then proceeds to take out a salt shaker, sprinkles some salt on the bouquet, and eats them.

Are we really such a big jump from that reality? We already eat a wide range of herbs. Culinary dishes from around the world have used flowers since the beginning of civilization. And, of course, we’re seeing more and more flavors distilled from flowers. About the only thing I would suggest is that if you eat a flower today, you might not want to use salt on it. There are, after all,

other low-sodium alternatives.

With that, there’s something definitely in the air as this month’s *Ingredients* sections looks at the following potential opportunities for aromatic ingredients.

### Aroma and Flower Power

*Gargouillou* (pronounced gar-gu-yu) is a salad consisting of such edible components as vegetables, leaves, fruits, and flowers—each prepared in a different way. And sometimes it’s served upon what looks like a black bed of dirt but is actually composed of ingredients such as roasted chicory root. Talk about your “garden” salad.

Whether you’re a flower-eater or not, this salad seems like a good way to introduce the emergence of floral ingredients and the aromas they bring to food and beverage applications. Although floral flavors are still probably in the early stages, they have the potential to create a number of interesting opportunities. Mintel expects that lavender, for example, will increasingly move beyond the home and personal care categories and into foods and beverages in 2009. Already seen in products such as this German confection, *Chocolat Provence’s Lemon-Lavender Dream chocolate*, lavender can be paired with more-familiar ingredients to bring a naturally soothing, aromatic quality to the product.

Other products are also appearing in the global marketplace. Avenue Gourmet launched an *Elderflower Vinegar* in the United States as part of its new gourmet line of Nordisk-branded Scandinavian products. And, while I was surfing the Internet, I saw a delicious-looking formulation for a floral mango ice cream with pistachios. Rose water gives the ice cream its floral notes, and you don’t get any petals stuck in your teeth.

Over the past year, I have written about several flavors that have been extracted from flowers. These have ranged from a chrysanthemum extract developed

by Frutarom USA Inc., North Bergen, N.J. (phone 201-861-9500, [www.frutarom.com](http://www.frutarom.com)), to distillates, *Rose Water* and *Orange Blossom Water*, from Nielsen-Massey Vanillas, Waukegan, Ill. (phone 847-578-1550, [www.nielsenmassey.com](http://www.nielsenmassey.com)).

One factor that can influence the blossoming of floral flavors in the marketplace is their special pairings with fruit flavors. Since fruit flavors in foods and beverages are more familiar to consumers, they might be more willing to try a product that combines a fruit flavor with a less-familiar floral one. Also, floral flavors work very well with many types of traditional fruit flavors, with the fruit providing a good background for the blossom’s pleasant aroma. In Italy, Molkerei Alois Muller introduced *Muller Frutta e Fiori Yogurt* in the following flavors: pineapple and orange flower, apple and elderflower, pear and lotus flower, and blackberry and violet.

Several flavor companies are clearly interested in the potential opportunities created by pairing floral with fruit. For example, one of the 2009 flavor trends that Wild Flavors Inc., Erlanger, Ky. (phone 859-342-3600, [www.wildflavors.com](http://www.wildflavors.com)), predicts is the appearance of fruit and floral flavor combinations, such as blueberry lavender, strawberry passionflower, and orange marigold. The company is planning to combine its blossom flavors with exotic fruit flavors, herbs, and spices for use in products ranging from beverages to ice creams and chocolates.

At the recent Research Chefs Assn. Annual Conference and Culinary Expo, Wild Flavors introduced aromatic *Simple Sparkling Sodas* in two versions, *Natural Vanilla Orchid Flavor* and *Natural Jamaica Hibiscus Flavor*. These sparkling sodas combine floral flavors with other flavors to create an aromatic product that appeals to adult taste preferences. Lightly sweetened with cane sugar, they contain 40 calories.

Virginia Dare, Brooklyn, N.Y. (phone 718-788-1776, [pg 66 foodtechnology 04.09 • \[www.ift.org\]\(http://www.ift.org\)](http://www.virgin-</a></p>
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iadare.com), launched several new floral flavors for use in flavored water concepts. These include *Raspberry and Hibiscus*, *Fuji Apple and Honeysuckle*, *Pomegranate and Orange Blossom*, *Cucumber and Apple Blossom*, *Blueberry and Jasmine*, *Nectarine and Rose*, *Lemon and Lavender*, and *Strawberry and Elderflower*. These flavors can add subtle and aromatic characteristics to flavored water and teas; spa-type beverages; and calming, soothing, and relaxation drinks.

GSB Flavor Creators, Kennesaw, Ga. (phone 770-424-1888, [www.gsbflavorcreators.com](http://www.gsbflavorcreators.com)), introduced a floral fruit flavor, *Lingering Lavender Berry*. The product, a fusion of lingonberry and lavender, is part of the company's "shuffled" flavor campaign, which creates flavors by combining unusual yet complementary tastes. The shuffled flavor may be used in such beverages as teas, soft drinks, and alcoholic beverages, as well as other applications.

Ottens Flavors offers a range of floral flavors that can add new flavor and aroma dimensions in food products. See the sidebar on this page for the company's historical perspective on floral flavors and aromas.

One area, in particular, where aromatic

flavors are creating new opportunities is tea or tea products. We've seen that ongoing story in at least three *Ingredients* sections: July 2008 ("Sniffing in New Ingredients"); October 2008 ("Drinking in New Flavors"); and February 2009 ("Beverage Flavors 'Spill Over' Into Foods").

As you may recall, International Flavors and Fragrances, New York, N.Y. (phone 212-765-5500, [www.iff.com](http://www.iff.com)), held a press conference in 2008 to demonstrate its expanded range of tea flavors. Aromatic varieties ranging from *Jasmine Berry* to *Chrysanthemum* were combined with tea extracts to showcase their flavor and aroma. And GSB Flavor Creators recently developed *Hibiscus Green Tea*, which fuses exotic hibiscus with subtle green tea.

Most recently, a leading purveyor of green tea products and beverages, Ito En (North America) Inc. ([www.itoen.com](http://www.itoen.com)) unveiled new traditional Japanese teas at Natural Products Expo West. *Jasmine Green Tea*, which is traditionally brewed and infused with jasmine flowers, has a nuanced flavor with an emphasis placed on the aroma of the flower.

Sweet smell of success? We'll have

to wait and see how far floral flavors will penetrate the marketplace. But from the perspective of this article, they are another example of how important aromas are in food formulating, even if they are not always recognized.

#### Aroma and Moods

Over the years, aroma has been looked at for the role it can play in shaping moods. A sniff of a certain food might conjure up a childhood memory, a certain holiday, or, on the negative side, an unpleasant experience.

Mood foods—or foods that trigger an emotion—seem to be gaining some attention right now, partially fueled by the current economy. This emergence may have an influence not only on the flavors created to connect with consumers' moods, but on the subsequent aromas, as well. For example, floral aromas can have a relaxing effect while others may have a more-stimulating effect.

"The connections between food and mood are well documented," said Mindy Edwards, Flavor Chemist at Wixon Inc., St. Francis, Wis. (phone 800-841-5304, [www.wixon.com](http://www.wixon.com)). "Our research indicates that consumers, whether they are celebrating a

## New Whiffs from the Past

The introduction of herbs and flowers to cooking is not a new phenomenon, observed Ottens Flavors, a company that offers a wide range of floral flavors. Herbs and perennials are mentioned in the Bible as foods, food flavorings, as well as medicines.

According to the company, lavender has been a favorite herb for centuries—and has been in documented use for more than 2,500 years. An early recorded mention of flowers in culinary use dates to 140 B.C. Many different cultures have incorporated flowers into their traditional foods. The practice was widespread during the Middle Ages and was popular throughout the Victorian era. Oriental dishes made use of daylily buds; the Romans used mallow, roses, and violets; Italian and Hispanic cultures gave us stuffed squash blossoms; and cultures from India used rose petals in many recipes.

Today, the American palate is being influenced by new flavors and food fragrances from around the world. Product developers will need to respond with different solutions. One of these may be floral flavors. Here are a few examples:

- **Jasmine**, considered an Oriental flavor associated primarily with tea and Thai rice, offers a floral taste characterized by a mild to light grassy green note. Because of its special flavor and fragrance, it is likely to move beyond its traditional applications.
- **Honeysuckle** has a sweet-edged, mild, floral, fruity flavor note suitable for fruit-based desserts and dairy

applications, as well as syrups and sweet sauces.

- **Orange blossoms** impart strongly characteristic, highly floral notes that are perfumy, citrusy, pungent, and sweet. They are highly effective with savory flavors from stir-fry to grilled meats, including lamb, beef, pork, and chicken. They also complement seafood flavors. Their orange blossomy notes are suitable in cookies, cakes, sorbet, ice cream, and other desserts.

- **Lavender** has notes that can be described as moderately floral, mild peppery, lemony, and citrusy. The herb is excellent for beef, lamb, and pork dishes, as it holds up well with strong savory notes and highlights the deeper notes of baked and grilled meats. It also provides subtle enhancements to fish and vegetable dishes.

- **Lilac** is very perfumy and slightly bitter with characterizing lemony notes. It is used in jams and jellies, and in mild meat dishes such as chicken. Lilac and lavender are sometimes used interchangeably in recipes.

- **Rose**, often considered the quintessential floral note, covers a wide spectrum. The deeper the color, the stronger the floral notes, and the older the variety, the stronger the floral notes. Rose's notes, described as aromatic, sweet, and spicy, are suitable for use in teas, vinegars, syrups, jams, jellies, cakes, and desserts. Rose's notes highlight strawberry, raspberry peach, apricot, and most tropical fruits.

## How Aromas Can Translate Into Dollars and Scents continued...



*Floral ingredients and the aromas they provide can help trigger certain memories or emotions in the consumer, making the product more desirable and differentiating it in the marketplace*

Photo courtesy of Wixon

personal success or feeling anxious after watching the evening news, are looking for foods to trigger an emotion. If they are stressed, they may look for a food that makes them calm. Or if they are feeling snowbound after a long winter, they may want something to remind them of a tropical vacation.”

With that in mind, Wixon has developed flavor/seasoning blends that evoke a certain mood or emotion. These include naughty (chipotle flavor and pepper combined with sour cream and buttermilk, touched with pepper, onion, garlic, and parsley); excited (a combination of mustards enhanced with the sweetness of honey and brown sugar and topped with bacon flavors and spices); angry (blend of mustards and wasabi powder enhanced with pepper and parsley); on vacation (blend of lemon and lime with a touch of tartness); cheerful (the sweetness of vanilla, brown sugar, and marshmallow flavor combined with the spices of pumpkin pie); blissful (brown sugar, vanilla, and apple flavors combined with winter spices); content (blend of cinnamon, ginger, and tea flavor); playful (combination of onion, garlic, and peppers with lime and tomato flavors); adventurous (maple flavor with several peppers and a touch of smoked paprika); sassy (mixture of mustard powders, bacon flavors, and spices); happy (a warm and aromatic blend of cinnamon and other spices); and relaxed (a blend of citrus flavors, mint, and lavender.

Snack prototypes made with several of these flavor blends were highlighted at Snaxpo. They were also featured when Wixon had the grand opening of its new innovation center for culinary and meat processing. The prototype snacks are made with the company’s *KClean Salt™*, which not only cuts sodium content in half, but matches salt’s taste, texture, functionality, and mouthfeel.

### Aroma and Improving Fruit Flavors

In recent years, several companies are using their expertise, combined with branded flavor technology, to improve existing fruit flavors. Not too surprising, aromas play an important part in the process.

For example, Blue Pacific Flavors Inc., City of Industry, Calif. (phone 626-934-0099, [www.bluepacificflavors.com](http://www.bluepacificflavors.com)), in an exclusive agreement with New Zealand-based HortResearch (+64-9-9257000, [www.hortresearch.co.nz](http://www.hortresearch.co.nz)), launched a technology, *hortRealfruit™*, to produce more-authentic fruit flavors.

Blue Pacific has exclusive ongoing access to HortResearch’s entire database of volatiles and aromas produced by fruits from around the world. Researchers at HortResearch claim that they have fine-tuned the science of gene discovery to such a degree that they can now accurately determine which genes create the individual flavors and fragrances found in fruits. Combined with the use of technology, this means that it should be possible to recreate the natural tastes and aromas of fruits. In the past, flavor manufacturers have had to seek synthetic solutions, which are not only expensive, but can never truly recreate the flavor or fragrance found naturally in fruits.

Frutarom provides pear and strawberry flavors that offer more-satisfying perceptions of fresh fruit. Both flavors are updated and improved versions of previous products. Newly developed *Natural Pear Flavor WONF FN3714* is sweet and aromatic with pulpy notes. It

is suitable for use in beverages, gelato, and fruit fillings. *Natural Organic Strawberry Flavor F918096* is described as aromatic with jammy notes. It may be used in beverages, sorbets, yogurt, and fruit fillings.

The company has recently acquired the United Kingdom-based company, Oxford Chemicals Ltd., which produces and markets specialty ingredients for the flavor and fragrance field. The acquisition is expected to enhance the product offering of Frutarom’s Fine Ingredients Div. and its customer base around the world, and offer a pipeline to creative developments, including fruit flavors and aromas.

Switzerland-based Givaudan developed eight new natural orange flavor varieties. This collection illustrates the sheer diversity and breadth of orange flavors now available to food and beverage manufacturers.

In a strategic partnership with the University of California, Riverside, Givaudan had access to more than 1,000 different citrus varieties, many of which are not yet commercially available. The new flavors were developed after the company identified and analyzed more than 50 new citrus fruit varieties in the field and in its laboratories.

Flavorists used the company’s proprietary Virtual Aroma Synthesizer (VAS) to rapidly analyze and translate the complex aromas from the fresh fruit into natural and naturally derived citrus flavors, ranging from the traditional to the exotic. The mini-VAS is used in the field and on customers’ premises, and can shorten flavor development time by weeks, if not months. Using the mini-Vas, a variety of completely new flavor concepts are presented to customers in the form of a broad, easy-to-discern palette of archetypes or keynote flavors. These flavor aromas can be swiftly adjusted and honed down to a particular flavor according to the customer’s specification.

The following are some examples

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of the flavors in the collection. *Gold Nugget* combines orange, mandarin, mango, and bergamot notes for a complex and energizing flavor. *Seedless Kishu* is refreshing and fun with hints of melon and pear enlivening the orange base notes. *Tarocco* has tropical overtones with hints of pineapple, green mango, and a summer berries finish.

### Aroma and New Cooking Techniques

New cooking techniques that infuse food with aromatic flavor have been in the news lately, again reinforcing the growing interest in the importance of aroma.

According to the *Dallas Cooking Examiner*, exclusive restaurants in the Dallas area are using a method called *Volcano Vaporizer*. A device fills a bag with a flavored aroma created from any number of different ingredients, including fruits, herbs, and spices. A food is sealed into the bag to cook and absorb the nuances of flavor from the aroma. When the item is served, a few small holes are placed in the bag at the table, and they release the scent of the food within. Opening the bag, the customer is able to enjoy a multi-sensory experience.

### Aroma and Enhanced Perceived Saltiness

A new study suggests that carefully selected odors may be used to enhance perceived saltiness in foods where sodium chloride has been reduced. If so, food formulators may have another way to address challenges involving low sodium.

Researchers from Institut National de la Recherche (INRA), Dijon, France, and Unilever Food and Health Research, Vlaardingen, The Netherlands, investigated the interactions between odor and saltiness in aqueous solutions. Their study consisted of two experiments.

In the first experiment, a panel of 81 consumers indicated expected taste attributes of 86 written labels of flavors related to common food items. Panelists were asked to rate expected saltiness of food flavor evoked by the written label. Differences in expected saltiness were observed in relation to actual salt content of food.

In the second experiment, researchers selected commercially available aromas that corresponded to 14 of the salt-associated flavor labels chosen from the first experiment and prepared them in aqueous solutions, with or without added sodium chloride. A panel of 51 consumers rated odor and taste intensity by smelling the solution (orthonasally) and tasting it in the mouth (retronasally). Results demonstrated that expected flavors could induce saltiness and enhance saltiness in solutions containing a low level of sodium chloride through odor-induced changes in taste perception.

“Our data revealed saltiness differences between tasteless aroma solutions evaluated orthonasally or retronasally,” the researchers stated. “We especially found the saltiness score to be higher when the odor was perceived orthonasally. Once in the mouth, most of the tested aroma solutions were not perceived as significantly more

salty than water.”

By

enhancing the perception of a food’s saltiness, odors can add a new dimension in the formulation of low-sodium foods. The findings of this study, accepted for publication in *Food Quality and Preference*, may also have implications for other tastes as well.

### Aroma and Spices

When one thinks of aroma, several spices quickly come to mind. These aromatic spices paired with different ingredients can play an important part in food formulating. *The McCormick Flavor Forecast 2009*, released by McCormick & Co., Hunt Valley, Md. (phone 410-527-9753, www.mccormick.com), looked at several emerging flavor combinations involving spices and the aromas they provide.

For example, the natural sweetness of beets marries well with the licorice edge of tarragon. Tarragon, with highly aromatic notes of anise and mint, is prized as an integral element of French cuisine. Its affinity for complementary flavors inspires exciting new combinations such as vibrantly colored beets served in raw or roasted forms. Potential recipes might include goat cheese beet ravioli with tarragon-orange sauce, tarragon-marinated beet shish kabobs, roasted beet and fruit pâté with tarragon sugar, and thinly sliced beet carpaccio with tarragon-infused walnut oil.

For those interested in a sweet and savory junction, rosemary and fruit preserves may excite the aromatic imagination. Rosemary’s aromatic hints of pine and eucalyptus can help reinterpret traditional fruit flavors. The herb offers a heady aroma and robust taste, which lends strength to complement fruit preserves. In particular, the herb cuts the inherent sweetness of the fruit, which in turn allows the fruit to work with savory preparations. The pairing of the two may be used in a wide range of possibilities. *Warm Rosemary Brie Cake with Peach Preserves* can provide a rich dessert while *Rosemary Macaroon Thumbprints* can put a twist on a classic cookie. For the main course, dishes such as strawberry-rhubarb game hens and rosemary-rubbed pork chops with plum preserves can be created.

Another pairing is Chinese five spice and artisan-cured pork. When the salty, smoky tastes of artisan-cured pork merge with deeply aromatic Chinese five spice (an Asian blend of anise, cinnamon, star anise, cloves, and ginger), the combination creates an innovative taste sensation. Dishes such as mixed greens with five-spiced bacon and poached egg, an Asian twist on the traditional BLT, candied bacon ice cream, steamed dumplings, or a glazed bacon nut mix sprinkled with Chinese five spice may be prepared.

Then there’s garam masala and pepitas. Garam masala, translated as “hot or warm spice blend,” is traditional in Indian, Bangladeshi, and Pakistani cooking. This mixture of black pepper,

cardamom, cinnamon, and coriander strikes a balance that offers deep flavor and complex richness. Pepitas, valued as a healthy snack, are kernels of pumpkin seeds popular in many global cuisines, including Latin America, African, and Asian. The combination of garam marsala and pepitas goes well with many flavors, such as pumpkin, lime, beets, root beer, and beef. Possible dishes include tagines with lamb, chicken, and dried fruits, pepita-crust ed halibut with blood orange jicama chutney, curry pumpkin soup with pepitas and pumpkin seed oil, or panna cotta with garam marsala syrup and pepita brittle.

Jean Niel Inc., Odessa, Fla. (phone 727-834-8855, www.nelaromes.com), has the capabilities to combine familiar aromatic flavors with more-original notes. For example, exotic and spicy flavors awaken the taste buds in flavor

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combinations featured under the name *Fruit & Spicy*. This line consists of such flavor blends as pineapple and four spices; coconut and curry; lemon and cinnamon; strawberry and ginger, and orange and cumin. These flavor combinations may be used in beverages, dairy products, marshmallow confectioneries, ice creams, snacks, and more. The company is the American subsidiary of Jean Niel, a perfume and flavor company in Grasse, France. The company established a laboratory and a manufacturing facility in Odessa, Fla., to better serve its customers in the development of natural and essential aromatic notes.

Robertet  
Flavors,  
Piscataway,

N.J. (phone 732-981-8300, [www.robertet.com](http://www.robertet.com)), recently launched new ginger flavors that provide aromatic flavor profiles for a variety of applications. Ginger's flavor profile can best be described as peppery and slightly sweet with a pungent and spicy aroma. Ginger easily complements other fruit profiles, including citrus, berry, and other tropical flavors. Traditionally used as a flavoring in ginger ale and the spicier ginger beer, ginger is beginning to appear in other beverages, including ready-to-drink teas, alcohol, and flavored waters, as well as tea bags.

Ginger is also made into candy; used as a flavoring for cookies, crackers, and cake; and performs as a cooking spice, especially in Asian cuisines. The company's latest ginger formulations—available in natural, liquid, water-soluble form—are suitable for use in beverages, dairy products, nutraceuticals, syrups, yogurt, ice cream, sorbet, and other products.

### Aroma and Obesity

A new study demonstrates that perceived satiation can be increased by altering the extent of aroma release during food consumption. Moreover, ingredient-related aroma cues are other aspects of aroma that might affect appetite regulation.

A researcher from Nizo won the Unilever Young Scientist Award for her groundbreaking work on the role of aromas for inducing satiation. Rianne Ruijschop demonstrated that aromas reaching the nose from the oral cavity (retronasal) during food consumption can have an effect on intrameal satiation. This, in turn, has an effect on meal termination.

At NIZO food research, Ruijschop focuses on the possibility of using sensory triggers and, in particular, aroma for inducing or increasing satiation. Tailored olfactometer equipment, which is able to deliver specific, well-defined flavor profiles to the subjects, has been developed to study the effects of olfaction on satiation.

By being able to administer aroma profiles separately from other stimuli (such as different ingredients, textures, and tastes), Ruijschop has the opportunity to investigate the rela-

## How Aromas Can Translate Into Dollars and Scents continued...



*Aromatic spices can help create emerging flavor combinations reflective of different global cuisines. Photo shows goat-cheese ravioli made with beets and a tarragon-orange sauce. Tarragon provides highly aromatic notes of anise and mint. Photo courtesy of McCormick & Co.*

tive importance of aroma stimuli for satiety.

According to Ruijschop, the ultimate aim is to develop a desirable-tasting food product that also induces an increased level of satiety, which will prevent consumers from overeating. The triggers may act in different phases of the “satiety cascade,” a framework that describes the mechanisms and processes that take place during consumption, digestion, and absorption of a food product, finally leading to a satiety response.

Such research may provide food and beverage manufacturers with a solution that can help address the current obesity epidemic.

### **Aroma and Food Packaging**

Aromas are being increasingly recognized as playing an important role in consumer decision making, as they can conjure up certain memories or feelings. One possible way that food and beverage manufacturers can “connect” with consumers—as well as differentiate their product in the marketplace—is through the use of scented packaging technology.

A technology, *CompelAroma*<sup>®</sup>,

was developed by ScentSational Technologies, Jenkintown, Pa. (phone 215-886-7777, [www.scent-sationaltechnologies.com](http://www.scent-sationaltechnologies.com)), utilizing encapsulated flavor and aroma release. The flavors are added directly into packaging materials at the time of manufacturing. During the process, the encapsulated flavors (and associated aromas) become integral parts of the package itself. The aromas may be released when a package is opened, or during food preparation.

For example, when applied to gasket liners of metal lids for glass jars, the technology traps fresh flavor within the structure of the polymer liner. As a result, the flavor stays fresh and stable significantly longer than when added directly to the contents. Imagine the potential to add the following aromas—fresh cut basil to pasta sauce, fresh sliced strawberries to jam, fresh ground peanuts to peanut butter, and smokiness to barbecue sauce.

“Up until now, smell has been the sense most neglected in brand marketing strategies,” said Steven M. Landau, Chief Technical Officer for the company. “Of the five senses, smell is the only one that has a direct pathway to the brain and is the only sense that is initially processed in the limbic lobe, the brain’s emotional center.” He added, “Invoking positive memories which are tied to the brand is a very powerful marketing tool.”

At the 2008 Innovative Roadshow held by David Michael, Philadelphia, Pa. (phone 215-632-3100, [www.dmflavors.com](http://www.dmflavors.com)), *CompelAroma* technology was demonstrated in baby food jar liners. David Michael’s Erica Byerly (Sensory & Flavor Insights Manager) and Rachel Czapl (Sensory & Flavor Insights Analyst) worked with Landau in developing this application.

According to the innovators, new parents are increasingly seeking out refrigerated and frozen baby foods because they are perceived to be fresher and healthier than

jarred versions. One contributing factor could be the aroma of jarred food. A solution to this problem would be the addition of a fresh and characterizing aroma to the cap liner. The added flavor infuses the product with aroma over time. Flavors used in the baby food liner included Spaghetti and Cheese, Split Pea and Carrot Soup, Peach Apricot Muesli, and Vegetable Beef Pilaf.

In addition to baby food, the demonstrated technology could also have applications in a variety of other products, including mayonnaise, pasta sauces, applesauce, salad dressings, jarred vegetables, and salsa.

### **Aroma and the Future**

So what’s in the air for aroma?

As this article has already demonstrated, aroma will play an increasingly important role in food formulating. With the economy the way it is, aromas are being used to create a sense of nostalgia, to uplift moods, or to instill a sense of fun in foods.

Aroma may find new ways to help formulators to create better-for-you foods, or even to address health challenges. This article has touched on two possible areas: obesity and sodium reduction. New studies are showing other possibilities. For example, coffee bean aroma can have a relaxation effect on rats, according to researchers at Seoul National University in South Korea. This again underscores the influence that aromas may have in stress reduction. We have already seen some of these properties in herb, spice, and floral scents, so don’t be too judgmental the next time you see a rat walking around with a coffee cup.

In the future, food manufacturers may be looking for longer-lasting aromatic materials to create products that provide differentiation in the marketplace. Imagine, in particular, the development of aromatic materials that resist sensory adaptation. (Sensory adaptation occurs

when humans smell an aroma, which seems to decline over time. The smell is likely not gone, but rather sensory receptors reduce their responsiveness to a stimulus after continuous exposure.) Longer-lasting perception of flavor and fragrance aromas would allow food and beverage manufacturers to create products with an added flavor and aroma dimension.

While we have seen a variety of flavor enhancers promoted by different companies, there are also increasing opportunities for the use of ingredients to enhance aromas in food products. Studies have shown that ingredients such as trehalose can accomplish that. Hopefully, we'll see emerging ingredient developments that can enhance aroma, and perhaps even provide different "layers" of aroma to a food formulation, much in the way that flavorists are able to create different layers of flavors through methods such as encapsulation.

I thought I would end this article with an interesting piece on the smell of British chips (French fries). Researchers

at Leeds University used gas chromatography mass spectrometry to isolate 46 different compounds. They then asked consumers to describe what these compounds smelled like. Answers included butterscotch, cocoa, onion, cheese, flowers, earthy potatoes, and ironing boards. (No accounting for smells, I guess.)

"The humble chip doesn't smell of just chips—the aroma is much more complex," said researcher Graham Clayton. "Perhaps chips will be treated like wine in the future—with chip fans turning into buffs as they impress their friends with eloquent descriptions of their favorite fries."

The way the chips are cooked can be crucial. "The research showed that the relationship between the potatoes, the oil, the temperature, and cooking, as well as adding condiments or foods, affects the aroma profile of the chips," noted Clayton. "Lightly cooked or undercooked chips were found to contain three simple aromas, including bitter cocoa. A little extra cooking was shown



*A packaging technology utilizing encapsulated flavor and aroma release can help "connect" with consumers. For example, a fresh and characterizing aroma can be added to the cap liner of a baby food jar. Photo courtesy of David Michael*

to produce a more-complex aroma profile, with up to nine different aromatic notes."

This research, which puts a nice accent mark to this article, shows not only how complex aroma profiles of foods can be, but also suggests how you can market or differentiate foods by their aroma. Perhaps in the future, we'll see food manufacturers take an approach that emphasizes aromas more and even ties them into areas such as health, culinary, novelty, flavor improvements, or the creation of mood foods. And by doing so, they can help differentiate their products in the marketplace, providing a

sweet smell of success. **FT**

*Next month, it's time for our Ingredients Pre-Show, a magic tour of the newest ingredient developments that will be presented at the 2009 IFT Annual Meeting & Food Expo in Anaheim.*



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