

FLAVOR CONTRIBUTORS

How the five taste senses of salty, sweet, sour, bitter and umami can combine to create an endless variety of flavors.

It's often said that "there is no accounting for taste," but anyone who knows even a bit about the science behind flavor, aromas and the taste receptors on our tongues knows differently. Briefly, taste is a function of taste buds, while flavor is more related to smell, with 70 to 80 percent of flavor actually being perceived as aroma.

While the focus here is on taste and basic flavor contributors such as salt, sugars, vinegars and other enhancers, it's important to note that not all flavors are created equally, nor are they perceived equally by the body. Basic flavors have a great impact on one another, and are best when balanced.

MORE THAN JUST A PINCH

Salt is a staple in most recipes, both sweet and savory. Besides adding to the taste sensation of saltiness, it also enhances the perception of most other flavors. And now we're no longer limited to just the white stuff in the shaker — salt is enjoying a

renaissance brought on by chefs seeking to develop unique flavors through the use of high-quality ingredients. According to a recent survey conducted by Cargill Salt, more than 70 percent of professional chefs are using specialty salts, and more than a third use at least three different types of salt in their cooking. From Hawaiian to rock, kosher to sea, chefs have distinct salt preferences.

Salt's many functions also mean that its manufacturers create many salt forms with varying attributes: adherence, bulk density, blendability, crystal count, caking resistance, flowability, friability, liquid absorption, mean particle size, solubility and specific surface.

According to George Lutz, quality assurance technical manager of Cargill Salt, "Most of these attributes are due to the particle size and shape of the crystal. Perhaps the three most critical attributes that dictate performance are adherence, blendability and solubility."

The faster the salt dissolves, the quicker the flavor is perceived. The longer it takes to dissolve, the longer the duration of the salty flavor. This is one reason the

QUICK-TAKE

THIS STORY TAKES A LOOK AT:

- The five senses of taste serve to emphasize the basic flavor contributors
- The types and varieties of flavor contributors that provide chefs with new flavor opportunities
- How contemporary cooking merges flavors of various cultures to satisfy the expanding American palate



MUSHROOM INFORMATION CENTER

MUSHROOMS, ONE OF THE FOODS IDENTIFIED AS HAVING AN ELUSIVE BUT SATISFYING UMAMI TASTE, BRING A FULL, MEATY, BALANCED FLAVOR TO AN ENTREE.

type of salt can be critical in topical applications. Faster solubility means an up-front hit that brings out other flavors in a recipe. A lingering salt taste tends to be associated with a bitter taste.

Chefs seeking different salt characteristics most often use sea salt because its subtle colors and flavors vary by geographic region. When ocean water is evaporated, the sodium chloride must be separated from calcium, magnesium and potassium. If it is not, a bitter taste remains, such as in the case of French salts, which some chefs prefer.

According to Cargill, the top four salts are sea salt, kosher salt, table salt and Hawaiian salt. Chefs use kosher salt most often, particularly with salt-encrusted foods, but recently more specialty or “celebrity” salts

have appeared, to keep pace with the demanding tastes of today’s cutting-edge chefs.

Three-quarters of chefs say they prefer using different salts for cooking than for finishing foods. Many use kosher salt through the preparation process but then finish with sea salt, for example. Floyd Cordoz of New York’s Tabla restaurant finishes with a specialty salt, *sel gris* from Le Paludier, a distinctive gray salt with a complex favor. “I like the flavor of the minerals in it,” he says.

More than half of the chefs surveyed by Cargill Salt said they season with salt by feel rather than measure. Seasoning by feel also helps prevent chefs from over-salting a dish, a mistake few chefs say they ever make. “Kosher salt flows through my fingers easily, so it’s easy

COMING TO TERMS WITH SALT

SALT VARIETIES

DESCRIPTION

ALBERGER	A method of producing hollow, pyramid-shaped crystals of pure salt developed by J.L. Alberger and patented in 1889. The largest crystals are sold as Diamond Crystal kosher salt, which has a different solubility rate that equals more surface coverage and a flavor burst that goes away.
BLACK SALT (KALA NAMAK)	Sometimes called rock salt (but not what is known as "rock salt" in the U.S.), black salt ranges in color from pale violet to purple-black. It has a strong sulfuric aroma and is used almost exclusively in regional Indian cooking; also known as Indian salt.
CELTIC GRAY SEA SALT	From the Atlantic coast of France, Celtic gray salt is harvested as medium-sized crystals. Moderate to expensive in price, some is sold as is, while some is crushed before it is sold.
CONDIMENT OR FINISHING SALT	Contemporary name for salts that should be sprinkled onto food immediately before serving rather than used during cooking.
DANISH SALT	Sea salt that is smoked over wood in Denmark; also called smoked salt.
DENDRIDIC SALT	Small hollow salt crystals (the size of table salt) made by introducing yellow prussiate of soda into a saturated brine, the result being a porous, star-shaped crystal.
FLAVOR SALT	Monosodium glutamate (MSG) used as a flavor enhancer in many Asian cuisines.
FLEUR DE SEL	This "flower of the sea" is produced along the French Atlantic coast. Hand-harvested, this is the world's highest-priced salt and the favorite of many chefs. It is delicately flavored, but its main contribution to a dish is its texture.
HAWAIIAN ALAEA SALT	A pale orange salt processed with Hawaiian red clay, which provides a mildly sweet salt with excellent curing properties; also known as red salt.
IODIZED SALT	Table salt to which potassium iodide has been added as a preventive against goiter.
KOSHER SALT	Virtually without exception, what is known as kosher salt is a coarse-grained crystal. By nature of its flake texture, it dissolves easily and is lighter (less dense) than table salt and preferred by most chefs.
LIMA SEA SALT	Brand name for a type of sea salt produced along the Atlantic coast of France.
MALDON SALT	Coarse, uneven flakes from Essex, England. Because of its thin, flaky texture that melts quickly on the tongue, it is an excellent finishing salt.
OSHIMA ISLAND RED LABEL	Brand name of the top grade of salt produced on Oshima Island, Japan.
PICKLING SALT	Pure food-grade salt, without additives (such as anti-caking agents) that will cloud liquid.
SALT SENSE	Brand name for medium-sized Alberger salt crystals, slightly smaller than kosher salt; less dense than granulated salt, and so by volume, it contains less sodium chloride.
SEA SALT	Any salt made from evaporated seawater; much table salt is also sea salt.
SEL GRIS	Generic name for gray sea salt.
TABLE SALT	Small, uniform cubes, also called granulated salt, usually iodized.

SOURCE: CARGILL, INC., MICHELE ANNA JORDAN, SALT & PEPPER, BROADWAY BOOKS, 1999

for me to figure how much I am putting on, as opposed to iodized salt in which the crystals are so small," says Gordon Hamersley, chef-owner of Hamersley's Bistro in Boston.

THE SWEETEST THING

Appealing to the sense of sweet is often associated solely with sugar. However, chefs have any number of options to add sweet flavor to foods across the menu.

While sugar is the primary source of sweetness, honey, syrups, chocolate and fruit juices, purées and concentrates all find sweetening uses in the kitchen.

Sweeteners are also blended for a number of reasons. Honey, molasses and fruit juices are often combined with sugar because of their unique flavor characteristics. Different sweeteners have different sweetness intensity over time in the mouth.

Sweeteners can modify certain flavor notes. For example, they may take some of the sharpness out of

AN ASSORTMENT OF SUGARS

SUGAR VARIETIES DESCRIPTION

“REGULAR” SUGAR	The most common white sugar, regular sugar is available as extra-fine or fine. These fine sugar crystals are ideal for bulk food preparation and are not susceptible to caking.
FRUIT SUGAR	Fruit sugar is slightly finer than regular sugar with a more uniform crystal size, which prevents separation and settling.
BAKER’S SPECIAL	The crystal size of baker’s special is even finer than that of fruit sugar and is used for sugaring doughnuts and cookies.
BAR SUGAR	Bar sugar or superfine/ultra fine sugar is the finest of all types of granulated sugar. It is ideal for extra-fine textured cakes and meringues, and dissolves instantly in liquids. In England, a sugar similar to superfine is known as caster or castor, named after the type of shaker in which it is often packaged.
CONFECTIONERS	Confectioners or powdered sugar is granulated sugar ground to a smooth powder and then sifted. It contains about three percent cornstarch to prevent caking, and is used in icings, confections and whipping cream.
COARSE SUGAR	With a crystal size larger than that of regular sugar, coarse sugar is normally processed from the purest sugar liquor. This processing method makes coarse sugar highly resistant to color change or inversion at high temperatures.
SANDING SUGAR	Sanding sugar is used mainly in baking and confections, or to sprinkle on top of baked goods.

Brown Sugars

TURBINADO SUGAR	Raw sugar that has been partially processed, removing some of the surface molasses. Blond in color with a mild brown-sugar flavor.
BROWN SUGAR	Consists of sugar crystals coated in a molasses syrup with natural flavor and color. Dark brown sugar has more color and a stronger molasses flavor than light brown sugar, and is good for gingerbread, baked beans and other full-flavored foods. Lighter types are generally used in baking and making condiments and glazes.
MUSCOVADO SUGAR	Also known as Barbados sugar, this is a specialty brown sugar that is very dark brown with a strong molasses flavor. The crystals are slightly coarser and stickier in texture than regular brown sugar.
FREE-FLOWING	Fine, powder-like brown sugar that is less moist than regular brown sugar, therefore it does not lump and is free-flowing like granulated white sugar.
DEMERARA SUGAR	Demerara sugar is popular in England, and light brown in color with large, slightly sticky golden crystals. Often used in tea, coffee or on top of hot cereals.
LIQUID SUGARS	Liquid sugars were developed before today’s methods of sugar processing. There are several types of liquid sugar: liquid sucrose is essentially liquid granulated sugar and can be used in applications similar to dissolved granulated sugar, and amber liquid sucrose is darker in color and can be used where cane sugar flavor is desirable.

SOURCE: THE SUGAR ASSOCIATION

saltiness or mute the bitterness. They can also change something with a sour flavor, such as vinegar, into something more pleasantly tart. Balanced properly, sweet and sour can create an agreeable flavor and act as a counterpoint to each other in sauces.

Sugar is a carbohydrate that occurs naturally in every fruit and vegetable, but sugar occurs in greatest quantities in sugar cane and sugar beets, from which it is separated for commercial use. Sugar is considered a nutritive sweetener in that, along with other

nutritive sweeteners such as honey and concentrated fruit juice, it provides an energy source while sweetening.

Non-nutritive sweeteners such as saccharin and aspartame offer no energy but sweeten with little volume. They are particularly popular in beverages and as a topping. In the kitchen, these sweeteners are beginning to be used with greater frequency as a baking ingredient, as chefs search for ways to reduce calories and carbohydrates in foods.

HONEY: STICKY SWEETNESS

Honey, available in its pure form or in dried mixtures, is used for its high sweetness and flavor attributes. Honey contains about 38 percent fructose, 31 percent glucose, 17 percent water and smaller amounts of other nutritive ingredients. In addition to its sweetening capabilities, honey's greatest benefit to a menu is its natural image.

Honey has the ability to enhance the sweetness intensity of other sweeteners. For example, in one research study, the addition of 25 percent honey to 5 percent sucrose doubled the sweetness intensity of the solution. Honey also improves the acceptability of sour products by decreasing the sourness without masking the flavor of the food.

With a few notable exceptions, consumers have a low acceptability threshold for bitter. Adding honey can mask the bitterness of some otherwise desirable ingredients. Honey also has the ability to decrease the intensity of salt.

In addition to these many functional benefits, honey has a diverse flavor source. There are more than 300 types of honey produced in the U.S., each originating from a different floral source.

SWEET COCOA CRAVINGS

It is difficult to discuss sweet taste and flavor contributors without mentioning chocolate. While the aroma and flavor of chocolate are alluring, it is the sweetness (and bittersweetness) of this tempting and, for some, addictive food that makes it so attractive as a dessert focus in foodservice.

Americans are passionate about chocolate. And they are equally picky about the flavor notes and aromatic characteristics that we in the U.S. know as chocolate. While many chefs have an affinity for European chocolates that are often dark with less sweetness, mainstream Americans have come to expect a lighter, sweeter, milk chocolate.

Hershey's Corporate Chef Ken Darling points out the differences that distinguish American from European chocolates. "The cocoa source, the bean blend, the roasting process and the milling process all influence the final product," he points out. "European cocoa is typically from the Ivory Coast and Madagascar while American chocolate is mostly from the Ivory Coast and South America."

To satisfy demand for all varieties, Hershey's offers a wide array of milk, dark and white chocolates, and other chocolate confections with familiar flavors,

THE FLAVOR OF HONEY

HONEY VARIETY	DESCRIPTION
ALFALFA HONEY	Light amber color; mild flavor and aroma
BASSWOOD HONEY	Water-white color; strong "biting" flavor
BUCKWHEAT HONEY	Dark amber color; strong, slightly malty flavor
BLUEBERRY HONEY	Light amber color; distinct fruit flavor
CLOVER HONEY	Color varies from water-white to amber; mild, "classic honey" flavor
EUCALYPTUS HONEY	Varies greatly in color; generally strong flavor with very slight menthol notes
MIXED WILDFLOWER HONEY	Varies greatly in color and flavor; typically strong flavor
SAGE HONEY	Water-white color; mild flavor
SAFFLOWER HONEY	Color varies from amber to dark amber with slight greenish cast; mild flavor
SOURWOOD HONEY	Light amber color; mild flavor
TUPELO HONEY	Light amber color with slight greenish cast; mild, distinctive flavor

SOURCE: NATIONAL HONEY BOARD

textures and brands such as Reese's and Heath. When merchandising desserts, brand and flavor familiarity achieve a higher-quality image and increase profit opportunities.

The influence of chocolate on desserts and the corresponding influence of desserts on a restaurant's check average has made chocolate the preferred ingredient on most dessert menus. Perhaps no meal component responds to merchandising like desserts and chocolate, which takes the lead in appealing to the 40 percent of women and 15 percent of men who admit to regular chocolate cravings.

While chocolate's primary application is in desserts, there has been more recent interest in using it in more savory dishes. "The earthy, smoky flavor of dark chocolate has not only served as a primary ingredient in Mexican moles," adds Darling, "but is also opening new opportunities for the pairing of dark and semi-sweet chocolates and cocoa with spices and other seasonings for glazes, barbecue sauces and dry rubs."

THE ACID TEST

Chefs turn to two broad sources of acids for cooking — acetic acids and citric acids.

Acetic acid is the result of fermenting alcohol with acetobacter in the presence of oxygen, and is what gives vinegar its sour taste. Specialty vinegars begin with specific raw materials that contribute characteristic flavors and colors.

It takes good alcohol (wine or beer) to make fermented vinegar. Winemaking suppliers list acetobacter as “mother” or vinegar culture. These cultures convert alcohol to acetic acid. Vinegar should contain at least 5 percent acid, as required for preserving or pickling. Specialty vinegar contains as much as 7 percent acid.

All acid flavors are not created equal. While the flavor differences between products like red wine vinegar and rice vinegar are obvious, subtle flavor differences exist among the different acidulants. Acetic acid gives a distinctive vinegar note, while citric acid gives a sharp, clean bite. Some acids may be selected for their ability to modify the sweetness of sugar.

Citric acid is extracted from citrus fruits such as lemons, limes, oranges and pineapples, and has a strong tart taste that can be used directly from the fruit as juice or purchased in a white powder or colorless translucent crystal. These acid powders provide a strong acidic flavor that rapidly dissipates on the palate. Citric acid helps to prevent discoloration and the development of off-odors in seafood. In confections, it prevents sugar crystallization and contributes to overall flavor.

UMAMI: THE SAVORY EXPERIENCE

Umami, which loosely translates to “delicious” in Japanese, has long been recognized as a taste distinct from sweet, salty, bitter and sour. Umami has been further described as imparting a savory, robust and at times, meaty flavor. It is both a basic taste and flavor enhancer produced by the presence of free glutamate.

First isolated in Japan in 1908, glutamate is a form of glutamic acid, which is one of many amino acids. Glutamate is to umami what sodium chloride is to saltiness. It can be purchased in processed form as MSG, for example, but is naturally found in many foods including mushrooms, soy sauce, tomatoes and Parmesan cheese.

But umami is more than just glutamate. A group of compounds called ribonucleotides has been found to work synergistically with glutamate to heighten the



TANGY-SWEET FLAVORS LIKE THAT OF PLUM SAUCE ARE A DELICATE BLEND AND BALANCE OF SWEETNESS, SOUR NOTES AND SAVORINESS.

“umaminess” of foods. Scientists hypothesize that the ribonucleotides prime the glutamate receptor sites on the tongue to provide a more intense umami taste sensation. Mushrooms, especially shiitake, naturally contain both free glutamate and ribonucleotides in significant amounts, further amplifying the umami sensation.

MEATY MUSHROOMS

Mushrooms add a full, meaty (umami), balanced flavor that entrées can otherwise lack. P.F. Chang’s Coconut-Curry Vegetables, made with stir-fried mushrooms, vegetables, crispy silken tofu and peanuts in a coconut-curry sauce, provides a good example of how mushrooms combine with other rich flavors to create a dish that has the elusive yet satisfying quality of umami.

Jack Czarnecki, chef-owner of The Joel Palmer House restaurant in Dayton, Ore., and author of *A Cook’s Book of Mushrooms* (Artisan, 1995), is a noted mushroom authority who believes he’s discovered the “fungal holy trinity” for seasoning mushrooms. He contends that blending the three tastes of salt, sugar and soy sauce creates the perfect seasoning for all kinds of fresh mushrooms.

“If salt is used exclusively, the mushrooms can take on a metallic flavor. Soy sauce enhances the flavor of mushrooms, but if soy is used exclusively, the mushrooms taste too much of soy,” he explains.

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– KEN DARLING
Corporate Chef, Hershey’s

“Finally, a tiny amount of sugar rounds out the sharpness from the salt and soy sauce, but the dish should not taste sweet at all.” This is a brilliant example of how a combination of flavors creates an explosion of taste.

MULTI-ETHNIC SOY SAUCE

Developed in China more than 2,500 years ago, soy sauce is thought to be one of the world’s oldest condiments. Rich in amino acids, naturally brewed soy sauce is one of the most widely used umami ingredients in Japanese cooking. Today, it is increasingly known in the west as a flavoring and flavor-enhancing ingredient for many types of foods beyond its Asian origins. Adding soy sauce to the foods from other cultures re-shapes ethnic cuisines and expands the umami experience.

Chef Douglas Rodriguez is often regarded as the inventor of Nuevo Latino cuisine. Rodriguez is executive chef and owner of Alma de Cuba in

Philadelphia, Deseo at the Kierland Resort & Spa in Scottsdale, Ariz., and Ola, with locations in New York and Miami. Although he specializes in Latin cuisine, Rodriguez recognizes how ingredients and techniques have blurred the lines of cultures and foods from various regions of the world.

“It would be difficult to say when the first time soy sauce was used in Latin cooking,” he says. “There has been a big influx of Asians in Latin America, especially Peru, where ceviche originated.” Rodriguez’s recipe for Chino-Latino Beef Tenderloin Ceviche includes a marinade of soy sauce, lime and orange juices, honey, ginger and red pepper.

“Throughout Peru, *chifas* [small restaurants, or diners] serve a cuisine which is a blend of Peruvian and Asian flavors, with dishes that are a fusion of traditional fare like fried rice mixed with Peruvian sausage and peppers,” he continues.

Maria Manso, executive chef of Asia de Cuba in San Francisco, concurs. “It sounds odd at first, but when you think about it, the two cultures actually have a lot in common,” she adds. “Latino and Asian cooks use similar methods and styles, are fond of the same basic ingredients like chiles, garlic, rice and cilantro, and serve their meals family-style in large quantities. In Cuba, even the *fideo* noodles are similar.” One of Manso’s most popular appetizers is her Tuna Pica, a unique presentation of ahi tuna, almonds, coconut, olives, ginger and garlic, all tied together with a soy sauce dressing.

BLENDING THE BASICS FOR A WORLD OF FLAVOR

The endless ways that basic food flavors influence taste sensations provide an entry point into an intriguing world of food science and flavor creativity. There are thousands of additional flavor sources that provide their own influences and further expand flavor options. An understanding of the opportunities within even the basic taste options of various flavor contributors cracks open a door to the many possibilities available in the world of flavor. So, despite the old saying, there really is a lot of accounting for taste. ☺

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