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(57) Abstract: The present invention relates generally to improving the taste of synthetic sweeteners and compositions sweetened therewith. In particular, the present invention relates to compositions that can improve the taste of synthetic sweeteners by imparting a more sugar-like taste or characteristic. In particular, the compositions and methods provide a more sugar-like temporal profile, including sweetness onset and sweetness linger, and/or a more sugar-like flavor profile, including osmotic taste.

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**SYNTHETIC SWEETENER COMPOSITIONS WITH IMPROVED TEMPORAL
PROFILE AND/OR FLAVOR PROFILE, METHODS FOR THEIR
FORMULATION, AND USES**

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FIELD OF THE INVENTION

The present invention relates generally to improving the taste of synthetic sweeteners and compositions sweetened therewith. In particular, the present invention relates to compositions that can improve the tastes of synthetic sweeteners by imparting a more sugar-like taste or characteristic. In particular, the compositions and methods provide a more sugar-like temporal profile, including sweetness onset and sweetness linger, and/or a more sugar-like flavor profile, including osmotic taste.

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BACKGROUND OF THE INVENTION

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Natural caloric sugars, such as sucrose, fructose, and glucose are utilized heavily in beverage, food, pharmaceutical, and oral hygienic/cosmetic industries due to their pleasant taste. In particular, sucrose imparts a desirable taste for consumers. Although sucrose provides superior sweetness characteristics, it is caloric. While calories are necessary for proper bodily functions, there is a need in the market to provide alternative non-caloric or low-caloric sweeteners with sugar-like taste for consumers with sedentary lifestyles or those who are calorie conscious. However, in general, non-caloric or low-caloric sweeteners have associated undesirable tastes to consumers such as delayed sweetness onset; lingering sweet aftertaste; bitter taste; metallic taste; astringent taste; cooling taste; licorice-like taste; and/or the like.

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Non-caloric or low-caloric sweeteners such as artificial sweeteners generally exhibit a sweet taste that has a different temporal profile, maximal response, flavor profile, mouth feel, and/or adaptation behavior than that of sugar. For example, the sweet tastes of synthetic sweeteners are slower in onset and longer in duration than the sweet taste produced by sugar and thus change the taste balance of a food composition. Because of these differences, use of a synthetic sweetener to replace a bulk sweetener, such as sugar, in a food or beverage, causes an unbalanced temporal profile and/or flavor profile. In addition to the difference in temporal profile, synthetic sweeteners generally exhibit (i)

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lower maximal response than sugar, (ii) off tastes including bitter, metallic, cooling, astringent, licorice-like taste, etc., and/or (iii) sweetness which diminishes on iterative tasting. It is well known to those skilled in the art of food/beverage formulation that changing the sweetener in a composition requires re-balancing of the flavor and other taste components (e.g., acidulants). If the taste profile of synthetic sweeteners could be modified to impart specific desired taste characteristics to be more sugar-like, the type and variety of compositions that may be prepared with that sweetener would be significantly expanded. Accordingly, it would be desirable to selectively modify the taste characteristics of synthetic sweeteners. As a result, several processes and/or compositions have been described for modifying the taste profile of beverage, food, pharmaceutical, nutraceutical, tobacco, and oral hygienic/cosmetic products sweetened with synthetic sweeteners.

However, improvement in sweetness and sugar-like characteristics of synthetic sweeteners to provide consumer satisfaction more like that of sucrose, fructose, or glucose is still desired.

SUMMARY OF THE INVENTION

Generally, this invention addresses the above described need by providing a synthetic sweetener composition with improved temporal profile, flavor profile, or both, a method for improving the temporal profile and/or flavor profile of a synthetic sweetener, synthetic sweetener sweetened compositions with improved temporal profile and/or flavor profile, and a method for improving the temporal profile and/or flavor profile of synthetic sweetener sweetened compositions. In particular, this invention improves the temporal profile and/or flavor profile by imparting a more sugar-like temporal profile and/or flavor profile.

More particularly, this invention encompasses a synthetic sweetener composition with a more sugar-like temporal profile and/or flavor profile comprising at least one synthetic sweetener and at least one sweet taste improving composition selected from the group consisting of carbohydrates, polyols, amino acids, other sweet taste improving additives, and combinations thereof.

According to another aspect, this invention encompasses a method for imparting a more sugar-like temporal profile and/or flavor profile to a synthetic sweetener by combining at least one synthetic sweetener and at least one sweet taste improving composition selected from the group consisting of carbohydrates, polyols, amino acids, other sweet taste improving additives, and combinations thereof.

According to still another aspect, this invention encompasses a synthetic sweetener sweetened composition with a more sugar-like temporal profile and/or flavor profile comprising a sweetenable composition, at least one synthetic sweetener, and at least one sweet taste improving composition selected from the group consisting of carbohydrates, polyols, amino acids, other sweet taste improving additives, and combinations thereof. According to particular embodiments of this invention, the synthetic sweetener sweetened composition is selected from the group consisting of beverage, food, pharmaceutical, nutraceutical, tobacco, oral hygienic/cosmetic products, and the like.

According to still another aspect, this invention encompasses a method for imparting a more sugar-like temporal profile and/or flavor profile to a synthetic sweetener sweetened composition by combining with a sweetenable composition, at least one synthetic sweetener, and at least one sweet taste improving composition selected from the group consisting of carbohydrates, polyols, amino acids, other sweet taste improving additives, and combinations thereof. Again, according to particular embodiments of this invention, the synthetic sweetener sweetened composition is selected from the group consisting of beverage, food, pharmaceutical, tobacco, oral hygienic/cosmetic product, nutraceutical, and the like.

Objects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention. Unless otherwise defined, all technical and scientific terms and abbreviations used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention pertains. Although methods and compositions similar or equivalent to those described herein can be used in the practice of the present invention, suitable methods and compositions are described without intending that any such methods and compositions limit the invention herein.

DETAILED DESCRIPTION OF THE EMBODIMENTS

I. Introduction

Reference now will be made in detail to the presently proffered embodiments of the invention. Each example is provided by way of explanation of embodiments of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the invention. For instance, features illustrated or described as part of one embodiment, can be used on another embodiment to yield a still further embodiment. Thus, it is intended that the present invention cover such modifications and variations within the scope of the appended claims and their equivalents.

As summarized above, this invention encompasses a synthetic sweetener composition with improved temporal profile and/or flavor profile, a method for improving the temporal profile and/or flavor profile of a synthetic sweetener, synthetic sweetener sweetened compositions with improved temporal profile and/or flavor profile, and a method for improving the temporal profile and/or flavor profile of synthetic sweetener sweetened compositions. In particular, this invention improves the temporal profile and/or flavor profile of a synthetic sweetener by imparting a more sugar-like temporal profile and/or flavor profile to compositions comprising a synthetic sweetener.

A. Sugar-Like Taste

As used herein, the phrases "sugar-like characteristic," "sugar-like taste," "sugar-like sweet," "sugary," and "sugar-like" are synonymous. Sugar-like characteristics include any characteristic similar to that of sucrose and include, but are not limited to, maximal response, flavor profile, temporal profile, adaptation behavior, mouth feel, concentration/response function, tastant/and flavor/sweet taste interactions, spatial pattern selectivity, and temperature effects. These characteristics are dimensions in which the taste of sucrose is different from the tastes of synthetic sweeteners. Of these, however, the flavor profile and temporal profile are particularly important. In a single tasting of a sweet food or beverage, differences (1) in the attributes that constitute a sweetener's flavor profile and (2) in the rates of sweetness onset and dissipation, which constitute a sweetener's temporal profile, between those observed for sucrose and for a synthetic sweetener can be noted. Desirable embodiments of this invention exhibit a more sugar-

like temporal profile or sugar-like flavor profile, or both, than compositions comprising a synthetic sweetener, but without a sweet taste improving composition. Whether or not a characteristic is more sugar-like is determined by an expert sensory panel who taste compositions comprising sugar and compositions comprising a synthetic sweetener, both with and without a sweet taste improving composition, and provide their impression as to the similarities of the characteristics of compositions comprising a synthetic sweetener, both with and without a sweet taste improving composition, with those comprising sugar. A suitable procedure for determining whether a composition has a more sugar-like taste is described in detail hereinbelow.

10 In a particular embodiment, a panel of assessors is used to measure the reduction of sweetness linger. Briefly described, a panel of assessors (generally 8 to 12 individuals) is trained to evaluate sweetness perception and measure sweetness at several time points from when the sample is initially taken into the mouth until 3 minutes after it has been expectorated. Using statistical analysis, the results are compared between samples
15 containing additives and samples that do not contain additives. A decrease in score for a time point measured after the sample has cleared the mouth indicates there has been a reduction in sweetness perception.

The panel of assessors may be trained using procedures well known to those of ordinary skill in the art. In a particular embodiment, the panel of assessors may be trained
20 using the Spectrum™ Descriptive Analysis Method (Meilgaard et al, Sensory Evaluation Techniques, 3rd edition, Chapter 11). Desirably, the focus of training should be the recognition of and the measure of the basic tastes; specifically, sweet. In order to ensure accuracy and reproducibility of results, each assessor should repeat the measure of the reduction of sweetness linger about three to about five times per sample, taking at least a
25 five minute break between each repetition and/or sample and rinsing well with water to clear the mouth.

Generally, the method of measuring sweetness comprises taking a 10 mL sample into the mouth, holding the sample in the mouth for 5 seconds and gently swirling the sample in the mouth, rating the sweetness intensity perceived at 5 seconds, expectorating
30 the sample (without swallowing following expectorating the sample), rinsing with one mouthful of water (e.g., vigorously moving water in mouth as if with mouth wash) and expectorating the rinse water, rating the sweetness intensity perceived immediately upon

expectorating the rinse water, waiting 45 seconds and, while waiting those 45 seconds, identifying the time of maximum perceived sweetness intensity and rating the sweetness intensity at that time (moving the mouth normally and swallowing as needed), rating the sweetness intensity after another 10 seconds, rating the sweetness intensity after another 5 60 seconds (cumulative 120 seconds after rinse), and rating the sweetness intensity after still another 60 seconds (cumulative 180 seconds after rinse). Between samples take a 5 minute break, rinsing well with water to clear the mouth.

In order to clarify the nature of preferred embodiments of this invention, some further explanation of the differences in flavor and temporal profiles between that of sugar and synthetic sweeteners may be helpful. While not wishing to be bound by theory, this 10 further explanation is as follows.

B. Flavor Profile

The flavor profile of a sweetener is a quantitative profile of the relative intensities of all of the taste attributes exhibited. Such profiles often are plotted as histograms or 15 radar plots. Sucrose, heretofore, has been accepted to exhibit only sweetness and, in fact, generally is employed as a standard for pure sweet taste quality. Most synthetic sweeteners exhibit other qualities of taste in addition to sweetness. Thus, as an example, saccharin, which is a synthetic sweetener, has been found to exhibit both bitter and metallic off tastes. As another example, cyclamate exhibits bitter and salty off tastes. For 20 examples, stevioside and hernandulcin, both natural high-potency sweeteners also have a bitter off taste. Other taste attributes commonly observed for synthetic sweeteners include cooling and licorice-like, and an occasional astringent taste.

It has been discovered, however, that sucrose exhibits a taste attribute, or perhaps even attributes, beyond sweetness. The bitter, sour, salty and umami attributes do not 25 describe it. Nonetheless, its taste is easily discerned from that of synthetic sweeteners exhibiting only sweetness (e.g., aspartame) within the first few seconds of tasting. Thus, the taste of sucrose is unique among sweeteners, even among those, which do not exhibit any of the "off" tastes noted above.

In the literature, this unique taste character of sucrose has been referred to in 30 various ways. Terms such as "mouth feel" and "body" often are used, both terms suggestive of viscosity or other tactile sensations. "Mouth feel" also can refer to the

texture, body, physical, and overall feel a human consumer detects in his or her mouth when tasting the composition. Thus, for example, a sugar-like mouth feel refers to texture, body, physical, and overall feel similar to that of sugar. However, it is believed now that the unique taste of sucrose relative to that of synthetic sweeteners is not a tactile sensation.

- 5 A plausible explanation for the unique taste of sucrose as well as other carbohydrate sweeteners is that hyperosmotic solutions induce rapid and sustained decreases in taste bud cell volumes. Specific effects accompanying the taste bud cell shrinkage are enhanced signaling from salt-sensitive taste bud cells in response to NaCl and signaling from sour-sensitive taste bud cells even in the absence of acid. Although effects on sweet-sensitive taste bud cells were not evaluated, this suggests that sucrose, and carbohydrate
- 10 sweeteners in general, must elicit taste responses by a pathway in addition to that mediated by the sweetener receptor $T1R2/T1R3$. This additional pathway likely is mediated by the taste bud cell shrinkage induced by the hyperosmotic character of sugar solutions. Thus, the unique taste of sucrose likely derives from a superimposition of these two pathways of
- 15 signaling. Sucrose is not perceived as sour or salty or, for that matter, bitter or umami either. However, it seems that the unique taste of sucrose derives from signaling to the brain by taste bud cells, which normally signal distinct modalities (e.g., strong signaling from sweet-sensitive cells, weak signaling from sour-sensitive cells, weak signaling from salt-sensitive cells, etc.). It is believed that this pattern of activity is in significant part
- 20 responsible for the unique taste of sucrose. In summary, it appears that sucrose is not only a pure sweet stimulus, but also exhibits a second taste attribute, and the superimposition of these two attributes constitutes "sucrose taste." Given that this second taste attribute of sucrose is due to its osmotic character, it is referred to herein as "osmotic taste."

- Consistent with the line of reasoning developed above, the osmotic taste of sucrose
- 25 can be observed in the absence of sucrose sweetness. Lactisole is a well known sweetness inhibitor, and if sucrose is tasted at 10% (w/v) in the presence of lactisole at 0.2% (w/v), the osmotic taste character of sucrose can be observed uncomplicated by the presence of intense sweetness. The taste of this sucrose/lactisole formulation exhibits faint sweetness, faint sourness as well as "thickness" or "body." Synthetic sweeteners do not exhibit
- 30 osmotic taste and accordingly will not reproduce the flavor profile of sucrose unless additives which reproduce the osmolality of the sucrose solution targeted without off taste are included.

In principle, any level of osmolarity higher than that of normal saliva exhibits at least some osmotic taste in the mouth. Average concentrations of inorganic ions present in saliva, which are responsible for nearly all of the osmolarity of saliva, are as illustrated in Table 1 below. From the data shown, it is clear that saliva typically has an osmolarity of 70 mOsM. Sucrose at 10%, however, is 292 mOsM, more than 4-fold higher, and therefore will cause significant shrinkage of taste bud cell volume and signaling to the central nervous system (CNS).

Table 1

Inorganic Ions	Saliva Concentration (mM)
Na ⁺	10
K ⁺	10-25
Ca ²⁺	1.7 - 3
Mg ²⁺	0.5 - 1
Cl ⁻	15 - 29
H ₂ PO ₄ ⁻	4 - 5
HCO ₃ ⁻	5 - 7

In the foregoing, it is suggested that the unique taste of sucrose is an outcome of two pathways of taste bud cell signaling, the first pathway proceeding only by activation of sweet-sensitive taste bud cells by direct action at the sweetener receptor T₁R₂/T₁R₃ and the second pathway proceeding by activation of several taste bud cell subtypes (e.g., sweet-, sour- and salt-sensitive taste bud cells) by a mechanism mediated by cell shrinkage due to the increased osmolarity of the sucrose stimulus. While this is believed to be the case, it could be that the complete explanation for the unique taste of sucrose is still somewhat more complicated. It is known that the sweetener receptor T₁R₂/T₁R₃ is a heterodimeric receptor constituted of two proteins associated with each other where each of them contains an extracellular domain generally referred to as the Venus Flytrap Domain (VFD). Evidence has been provided that sucrose binds in both VFDs to activate the receptor. At the same time, it is known that high-potency sweeteners bind differently. Thus, aspartame and neotame bind only to the VFD of T₁R₂ while, at the same time, cyclamate does not bind in either VFD domain, but rather binds in the transmembrane domain of T₁R₃. The activated T₁R₂/T₁R₃ receptor which follows from sucrose

stimulation through binding in both VFDs will be somewhat different in shape from that of activated receptors which derive from the quite different binding of synthetic sweeteners. Thus, complete reproduction of sucrose taste with synthetic sweeteners may also require simultaneous binding of sweeteners in both VFDs of T_1R_2/T_1R_3 .

C. Temporal Profile

1. Sweetness Onset and Linger

Sucrose exhibits a sweet taste in which the maximal response is perceived quickly and where perceived sweetness disappears relatively quickly on swallowing a food or beverage. In contrast, the sweet tastes of essentially all synthetic sweeteners reach their maximal responses somewhat more slowly and they then decline in intensity more slowly than is the case for sucrose. This decline in sweetness is often referred to as "Sweetness Linger" and is a major limitation for synthetic sweeteners. Slow onset of sweetness also can be a problem. In general, however, sweetness linger is a more significant problem. And so, preferred embodiments of this invention exhibit significant reductions in sweetness linger. As used herein, "temporal profile" of a composition means the intensity of sweetness perceived over time in tasting of the composition by a human. As explained above, the sweet taste of sugar, as well as other carbohydrate and polyol sweeteners, has a quick onset followed by a rapid decrease in sweetness, whereas a synthetic sweetener typically has a slower sweet taste onset than sugar followed by a sweetness linger that is longer than sugar.

It is believed that most, if not all, synthetic sweeteners bind nonspecifically throughout the oral cavity. Thus, they may stick to the periphery of cells, diffuse into the membranes of cells and even diffuse into cells, the majority of which are not even taste bud cells. This can explain a delay in sweetness onset since attainment of maximal receptor occupancy only will occur subsequent to diffusion of the synthetic sweetener past an enormous concentration of non-specific binding sites and the delay in onset of maximal sweetness will be proportional to the propensity for the sweetener to engage in non-specific binding. At the same time, sweetener molecules that are released from the receptor have a very high likelihood of non-specific binding nearby the receptor only to diffuse back to the receptor and stimulate it again and again. Such a process also would delay the time required for clearance of sweetener from the sweetener receptor (i.e., the time for disappearance of sweetness perception). Thus, two approaches for modulating

the atypical temporal profiles of synthetic sweetener comprise (i) inhibition of the nonspecific binding of synthetic sweeteners by taste bud and epithelial cells and (ii) inhibition of the rate of egress of a synthetic sweetener from taste bud and epithelial cells and their membranes.

5 Thus, in particularly desirable embodiments of this invention, the combination of a synthetic sweetener with certain sweet taste improving additives reduces the non-specific binding of synthetic sweeteners to membranes of cells in the oral cavity. Particularly, certain of the sweet taste improving compositions are hyperosmotic stimuli and cause shrinkage of epithelial and taste bud cell membranes, thus retarding the ability of the
10 membranes to engage in non-specific absorption of synthetic sweeteners. Particularly desirable sweet taste improving additives increase osmolarity without introducing excessive off taste.

In addition, particularly desirable sweet taste improving additives reduce sweetness linger by retarding the rate of egress of non-specifically absorbed synthetic sweeteners
15 from cell membranes. For example, polymers that bind to the surfaces of cells so as to reduce the fluidities of cell membranes are effective in this manner.

According to still other embodiments of this invention, sweetness linger of a synthetic sweetener is masked by the presence of other ingredients which exhibit lingering taste characteristics. For example, synthetic sweeteners can be combined with food acids
20 (e.g., acidulants such as citric acid, malic acid, tartaric acid, fumaric acid, and adipic acid) which exhibit sourness that lingers relative to that of mineral acids (e.g., H_3PO_4), astringent compounds and other compounds which introduce lingering sensory notes. These embodiments overlay the objectionable sweetness linger with sourness linger and other lingering characteristics such that the overall taste remains in balance over time.

25 2. Inhibiting The Nonspecific Binding Of Synthetic Sweetener By Taste Bud And Epithelial Cells

Again without being bound by theory, high osmolarity solutions improve the temporal profile of synthetic sweetener to be more sugar-like. Synthetic sweeteners normally exhibit slow sweetness onset and lingering sweetness. The high osmolarity
30 nature of sucrose and other carbohydrate or polyol sweetener solutions contributes to the sweet taste sensation. It generally is known that (i) high osmolarity solutions cause

marked shrinkage of taste bud cells and (ii) taste bud cells absorb and/or adsorb high-potency sweeteners of a variety of chemical structures. Thus, it is hypothesized that high osmolarity solutions cause tightened packing of membrane lipid molecules in taste bud cells as well as in other epithelial cells in the oral cavity and thereby diminish the abilities of such cells to absorb synthetic sweetener. Therefore, any compounds which impart osmolarities sufficient to affect the taste bud and epithelial cell membranes should diminish non-specific binding and thereby would cause synthetic sweeteners to exhibit sweetness with more sugar-like temporal profiles. In one embodiment, any sweet taste improving composition that imparts increased osmolarity will be effective by this mechanism.

3. Inhibiting The Rate Of Egress Of Synthetic Sweetener From Taste Bud And Epithelial Cells And Their Membranes

Another pathway whereby temporal profiles of synthetic sweeteners may be improved is to slow the rates of egress of absorbed sweeteners from the taste bud and epithelial cells and their membranes. Thus, in one embodiment, sweet taste improving compositions which reduce the fluidity of the cell membranes improve the temporal profile of synthetic sweeteners to be more sugar-like. Non-limiting examples of compositions which slow the rates of egress of absorbed sweeteners from the taste bud and epithelial cells and their membranes include sweet taste improving surfactant additives, sweet taste improving cationic polymer additives, sweet taste improving hydrocolloid additives, and other sweet taste improving polymer additives. In yet another embodiment, suitable compositions which slow the rates of egress of absorbed sweeteners from the taste bud and epithelial cells and their membranes include, but are not limited to, cationic polymeric agents such as polylysines (e.g., poly-L- α -lysine or poly-L- ϵ -lysine), poly-L-ornithine (e.g., poly-L- α -ornithine or poly-L- ϵ -ornithine), polyethylenimine, and chitosan, as well as surface active compositions including sucrose esters, sorbic acid esters, sorbitan, sorbitan esters, anionic detergents, polysorbates, polyethylene sorbitan esters, propylene glycol esters, glycerol esters, polyglycerol esters, polyethylene esters, complex esters, (e.g., lactate, tartrate, and the like), cationic detergents, gum acacia senegal, gum acacia seyal, anionic polymers (e.g., polyaspartic acid), polyethylene glycol, lecithins, and saponins. The polymeric agents are hypothesized to bind to cell surfaces and engage in multiple points of binding contact and reduce the fluidity of the cell membranes.

II. Synthetic Sweetener and Sweetened Compositions

It has been discovered that at least one synthetic sweetener in combination with at least one sweet taste improving composition imparts a more sugar-like taste. In a desired embodiment, a composition and method with an improved temporal profile and/or flavor profile are provided. In another embodiment, synthetic sweetener-sweetened compositions with a more sugar-like temporal profile and/or flavor profile comprising a sweetenable composition, at least one synthetic sweetener, and at least one sweet taste improving composition are provided. A suitable sweetenable composition can be any material suitable for sweetening with a sweetener and desirably is an orally ingestible composition. By the term "orally ingestible composition", as used herein, is meant substances which are contacted with the mouth of man or animal, including substances which are taken into and subsequently ejected from the mouth and substances which are drunk, eaten, swallowed or otherwise ingested, and are safe for human or animal consumption when used in a generally acceptable range.

A. Orally Ingestible Sweetenable Compositions

There are no restrictions on the type of orally ingestible compositions encompassed by embodiments of this invention as long as they are safe for human or animal consumption when used in a generally acceptable range. These compositions include food, beverage, pharmaceutical, tobacco, nutraceutical, oral hygienic/cosmetic products, and the like. Non-limiting examples of these products include non-carbonated and carbonated beverages such as colas, ginger ales, root beers, ciders, fruit-flavored soft drinks (e.g., citrus-flavored soft drinks such as lemon-lime or orange), powdered soft drinks (e.g., cola, juice, tea, water, coffee), and the like; fruit juices originating in fruits or vegetables, fruit juices including squeezed juices or the like, fruit juices containing fruit particles, fruit beverages, fruit juice beverages, beverages containing fruit juices, beverages with fruit flavorings, vegetable juices, juices containing vegetables, and mixed juices containing fruits and vegetables; sport drinks, energy drinks, near water and the like drinks (e.g., water with natural or synthetic flavorants); tea type or favorite type beverages such as coffee, cocoa, black tea, green tea, oolong tea and the like; beverages containing milk components such as milk beverages, coffee containing milk components, café au lait, milk tea, fruit milk beverages, drinkable yogurt, lactic acid bacteria beverages or the like; dairy products; bakery products; desserts such as yogurt, jellies, drinkable jellies,

puddings, Bavarian cream, blancmange, cakes, brownies, mousse and the like, sweetened food products eaten at tea time or following meals; frozen foods; cold confections, e. g. types of ice cream such as ice cream, ice milk, lacto-ice and the like (food products in which sweeteners and various other types of raw materials are added to milk products, and the resulting mixture is agitated and frozen), and ice confections such as sherbets, dessert 5 ices and the like (food products in which various other types of raw materials are added to a sugary liquid, and the resulting mixture is agitated and frozen); ice cream; general confections, e.g., baked confections or steamed confections such as cakes, crackers, biscuits, buns with bean-jam filling and the like; rice cakes and snacks; table top products; 10 general sugar confections such as chewing gum (e.g., including compositions which comprise a substantially water-insoluble, chewable gum base, such as chicle or substitutes thereof, including jetulong, guttakay rubber or certain comestible natural synthetic resins or waxes), hard candy, soft candy, mints, nougat candy, jelly beans and the like; sauces including fruit flavored sauces, chocolate sauces and the like; edible gels; crèmes 15 including butter crèmes, flour pastes, whipped cream and the like; jams including strawberry jam, marmalade and the like; breads including sweet breads and the like or other starch products; spice; general condiments including seasoned soy sauce used on roasted meats, roast fowl, barbecued meat and the like, as well as tomato catsup, sauces, noodle broth and the like; processed agricultural products, livestock products or seafood; 20 processed meat products such as sausage and the like; retort food products, pickles, preserves boiled in soy sauce, delicacies, side dishes; snacks such as potato chips, cookies, or the like; cereal products; drugs or quasi-drugs that are administered orally or used in the oral cavity (e.g., vitamins, cough syrups, cough drops, chewable medicine tablets, amino acids, bitter-tasting agents, acidulants or the like), wherein the drug may be in solid, liquid, 25 gel, or gas form such as a pill, tablet, spray, capsule, syrup, drop, troche agent, powder, and the like; personal care products such as other oral compositions used in the oral cavity such as mouth freshening agents, gargling agents, mouth rinsing agents, toothpaste, tooth polish, dentrifices, mouth sprays, teeth-whitening agent and the like; dietary supplements; tobacco products including smoke and smokeless tobacco products such as snuff, 30 cigarette, pipe and cigar tobacco, and all forms of tobacco such as shredded filler, leaf, stem, stalk, homogenized leaf cured, reconstituted binders and reconstituted tobacco from tobacco dust, fines or ether sources in sheet, pellet or other forms, tobacco substitutes

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formulated from non-tobacco materials, dip or chewing tobacco; animal feed; nutraceutical products, which includes any food or part of a food that may provide medicinal or health benefits, including the prevention and treatment of disease (e.g., cardiovascular disease and high cholesterol, diabetes, osteoporosis, inflammation, or autoimmune disorders), non-limiting, examples of nutraceuticals include naturally nutrient-rich or medicinally active food, such as garlic, soybeans, antioxidants, fibers, phytosterols and phytostanols and their esters, glucosamine, chondroitin sulfate, stenol, stanol, ginseng, ginko, echinacea, or the like; other nutrients that provide health benefits, such as amino acids, vitamins, minerals, carotenoids, dietary fiber, fatty acids such as omega-3 or omega-6 fatty acids, DHA, EPA, or ALA which can be derived from plant or animal sources (e.g., salmon and other cold-water fish or algae), flavonoids, phenols, polyols, polyphenols (e.g., catechins, proanthocyanidins, procyanidins, anthocyanins, quercetin, resveratrol, isoflavones, curcumin, punicalagin, ellagitannin, citrus flavonoids such as hesperidin and naringin, and chlorogenic acid), prebiotics/probiotics, phytoestrogens, sulfides/thiols, policosanol, saponin, rubisco peptide, appetite suppressants, hydration agents, autoimmune agents, C-reactive protein reducing agents, or anti-inflammatory agents; or any other functional ingredient that is beneficial to the treatment of specific diseases or conditions, such as diabetes, osteoporosis, inflammation, or high cholesterol levels in the blood.

20 In accordance with desirable embodiments of this invention, synthetic sweetener sweetened compositions such as those described hereinabove comprise a sweetenable orally ingestible composition, at least one synthetic sweetener, and at least one sweet taste improving composition selected from the group consisting of carbohydrates, polyols, amino acids, other sweet taste improving additives, and combinations thereof. For example, according to a particular embodiment of this invention, a synthetic sweetener sweetened beverage comprises an orally ingestible beverage composition, such as an aqueous beverage composition or the like, and a synthetic sweetener composition with a more sugar-like temporal profile and/or flavor profile, as disclosed herein. In addition, according to a particular embodiment of this invention, a synthetic sweetener sweetened food comprises an orally ingestible food composition and a synthetic sweetener composition with a more sugar-like temporal profile and/or flavor profile, as disclosed herein. In addition, according to a particular embodiment of this invention, a synthetic

sweetener sweetened pharmaceutical comprises a pharmaceutically active composition and/or pharmaceutically acceptable salts thereof, and a synthetic sweetener composition with a more sugar-like temporal profile and/or flavor profile, as disclosed herein. Alternatively, in addition, according to a particular embodiment of this invention, a synthetic sweetener sweetened pharmaceutical comprises a pharmaceutically active composition and/or pharmaceutically acceptable salts thereof and a coating comprising an orally ingestible composition and a synthetic sweetener composition with a more sugar-like temporal profile and/or flavor profile, as disclosed herein. In addition, according to a particular embodiment of this invention, a synthetic sweetener sweetened tobacco product comprises a tobacco and a synthetic sweetener composition with a more sugar-like temporal profile and/or flavor profile, as disclosed herein. In addition, according to a particular embodiment of this invention, a synthetic sweetener sweetened nutraceutical product comprises an orally ingestible nutraceutical composition and a synthetic sweetener composition with a more sugar-like temporal profile and/or flavor profile, as disclosed herein. In addition, according to a particular embodiment of this invention, a synthetic sweetener sweetened oral hygienic product comprises an orally ingestible oral hygienic composition and a synthetic sweetener composition with a more sugar-like temporal profile and/or flavor profile, as disclosed herein. In addition, according to a particular embodiment of this invention, a synthetic sweetener sweetened cosmetic product comprises an orally ingestible cosmetic composition and a synthetic sweetener composition with a more sugar-like temporal profile and/or flavor profile, as disclosed herein.

B. Synthetic Sweeteners

As used herein, the phrase "synthetic sweetener" refers to any composition which is not found naturally in nature and characteristically has a sweetness potency greater than sucrose, fructose, or glucose, yet have less calories. Non-limiting examples of synthetic sweeteners suitable for embodiments of this invention includes sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, salts thereof, and the like.

In addition, those of ordinary skill in the art should appreciate that the sweetener composition can be customized to obtain a desired calorie content. For example, a low-caloric or non-caloric synthetic sweetener may be combined with a caloric sweetener and/or other caloric additives to produce a sweetener composition with a preferred calorie content.

C. Sweet Taste Improving Compositions

As used herein, the phrase "sweet taste improving composition" includes any composition which imparts a more sugar-like temporal profile, sugar-like flavor profile, or both to a synthetic sweetener. Examples of sweet taste improving compositions include, but are not limited to, carbohydrates, polyols, amino acids, and other sweet taste improving taste additives imparting such sugar-like characteristics.

The term "carbohydrate" generally refers to aldehyde or ketone compounds substituted with multiple hydroxyl groups, of the general formula $(CH_2O)_n$, wherein n is 3-30, as well as their oligomers and polymers. The carbohydrates of the present invention can, in addition, be substituted or deoxygenated at one or more positions. Carbohydrates as used herein encompasses unmodified carbohydrates, carbohydrate derivatives, substituted carbohydrates, and modified carbohydrates. As used herein the phrases "carbohydrate derivatives", "substituted carbohydrate", and "modified carbohydrates" are synonymous. Modified carbohydrate means any carbohydrate wherein at least one atom has been added, removed, substituted, or combinations thereof. Thus, carbohydrate derivatives or substituted carbohydrates include substituted and unsubstituted monosaccharides, disaccharides, oligosaccharides, and polysaccharides. The carbohydrate derivatives or substituted carbohydrates optionally can be deoxygenated at any corresponding C-position, and/or substituted with one or more moieties such as hydrogen, halogen, haloalkyl, carboxyl, acyl, acyloxy, amino, amido, carboxyl derivatives, alkylamino, dialkylamino, arylamino, alkoxy, aryloxy, nitro, cyano, sulfo, mercapto, imino, sulfonyl, sulfenyl, sulfinyl, sulfamoyl, carboalkoxy, carboxamido, phosphonyl, phosphinyl, phosphoryl, phosphino, thioester, thioether, oximino, hydrazino, carbamyl, phospho, phosphonato, or any other viable functional group provided the carbohydrate derivative or substituted carbohydrate functions to improve the sweet taste of a synthetic sweetener.

Non-limiting examples of carbohydrates in embodiments of this invention include tagatose, trehalose, galactose, rhamnose, cyclodextrin (e.g., α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrin), maltodextrin (including resistant maltodextrins such as Fibersol-2™), dextran, sucrose, glucose, ribulose, fructose, threose, arabinose, xylose, lyxose, allose, altrose, mannose, idose, lactose, maltose, invert sugar, isotrehalose, neotrehalose, palatinose or isomaltulose, erythrose, deoxyribose, gulose, idose, talose, erythrulose, xylulose, psicose, turanose, cellobiose, amylopectin, glucosamine, mannosamine, fucose, glucuronic acid, gluconic acid, glucono-lactone, abequose, galactosamine, beet oligosaccharides, isomalto-oligosaccharides (isomaltose, isomaltotriose, panose and the like), xylo-oligosaccharides (xylotriose, xylobiose and the like), gentio-oligosaccharides (gentiobiose, gentiotriose, gentiotetraose and the like), sorbose, nigero-oligosaccharides, palatinose oligosaccharides, fucose, fructooligosaccharides (kestose, nystose and the like), maltotetraol, maltotriol, malto-oligosaccharides (maltotriose, maltotetraose, maltopentaose, maltohexaose, maltoheptaose and the like), lactulose, melibiose, raffinose, rhamnose, ribose, isomerized liquid sugars such as high fructose corn/starch syrup (e.g., HFCS55, HFCS42, or HFCS90), coupling sugars, soybean oligosaccharides, and glucose syrup. Additionally, the carbohydrates as used herein may be in either the D- or L- configuration.

The term "alkyl", as used herein, unless otherwise specified, refers to a saturated straight, branched, or cyclic, primary, secondary, or tertiary hydrocarbon, typically of C_1 to C_{18} , and specifically includes methyl, ethyl, propyl, isopropyl, butyl, isobutyl, t-butyl, pentyl, cyclopentyl, isopentyl, neopentyl, hexyl, isohexyl, cyclohexyl, cyclohexylmethyl, 3-methylpentyl, 2,2-dimethylbutyl, 2,3-dimethylbutyl, and 3,3-dimethylbutyl. The alkyl group optionally can be substituted with one or more moieties selected from the group consisting of hydroxyl, carboxy, carboxamido, carboalkoxy, acyl, amino, alkylamino, arylamino, alkoxy, aryloxy, nitro, cyano, sulfo, sulfato, phospho, phosphato, or phosphonato.

The term "alkenyl", as referred to herein, and unless otherwise specified, refers to a straight, branched, or cyclic hydrocarbon of C_2 to C_{10} with at least one double bond. The alkenyl groups optionally can be substituted in the same manner as described above for the alkyl groups and also optionally can be substituted with a substituted or unsubstituted alkyl group.

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The term "alkynyl", as referred to herein, and unless otherwise specified, refers to a C₂ to C₁₀ straight or branched hydrocarbon with at least one triple bond. The alkynyl groups optionally can be substituted in the same manner as described above for the alkyl groups and also optionally can be substituted with a substituted or unsubstituted alkyl group.

The term "aryl", as used herein, and unless otherwise specified, refers to phenyl, biphenyl, or naphthyl, and preferably phenyl. The aryl group optionally can be substituted with one or more moieties selected from the group consisting of hydroxyl, acyl, amino, halo, carboxy, carboxamido, carboalkoxy, alkylamino, alkoxy, aryloxy, nitro, cyano, sulfo, sulfato, phospho, phosphato, or phosphonato.

The term "heteroaryl" or "heteroaromatic", as used herein, refers to an aromatic or unsaturated cyclic moiety that includes at least one sulfur, oxygen, nitrogen, or phosphorus in the aromatic ring. Non-limiting examples are furyl, pyridyl, pyrimidyl, thienyl, isothiazolyl, imidazolyl, tetrazolyl, pyrazinyl, benzofuranyl, benzothiophenyl, quinolyl, isoquinolyl, benzothienyl, isobenzofuryl, pyrazolyl, indolyl, isoindolyl, benzimidazolyl, purinyl, carbazolyl, oxazolyl, thiazolyl, isothiazolyl, 1,2,4-thiadiazolyl, isooxazolyl, pyrrolyl, quinazolinyl, pyridazinyl, pyrazinyl, cinnolinyl, phthalazinyl, quinoxalyl, xanthinyl, hypoxanthinyl, and pteridinyl. The heteroaryl or heteroaromatic group optionally can be substituted with one or more moieties selected from the group consisting of hydroxyl, acyl, amino, halo, alkylamino, alkoxy, aryloxy, nitro, cyano, sulfo, sulfato, phospho, phosphato, or phosphonato.

The term "heterocyclic" refers to a saturated nonaromatic cyclic group which may be substituted, and wherein there is at least one heteroatom, such as oxygen, sulfur, nitrogen, or phosphorus in the ring. The heterocyclic group optionally can be substituted in the same manner as described above for the heteroaryl group.

The term "aralkyl", as used herein, and unless otherwise specified, refers to an aryl group as defined above linked to the molecule through an alkyl group as defined above. The term alkaryl, as used herein, and unless otherwise specified, refers to an alkyl group as defined above linked to the molecule through an aryl group as defined above. The aralkyl or alkaryl group optionally can be substituted with one or more moieties selected from the group consisting of hydroxyl, carboxy, carboxamido, carboalkoxy, acyl, amino,

halo, alkylamino, alkoxy, aryloxy, nitro, cyano, sulfo, sulfato, phospho, phosphato, or phosphonato.

The term "halo", as used herein, specifically includes chloro, bromo, iodo, and fluoro.

- 5 The term "alkoxy", as used herein, and unless otherwise specified, refers to a moiety of the structure -O-alkyl, wherein alkyl is as defined above.

The term "acyl", as used herein, refers to a group of the formula $C(O)R'$, wherein R' is an alkyl, aryl, alkaryl or aralkyl group, or substituted alkyl, aryl, aralkyl or alkaryl, wherein these groups are as defined above.

- 10 The term "polyol", as used herein, refers to a molecule that contains more than one hydroxyl group. A polyol may be a diol, triol, or a tetraol which contains 2, 3, and 4 hydroxyl groups respectively. A polyol also may contain more than four hydroxyl groups, such as a pentaol, hexaol, heptaol, or the like, which contain, 5, 6, or 7 hydroxyl groups, respectively. Additionally, a polyol also may be a sugar alcohol, polyhydric alcohol, or
15 polyalcohol which is a reduced form of carbohydrate, wherein the carbonyl group (aldehyde or ketone, reducing sugar) has been reduced to a primary or secondary hydroxyl group.

- Non-limiting examples of polyols in embodiments of this invention include erythritol, maltitol, mannitol, sorbitol, lactitol, xylitol, isomalt, propylene glycol, glycerol
20 (glycerine), threitol, galactitol, palatinose, reduced isomalto-oligosaccharides, reduced xylo-oligosaccharides, reduced gentio-oligosaccharides, reduced maltose syrup, reduced glucose syrup, and sugar alcohols or any other carbohydrates capable of being reduced which do not adversely affect the taste of the synthetic sweetener or the orally ingestible composition.

- 25 As used herein, the phrase "sweet taste improving additive" means any material that imparts a more sugar-like temporal profile or sugar-like flavor profile or both to a synthetic sweetener. Suitable sweet taste improving additives useful in embodiments of this invention include amino acids and their salts, polyamino acids and their salts, peptides, sugar acids and their salts, nucleotides and their salts, organic acids, inorganic
30 acids, organic salts including organic acid salts and organic base salts, inorganic acid salts (e.g., sodium chloride, potassium chloride, magnesium chloride), bitter compounds,

flavorants and flavoring ingredients, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, and natural high-potency sweeteners.

Suitable sweet taste improving amino acid additives for use in embodiments of this invention include, but are not limited to, aspartic acid, arginine, glycine, glutamic acid, proline, threonine, theanine, cysteine, cystine, alanine, valine, tyrosine, leucine, isoleucine, asparagine, serine, lysine, histidine, ornithine, methionine, carnitine, aminobutyric acid (alpha-, beta-, or gamma- isomers), glutamine, hydroxyproline, taurine, norvaline, sarcosine, and their salt forms such as sodium or potassium salts or acid salts. The sweet taste improving amino acid additives also may be in the D- or L- configuration and in the mono-, di-, or tri- form of the same or different amino acids. Additionally, the amino acids may be α -, β -, γ -, δ -, and ϵ -isomers if appropriate. Combinations of the foregoing amino acids and their corresponding salts (e.g., sodium, potassium, calcium, magnesium salts or other alkali or alkaline earth metal salts thereof, or acid salts) also are suitable sweet taste improving additives in embodiments of this invention. The amino acids may be natural or synthetic. The amino acids also may be modified. Modified amino acids refers to any amino acid wherein at least one atom has been added, removed, substituted, or combinations thereof (e.g., N-alkyl amino acid, N-acyl amino acid, or N-methyl amino acid). Non-limiting examples of modified amino acids include amino acid derivatives such as trimethyl glycine, N-methyl-glycine, and N-methyl-alanine. As used herein, modified amino acids encompass both modified and unmodified amino acids. As used herein, amino acids also encompass both peptides and polypeptides (e.g., dipeptides, tripeptides, tetrapeptides, and pentapeptides) such as glutathione and L-alanyl-L-glutamine. Suitable sweet taste improving polyamino acid additives include poly-L-aspartic acid, poly-L-lysine (e.g., poly-L- α -lysine or poly-L- ϵ -lysine), poly-L-ornithine (e.g., poly-L- α -ornithine or poly-L- ϵ -ornithine), poly-L-arginine, other polymeric forms of amino acids, and salt forms thereof (e.g., calcium, potassium, sodium, or magnesium salts such as L-glutamic acid mono sodium salt). The sweet taste improving polyamino acid additives also may be in the D- or L- configuration. Additionally, the polyamino acids may be α -, β -, γ -, δ -, and ϵ -isomers if appropriate. Combinations of the foregoing polyamino acids and their corresponding salts (e.g., sodium, potassium, calcium, magnesium salts or other alkali or alkaline earth metal salts thereof or acid salts) also are

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suitable sweet taste improving additives in embodiments of this invention. The polyamino acids described herein also may comprise co-polymers of different amino acids. The polyamino acids may be natural or synthetic. The polyamino acids also may be modified, such that at least one atom has been added, removed, substituted, or combinations thereof (e.g., N-alkyl polyamino acid or N-acyl polyamino acid). As used herein, polyamino acids encompass both modified and unmodified polyamino acids. In accordance with particular embodiments of this invention, modified polyamino acids include, but are not limited to polyamino acids of various molecular weights (MW), such as poly-L- α -lysine with a MW of 1,500, MW of 6,000, MW of 25,200, MW of 63,000, MW of 83,000, or MW of 300,000.

Suitable sweet taste improving sugar acid additives for use in embodiments of this invention include but are not limited to aldonic, uronic, aldaric, alginic, gluconic, glucuronic, glucaric, galactaric, galacturonic, and their salts (e.g., sodium, potassium, calcium, magnesium salts or other physiologically acceptable salts), and combinations thereof.

Suitable sweet taste improving nucleotide additives for use in embodiments of this invention include but are not limited to inosine monophosphate ("IMP"), guanosine monophosphate ("GMP"), adenosine monophosphate ("AMP"), cytosine monophosphate (CMP), uracil monophosphate (UMP), inosine diphosphate, guanosine diphosphate, adenosine diphosphate, cytosine diphosphate, uracil diphosphate, inosine triphosphate, guanosine triphosphate, adenosine triphosphate, cytosine triphosphate, uracil triphosphate, and their alkali or alkaline earth metal salts, and combinations thereof. The nucleotides described herein also may comprise nucleotide-related additives, such as nucleosides or nucleic acid bases (e.g., guanine, cytosine, adenine, thymine, uracil).

Suitable sweet taste improving organic acid additives include any compound which comprises a -COOH moiety. Suitable sweet taste improving organic acid additives for use in embodiments of this invention include but are not limited to C2-C30 carboxylic acids, substituted hydroxyl C2-C30 carboxylic acids, benzoic acid, substituted benzoic acids (e.g., 2,4-dihydroxybenzoic acid), substituted cinnamic acids, hydroxyacids, substituted hydroxybenzoic acids, substituted cyclohexyl carboxylic acids, tannic acid, lactic acid, tartaric acid, citric acid, gluconic acid, glucoheptonic acids, adipic acid, hydroxycitric acid, malic acid, fruitaric acid (a blend of malic, fumaric, and tartaric acids),

fumaric acid, maleic acid, succinic acid, chlorogenic acid, salicylic acid, creatine, caffeic acid, bile acids, acetic acid, ascorbic acid, alginic acid, erythorbic acid, polyglutamic acid, glucono delta lactone, and their alkali or alkaline earth metal salt derivatives thereof. In addition, the organic acid additives also may be in either the D- or L- configuration.

5 Suitable sweet taste improving organic acid additive salts include, but are not limited to, sodium, calcium, potassium, and magnesium salts of all organic acids, such as salts of citric acid, malic acid, tartaric acid, fumaric acid, lactic acid (e.g., sodium lactate), alginic acid (e.g., sodium alginate), ascorbic acid (e.g., sodium ascorbate), benzoic acid (e.g., sodium benzoate or potassium benzoate), and adipic acid. The examples of the
10 sweet taste improving organic acid additives described optionally may be substituted with one or more of the following moiety selected from the group consisting of hydrogen, alkyl, alkenyl, alkynyl, halo, haloalkyl, carboxyl, acyl, acyloxy, amino, amido, carboxyl derivatives, alkylamino, dialkylamino, arylamino, alkoxy, aryloxy, nitro, cyano, sulfo, thiol, imine, sulfonyl, sulfenyl, sulfinyl, sulfamyl, carboxalkoxy, carboxamido,
15 phosphonyl, phosphinyl, phosphoryl, phosphino, thioester, thioether, anhydride, oximino, hydrazino, carbamyl, phospho, phosphonato, or any other viable functional group provided the substituted organic acid additives function to improve the sweet taste of a synthetic sweetener.

 Suitable sweet taste improving inorganic acid additives for use in embodiments of
20 this invention include but are not limited to phosphoric acid, phosphorous acid, polyphosphoric acid, hydrochloric acid, sulfuric acid, carbonic acid, sodium dihydrogen phosphate, and their corresponding alkali or alkaline earth metal salts thereof (e.g., inositol hexaphosphate Mg/Ca).

 Suitable sweet taste improving bitter compound additives for use in embodiments
25 of this invention include but are not limited to caffeine, quinine, urea, bitter orange oil, naringin, quassia, and salts thereof.

 Suitable sweet taste improving flavorant and flavoring ingredient additives for use in embodiments of this invention include but are not limited to vanillin, vanilla extract, mango extract, cinnamon, citrus, coconut, ginger, viridiflorol, almond, menthol (including
30 menthol without mint), grape skin extract, and grape seed extract. "Flavorant" and "flavoring ingredient" are synonymous and can include natural or synthetic substances or

combinations thereof. Flavorants also include any other substance which imparts flavor and may include natural or non-natural (synthetic) substances which are safe for human or animals when used in a generally accepted range. Non-limiting examples of proprietary flavorants include Döhler™ Natural Flavoring Sweetness Enhancer K14323 (Döhler™, Darmstadt, Germany), Symrise™ Natural Flavor Mask for Sweeteners 161453 and 164126 (Symrise™, Holzminden, Germany), Natural Advantage™ Bitterness Blockers 1, 2, 9 and 10 (Natural Advantage™, Freehold, New Jersey, U.S.A.), and Sucramask™ (Creative Research Management, Stockton, California, U.S.A.).

Suitable sweet taste improving polymer additives for use in embodiments of this invention include, but are not limited to, chitosan, pectin, pectic, pectinic, polyuronic, polygalacturonic acid, starch, food hydrocolloid or crude extracts thereof (e.g., gum acacia senegal (Fibergum™), gum acacia seyal, carageenan), poly-L-lysine (e.g., poly-L- α -lysine or poly-L- ϵ -lysine), poly-L-ornithine (e.g., poly-L- α -ornithine or poly-L- ϵ -ornithine), polypropylene glycol, polyethylene glycol, poly(ethylene glycol methyl ether), polyarginine, polyaspartic acid, polyglutamic acid, polyethyleneimine, alginic acid, sodium alginate, propylene glycol alginate, sodium polyethyleneglycolalginate, sodium hexametaphosphate or its salts, and other cationic polymers and anionic polymers.

Suitable sweet taste improving protein or protein hydrolysate additives for use in embodiments of this invention include, but are not limited to, bovine serum albumin (BSA), whey protein (including fractions or concentrates thereof such as 90% instant whey protein isolate, 34% whey protein, 50% hydrolyzed whey protein, and 80% whey protein concentrate), soluble rice protein, soy protein, protein isolates, protein hydrolysates, reaction products of protein hydrolysates, glycoproteins, and/or proteoglycans containing amino acids (e.g., glycine, alanine, serine, threonine, asparagine, glutamine, arginine, valine, isoleucine, leucine, norvaline, methionine, proline, tyrosine, hydroxyproline, and the like), collagen (e.g., gelatin), partially hydrolyzed collagen (e.g., hydrolyzed fish collagen), and collagen hydrolysates (e.g., porcine collagen hydrolysate).

Suitable sweet taste improving surfactant additives for use in embodiments of this invention include but are not limited to polysorbates (e.g., polyoxyethylene sorbitan monooleate (polysorbate 80), polysorbate 20, polysorbate 60), sodium dodecylbenzenesulfonate, dioctyl sulfosuccinate or dioctyl sulfosuccinate sodium, sodium dodecyl sulfate, cetylpyridinium chloride (hexadecylpyridinium chloride),

hexadecyltrimethylammonium bromide, sodium cholate, carbamoyl, choline chloride, sodium glycocholate, sodium taurodeoxycholate, lauric arginate, sodium stearyl lactylate, sodium taurocholate, lecithins, sucrose oleate esters, sucrose stearate esters, sucrose palmitate esters, sucrose laurate esters, and other emulsifiers, and the like.

5 Suitable sweet taste improving flavonoid additives for use in embodiments of this invention generally are classified as flavonols, flavones, flavanones, flavan-3-ols, isoflavones, or anthocyanidins. Non-limiting examples of flavonoid additives include catechins (e.g., green tea extracts such as Polyphenon™ 60, Polyphenon™ 30, and Polyphenon™ 25 (Mitsui Norin Co., Ltd., Japan), polyphenols, rutins (e.g., enzyme
10 modified rutin Sanmelin™ AO (San-fi Gen F.F.I., Inc., Osaka, Japan)), neohesperidin, naringin, neohesperidin dihydrochalcone, and the like.

 Suitable sweet taste improving alcohol additives for use in embodiments of this invention include, but are not limited to, ethanol.

 Suitable sweet taste improving astringent compound additives include, but are not
15 limited to, tannic acid, europium chloride (EuCl_3), gadolinium chloride (GdCl_3), terbium chloride (TbCl_3), alum, tannic acid, and polyphenols (e.g., tea polyphenol).

 Suitable sweet taste improving vitamins include nicotinamide (Vitamin B3) and pyridoxal hydrochloride (Vitamin B6).

 Suitable sweet taste improving natural high-potency sweetener additives for use in
20 embodiments of this invention include, but are not limited to, rebaudioside A, rebaudioside B, rebaudioside C, rebaudioside D, rebaudioside E, rebaudioside F, dulcoside A, dulcoside B, rubusoside, stevia, stevioside, mogroside IV, mogroside V, Luo Han Guo sweetener, siamenoside, monatin and its salts (monatin SS, RR, RS, SR), curculin, glycyrrhizic acid and its salts, thaumatin, monellin, mabinlin, brazzein, hernandulcin,
25 phyllodulcin, glycyphyllin, phloridzin, trilobatin, baiyunoside, osladin, polypodoside A, pterocaryoside A, pterocaryoside B, mukurozioside, phlomisioside I, periandrin I, abrusoside A, and cyclocarioside I. As used herein, the phrase "natural high-potency sweetener" or "NHPS" means any sweetener found in nature which may be in raw, extracted, purified, or any other form, singularly or in combination thereof and
30 characteristically have a sweetness potency greater than sucrose, fructose, or glucose, yet have less calories. NHPS may be further modified. Modified NHPSs includes NHPSs

which have been altered naturally or synthetically. For example, a modified NHPS includes, but is not limited to, NHPSs which have been fermented, contacted with enzyme, or derivatized, or the product of any process wherein at least one atom has been added to, removed from, or substituted on the NHPS. In one embodiment, extracts of NHPS may be used in any purity percentage. In another embodiment, when a NHPS is used as a non-extract, the purity of the NHPS may range for example from about 25% to about 100%. In another example, the purity of the NHPS may range from about 70% to about 100%; from about 80% to about 90%; from about 90% to about 100%; from about 95% to about 100%; from about 96% to about 99%; from about 97% to about 98%; from about 98% to about 99%; and from about 99% to about 100%. Specific embodiments of NHPS compositions in combination with sweet taste improving compositions are disclosed in U.S. Provisional Application No. 60/739,302, entitled "Natural High-Potency Sweetener Compositions with Improved Temporal Profile and/or Flavor Profile, Methods for Their Formulation, and Uses," filed on November 23, 2005, by DuBois, et al., the disclosure of which is incorporated herein by reference in its entirety.

The sweet taste improving compositions also may be in salt form which may be obtained using standard procedures well known in the art. The term "salt" also refers to complexes that retain the desired chemical activity of the sweet taste improving compositions of the present invention and are safe for human or animal consumption in a generally acceptable range. Alkali metal (for example, sodium or potassium) or alkaline earth metal (for example, calcium or magnesium) salts also can be made. Salts also may include combinations of alkali and alkaline earth metals. Non-limiting examples of such salts are (a) acid addition salts formed with inorganic acids and salts formed with organic acids; (b) base addition salts formed with metal cations such as calcium, bismuth, barium, magnesium, aluminum, copper, cobalt, nickel, cadmium, sodium, potassium, and the like, or with a cation formed from ammonia, N,N-dibenzylethylenediamine, D-glucosamine, tetraethylammonium, or ethylenediamine; or (c) combinations of (a) and (b). Thus, any salt forms which may be derived from the sweet taste improving compositions may be used with the embodiments of the present invention as long as the salts of the sweet taste improving additives do not adversely affect the taste of synthetic sweeteners or the orally ingestible compositions which comprises at least one synthetic sweetener. The salt forms

of the additives can be added to the synthetic sweetener composition in the same amounts as their acid or base forms.

In particular embodiments, suitable sweet taste improving inorganic salts useful as sweet taste improving additives include sodium chloride, potassium chloride, sodium sulfate, magnesium phosphate, potassium citrate, europium chloride (EuCl_3), gadolinium chloride (GdCl_3), terbium chloride (TbCl_3), magnesium sulfate, alum, magnesium chloride, mono-, di-, tri-basic sodium or potassium salts of phosphoric acid (e.g., inorganic phosphates), salts of hydrochloric acid (e.g., inorganic chlorides), sodium carbonate, sodium bisulfate, and sodium bicarbonate. Furthermore, in particular embodiments, suitable organic salts useful as sweet taste improving additives include, but are not limited to, alginic acid sodium salt (sodium alginate), glucoheptonic acid sodium salt, choline chloride, gluconic acid sodium salt (sodium gluconate), gluconic acid potassium salt (potassium gluconate), guanidine HCl, glucosamine HCl, monosodium glutamate (MSG), amiloride HCl, adenosine monophosphate salt, magnesium gluconate, potassium tartrate (monohydrate), and sodium tartrate (dihydrate).

Embodiments of the sweet taste improving compositions of this invention can impart a more sharp and clean sensation to the taste of synthetic sweeteners. Furthermore, embodiments of the sweet taste improving compositions of the present invention have a superior effect in improving the temporal profile and/or flavor profile of synthetic sweeteners while at the same time providing a sweetener composition with a low-caloric or non-caloric content, imparting more sugar-like characteristics.

D. Temporal Profile Modulation

According to an embodiment of this invention, a synthetic sweetener composition comprises at least one sweet taste improving composition present in the synthetic sweetener composition in an amount effective for the synthetic sweetener composition to impart an osmolarity of at least 10 mOsmoles/L to an aqueous solution of the synthetic sweetener composition wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous solution of sucrose by weight. As used herein, "mOsmoles/L" refers to milliosmoles per liter. According to another embodiment, a synthetic sweetener composition comprises at least one sweet taste improving composition in an amount

effective for the synthetic sweetener composition to impart an osmolarity of 10 to 500 mOsmoles/L, preferably 25 to 500 mOsmoles/L preferably, 100 to 500 mOsmoles/L, more preferably 200 to 500 mOsmoles/L, and still more preferably 300 to 500 mOsmoles/L to an aqueous solution of the synthetic sweetener composition wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous solution of sucrose by weight. In particular embodiments, a plurality of sweet taste improving compositions may be combined with a synthetic sweetener and in that case, the osmolarity impacted is that of the total combination of the plurality of sweet taste improving compositions.

Osmolarity refers to the measure of osmoles of solute per liter of solution, wherein osmole is equal to the number of moles of osmotically active particles in an ideal solution (e.g., a mole of glucose is one osmole), whereas a mole of sodium chloride is two osmoles (one mole of sodium and one mole of chloride). Thus, in order to improve in the quality of taste of synthetic sweeteners, the osmotically active compounds or the compounds which impart osmolarity must not introduce significant off taste to the formulation.

In one embodiment, suitable sweet taste improving compositions which improves the temporal profile of the synthetic sweetener or sweetenable composition to be more sugar-like include carbohydrates, polyols, amino acids, other sweet taste improving additives (e.g., sugar acids and their salts, nucleotides, organic acids, inorganic acids, organic salts including organic acid salts and/or organic base salts, inorganic salts, bitter compounds, astringent compounds, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, and natural high-potency sweeteners).

In more preferred embodiments, non-limiting examples of suitable compounds which impart osmolarity include sweet taste improving carbohydrate additives, sweet taste improving polyol additives, sweet taste improving alcohol additives, sweet taste improving inorganic acid additives, sweet taste improving organic acid additives, sweet taste improving inorganic salt additives, sweet taste improving organic salt additives, sweet taste improving organic base salt additives, sweet taste improving amino acid additives, sweet taste improving amino acid salt additives, sweet taste improving bitter additives, and sweet taste improving astringent additives.

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In one embodiment, suitable compounds which impart osmolarity include, but are not limited to, sucrose, fructose, glucose, maltose, lactose, mannose, galactose, tagatose, erythritol, glycerol, propylene glycol, ethanol, phosphoric acid (including corresponding sodium, potassium, calcium, and magnesium salts thereof), citric acid, malic acid, tartaric acid, fumaric acid, gluconic acid, adipic acid, glucosamine and glucosamine salt, choline salt, guanidine salt, protein or protein hydrolysate, glycine, alanine, serine, threonine, theanine, caffeine, quinine, urea, naringin, tannic acid, $\text{AlNa}(\text{SO}_4)_2$, $\text{AlK}(\text{SO}_4)_2$ and other forms of alum, and combinations thereof.

In one embodiment, suitable sweet taste improving carbohydrate additives for the present invention have a molecular weight less than or equal to 500 and desirably have a molecular weight from 50 to 500. In particular embodiments, suitable carbohydrates with a molecular weight less than or equal to 500 include, but are not limited to, sucrose, fructose, glucose, maltose, lactose, mannose, galactose, and tagatose. Generally, in accordance with desirable embodiments of this invention, a carbohydrate is present in the synthetic sweetener compositions in an amount from about 1,000 to about 100,000 ppm. (Throughout this specification, the term ppm means parts per million by weight or volume. For example, 500 ppm means 500 mg in a liter.) In accordance with other desirable embodiments of this invention, a carbohydrate is present in the synthetic sweetener sweetened compositions in an amount from about 2,500 to about 10,000 ppm. In another embodiment, suitable sweet taste improving carbohydrate additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, sweet taste improving carbohydrate additives with a molecular weight ranging from about 50 to about 500.

In one embodiment, suitable polyol additives have a molecular weight less than or equal to 500 and desirably have a molecular weight from 76 to 500. In particular embodiments, suitable polyols with a molecular weight less than or equal to 500 include, but are not limited to, erythritol, glycerol, and propylene glycol. Generally, in accordance with desirable embodiments of this invention, a polyol is present in the synthetic sweetener compositions in an amount from about 400 ppm to about 80,000 ppm. In other embodiments of this invention, a polyol is present in the synthetic sweetener compositions in an amount from about 5,000 to about 40,000 ppm of the composition, more particularly from about 10,000 to about 35,000 ppm of the composition. In accordance with other

desirable embodiments of this invention, a polyol is present in the synthetic sweetener sweetened compositions in an amount from about 400 to about 80,000 ppm. In a sub-embodiment, suitable sweet taste improving polyol additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to sweet taste improving polyol additives with a molecular weight ranging from about 76 to about 500.

Generally, in accordance with another embodiment of this invention, a suitable sweet taste improving alcohol is present in the synthetic sweetener compositions in an amount from about 625 to about 10,000 ppm. In another embodiment, suitable sweet taste improving alcohol additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to sweet taste improving alcohol additives with a molecular weight ranging from about 46 to about 500. A non-limiting example of a sweet taste improving alcohol additive with a molecular weight ranging from about 46 to about 500 includes ethanol.

In one embodiment, suitable sweet taste improving amino acid additives have a molecular weight of less than or equal to 250 and desirably have a molecular weight from 75 to 250. In particular embodiments, suitable amino acids with a molecular weight less than or equal to 250 include, but are not limited to, glycine, alanine, serine, valine, leucine, isoleucine, proline, theanine, and threonine. Preferred amino acids include those which are sweet tasting at high concentrations, but are desirably present in embodiments of this invention at amounts below or above their sweetness taste detection threshold. Even more preferred are mixtures of amino acids at amounts below or above their sweetness taste detection threshold. Generally, in accordance with desirable embodiments of this invention, an amino acid is present in the synthetic sweetener compositions in an amount from about 100 ppm to about 25,000 ppm, more particularly from about 1,000 to about 10,000 ppm, and still more particularly from about 2,500 to about 5,000 ppm. In accordance with other desirable embodiments of this invention, an amino acid is present in the synthetic sweetener sweetened compositions in an amount from about 250 ppm to about 7,500 ppm. In a sub-embodiment, suitable sweet taste improving amino acid additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to sweet taste

improving amino acid additives with a molecular weight ranging from about 75 to about 250.

Generally, in accordance with yet another embodiment of this invention, a suitable sweet taste improving amino acid salt additive is present in the synthetic sweetener compositions in an amount from about 25 to about 10,000 ppm more particularly from about 1,000 to about 7,500 ppm, and still more particularly from about 2,500 to about 5,000 ppm. In another embodiment, suitable sweet taste improving amino acid salt additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, sweet taste improving amino acid additives with a molecular weight ranging from about 75 to about 300. Non-limiting examples of sweet taste improving amino acid salt additives with a molecular weight ranging from about 75 to about 300 include salts of glycine, alanine, serine, theanine, and threonine.

Generally, in accordance with still another embodiment of this invention, a suitable sweet taste improving protein or protein hydrolysate additive is present in the synthetic sweetener compositions in an amount from about 200 to about 50,000 ppm. In another embodiment, suitable sweet taste improving protein or protein hydrolysate additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, sweet taste improving protein hydrolysate additives with a molecular weight ranging from about 75 to about 300. Non-limiting examples of sweet taste improving protein or protein hydrolysate additives with a molecular weight ranging from about 75 to about 300 include proteins or protein hydrolysates containing glycine, alanine, serine, and threonine.

Generally, in accordance with another embodiment of this invention, a suitable sweet taste improving inorganic acid additive is present in the synthetic sweetener compositions in an amount from about 25 to about 5,000 ppm. In another embodiment, suitable sweet taste improving inorganic acid additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, phosphoric acid, HCl, and H₂SO₄ and any other inorganic acid additives which are safe for human or animal consumption when used in a generally acceptable range. In a sub-embodiment, suitable suitable sweet taste improving inorganic acid additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500

mOsmoles/L to a sweetenable composition include, but are not limited to, sweet taste improving inorganic acid additives with a molecular weight range from about 36 to about 98.

Generally, in accordance with still another embodiment of this invention, a suitable
5 sweet taste improving inorganic acid salt additive is present in the synthetic sweetener compositions in an amount from about 25 to about 5,000 ppm. In another embodiment, suitable sweet taste improving inorganic acid salt additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, salts of inorganic acid, for example sodium,
10 potassium, calcium, and magnesium salts of phosphoric acid (e.g., inorganic phosphates), and any other alkali or alkaline earth metal salts of other inorganic acid additives (e.g., sodium bisulfate) which are safe for human or animal consumption when used in a generally acceptable range. In a particular embodiment, suitable sweet taste improving inorganic acid salt additives include magnesium chloride, magnesium sulfate, sodium
15 chloride, or combinations thereof.

In a sub-embodiment, suitable suitable sweet taste improving inorganic acid salt additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, sweet taste
20 improving inorganic acid salt additives with a molecular weight range from about 58 to about 120.

Generally, in accordance with still another embodiment of this invention, a suitable sweet taste improving organic acid additive is present in the synthetic sweetener compositions in an amount from about 10 to about 5,000 ppm. In another embodiment, suitable sweet taste improving organic acid additives for imparting osmolarities ranging
25 from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, creatine, citric acid, malic acid, succinic acid, hydroxycitric acid, tartaric acid, fumaric acid, gluconic acid, glutaric acid, adipic acid, and any other sweet taste improving organic acid additives which are safe for human or animal consumption when used in a generally acceptable range. In one embodiment, the sweet
30 taste improving organic acid additive comprises a molecular weight range from about 60 to about 208.

Generally, in accordance with still another embodiment of this invention, a suitable sweet taste improving organic acid salt additive is present in the synthetic sweetener compositions in an amount from about 20 to about 10,000 ppm. In another embodiment, suitable sweet taste improving organic acid salt additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, salts the sweet taste improving organic acid additives such as sodium, potassium, calcium, magnesium, and other alkali or alkaline metal salts of citric acid, malic acid, tartaric acid, fumaric acid, gluconic acid, adipic acid, hydroxycitric acid, succinic acid, glutaric acid, and salts of any other sweet taste improving organic acid additives which are safe for human or animal consumption when used in a generally acceptable range. In one embodiment, the sweet taste improving organic acid salt additive comprises a molecular weight range from about 140 to about 208.

Generally, in accordance with yet another embodiment of this invention, a suitable sweet taste improving organic base salt additive is present in the synthetic sweetener compositions in an amount from about 10 to about 5,000 ppm. In another embodiment, suitable sweet taste improving organic base salt additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, inorganic and/or organic acid salts of organic bases such as glucosamine salts, choline salts, and guanidine salts.

Generally, in accordance with yet another embodiment of this invention, a suitable sweet taste improving astringent additive is present in the synthetic sweetener compositions in an amount from about 25 to about 1,000 ppm. In another embodiment, suitable sweet taste improving astringent additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, tannic acid, tea polyphenols, catechins, aluminum sulfate, $\text{AlNa}(\text{SO}_4)_2$, $\text{AlK}(\text{SO}_4)_2$ and other forms of alum.

Generally, in accordance with yet another embodiment of this invention, a suitable sweet taste improving nucleotide additive is present in the synthetic sweetener compositions in an amount from about 5 to about 1,000 ppm. In another embodiment, suitable sweet taste improving nucleotide additives for imparting osmolarities ranging

from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, adenosine monophosphate.

Generally, in accordance with yet another embodiment of this invention, a suitable sweet taste improving polyamino acid additive is present in the synthetic sweetener compositions in an amount from about 30 to about 2,000 ppm. In another embodiment, suitable sweet taste improving polyamino acid additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, poly-L-lysine (e.g., poly-L- α -lysine or poly-L- ϵ -lysine), poly-L-ornithine (e.g., poly-L- α -ornithine or poly- ϵ -ornithine), and poly-L-arginine.

Generally, in accordance with yet another embodiment of this invention, a suitable sweet taste improving polymer additive is present in the synthetic sweetener compositions in an amount from about 30 to about 2,000 ppm. In another embodiment, suitable sweet taste improving polymer additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, chitosan, pectin, hydrocolloids such as gum acacia senegal, propylene glycol, polyethylene glycol, and poly(ethylene glycol methyl ether).

Generally, in accordance with yet another embodiment of this invention, a suitable sweet taste improving surfactant additive is present in the synthetic sweetener compositions in an amount from about 1 to about 5,000 ppm. In another embodiment, suitable sweet taste improving surfactant additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include, but are not limited to, polysorbates, choline chloride, sodium taurocholate, lecithins, sucrose oleate esters, sucrose stearate esters, sucrose palmitate esters, and sucrose laurate esters.

Generally, in accordance with yet another embodiment of this invention, a suitable sweet taste improving flavonoid additive is present in the synthetic sweetener compositions in an amount from about 0.1 to about 1,000 ppm. In another embodiment, suitable sweet taste improving flavonoid additives for imparting osmolarities ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition include,

but are not limited to, naringin, catechins, rutins, neohesperidin, and neoheperidin dihydrochalcone.

E. Flavor Profile Modulation

As hypothesized above, flavor profile imparts sugar-like characteristic to synthetic sweeteners. In one embodiment, any sweet taste improving composition that imparts a sugar-like flavor profile to synthetic sweeteners will be effective by this mechanism. In particular, any sweet taste improving composition that imparts a more sugar-like osmotic taste will be effective by this mechanism. In one embodiment, suitable sweet taste improving compositions which improves the flavor profile, including the osmotic taste, of the synthetic sweetener or sweetenable composition to be more sugar-like include carbohydrates, polyols, amino acids, and other sweet taste improving additives (e.g., polyamino acids, peptides, sugar acids and their salts, nucleotides, organic acids, inorganic acids, organic salts including organic acid salts and organic base salts, inorganic salts, bitter compounds, flavorants and flavoring ingredients, astringent compounds, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, and natural high-potency sweeteners).

In a preferred embodiment, non-limiting examples of sweet taste improving compositions enhancing the synthetic sweetener's osmotic taste to be more sugar-like include sweet taste improving carbohydrate additives, sweet taste improving alcohol additives, sweet taste improving polyol additives, sweet taste improving amino acid additives, sweet taste improving amino acid salt additives, sweet taste improving inorganic acid salt additives, sweet taste improving polymer additives, and sweet taste improving protein or protein hydrolysate additives.

In another embodiment, suitable sweet improving amino acid additives for improving the osmotic taste of the synthetic sweeteners to be more sugar-like include, but are not limited to, amino acid additives comprising a molecular weight less than or equal to 250. In one example, suitable sweet taste improving amino acids include, but are not limited to, low molecular weight amino acids such as glycine, leucine, valine, isoleucine, proline, hydroxyproline, alanine, serine, theanine, and threonine.

In another embodiment, suitable sweet taste improving carbohydrate additives for improving the osmotic taste of the synthetic sweeteners to be more sugar-like include, but

are not limited to, sweet taste improving carbohydrate additives with a molecular weight ranging from about 50 to about 500. Non-limiting examples of sweet taste improving carbohydrate additives with a molecular weight ranging from about 50 to about 500 include sucrose, fructose, glucose, maltose, lactose, mannose, galactose, ribose, rhamnose, trehalose, and tagatose.

In another embodiment, suitable sweet taste improving polyol additives for improving the osmotic taste of the synthetic sweeteners to be more sugar-like include, but are not limited to, sweet taste improving polyol additives with a molecular weight ranging from about 76 to about 500. Non-limiting examples of sweet taste improving polyol additives with a molecular weight ranging from about 76 to about 500 include erythritol, glycerol, and propylene glycol. In a sub-embodiment, other suitable sweet taste improving polyol additives include sugar alcohols.

In another embodiment, suitable sweet taste improving alcohol additives for improving the osmotic taste of the synthetic sweeteners to be more sugar-like include, but are not limited to, sweet taste improving alcohol additives with a molecular weight ranging from about 46 to about 500. A non-limiting example of sweet taste improving alcohol additive with a molecular weight ranging from about 46 to about 500 includes ethanol.

In another embodiment, suitable sweet taste improving amino acid additives for improving the osmotic taste of the synthetic sweeteners to be more sugar-like include, but are not limited to, sweet taste improving amino acid additives with a molecular weight ranging from about 75 to about 250. Non-limiting examples of sweet taste improving amino acid additives with a molecular weight ranging from about 75 to about 250 include glycine, alanine, serine, leucine, valine, isoleucine, proline, hydroxyproline, glutamine, theanine, and threonine.

In another embodiment, suitable sweet taste improving amino acid salt additives for improving the osmotic taste of the synthetic sweeteners to be more sugar-like include, but are not limited to, sweet taste improving amino acid salt additives with a molecular weight ranging from about 75 to about 300. Non-limiting examples of sweet taste improving amino acid salt additives with a molecular weight ranging from about 75 to

about 300 include salts of glycine, alanine, serine, leucine, valine, isoleucine, proline, hydroxyproline, glutamine, theanine, and threonine.

In another embodiment, suitable sweet taste improving protein or protein hydrolysate additives for improving the osmotic taste of the synthetic sweeteners to be more sugar-like include, but are not limited to, sweet taste improving protein or protein hydrolysate additives with a molecular weight ranging from about 75 to about 300. Non-limiting examples of sweet taste improving protein or protein hydrolysate additives with a molecular weight ranging from about 75 to about 300 include proteins or protein hydrolysates containing glycine, alanine, serine, leucine, valine, isoleucine, proline, hydroxyproline, glutamine, and threonine.

In another embodiment, suitable sweet taste improving inorganic acid salt additives for improving the osmotic taste of synthetic sweeteners to be more sugar-like include, but are not limited to, sodium chloride, potassium chloride, magnesium chloride, KH_2PO_4 and NaH_2PO_4 . Suitable sweet taste improving inorganic acid salt additives for improving the osmotic taste may comprise a molecular weight from about 58 to about 120.

In another embodiment, suitable sweet taste improving bitter additives for improving the osmotic taste of the synthetic sweetener to be more sugar-like include, but are not limited to, caffeine, quinine, urea, quassia, tannic acid, and naringin.

In a further embodiment, the sweet taste improving compositions improve the synthetic sweeteners to be similar to that of sucrose through at least one mechanism selected from temporal profile (e.g., sweetness onset or sweetness linger), maximal response, flavor profile (e.g., osmotic taste), adaptation behavior, and flavor profile. In a sub-embodiment, the sweet taste compositions improve the synthetic sweeteners to be similar to that of sucrose through at least one mechanism selected from temporal profile, maximal response, flavor profile, adaptation behavior, and flavor profile, and optionally impart a masking effect to suppress, reduce, or eliminate the undesirable taste of the synthetic sweetener and/or impart sugar-like characteristics to the synthetic sweeteners.

F. Combinations of Synthetic Sweeteners and Sweet Taste Improving Compositions

It has been discovered that combinations of at least one synthetic sweetener and at least one sweet taste improving composition improve the temporal profile and/or flavor

profile, including the osmotic taste, to be more sugar-like. One of ordinary skill in the art, with the teachings of the present invention, may arrive at all the possible combinations of the synthetic sweeteners and sweet taste improving compositions. For example, non-limiting combinations of the synthetic sweetener and sweet taste improving compositions include:

1. at least one synthetic sweetener and at least one carbohydrate;
2. at least one synthetic sweetener and at least one polyol;
3. at least one synthetic sweetener and at least one amino acid;
4. at least one synthetic sweetener and at least one other sweet taste improving additive;
5. at least one synthetic sweetener, at least one carbohydrate, at least one polyol, at least one amino acid, and at least one other sweet taste improving additive;
6. at least one synthetic sweetener, at least one carbohydrate, and at least one polyol;
7. at least one synthetic sweetener, at least one carbohydrate, and at least one amino acid;
8. at least one synthetic sweetener, at least one carbohydrate, and at least one other sweet taste improving additive;
9. at least one synthetic sweetener, at least one polyol, and at least one amino acid;
10. at least one synthetic sweetener, at least one polyol, and at least one other sweet taste improving additive;
11. at least one synthetic sweetener, at least one amino acid, and at least one other sweet taste improving additive;
12. at least one synthetic sweetener, at least one carbohydrate, at least one polyol, and at least one amino acid;
13. at least one synthetic sweetener, at least one carbohydrate, at least one polyol, and at least one other sweet taste improving additive;
14. at least one synthetic sweetener, at least one polyol, at least one amino acid, and at least one other sweet taste improving additive; and

15. at least one synthetic sweetener, at least one carbohydrate, at least one amino acid, and at least one other sweet taste improving additive.

These fifteen major combinations further may be broken down into further combinations in order to improve the overall taste of synthetic sweeteners or the orally ingestible compositions comprising a synthetic sweetener.

1. Combinations of Synthetic Sweeteners

A single synthetic sweetener may be combined with at least one sweet taste improving composition or a plurality of synthetic sweeteners may be combined with at least one sweet taste improving composition. Likewise, the sweet taste improving composition can include combinations of the foregoing identified polyols, carbohydrates, amino acids, other sweet taste improving additives, and combinations thereof. Multiple synthetic sweeteners can be combined as long as the combined effect does not adversely affect the taste of the synthetic sweetener in combination with the sweet taste improving compositions or the taste of the orally ingestible compositions which comprising the synthetic sweeteners. Furthermore, multiple synthetic sweeteners can be combined to offset undesirable tastes of the individual synthetic sweeteners in the combination.

2. Combinations of Sweet Taste Improving Compositions

As explained above, the sweet taste improving composition is selected from the group consisting of polyols, carbohydrates, amino acids, other sweet taste improving additives, and combinations thereof. The other sweet taste improving additives useful in embodiments of this invention are described herein above. In one embodiment, a single sweet taste improving composition may be used with a single synthetic sweetener. In another embodiment of the present invention, a single sweet taste improving composition may be used with one or more synthetic sweeteners. In yet another embodiment, one or more sweet taste improving compositions may be used with a single synthetic sweetener. In a further embodiment, there may be a plurality of sweet taste improving compositions used in combination with one or more synthetic sweeteners. Thus, non-limiting examples of sweet taste improving composition combinations for embodiments of this invention include:

- i. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one other sweet taste improving additive;

- ii. at least one polyol, at least one carbohydrate, and at least one other sweet taste improving additive;
- iii. at least one polyol and at least one other sweet taste improving additive;
- iv. at least one polyol and at least one carbohydrate;
- 5 v. at least one carbohydrate and at least one other sweet taste improving additive;
- vi. at least one polyol and at least one amino acid;
- vii. at least one carbohydrate and at least one amino acid;
- viii. at least one amino acid and at least one other sweet taste improving additive.

Other sweet taste improving composition combinations in accordance with embodiments of this invention include:

- 1. at least one polyol, at least one carbohydrate, and at least one amino acid;
- 15 2. at least one polyol, at least one carbohydrate, and at least one polyamino acid;
- 3. at least one polyol, at least one carbohydrate, and at least one sugar acid;
- 4. at least one polyol, at least one carbohydrate, and at least one nucleotide;
- 5. at least one polyol, at least one carbohydrate, and at least one organic acid;
- 6. at least one polyol, at least one carbohydrate, and at least one inorganic acid;
- 20 7. at least one polyol, at least one carbohydrate, and at least one bitter compound;
- 8. at least one polyol, at least one carbohydrate, and at least one flavorant or flavoring ingredient;
- 9. at least one polyol, at least one carbohydrate, and at least one polymer;
- 10. at least one polyol, at least one carbohydrate, and at least one protein or protein hydrolysate or protein or protein hydrolysate with a mixture of low molecular weight amino acids;
- 25 11. at least one polyol, at least one carbohydrate, and at least one surfactant;
- 12. at least one polyol, at least one carbohydrate, and at least one flavonoid;
- 13. at least one polyol, at least one carbohydrate, and at least one alcohol;
- 30 14. at least one polyol, at least one carbohydrate, and at least one emulsifier;
- 15. at least one polyol, at least one carbohydrate, and at least one inorganic salt,
- 16. at least one polyol, at least one carbohydrate, and at least one organic salt,

17. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one other sweet taste improving additive;
18. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one other sweet taste improving additive;
- 5 19. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one other sweet taste improving additive;
20. at least one polyol, at least one carbohydrate, at least one nucleotide, and at least one other sweet taste improving additive;
21. at least one polyol, at least one carbohydrate, at least one organic acid, and at least one other sweet taste improving additive;
- 10 22. at least one polyol, at least one carbohydrate, at least one inorganic acid, and at least one other sweet taste improving additive;
23. at least one polyol, at least one carbohydrate, at least one bitter compound, and at least one other sweet taste improving additive;
- 15 24. at least one polyol, at least one carbohydrate, at least one flavorant or flavoring ingredient, and at least one other sweet taste improving additive;
25. at least one polyol, at least one carbohydrate, at least one polymer, and at least one other sweet taste improving additive;
- 20 26. at least one polyol, at least one carbohydrate, at least one protein or protein hydrolysate, and at least one other sweet taste improving additive;
27. at least one polyol, at least one carbohydrate, at least one surfactant, and at least one other sweet taste improving additive;
28. at least one polyol, at least one carbohydrate, at least one flavonoid, and at least one other sweet taste improving additive;
- 25 29. at least one polyol, at least one carbohydrate, at least one alcohol, and at least one other sweet taste improving additive;
30. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one polyamino acid;
31. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, and at least one sugar acid;
- 30 32. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, and at least one nucleotide;

33. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, and at least one organic acid;
34. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, and at least one inorganic acid;
35. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, and at least one bitter compound;
36. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, and at least one polymer;
37. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, and at least one protein or protein hydrolysate;
38. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, at least one protein or protein hydrolysate, and at least one surfactant;
39. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, at least one protein or protein hydrolysate, at least one surfactant, and at least one flavonoid;
40. at least one polyol, at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, at least one protein or protein hydrolysate, at least one surfactant, at least one flavonoid, and at least one alcohol;

41. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one sugar acid;
42. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one nucleotide;
- 5 43. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one organic acid;
44. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one inorganic acid;
45. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one bitter compound;
- 10 46. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one polymer;
47. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one protein or protein hydrolysate;
- 15 48. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one surfactant;
49. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one flavonoid;
50. at least one polyol, at least one carbohydrate, at least one amino acid, and at least one alcohol;
- 20 51. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one sugar acid;
52. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one nucleotide;
- 25 53. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one organic acid;
54. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one inorganic acid;
55. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one bitter compound;
- 30 56. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one polymer;

57. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one protein or protein hydrolysate;
58. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one surfactant;
59. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one flavonoid;
60. at least one polyol, at least one carbohydrate, at least one polyamino acid, and at least one alcohol;
61. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one nucleotide;
62. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one organic acid;
63. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one inorganic acid;
64. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one bitter compound;
65. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one polymer;
66. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one protein or protein hydrolysate;
67. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one surfactant;
68. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one flavonoid;
69. at least one polyol, at least one carbohydrate, at least one sugar acid, and at least one alcohol;
70. at least one polyol, at least one carbohydrate, at least one nucleotide, and at least one organic acid;
71. at least one polyol, at least one carbohydrate, at least one nucleotide, and at least one inorganic acid;
72. at least one polyol, at least one carbohydrate, at least one nucleotide, and at least one bitter compound;

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73. at least one polyol, at least one carbohydrate, at least one nucleotide, and at least one polymer;
74. at least one polyol, at least one carbohydrate, at least one nucleotide, and at least one protein or protein hydrolysate;
- 5 75. at least one polyol, at least one carbohydrate, at least one nucleotide, and at least one surfactant;
76. at least one polyol, at least one carbohydrate, at least one nucleotide, and at least one flavonoid;
77. at least one polyol, at least one carbohydrate, at least one nucleotide, and at least one alcohol;
- 10 78. at least one polyol, at least one carbohydrate, at least one organic acid, and at least one inorganic acid;
79. at least one polyol, at least one carbohydrate, at least one organic acid, and at least one bitter compound;
- 15 80. at least one polyol, at least one carbohydrate, at least one organic acid, and at least one polymer;
81. at least one polyol, at least one carbohydrate, at least one organic acid, and at least one protein or protein hydrolysate;
82. at least one polyol, at least one carbohydrate, at least one organic acid, and at least one surfactant;
- 20 83. at least one polyol, at least one carbohydrate, at least one organic acid, and at least one flavonoid;
84. at least one polyol, at least one carbohydrate, at least one organic acid, and at least one alcohol;
- 25 85. at least one polyol, at least one carbohydrate, at least one inorganic acid, and at least one bitter compound;
86. at least one polyol, at least one carbohydrate, at least one inorganic acid, and at least one polymer;
87. at least one polyol, at least one carbohydrate, at least one inorganic acid, and at least one protein or protein hydrolysate;
- 30 88. at least one polyol, at least one carbohydrate, at least one inorganic acid, and at least one surfactant;

89. at least one polyol, at least one carbohydrate, at least one inorganic acid, and at least one flavonoid;
90. at least one polyol, at least one carbohydrate, at least one inorganic acid, and at least one alcohol;
- 5 91. at least one polyol, at least one carbohydrate, at least one bitter compound, and at least one polymer;
92. at least one polyol, at least one carbohydrate, at least one bitter compound, and at least one protein or protein hydrolysate;
93. at least one polyol, at least one carbohydrate, at least one bitter compound, and at least one surfactant;
- 10 94. at least one polyol, at least one carbohydrate, at least one bitter compound, and at least one flavonoid;
95. at least one polyol, at least one carbohydrate, at least one bitter compound, and at least one alcohol;
- 15 96. at least one polyol, at least one carbohydrate, at least one polymer, and at least one protein or protein hydrolysate;
97. at least one polyol, at least one carbohydrate, at least one polymer, and at least one surfactant;
98. at least one polyol, at least one carbohydrate, at least one polymer, and at least one flavonoid;
- 20 99. at least one polyol, at least one carbohydrate, at least one polymer, and at least one alcohol;
100. at least one polyol, at least one carbohydrate, at least one protein or protein hydrolysate, and at least one surfactant;
- 25 101. at least one polyol, at least one carbohydrate, at least one protein or protein hydrolysate, and at least one flavonoid;
102. at least one polyol, at least one carbohydrate, at least one surfactant, and at least one flavonoid;
103. at least one polyol, at least one carbohydrate, at least one surfactant, and at least one alcohol; and
- 30 104. at least one polyol, at least one carbohydrate, at least one flavonoid, and at least one alcohol.

Other sweet taste improving composition combinations in accordance with embodiments of this invention include:

1. at least one polyol and at least one amino acid;
- 5 2. at least one polyol and at least one polyamino acid;
3. at least one polyol and at least one sugar acid;
4. at least one polyol and at least one nucleotide;
5. at least one polyol and at least one organic acid;
6. at least one polyol and at least one inorganic acid;
- 10 7. at least one polyol and at least one bitter compound;
8. at least one polyol and at least one flavorant or flavoring ingredient;
9. at least one polyol and at least one polymer;
10. at least one polyol and at least one protein or protein hydrolysate;
11. at least one polyol and at least one surfactant;
- 15 12. at least one polyol and at least one flavonoid;
13. at least one polyol and at least one alcohol;
14. at least one polyol and at least one emulsifier;
15. at least one polyol and at least one inorganic salt;
16. at least one polyol and at least one organic salt;
- 20 17. at least one polyol and at least one protein or protein hydrolysate or mixture of low molecular weight amino acids;
18. at least one polyol, at least one amino acid, and at least one other sweet taste improving additive;
19. at least one polyol, at least one polyamino acid, and at least one other sweet taste improving additive;
- 25 20. at least one polyol, at least one sugar acid, and at least one other sweet taste improving additive;
21. at least one polyol, at least one nucleotide, and at least one other sweet taste improving additive;
- 30 22. at least one polyol, at least one organic acid, and at least one other sweet taste improving additive;

23. at least one polyol, at least one inorganic acid, and at least one other sweet taste improving additive;
24. at least one polyol, at least one bitter compound, and at least one other sweet taste improving additive;
- 5 25. at least one polyol, at least one flavorant or flavoring ingredient, and at least one other sweet taste improving additive;
26. at least one polyol, at least one polymer, and at least one other sweet taste improving additive;
27. at least one polyol, at least one protein or protein hydrolysate, and at least one
10 other sweet taste improving additive;
28. at least one polyol, at least one surfactant, and at least one other sweet taste improving additive;
29. at least one polyol, at least one flavonoid, and at least one other sweet taste improving additive;
- 15 30. at least one polyol, at least one alcohol, and at least one other sweet taste improving additive;
31. at least one polyol, at least one amino acid, and at least one polyamino acid;
32. at least one polyol, at least one amino acid, at least one polyamino acid, and at least one sugar acid;
- 20 33. at least one polyol, at least one amino acid, at least one polyamino acid, at least one sugar acid, and at least one nucleotide;
34. at least one polyol, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, and at least one organic acid;
35. at least one polyol, at least one amino acid, at least one polyamino acid, at least one
25 sugar acid, at least one nucleotide, at least one organic acid, and at least one inorganic acid;
36. at least one polyol, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, and at least one bitter compound;
- 30 37. at least one polyol, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, and at least one polymer;

38. at least one polyol, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, and at least one protein or protein hydrolysate;
- 5 39. at least one polyol, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, at least one protein or protein hydrolysate, and at least one surfactant;
- 10 40. at least one polyol, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, at least one protein or protein hydrolysate, at least one surfactant, and at least one flavonoid;
- 15 41. at least one polyol, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, at least one protein or protein hydrolysate, at least one surfactant, at least one flavonoid, and at least one alcohol;
42. at least one polyol, at least one amino acid, and at least one sugar acid;
43. at least one polyol, at least one amino acid, and at least one nucleotide;
- 20 44. at least one polyol, at least one amino acid, and at least one organic acid;
45. at least one polyol, at least one amino acid, and at least one inorganic acid;
46. at least one polyol, at least one amino acid, and at least one bitter compound;
47. at least one polyol, at least one amino acid, and at least one polymer;
48. at least one polyol, at least one amino acid, and at least one protein or protein hydrolysate;
- 25 49. at least one polyol, at least one amino acid, and at least one surfactant;
50. at least one polyol, at least one amino acid, and at least one flavonoid;
51. at least one polyol, at least one amino acid, and at least one alcohol;
52. at least one polyol, at least one polyamino acid, and at least one sugar acid;
- 30 53. at least one polyol, at least one polyamino acid, and at least one nucleotide;
54. at least one polyol, at least one polyamino acid, and at least one organic acid;
55. at least one polyol, at least one polyamino acid, and at least one organic salt;

56. at least one polyol, at least one polyamino acid, and at least one inorganic acid;
57. at least one polyol, at least one polyamino acid, and at least one inorganic salt;
58. at least one polyol, at least one polyamino acid, and at least one bitter compound;
59. at least one polyol, at least one polyamino acid, and at least one polymer;
5 60. at least one polyol, at least one polyamino acid, and at least one protein or protein hydrolysate;
61. at least one polyol, at least one polyamino acid, and at least one surfactant;
62. at least one polyol, at least one polyamino acid, and at least one flavonoid;
63. at least one polyol, at least one polyamino acid, and at least one alcohol;
10 64. at least one polyol, at least one sugar acid, and at least one nucleotide;
65. at least one polyol, at least one sugar acid, and at least one organic acid;
66. at least one polyol, at least one sugar acid, and at least one inorganic acid;
67. at least one polyol, at least one sugar acid, and at least one bitter compound;
68. at least one polyol, at least one sugar acid, and at least one polymer;
15 69. at least one polyol, at least one sugar acid, and at least one protein or protein hydrolysate;
70. at least one polyol, at least one sugar acid, and at least one surfactant;
71. at least one polyol, at least one sugar acid, and at least one flavonoid;
72. at least one polyol, at least one sugar acid, and at least one alcohol;
20 73. at least one polyol, at least one nucleotide, and at least one organic acid;
74. at least one polyol, at least one nucleotide, and at least one inorganic acid;
75. at least one polyol, at least one nucleotide, and at least one bitter compound;
76. at least one polyol, at least one nucleotide, and at least one polymer;
77. at least one polyol, at least one nucleotide, and at least one protein or protein hydrolysate;
25 78. at least one polyol, at least one nucleotide, and at least one surfactant;
79. at least one polyol, at least one nucleotide, and at least one flavonoid;
80. at least one polyol, at least one nucleotide, and at least one alcohol;
81. at least one polyol, at least one organic acid, and at least one inorganic acid;
30 82. at least one polyol, at least one organic acid, and at least one bitter compound;
83. at least one polyol, at least one organic acid, and at least one polymer;

84. at least one polyol, at least one organic acid, and at least one protein or protein hydrolysate;
85. at least one polyol, at least one organic acid, and at least one surfactant;
86. at least one polyol, at least one organic acid, and at least one flavonoid;
- 5 87. at least one polyol, at least one organic acid, and at least one alcohol;
88. at least one polyol, at least one inorganic acid, and at least one bitter compound;
89. at least one polyol, at least one inorganic acid, and at least one polymer;
90. at least one polyol, at least one inorganic acid, and at least one protein or protein hydrolysate;
- 10 91. at least one polyol, at least one inorganic acid, and at least one surfactant;
92. at least one polyol, at least one inorganic acid, and at least one flavonoid;
93. at least one polyol, at least one inorganic acid, and at least one alcohol;
94. at least one polyol, at least one bitter compound, and at least one polymer;
95. at least one polyol, at least one bitter compound, and at least one protein or protein hydrolysate;
- 15 96. at least one polyol, at least one bitter compound, and at least one surfactant;
97. at least one polyol, at least one bitter compound, and at least one flavonoid;
98. at least one polyol, at least one bitter compound, and at least one alcohol;
99. at least one polyol, at least one polymer, and at least one protein or protein hydrolysate;
- 20 100. at least one polyol, at least one polymer, and at least one surfactant;
101. at least one polyol, at least one polymer, and at least one flavonoid;
102. at least one polyol, at least one polymer, and at least one alcohol;
103. at least one polyol, at least one protein or protein hydrolysate, and at least one surfactant;
- 25 104. at least one polyol, at least one protein or protein hydrolysate, and at least one flavonoid;
105. at least one polyol, at least one surfactant, and at least one flavonoid;
106. at least one polyol, at least one surfactant, and at least one alcohol;
- 30 107. at least one polyol, at least one flavonoid, and at least one alcohol;
108. at least one sweet taste improving additive and erythritol;
109. at least one sweet taste improving additive and maltitol;

110. at least one sweet taste improving additive and mannitol;
111. at least one sweet taste improving additive and sorbitol;
112. at least one sweet taste improving additive and lactitol;
113. at least one sweet taste improving additive and xylitol;
- 5 114. at least one sweet taste improving additive and isomalt;
115. at least one sweet taste improving additive and propylene glycol;
116. at least one sweet taste improving additive and glycerol;
117. at least one sweet taste improving additive and palatinose;
118. at least one sweet taste improving additive and reduced isomalto-oligosaccharides;
- 10 119. at least one sweet taste improving additive and reduced xylo-oligosaccharides;
120. at least one sweet taste improving additive and reduced gentio-oligosaccharides;
121. at least one sweet taste improving additive and reduced maltose syrup;
122. at least one sweet taste improving additive and reduced glucose syrup;
123. at least one sweet taste improving additive, erythritol, and at least one other polyol;
- 15 124. at least one sweet taste improving additive, maltitol, and at least one other polyol;
125. at least one sweet taste improving additive, mannitol, and at least one other polyol;
126. at least one sweet taste improving additive, sorbitol, and at least one other polyol;
127. at least one sweet taste improving additive, lactitol, and at least one other polyol;
128. at least one sweet taste improving additive, xylitol, and at least one other polyol;
- 20 129. at least one sweet taste improving additive, isomalt, and at least one other polyol;
130. at least one sweet taste improving additive, propylene glycol, and at least one other polyol;
131. at least one sweet taste improving additive, glycerol, and at least one other polyol;
132. at least one sweet taste improving additive, palatinose, and at least one other polyol;
- 25 133. at least one sweet taste improving additive, reduced isomalto-oligosaccharides, and at least one other polyol;
134. at least one sweet taste improving additive, reduced xylo-oligosaccharides, and at least one other polyol;
- 30 135. at least one sweet taste improving additive, reduced gentio-oligosaccharides, and at least one other polyol;

136. at least one sweet taste improving additive, reduced maltose syrup, and at least one other polyol; and
137. at least one sweet taste improving additive, reduced glucose syrup, and at least one other polyol.

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Other sweet taste improving composition combinations in accordance with embodiments of this invention include:

1. at least one polyol and tagatose;
2. at least one polyol and trehalose;
- 10 3. at least one polyol and galactose;
4. at least one polyol and rhamnose;
5. at least one polyol and dextrin;
6. at least one polyol and cyclodextrin;
7. at least one polyol and α -cyclodextrin, β -cyclodextrin, or γ -cyclodextrin;
- 15 8. at least one polyol and maltodextrin;
9. at least one polyol and dextran;
10. at least one polyol and sucrose;
11. at least one polyol and glucose;
12. at least one polyol and fructose;
- 20 13. at least one polyol and threose;
14. at least one polyol and arabinose;
15. at least one polyol and xylose;
16. at least one polyol and lyxose;
17. at least one polyol and allose;
- 25 18. at least one polyol and altrose;
19. at least one polyol and mannose;
20. at least one polyol and idose;
21. at least one polyol and talose;
22. at least one polyol and lactose;
- 30 23. at least one polyol and maltose;
24. at least one polyol and invert sugar;
25. at least one polyol and trehalose;

26. at least one polyol and isotrehalose;
27. at least one polyol and neotrehalose;
28. at least one polyol and palatinose;
29. at least one polyol and galactose;
- 5 30. at least one polyol and beet oligosaccharides;
31. at least one polyol and isomalto-oligosaccharides;
32. at least one polyol and isomaltose;
33. at least one polyol and isomaltotriose;
34. at least one polyol and panose;
- 10 35. at least one polyol and xylo-oligosaccharides;
36. at least one polyol and xylotriose;
37. at least one polyol and xylobiose;
38. at least one polyol and gentio-oligosaccharides;
39. at least one polyol and gentiobiose;
- 15 40. at least one polyol and gentiotriose;
41. at least one polyol and gentiotetraose;
42. at least one polyol and sorbose;
43. at least one polyol and nigero-oligosaccharides;
44. at least one polyol and palatinose oligosaccharides;
- 20 45. at least one polyol and fucose;
46. at least one polyol and fructooligosaccharides;
47. at least one polyol and kestose;
48. at least one polyol and nystose;
49. at least one polyol and maltotetraol;
- 25 50. at least one polyol and maltotriol;
51. at least one polyol and malto-oligosaccharides;
52. at least one polyol and maltotriose;
53. at least one polyol and maltotetraose;
54. at least one polyol and maltopentaose;
- 30 55. at least one polyol and maltohexaose;
56. at least one polyol and maltoheptaose;
57. at

58. at least one polyol and melibiose;
59. at least one polyol and raffinose;
60. at least one polyol and rhamnose;
61. at least one polyol and ribose;
- 5 62. at least one polyol and isomerized liquid sugars;
63. at least one polyol and high fructose corn syrup (e.g., HFCS55, HFCS42, or HFCS90) or starch syrup;
64. at least one polyol and coupling sugars;
65. at least one polyol and soybean oligosaccharides;
- 10 66. at least one polyol and glucose syrup;
67. at least one polyol, tagatose, and at least one other carbohydrate;
68. at least one polyol, trehalose, and at least one other carbohydrate;
69. at least one polyol, galactose, and at least one other carbohydrate;
70. at least one polyol, rhamnose, and at least one other carbohydrate;
- 15 71. at least one polyol, dextrin, and at least one other carbohydrate;
72. at least one polyol, cyclodextrin, and at least one other carbohydrate;
73. at least one polyol, β -cyclodextrin, and at least one other carbohydrate;
74. at least one polyol, maltodextrin, and at least one other carbohydrate;
75. at least one polyol, dextran, and at least one other carbohydrate;
- 20 76. at least one polyol, sucrose, and at least one other carbohydrate;
77. at least one polyol, glucose, and at least one other carbohydrate;
78. at least one polyol, fructose, and at least one other carbohydrate;
79. at least one polyol, threose, and at least one other carbohydrate;
80. at least one polyol, arabinose, and at least one other carbohydrate;
- 25 81. at least one polyol, xylose, and at least one other carbohydrate;
82. at least one polyol, lyxose, and at least one other carbohydrate;
83. at least one polyol, allose, and at least one other carbohydrate;
84. at least one polyol, altrose, and at least one other carbohydrate;
85. at least one polyol, mannose, and at least one other carbohydrate;
- 30 86. at least one polyol, idose, and at least one other carbohydrate;
87. at least one polyol, talose, and at least one other carbohydrate;
88. at least one polyol, lactose, and at least one other carbohydrate;

89. at least one polyol, maltose, and at least one other carbohydrate;
90. at least one polyol, invert sugar, and at least one other carbohydrate;
91. at least one polyol, trehalose, and at least one other carbohydrate;
92. at least one polyol, isotrehalose, and at least one other carbohydrate;
- 5 93. at least one polyol, neotrehalose, and at least one other carbohydrate;
94. at least one polyol, palatinose, and at least one other carbohydrate;
95. at least one polyol, galactose, and at least one other carbohydrate;
96. at least one polyol, beet oligosaccharides, and at least one other carbohydrate;
97. at least one polyol, isomalto-oligosaccharides, and at least one other carbohydrate;
- 10 98. at least one polyol, isomaltose, and at least one other carbohydrate;
99. at least one polyol, isomaltotriose, and at least one other carbohydrate;
100. at least one polyol, panose, and at least one other carbohydrate;
101. at least one polyol, xylo-oligosaccharides, and at least one other carbohydrate;
102. at least one polyol, xylotriase, and at least one other carbohydrate;
- 15 103. at least one polyol, xylobiose, and at least one other carbohydrate;
104. at least one polyol, gentio-oligosaccharides, and at least one other carbohydrate;
105. at least one polyol, gentiobiose, and at least one other carbohydrate;
106. at least one polyol, gentiotriose, and at least one other carbohydrate;
107. at least one polyol, gentiotetraose, and at least one other carbohydrate;
- 20 108. at least one polyol, sorbose, and at least one other carbohydrate;
109. at least one polyol, nigero-oligosaccharides, and at least one other carbohydrate;
110. at least one polyol, palatinose oligosaccharides, and at least one other carbohydrate;
111. at least one polyol, fucose, and at least one other carbohydrate;
- 25 112. at least one polyol, fructooligosaccharides, and at least one other carbohydrate;
113. at least one polyol, kestose, and at least one other carbohydrate;
114. at least one polyol, nystose, and at least one other carbohydrate;
115. at least one polyol, maltotetraol, and at least one other carbohydrate;
116. at least one polyol, maltotriol, and at least one other carbohydrate;
- 30 117. at least one polyol, malto-oligosaccharides, and at least one other carbohydrate;
118. at least one polyol, maltotriose, and at least one other carbohydrate;
119. at least one polyol, maltotetraose, and at least one other carbohydrate;

120. at least one polyol, maltopentaose, and at least one other carbohydrate;
121. at least one polyol, maltohexaose, and at least one other carbohydrate;
122. at least one polyol, maltoheptaose, and at least one other carbohydrate;
123. at least one polyol, lactulose, and at least one other carbohydrate;
- 5 124. at least one polyol, melibiose, and at least one other carbohydrate;
125. at least one polyol, raffinose, and at least one other carbohydrate;
126. at least one polyol, rhamnose, and at least one other carbohydrate;
127. at least one polyol, ribose, and at least one other carbohydrate;
128. at least one polyol, isomerized liquid sugars, and at least one other carbohydrate;
- 10 129. at least one polyol, high fructose corn syrup (e.g., HFCS55, HFCS42, or HFCS90)
or starch syrup, and at least one other carbohydrate;
130. at least one polyol, coupling sugars, and at least one other carbohydrate;
131. at least one polyol, soybean oligosaccharides, and at least one other carbohydrate;
132. at least one polyol, glucose syrup, and at least one other carbohydrate;
- 15 133. at least one carbohydrate and erythritol;
134. at least one carbohydrate and maltitol;
135. at least one carbohydrate and mannitol;
136. at least one carbohydrate and sorbitol;
137. at least one carbohydrate and lactitol;
- 20 138. at least one carbohydrate and xylitol;
139. at least one carbohydrate and isomalt;
140. at least one carbohydrate and propylene glycol;
141. at least one carbohydrate and glycerol;
142. at least one carbohydrate and palatinose;
- 25 143. at least one carbohydrate and reduced isomalto-oligosaccharides;
144. at least one carbohydrate and reduced xylo-oligosaccharides;
145. at least one carbohydrate and reduced gentio-oligosaccharides;
146. at least one carbohydrate and reduced maltose syrup;
147. at least one carbohydrate and reduced glucose syrup;
- 30 148. at least one carbohydrate, erythritol, and at least one other polyol;
149. at least one carbohydrate, maltitol, and at least one other polyol;
150. at least one carbohydrate, mannitol, and at least one other polyol;

151. at least one carbohydrate, sorbitol, and at least one other polyol;
152. at least one carbohydrate, lactitol, and at least one other polyol;
153. at least one carbohydrate, xylitol, and at least one other polyol;
154. at least one carbohydrate, isomalt, and at least one other polyol;
- 5 155. at least one carbohydrate, propylene glycol, and at least one other polyol;
156. at least one carbohydrate, glycerol, and at least one other polyol;
157. at least one carbohydrate, palatinose, and at least one other polyol;
158. at least one carbohydrate, reduced isomalto-oligosaccharides, and at least one other polyol;
- 10 159. at least one carbohydrate, reduced xylo-oligosaccharides, and at least one other polyol;
160. at least one carbohydrate, reduced gentio-oligosaccharides, and at least one other polyol;
161. at least one carbohydrate, reduced maltose syrup, and at least one other polyol; and
- 15 162. at least one carbohydrate, reduced glucose syrup, and at least one other polyol.

Other sweet taste improving composition combinations in accordance with embodiments of this invention include:

1. at least one carbohydrate and at least one amino acid;
- 20 2. at least one carbohydrate and at least one polyamino acid;
3. at least one carbohydrate and at least one sugar acid;
4. at least one carbohydrate and at least one nucleotide;
5. at least one carbohydrate and at least one organic acid;
6. at least one carbohydrate and at least one inorganic acid;
- 25 7. at least one carbohydrate and at least one bitter compound;
8. at least one carbohydrate and at least one flavorant or flavoring ingredient;
9. at least one carbohydrate and at least one polymer;
10. at least one carbohydrate and at least one protein or protein hydrolysate;
11. at least one carbohydrate and at least one surfactant;
- 30 12. at least one carbohydrate and at least one flavonoid;
13. at least one carbohydrate and at least one alcohol;

14. at least one carbohydrate and at least one protein or protein hydrolysate or mixture of low molecular weight amino acids;
15. at least one carbohydrate and at least one emulsifier;
16. at least one carbohydrate and at least one inorganic salt;
- 5 17. at least one carbohydrate, at least one amino acid, and at least one other sweet taste improving additive;
18. at least one carbohydrate, at least one polyamino acid, and at least one other sweet taste improving additive;
19. at least one carbohydrate, at least one sugar acid, and at least one other sweet taste improving additive;
- 10 20. at least one carbohydrate, at least one nucleotide, and at least one other sweet taste improving additive;
21. at least one carbohydrate, at least one organic acid, and at least one other sweet taste improving additive;
- 15 22. at least one carbohydrate, at least one inorganic acid, and at least one other sweet taste improving additive;
23. at least one carbohydrate, at least one bitter compound, and at least one other sweet taste improving additive;
24. at least one carbohydrate, at least one flavorant or flavoring ingredient, and at least one other sweet taste improving additive;
- 20 25. at least one carbohydrate, at least one polymer, and at least one other sweet taste improving additive;
26. at least one carbohydrate, at least one protein or protein hydrolysate, and at least one other sweet taste improving additive;
- 25 27. at least one carbohydrate, at least one surfactant, and at least one other sweet taste improving additive;
28. at least one carbohydrate, at least one flavonoid, and at least one other sweet taste improving additive;
29. at least one carbohydrate, at least one alcohol, and at least one other sweet taste improving additive;
- 30 30. at least one carbohydrate, at least one amino acid, and at least one polyamino acid;

31. at least one carbohydrate, at least one amino acid, at least one polyamino acid, and at least one sugar acid;
32. at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, and at least one nucleotide;
- 5 33. at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, and at least one organic acid;
34. at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, and at least one inorganic acid;
- 10 35. at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, and at least one bitter compound;
36. at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, and at least one polymer;
- 15 37. at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, and at least one protein or protein hydrolysate;
- 20 38. at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, at least one protein or protein hydrolysate, and at least one surfactant;
39. at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, at least one protein or protein hydrolysate, at least one surfactant, and at least one flavonoid;
- 25 40. at least one carbohydrate, at least one amino acid, at least one polyamino acid, at least one sugar acid, at least one nucleotide, at least one organic acid, at least one inorganic acid, at least one bitter compound, at least one polymer, at least one protein or protein hydrolysate, at least one surfactant, at least one flavonoid, and at least one alcohol;
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41. at least one carbohydrate, at least one amino acid, and at least one sugar acid;
42. at least one carbohydrate, at least one amino acid, and at least one nucleotide;
43. at least one carbohydrate, at least one amino acid, and at least one organic acid;
44. at least one carbohydrate, at least one amino acid, and at least one inorganic acid;
5 45. at least one carbohydrate, at least one amino acid, and at least one bitter compound;
46. at least one carbohydrate, at least one amino acid, and at least one polymer;
47. at least one carbohydrate, at least one amino acid, and at least one protein or protein hydrolysate;
10 48. at least one carbohydrate, at least one amino acid, and at least one surfactant;
49. at least one carbohydrate, at least one amino acid, and at least one flavonoid;
50. at least one carbohydrate, at least one amino acid, and at least one alcohol;
51. at least one carbohydrate, at least one polyamino acid, and at least one sugar acid;
52. at least one carbohydrate, at least one polyamino acid, and at least one nucleotide;
15 53. at least one carbohydrate, at least one polyamino acid, and at least one organic acid;
54. at least one carbohydrate, at least one polyamino acid, and at least one inorganic acid;
55. at least one carbohydrate, at least one polyamino acid, and at least one bitter compound;
20 56. at least one carbohydrate, at least one polyamino acid, and at least one polymer;
57. at least one carbohydrate, at least one polyamino acid, and at least one protein or protein hydrolysate;
58. at least one carbohydrate, at least one polyamino acid, and at least one surfactant;
25 59. at least one carbohydrate, at least one polyamino acid, and at least one flavonoid;
60. at least one carbohydrate, at least one polyamino acid, and at least one alcohol;
61. at least one carbohydrate, at least one sugar acid, and at least one nucleotide;
62. at least one carbohydrate, at least one sugar acid, and at least one organic acid;
63. at least one carbohydrate, at least one sugar acid, and at least one inorganic acid;
30 64. at least one carbohydrate, at least one sugar acid, and at least one bitter compound;
65. at least one carbohydrate, at least one sugar acid, and at least one polymer;

66. at least one carbohydrate, at least one sugar acid, and at least one protein or protein hydrolysate;
67. at least one carbohydrate, at least one sugar acid, and at least one surfactant;
68. at least one carbohydrate, at least one sugar acid, and at least one flavonoid;
- 5 69. at least one carbohydrate, at least one sugar acid, and at least one alcohol;
70. at least one carbohydrate, at least one nucleotide, and at least one organic acid;
71. at least one carbohydrate, at least one nucleotide, and at least one inorganic acid;
72. at least one carbohydrate, at least one nucleotide, and at least one bitter compound;
73. at least one carbohydrate, at least one nucleotide, and at least one polymer;
- 10 74. at least one carbohydrate, at least one nucleotide, and at least one protein or protein hydrolysate;
75. at least one carbohydrate, at least one nucleotide, and at least one surfactant;
76. at least one carbohydrate, at least one nucleotide, and at least one flavonoid;
77. at least one carbohydrate, at least one nucleotide, and at least one alcohol;
- 15 78. at least one carbohydrate, at least one organic acid, and at least one inorganic acid;
79. at least one carbohydrate, at least one organic acid, and at least one bitter compound;
80. at least one carbohydrate, at least one organic acid, and at least one polymer;
81. at least one carbohydrate, at least one organic acid, and at least one protein or protein hydrolysate;
- 20 82. at least one carbohydrate, at least one organic acid, and at least one surfactant;
83. at least one carbohydrate, at least one organic acid, and at least one flavonoid;
84. at least one carbohydrate, at least one organic acid, and at least one alcohol;
85. at least one carbohydrate, at least one inorganic acid, and at least one bitter compound;
- 25 86. at least one carbohydrate, at least one inorganic acid, and at least one polymer;
87. at least one carbohydrate, at least one inorganic acid, and at least one protein or protein hydrolysate;
88. at least one carbohydrate, at least one inorganic acid, and at least one surfactant;
- 30 89. at least one carbohydrate, at least one inorganic acid, and at least one flavonoid;
90. at least one carbohydrate, at least one inorganic acid, and at least one alcohol;
91. at least one carbohydrate, at least one bitter compound, and at least one polymer;

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92. at least one carbohydrate, at least one bitter compound, and at least one protein or protein hydrolysate;
93. at least one carbohydrate, at least one bitter compound, and at least one surfactant;
94. at least one carbohydrate, at least one bitter compound, and at least one flavonoid;
- 5 95. at least one carbohydrate, at least one bitter compound, and at least one alcohol;
96. at least one carbohydrate, at least one polymer, and at least one protein or protein hydrolysate;
97. at least one carbohydrate, at least one polymer, and at least one surfactant;
98. at least one carbohydrate, at least one polymer, and at least one flavonoid;
- 10 99. at least one carbohydrate, at least one polymer, and at least one alcohol;
100. at least one carbohydrate, at least one protein or protein hydrolysate, and at least one surfactant;
101. at least one carbohydrate, at least one protein or protein hydrolysate, and at least one flavonoid;
- 15 102. at least one carbohydrate, at least one surfactant, and at least one flavonoid;
103. at least one carbohydrate, at least one surfactant, and at least one alcohol;
104. at least one carbohydrate, at least one flavonoid, and at least one alcohol;
105. at least one sweet taste improving additive and D-tagatose;
106. at least one sweet taste improving additive and trehalose;
- 20 107. at least one sweet taste improving additive and D-galactose;
108. at least one sweet taste improving additive and rhamnose;
109. at least one sweet taste improving additive and dextrin;
110. at least one sweet taste improving additive and cyclodextrin;
111. at least one sweet taste improving additive and β -cyclodextrin;
- 25 112. at least one sweet taste improving additive and maltodextrin;
113. at least one sweet taste improving additive and dextran;
114. at least one sweet taste improving additive and sucrose;
115. at least one sweet taste improving additive and glucose;
116. at least one sweet taste improving additive and fructose;
- 30 117. at least one sweet taste improving additive and threose;
118. at least one sweet taste improving additive and arabinose;
119. at least one sweet taste improving additive and xylose;

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120. at least one sweet taste improving additive and lyxose;
121. at least one sweet taste improving additive and allose;
122. at least one sweet taste improving additive and altrose;
123. at least one sweet taste improving additive and mannose;
5 124. at least one sweet taste improving additive and idose;
125. at least one sweet taste improving additive and talose;
126. at least one sweet taste improving additive and lactose;
127. at least one sweet taste improving additive and maltose;
128. at least one sweet taste improving additive and invert sugar;
10 129. at least one sweet taste improving additive and trehalose;
130. at least one sweet taste improving additive and isotrehalose;
131. at least one sweet taste improving additive and neotrehalose;
132. at least one sweet taste improving additive and palatinose;
133. at least one sweet taste improving additive and galactose;
15 134. at least one sweet taste improving additive and beet oligosaccharides;
135. at least one sweet taste improving additive and isomalto-oligosaccharides;
136. at least one sweet taste improving additive and isomaltose;
137. at least one sweet taste improving additive and isomaltotriose;
138. at least one sweet taste improving additive and panose;
20 139. at least one sweet taste improving additive and xylo-oligosaccharides;
140. at least one sweet taste improving additive and xylotriose;
141. at least one sweet taste improving additive and xylobiose;
142. at least one sweet taste improving additive and gentio-oligosaccharides;
143. at least one sweet taste improving additive and gentiobiose;
25 144. at least one sweet taste improving additive and gentiotriose;
145. at least one sweet taste improving additive and gentiotetraose;
146. at least one sweet taste improving additive and sorbose;
147. at least one sweet taste improving additive and nigero-oligosaccharides;
148. at least one sweet taste improving additive and palatinose oligosaccharides;
30 149. at least one sweet taste improving additive and fucose;
150. at least one sweet taste improving additive and fructooligosaccharides;
151. at least one sweet taste improving additive and kestose;

152. at least one sweet taste improving additive and nystose;
153. at least one sweet taste improving additive and maltotetraol;
154. at least one sweet taste improving additive and maltotriol;
155. at least one sweet taste improving additive and malto-oligosaccharides;
- 5 156. at least one sweet taste improving additive and maltotriose;
157. at least one sweet taste improving additive and maltotetraose;
158. at least one sweet taste improving additive and maltopentaose;
159. at least one sweet taste improving additive and maltohexaose;
160. at least one sweet taste improving additive and maltoheptaose;
- 10 161. at least one sweet taste improving additive and lactulose;
162. at least one sweet taste improving additive and melibiose;
163. at least one sweet taste improving additive and raffinose;
164. at least one sweet taste improving additive and rhamnose;
165. at least one sweet taste improving additive and ribose;
- 15 166. at least one sweet taste improving additive and isomerized liquid sugars;
167. at least one sweet taste improving additive and high fructose corn syrup (e.g., HFCS55, HFCS42, or HFCS90) or starch syrup;
168. at least one sweet taste improving additive and coupling sugars;
169. at least one sweet taste improving additive and soybean oligosaccharides;
- 20 170. at least one sweet taste improving additive and glucose syrup;
171. at least one sweet taste improving additive, D-tagatose, and at least one other carbohydrate;
172. at least one sweet taste improving additive, trehalose, and at least one other carbohydrate;
- 25 173. at least one sweet taste improving additive, D-galactose, and at least one other carbohydrate;
174. at least one sweet taste improving additive, rhamnose, and at least one other carbohydrate;
175. at least one sweet taste improving additive, dextrin, and at least one other carbohydrate;
- 30 176. at least one sweet taste improving additive, cyclodextrin, and at least one other carbohydrate;

177. at least one sweet taste improving additive, β -cyclodextrin, and at least one other carbohydrate;
178. at least one sweet taste improving additive, maltodextrin, and at least one other carbohydrate;
- 5 179. at least one sweet taste improving additive, dextran, and at least one other carbohydrate;
180. at least one sweet taste improving additive, sucrose, and at least one other carbohydrate;
181. at least one sweet taste improving additive, glucose, and at least one other carbohydrate;
- 10 182. at least one sweet taste improving additive, fructose, and at least one other carbohydrate;
183. at least one sweet taste improving additive, threose, and at least one other carbohydrate;
- 15 184. at least one sweet taste improving additive, arabinose, and at least one other carbohydrate;
185. at least one sweet taste improving additive, xylose, and at least one other carbohydrate;
186. at least one sweet taste improving additive, lyxose, and at least one other carbohydrate;
- 20 187. at least one sweet taste improving additive, allose, and at least one other carbohydrate;
188. at least one sweet taste improving additive, altrose, and at least one other carbohydrate;
- 25 189. at least one sweet taste improving additive, mannose, and at least one other carbohydrate;
190. at least one sweet taste improving additive, idose, and at least one other carbohydrate;
191. at least one sweet taste improving additive, talose, and at least one other carbohydrate;
- 30 192. at least one sweet taste improving additive, lactose, and at least one other carbohydrate;

193. at least one sweet taste improving additive, maltose, and at least one other carbohydrate;
194. at least one sweet taste improving additive, invert sugar, and at least one other carbohydrate;
- 5 195. at least one sweet taste improving additive, trehalose, and at least one other carbohydrate;
196. at least one sweet taste improving additive, isotrehalose, and at least one other carbohydrate;
197. at least one sweet taste improving additive, neotrehalose, and at least one other carbohydrate;
- 10 198. at least one sweet taste improving additive, palatinose, and at least one other carbohydrate;
199. at least one sweet taste improving additive, galactose, and at least one other carbohydrate;
- 15 200. at least one sweet taste improving additive, beet oligosaccharides, and at least one other carbohydrate;
201. at least one sweet taste improving additive, isomalto-oligosaccharides, and at least one other carbohydrate;
202. at least one sweet taste improving additive, isomaltose, and at least one other carbohydrate;
- 20 203. at least one sweet taste improving additive, isomaltotriose, and at least one other carbohydrate;
204. at least one sweet taste improving additive, panose, and at least one other carbohydrate;
- 25 205. at least one sweet taste improving additive, xylo-oligosaccharides, and at least one other carbohydrate;
206. at least one sweet taste improving additive, xylotriose, and at least one other carbohydrate;
207. at least one sweet taste improving additive, xylobiose, and at least one other carbohydrate;
- 30 208. at least one sweet taste improving additive, gentio-oligosaccharides, and at least one other carbohydrate;

209. at least one sweet taste improving additive, gentiobiose, and at least one other carbohydrate;
210. at least one sweet taste improving additive, gentiotriose, and at least one other carbohydrate;
- 5 211. at least one sweet taste improving additive, gentiotetraose, and at least one other carbohydrate;
212. at least one sweet taste improving additive, sorbose, and at least one other carbohydrate;
213. at least one sweet taste improving additive, nigero-oligosaccharides, and at least one other carbohydrate;
- 10 214. at least one sweet taste improving additive, palatinose oligosaccharides, and at least one other carbohydrate;
215. at least one sweet taste improving additive, fucose, and at least one other carbohydrate;
- 15 216. at least one sweet taste improving additive, fructooligosaccharides, and at least one other carbohydrate;
217. at least one sweet taste improving additive, kestose, and at least one other carbohydrate;
218. at least one sweet taste improving additive, nystose, and at least one other carbohydrate;
- 20 219. at least one sweet taste improving additive, maltotetraol, and at least one other carbohydrate;
220. at least one sweet taste improving additive, maltotriol, and at least one other carbohydrate;
- 25 221. at least one sweet taste improving additive, malto-oligosaccharides, and at least one other carbohydrate;
222. at least one sweet taste improving additive, maltotriose, and at least one other carbohydrate;
223. at least one sweet taste improving additive, maltotetraose, and at least one other carbohydrate;
- 30 224. at least one sweet taste improving additive, maltopentaose, and at least one other carbohydrate;

225. at least one sweet taste improving additive, maltohexaose, and at least one other carbohydrate;
226. at least one sweet taste improving additive, maltoheptaose, and at least one other carbohydrate;
- 5 227. at least one sweet taste improving additive, lactulose, and at least one other carbohydrate;
228. at least one sweet taste improving additive, melibiose, and at least one other carbohydrate;
229. at least one sweet taste improving additive, raffinose, and at least one other carbohydrate;
- 10 230. at least one sweet taste improving additive, rhamnose, and at least one other carbohydrate;
231. at least one sweet taste improving additive, ribose, and at least one other carbohydrate;
- 15 232. at least one sweet taste improving additive, isomerized liquid sugars, and at least one other carbohydrate;
233. at least one sweet taste improving additive, high fructose corn syrup (e.g., HFCS55, HFCS42, or HFCS90) or starch syrup, and at least one other carbohydrate;
- 20 234. at least one sweet taste improving additive, coupling sugars, and at least one other carbohydrate;
235. at least one sweet taste improving additive, soybean oligosaccharides, and at least one other carbohydrate; and
236. at least one sweet taste improving additive, glucose syrup, and at least one other carbohydrate.
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In one embodiment, combinations of the at least one synthetic sweetener and at least one sweet taste improving composition suppress, reduce, or eliminate undesirable taste and impart sugar-like characteristics to the synthetic sweetener. As used herein, the phrase “undesirable taste” includes any taste property which is not imparted by sugars such as glucose, sucrose, fructose, or similar saccharides. Non-limiting examples of undesirable taste include delayed sweetness onset, lingering sweet aftertaste, metallic

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taste, bitter taste, cooling sensation taste or menthol-like taste, licorice-like taste, and/or the like.

In another embodiment, at least one synthetic sweetener is combined with a plurality of sweet taste improving additives, desirably 3 or more sweet taste improving additives, and even more desirably 4 or more sweet taste improving additives, wherein each sweet taste improving additive is present in an amount such that no one sweet taste improving additive imparts a substantial off taste to the synthetic sweetener composition. In other words, the amounts of the sweet taste improving additives in the synthetic sweetener composition are balanced so that no one sweet taste improving additive imparts a substantial off taste to the synthetic sweetener composition. Desirably, each of the plurality of sweet taste improving additives is present in the synthetic sweetener composition in an amount which imparts an osmolarity ranging from 10 to 100 mOsmoles/L to a sweetenable composition, but the combination of sweet improving additives imparts an osmolarity ranging from about 10 mOsmoles/L to about 500 mOsmoles/L to a sweetenable composition.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving nucleotide additive chosen from inosine monophosphate ("IMP"), guanosine monophosphate ("GMP"), adenosine monophosphate ("AMP"), cytosine monophosphate (CMP), uracil monophosphate (UMP), inosine diphosphate, guanosine diphosphate, adenosine diphosphate, cytosine diphosphate, uracil diphosphate, inosine triphosphate, guanosine triphosphate, adenosine triphosphate, cytosine triphosphate, uracil triphosphate, nucleosides thereof, nucleic acid bases thereof, or salts thereof.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-

hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving carbohydrate additive chosen from tagatose, trehalose, galactose, rhamnose, cyclodextrin (e.g., α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrin), maltodextrin (including resistant maltodextrins such as Fibersol-2™), dextran, sucrose, glucose, ribulose, fructose, threose, arabinose, xylose, lyxose, allose, altrose, mannose, idose, lactose, maltose, invert sugar, isotrehalose, neotrehalose, palatinose or isomaltulose, erythrose, deoxyribose, gulose, idose, talose, erythrulose, xylulose, psicose, turanose, cellobiose, amylopectin, glucosamine, mannosamine, fucose, glucuronic acid, gluconic acid, glucono-lactone, abequose, galactosamine, beet oligosaccharides, isomalto-oligosaccharides (isomaltose, isomaltotriose, panose and the like), xylo-oligosaccharides (xylotriose, xylobiose and the like), gentio-oligosaccharides (gentiobiose, gentiotriose, gentiotetraose and the like), sorbose, nigero-oligosaccharides, palatinose oligosaccharides, fucose, fructooligosaccharides (kestose, nystose and the like), maltotetraol, maltotriol, malto-oligosaccharides (maltotriose, maltotetraose, maltopentaose, maltohexaose, maltoheptaose and the like), lactulose, melibiose, raffinose, rhamnose, ribose, isomerized liquid sugars such as high fructose corn/starch syrup (e.g., HFCS55, HFCS42, or HFCS90), coupling sugars, soybean oligosaccharides, or glucose syrup.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving polyol additive chosen from erythritol, maltitol, mannitol, sorbitol, lactitol, xylitol, isomalt, propylene glycol, glycerol (glycerine), threitol, galactitol, palatinose, reduced isomalto-oligosaccharides, reduced xylo-oligosaccharides, reduced gentio-oligosaccharides, reduced maltose syrup, or reduced glucose syrup.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame,

saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving amino acid additive chosen from aspartic acid, arginine, glycine, glutamic acid, proline, threonine, theanine, cysteine, cystine, alanine, valine, tyrosine, leucine, isoleucine, asparagine, serine, lysine, histidine, ornithine, methionine, carnitine, aminobutyric acid (alpha-, beta-, or gamma- isomers), glutamine, hydroxyproline, taurine, norvaline, sarcosine, or salts thereof.

10 In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, 15 or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving polyamino acid additive chosen from poly-L-aspartic acid, poly-L-lysine (e.g., poly-L- α -lysine or poly-L- ϵ -lysine), poly-L-ornithine (e.g., poly-L- α -ornithine or poly-L- ϵ -ornithine), poly-L-arginine, other polymeric forms of amino acids, or salts thereof.

20 In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, 25 or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving sugar acid additive chosen from aldonic, uronic, aldaric, alginic, gluconic, glucuronic, glucaric, galactaric, galacturonic, or salts thereof.

In one embodiment, a sweetener composition is provided comprising at least one 30 synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-

hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving organic acid additive chosen from the group C2-C30 carboxylic acids, substituted hydroxyl C1-C30 carboxylic acids, benzoic acid, substituted benzoic acids (e.g., 2,4-dihydroxybenzoic acid), substituted cinnamic acids, hydroxyacids, substituted hydroxybenzoic acids, substituted cyclohexyl carboxylic acids, tannic acid, lactic acid, tartaric acid, citric acid, gluconic acid, glutaric acid, adipic acid, hydroxycitric acid, malic acid, fumaric acid, fruitaric acid, maleic acid, succinic acid, chlorogenic acid, salicylic acid, caffeic acid, bile acids, acetic acid, ascorbic acid, alginic acid, erythorbic acid, polyglutamic acid, or salts thereof.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving inorganic acid additive chosen from phosphoric acid, phosphorous acid, polyphosphoric acid, hydrochloric acid, sulfuric acid, carbonic acid, sodium dihydrogen phosphate, or salts thereof.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving bitter compound additive chosen from caffeine, quinine, urea, bitter orange oil, naringin, quassia, or salts thereof.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester,

or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving flavorant additive chosen from vanillin, vanilla extract, mango extract, cinnamon, citrus, coconut, ginger, viridiflorol, almond, menthol, grape skin extract, or grape seed extract. In another particular embodiment, the at least one sweet taste improving flavorant additive comprises a proprietary sweetener chosen from Döhler™ Natural Flavoring Sweetness Enhancer K14323 (Döhler™, Darmstadt, Germany), Symrise™ Natural Flavor Mask for Sweeteners 161453 or 164126 (Symrise™, Holzminden, Germany), Natural Advantage™ Bitterness Blockers 1, 2, 9 or 10 (Natural Advantage™, Freehold, New Jersey, U.S.A.), or Sucramask™ (Creative Research Management, Stockton, California, U.S.A.).

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving polymer additive chosen from chitosan, pectin, pectic, pectinic, polyuronic, polygalacturonic acid, starch, food hydrocolloid or crude extracts thereof (e.g., gum acacia senegal, gum acacia seyal, carageenan), poly-L-lysine (e.g., poly-L- α -lysine or poly-L- ϵ -lysine), poly-L-ornithine (e.g., poly-L- α -ornithine or poly-L- ϵ -ornithine), polypropylene glycol, polyethylene glycol, poly(ethylene glycol methyl ether), polyarginine, polyaspartic acid, polyglutamic acid, polyethyleneimine, alginic acid, sodium alginate, propylene glycol alginate, sodium polyethyleneglycolalginate, sodium hexametaphosphate or its salts, or other cationic polymers and anionic polymers.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving protein or protein hydrolysate

additive chosen from bovine serum albumin (BSA), whey protein (including fractions or concentrates thereof such as 90% instant whey protein isolate, 34% whey protein, 50% hydrolyzed whey protein, and 80% whey protein concentrate), soluble rice protein, soy protein, protein isolates, protein hydrolysates, reaction products of protein hydrolysates, glycoproteins, and/or proteoglycans containing amino acids (e.g., glycine, alanine, serine, threonine, theanine, asparagine, glutamine, arginine, valine, isoleucine, leucine, norvaline, methionine, proline, tyrosine, hydroxyproline, or the like), collagen (e.g., gelatin), partially hydrolyzed collagen (e.g., hydrolyzed fish collagen), and collagen hydrolysates (e.g., porcine collagen hydrolysate).

10 In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, 15 or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving surfactant additive chosen from polysorbates (e.g., polyoxyethylene sorbitan monooleate (polysorbate 80), polysorbate 20, polysorbate 60), sodium dodecylbenzenesulfonate, dioctyl sulfosuccinate or dioctyl sulfosuccinate sodium, sodium dodecyl sulfate, cetylpyridinium chloride, 20 hexadecyltrimethylammonium bromide, sodium cholate, carbamoyl, choline chloride, sodium glycocholate, sodium taurodeoxycholate, lauric arginate, sodium stearyl lactylate, lecithins, sucrose oleate esters, sucrose stearate esters, and other emulsifiers, or the like.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, 25 saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving flavonoid additive chosen 30 from catechins, polyphenols, neohesperidin, naringin, neohesperidin dihydrochalcone, or the like.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with ethanol.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving astringent compound additive chosen from tannic acid, europium chloride (EuCl_3), gadolinium chloride (GdCl_3), terbium chloride (TbCl_3), alum, tannic acid, and polyphenols (e.g., tea polyphenol).

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving natural high-potency sweetener chosen from rebaudioside A, rebaudioside B, rebaudioside C, rebaudioside D, rebaudioside E, rebaudioside F, dulcoside A, dulcoside B, rubusoside, stevia, stevioside, mogroside IV, mogroside V, Luo Han Guo sweetener, siamenoside, monatin and its salts (monatin SS, RR, RS, SR), curculin, glycyrrhizic acid and its salts, thaumatin, monellin, mabinlin, brazzein, hernandulcin, phyllodulcin, glycyphyllin, phloridzin, trilobatin, baiyunoside, osladin, polypodoside A, pterocaryoside A, pterocaryoside B, mukurozioside, phlomisioside I, periandrin I, abrusoside A, or cyclocarioside I and at least one other sweet taste improving composition.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving inorganic salt additive chosen from sodium chloride, potassium chloride, sodium sulfate, potassium citrate, europium chloride (EuCl_3), gadolinium chloride (GdCl_3), terbium chloride (TbCl_3), magnesium sulfate, alum, magnesium chloride, mono-, di-, tri-basic sodium or potassium salts of phosphoric acid (e.g., inorganic phosphates), salts of hydrochloric acid (e.g., inorganic chlorides), sodium carbonate, sodium bisulfate, or sodium bicarbonate.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener select from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving nucleotide additive; at least one sweet taste improving carbohydrate additive, at least one sweet taste improving polyol additive, and at least one sweet taste improving amino acid additive; wherein the at least one nucleotide additive is chosen from inosine monophosphate ("IMP"), guanosine monophosphate ("GMP"), adenosine monophosphate ("AMP"), cytosine monophosphate (CMP), uracil monophosphate (UMP), inosine diphosphate, guanosine diphosphate, adenosine diphosphate, cytosine diphosphate, uracil diphosphate, inosine triphosphate, guanosine triphosphate, adenosine triphosphate, cytosine triphosphate, uracil triphosphate, nucleosides thereof, nucleic acid bases thereof, or salts thereof; wherein the at least one carbohydrate additive is chosen from tagatose, trehalose, galactose, rhamnose, cyclodextrin (e.g., α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrin), maltodextrin (including resistant maltodextrins such as Fibersol-2™), dextran, sucrose, glucose, ribulose, fructose, threose, arabinose, xylose, lyxose, allose, altrose, mannose, idose, lactose, maltose, invert sugar, isotrehalose, neotrehalose,

palatinose or isomaltulose, erythrose, deoxyribose, gulose, idose, talose, erythrulose, xylulose, psicose, turanose, cellobiose, amylopectin, glucosamine, mannosamine, fucose, glucuronic acid, gluconic acid, glucono-lactone, abequose, galactosamine, beet oligosaccharides, isomalto-oligosaccharides (isomaltose, isomaltotriose, panose and the like), xylo-oligosaccharides (xylotriose, xylobiose and the like), gentio-oligosaccharides (gentiobiose, gentiotriose, gentiotetraose and the like), sorbose, nigero-oligosaccharides, palatinose oligosaccharides, fucose, fructooligosaccharides (kestose, nystose and the like), maltotetraol, maltotriol, malto-oligosaccharides (maltotriose, maltotetraose, maltopentaose, maltohexaose, maltoheptaose and the like), lactulose, melibiose, raffinose, rhamnose, ribose, isomerized liquid sugars such as high fructose corn/starch syrup (e.g., HFCS55, HFCS42, or HFCS90), coupling sugars, soybean oligosaccharides, or glucose syrup; wherein the at least one polyol additive is chosen from erythritol, maltitol, mannitol, sorbitol, lactitol, xylitol, isomalt, propylene glycol, glycerol, threitol, galactitol, palatinose, reduced isomalto-oligosaccharides, reduced xylo-oligosaccharides, reduced gentio-oligosaccharides, reduced maltose syrup, or reduced glucose syrup; and wherein the at least one amino acid additive chosen from aspartic acid, arginine, glycine, glutamic acid, proline, threonine, theanine, cysteine, cystine, alanine, valine, tyrosine, leucine, isoleucine, asparagine, serine, lysine, histidine, ornithine, methionine, carnitine, aminobutyric acid (alpha-, beta-, or gamma- isomers), glutamine, hydroxyproline, taurine, norvaline, sarcosine, or salts thereof.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener select from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving nucleotide additive and at least one sweet taste improving carbohydrate additive; wherein the at least one nucleotide additive is chosen from inosine monophosphate ("IMP"), guanosine monophosphate ("GMP"), adenosine monophosphate ("AMP"), cytosine monophosphate (CMP), uracil monophosphate (UMP), inosine diphosphate, guanosine diphosphate, adenosine diphosphate, cytosine diphosphate, uracil diphosphate, inosine

triphosphate, guanosine triphosphate, adenosine triphosphate, cytosine triphosphate, uracil triphosphate, nucleosides thereof, nucleic acid bases thereof, or salts thereof; and wherein the at least one carbohydrate additive is chosen from tagatose, trehalose, galactose, rhamnose, cyclodextrin (e.g., α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrin), maltodextrin (including resistant maltodextrins such as Fibersol-2™), dextran, sucrose, glucose, ribulose, fructose, threose, arabinose, xylose, lyxose, allose, altrose, mannose, idose, lactose, maltose, invert sugar, isotrehalose, neotrehalose, palatinose or isomaltulose, erythrose, deoxyribose, gulose, idose, talose, erythrulose, xylulose, psicose, turanose, cellobiose, amylopectin, glucosamine, mannosamine, fucose, glucuronic acid, gluconic acid, glucono-lactone, abequose, galactosamine, beet oligosaccharides, isomalto-oligosaccharides (isomaltose, isomaltotriose, panose and the like), xylo-oligosaccharides (xylotriose, xylobiose and the like), gentio-oligosaccharides (gentiobiose, gentiotriose, gentiotetraose and the like), sorbose, nigero-oligosaccharides, palatinose oligosaccharides, fucose, fructooligosaccharides (kestose, nystose and the like), maltotetraol, maltotriol, malto-oligosaccharides (maltotriose, maltotetraose, maltopentaose, maltohexaose, maltoheptaose and the like), lactulose, melibiose, raffinose, rhamnose, ribose, isomerized liquid sugars such as high fructose corn/starch syrup (e.g., HFCS55, HFCS42, or HFCS90), coupling sugars, soybean oligosaccharides, or glucose syrup.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener select from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving nucleotide additive and at least one sweet taste improving polyol additive; wherein the at least one nucleotide additive is chosen from inosine monophosphate ("IMP"), guanosine monophosphate ("GMP"), adenosine monophosphate ("AMP"), cytosine monophosphate (CMP), uracil monophosphate (UMP), inosine diphosphate, guanosine diphosphate, adenosine diphosphate, cytosine diphosphate, uracil diphosphate, inosine triphosphate, guanosine triphosphate, adenosine triphosphate, cytosine triphosphate, uracil triphosphate, nucleosides thereof, nucleic acid bases thereof, or salts thereof; and wherein the at least

one polyol additive is chosen from erythritol, maltitol, mannitol, sorbitol, lactitol, xylitol, isomalt, propylene glycol, glycerol, threitol, galactitol, palatinose, reduced isomalto-oligosaccharides, reduced xylo-oligosaccharides, reduced gentio-oligosaccharides, reduced maltose syrup, or reduced glucose syrup.

5 In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener select from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving nucleotide additive and at least one sweet taste improving amino acid additive; wherein the at least one nucleotide additive is chosen from inosine monophosphate ("IMP"), guanosine monophosphate ("GMP"), adenosine monophosphate ("AMP"), cytosine monophosphate (CMP), uracil monophosphate (UMP), inosine diphosphate, guanosine diphosphate, adenosine diphosphate, cytosine diphosphate, uracil diphosphate, inosine triphosphate, guanosine triphosphate, adenosine triphosphate, cytosine triphosphate, uracil triphosphate, nucleosides thereof, nucleic acid bases thereof, or salts thereof; and wherein the at least one amino acid additive chosen from aspartic acid, arginine, glycine, glutamic acid, proline, threonine, theanine, cysteine, cystine, alanine, valine, tyrosine, leucine, isoleucine, asparagine, serine, lysine, histidine, ornithine, methionine, carnitine, aminobutyric acid (alpha-, beta-, or gamma- isomers), glutamine, hydroxyproline, taurine, norvaline, sarcosine, or salts thereof.

25 In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving carbohydrate additive, at least one sweet taste improving polyol additive, and at least one sweet taste improving amino acid additive; wherein the at least one carbohydrate

additive is chosen from tagatose, trehalose, galactose, rhamnose, cyclodextrin (e.g., α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrin), maltodextrin (including resistant maltodextrins such as Fibersol-2TM), dextran, sucrose, glucose, ribulose, fructose, threose, arabinose, xylose, lyxose, allose, altrose, mannose, idose, lactose, maltose, invert sugar, isotrehalose, neotrehalose, palatinose or isomaltulose, erythrose, deoxyribose, gulose, idose, talose, erythrulose, xylulose, psicose, turanose, cellobiose, amylopectin, glucosamine, mannosamine, fucose, glucuronic acid, gluconic acid, glucono-lactone, abequose, galactosamine, beet oligosaccharides, isomalto-oligosaccharides (isomaltose, isomaltotriose, panose and the like), xylo-oligosaccharides (xylotriose, xylobiose and the like), gentio-oligosaccharides (gentiobiose, gentiotriose, gentiotetraose and the like), sorbose, nigero-oligosaccharides, palatinose oligosaccharides, fucose, fructooligosaccharides (kestose, nystose and the like), maltotetraol, maltotriol, malto-oligosaccharides (maltotriose, maltotetraose, maltopentaose, maltohexaose, maltoheptaose and the like), lactulose, melibiose, raffinose, rhamnose, ribose, isomerized liquid sugars (high fructose corn/starch syrup *e.g.* HFCS55, HFCS42, or HFCS90), coupling sugars, soybean oligosaccharides, or glucose syrup; wherein the at least one polyol additive is chosen from erythritol, maltitol, mannitol, sorbitol, lactitol, xylitol, isomalt, propylene glycol, glycerol, threitol, galactitol, palatinose, reduced isomalto-oligosaccharides, reduced xylo-oligosaccharides, reduced gentio-oligosaccharides, reduced maltose syrup, or reduced glucose syrup; and wherein the at least one amino acid additive chosen from aspartic acid, arginine, glycine, glutamic acid, proline, threonine, theanine, cysteine, cystine, alanine, valine, tyrosine, leucine, isoleucine, asparagine, serine, lysine, histidine, ornithine, methionine, carnitine, aminobutyric acid (α -, β -, or γ - isomers), glutamine, hydroxyproline, taurine, norvaline, sarcosine, or salts thereof.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener select from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving carbohydrate additive and at least one sweet taste improving polyol additive; wherein the

at least one carbohydrate additive is chosen from tagatose, trehalose, galactose, rhamnose, cyclodextrin (e.g., α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrin), maltodextrin (including resistant maltodextrins such as Fibersol-2™), dextran, sucrose, glucose, ribulose, fructose, threose, arabinose, xylose, lyxose, allose, altrose, mannose, idose, lactose, maltose, invert sugar, isotrehalose, neotrehalose, palatinose or isomaltulose, erythrose, deoxyribose, gulose, idose, talose, erythrulose, xylulose, psicose, turanose, cellobiose, amylopectin, glucosamine, mannosamine, fucose, glucuronic acid, gluconic acid, glucono-lactone, abequose, galactosamine, beet oligosaccharides, isomalto-oligosaccharides (isomaltose, isomaltotriose, panose and the like), xylo-oligosaccharides (xylotriose, xylobiose and the like), gentio-oligosaccharides (gentiobiose, gentiotriose, gentiotetraose and the like), sorbose, nigero-oligosaccharides, palatinose oligosaccharides, fucose, fructooligosaccharides (kestose, nystose and the like), maltotetraol, maltotriol, malto-oligosaccharides (maltotriose, maltotetraose, maltopentaose, maltohexaose, maltoheptaose and the like), lactulose, melibiose, raffinose, rhamnose, ribose, isomerized liquid sugars such as high fructose corn/starch syrup (e.g., HFCS55, HFCS42, or HFCS90), coupling sugars, soybean oligosaccharides, or glucose syrup; and wherein the at least one polyol additive is chosen from erythritol, maltitol, mannitol, sorbitol, lactitol, xylitol, isomalt, propylene glycol, glycerol, threitol, galactitol, palatinose, reduced isomalto-oligosaccharides, reduced xylo-oligosaccharides, reduced gentio-oligosaccharides, reduced maltose syrup, or reduced glucose syrup.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener select from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving carbohydrate additive and at least one sweet taste improving amino acid additive; wherein the at least one carbohydrate additive is chosen from tagatose, trehalose, galactose, rhamnose, cyclodextrin (e.g., α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrin), maltodextrin (including resistant maltodextrins such as Fibersol-2™), dextran, sucrose, glucose, ribulose, fructose, threose, arabinose, xylose, lyxose, allose, altrose, mannose,

idose, lactose, maltose, invert sugar, isotrehalose, neotrehalose, palatinose or isomaltulose, erythrose, deoxyribose, gulose, idose, talose, erythrulose, xylulose, psicose, turanose, cellobiose, amylopectin, glucosamine, mannosamine, fucose, glucuronic acid, gluconic acid, glucono-lactone, abequose, galactosamine, beet oligosaccharides, isomalto-
 5 oligosaccharides (isomaltose, isomaltotriose, panose and the like), xylo-oligosaccharides (xylotriase, xylobiose and the like), gentio-oligosaccharides (gentiobiose, gentiotriose, gentiotetraose and the like), sorbose, nigero-oligosaccharides, palatinose oligosaccharides, fucose, fructooligosaccharides (kestose, nystose and the like), maltotetraol, maltotriol, malto-oligosaccharides (maltotriose, maltotetraose, maltopentaose, maltohexaose,
 10 maltoheptaose and the like), lactulose, melibiose, raffinose, rhamnose, ribose, isomerized liquid sugars such as high fructose corn/starch syrup (e.g., HFCS55, HFCS42, or HFCS90), coupling sugars, soybean oligosaccharides, or glucose syrup; and wherein the at least one amino acid additive is chosen from aspartic acid, arginine, glycine, glutamic acid, proline, threonine, theanine, cysteine, cystine, alanine, valine, tyrosine, leucine,
 15 isoleucine, asparagine, serine, lysine, histidine, ornithine, methionine, carnitine, aminobutyric acid (alpha-, beta-, or gamma- isomers), glutamine, hydroxyproline, taurine, norvaline, sarcosine, or salts thereof.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener select from the group consisting of sucralose, potassium acesulfame,
 20 aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving
 25 polyol additive and at least one sweet taste improving amino acid additive; wherein the at least one at least one polyol additive is chosen from erythritol, maltitol, mannitol, sorbitol, lactitol, xylitol, isomalt, propylene glycol, glycerol, threitol, galactitol, palatinose, reduced isomalto-oligosaccharides, reduced xylo-oligosaccharides, reduced gentio-oligosaccharides, reduced maltose syrup, or reduced glucose syrup; and wherein the at
 30 least one amino acid additive is chosen from aspartic acid, arginine, glycine, glutamic acid, proline, threonine, theanine, cysteine, cystine, alanine, valine, tyrosine, leucine, isoleucine, asparagine, serine, lysine, histidine, ornithine, methionine, carnitine,

aminobutyric acid (alpha-, beta-, or gamma- isomers), glutamine, hydroxyproline, taurine, norvaline, sarcosine, or salts thereof.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving polyol additive and at least one sweet taste improving inorganic salt additive; wherein the at least one polyol additive is chosen from erythritol, maltitol, mannitol, sorbitol, lactitol, xylitol, isomalt, propylene glycol, glycerol, threitol, galactitol, palatinose, reduced isomalto-oligosaccharides, reduced xylo-oligosaccharides, reduced gentio-oligosaccharides, reduced maltose syrup, or reduced glucose syrup; and wherein the at least one inorganic salt additive is chosen from sodium chloride, potassium chloride, sodium sulfate, potassium citrate, europium chloride (EuCl₃), gadolinium chloride (GdCl₃), terbium chloride (TbCl₃), magnesium sulfate, alum, magnesium chloride, mono-, di-, tri-basic sodium or potassium salts of phosphoric acid (e.g., inorganic phosphates), salts of hydrochloric acid (e.g., inorganic chlorides), sodium carbonate, sodium bisulfate, or sodium bicarbonate.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener select from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving carbohydrate additive and at least one sweet taste improving inorganic salt additive; wherein the at least one carbohydrate additive is chosen from tagatose, trehalose, galactose, rhamnose, cyclodextrin (e.g., α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrin), maltodextrin (including resistant maltodextrins such as Fibersol-2™), dextran, sucrose, glucose, ribulose, fructose, threose, arabinose, xylose, lyxose, allose, altrose, mannose, idose, lactose, maltose, invert sugar, isotrehalose, neotrehalose,

palatinose or isomaltulose, erythrose, deoxyribose, gulose, idose, talose, erythrulose, xylulose, psicose, turanose, cellobiose, amylopectin, glucosamine, mannosamine, fucose, glucuronic acid, gluconic acid, glucono-lactone, abequose, galactosamine, beet oligosaccharides, isomalto-oligosaccharides (isomaltose, isomaltotriose, panose and the like), xylo-oligosaccharides (xylotriose, xylobiose and the like), gentio-oligosaccharides (gentiobiose, gentiotriose, gentiotetraose and the like), sorbose, nigero-oligosaccharides, palatinose oligosaccharides, fucose, fructooligosaccharides (kestose, nystose and the like), maltotetraol, maltotriol, malto-oligosaccharides (maltotriose, maltotetraose, maltopentaose, maltohexaose, maltoheptaose and the like), lactulose, melibiose, raffinose, rhamnose, ribose, isomerized liquid sugars such as high fructose corn/starch syrup (e.g., HFCS55, HFCS42, or HFCS90), coupling sugars, soybean oligosaccharides, or glucose syrup; and wherein the at least one inorganic salt additive is chosen from sodium chloride, potassium chloride, sodium sulfate, potassium citrate, europium chloride (EuCl_3), gadolinium chloride (GdCl_3), terbium chloride (TbCl_3), magnesium phosphate, magnesium chloride, magnesium sulfate, alum, mono-, di-, tri-basic sodium or potassium salts of phosphoric acid (e.g., inorganic phosphates), salts or hydrochloric acid (e.g., inorganic chlorides), sodium carbonate, sodium bisulfate, or sodium bicarbonate.

In one embodiment, a sweetener composition is provided comprising at least one synthetic sweetener select from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving carbohydrate additive, at least one sweet taste improving amino acid additive, and at least one sweet taste improving inorganic salt additive; wherein the at least one carbohydrate additive is chosen from tagatose, trehalose, galactose, rhamnose, cyclodextrin (e.g., α -cyclodextrin, β -cyclodextrin, and γ -cyclodextrin), maltodextrin (including resistant maltodextrins such as Fibersol-2TM), dextran, sucrose, glucose, ribulose, fructose, threose, arabinose, xylose, lyxose, allose, altrose, mannose, idose, lactose, maltose, invert sugar, isotrehalose, neotrehalose, palatinose or isomaltulose, erythrose, deoxyribose, gulose, idose, talose, erythrulose, xylulose, psicose, turanose, cellobiose, amylopectin,

glucosamine, mannosamine, fucose, glucuronic acid, gluconic acid, glucono-lactone, abequeose, galactosamine, beet oligosaccharides, isomalto-oligosaccharides (isomaltose, isomaltotriose, panose and the like), xylo-oligosaccharides (xylotriose, xylobiose and the like), gentio-oligosaccharides (gentiobiose, gentiotriose, gentiotetraose and the like), sorbose, niger-oligosaccharides, palatinose oligosaccharides, fucose, fructooligosaccharides (kestose, nystose and the like), maltotetraol, maltotriol, malto-oligosaccharides (maltotriose, maltotetraose, maltopentaose, maltohexaose, maltoheptaose and the like), lactulose, melibiose, raffinose, rhamnose, ribose, isomerized liquid sugars such as high fructose corn/starch syrup (e.g., HFCS55, HFCS42, or HFCS90), coupling sugars, soybean oligosaccharides, or glucose syrup; wherein the at least one amino acid additive is chosen from aspartic acid, arginine, glycine, glutamic acid, proline, threonine, theanine, cysteine, cystine, alanine, valine, tyrosine, leucine, isoleucine, asparagine, serine, lysine, histidine, ornithine, methionine, carnitine, aminobutyric acid (alpha-, beta-, or gamma- isomers), glutamine, hydroxyproline, taurine, norvaline, sarcosine, or salts thereof; and wherein the at least one inorganic salt additive is chosen from sodium chloride, potassium chloride, sodium sulfate, potassium citrate, europium chloride (EuCl_3), gadolinium chloride (GdCl_3), terbium chloride (TbCl_3), magnesium sulfate, alum, magnesium chloride, magnesium phosphate, salts of hydrochloric acid, mono-, di-, tri-basic sodium or potassium salts of phosphoric acid, sodium carbonate, sodium bisulfate, or sodium bicarbonate.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving polyol additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 ppm to about 25,000 ppm of the composition, and the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. In a still more particular embodiment, the at least one sweet taste improving amino acid additive is glycine or lysine, and the at least one sweet taste improving polyol additive is erythritol.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving protein or protein hydrolysate additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about

100 to about 25,000 ppm of the composition, and the at least one sweet taste improving protein or protein hydrolysate additive is present in an amount from about 200 ppm to about 50,000 ppm of the composition. In a still more particular embodiment, the at least one sweet taste improving amino acid additive is glycine or lysine, and the at least one
5 sweet taste improving protein or protein hydrolysate additive is a protein, a hydrolysate, or a reaction product of a hydrolysate of proteins containing glycine, alanine, serine, leucine, valine, isoleucine, proline, or threonine.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving protein or protein hydrolysate additive, and at least one
10 sweet taste improving polyol additive is provided. In a particular embodiment, the at least one sweet taste improving protein hydrolysate additive is present in an amount from about 200 ppm to about 50,000 ppm of the composition, and at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. In a still more particular embodiment, the at least one sweet taste improving
15 protein or protein hydrolysate additive is a protein, a hydrolysate, or a reaction product of a hydrolysate of proteins containing glycine, alanine, serine, leucine, valine, isoleucine, proline, or threonine, and the at least one sweet taste improving polyol additive is erythritol.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving carbohydrate additive is provided. In a particular
20 embodiment, the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition. In a still more particular embodiment, the composition comprises sucralose and D-fructose.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving polyol additive is provided. In a particular embodiment,
25 the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. Non-limiting examples include sucralose in combination with propylene glycol, erythritol, or combinations thereof.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving polyol additive is provided. Desirably, the at least one
30 sweet taste improving polyol comprises erythritol. In a particular embodiment of the

composition, sucralose is present in an amount from about 1 to about 1,000 ppm and the erythritol is present in an amount from about 400 to about 80,000 ppm of the total composition.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving carbohydrate additive and at least one sweet taste improving polyol additive is provided. In a particular embodiment, the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition, and at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. Non-limiting examples include sucralose in combination with tagatose, fructose or sucrose and erythritol.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving inorganic salt additive is provided. Non-limiting examples include sucralose in combination with NaCl, KCl, NaHSO₄.H₂O, NaH₂PO₄, MgSO₄, KAl(SO₄)₂ (alum), magnesium phosphate, magnesium chloride, KCl and KH₂PO₄, or other combinations thereof. A particularly desirable embodiment comprises sucralose in combination with a mixture of sweet taste improving inorganic salt additives, such as chlorides, phosphates, and sulfates of sodium, magnesium, potassium, and calcium (e.g., sodium chloride and potassium chloride; potassium phosphate and potassium chloride; sodium chloride and sodium phosphate; calcium phosphate and calcium sulfate; magnesium chloride and magnesium phosphate; and calcium phosphate, calcium sulfate, and potassium sulfate).

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving organic acid salt additive is provided. Non-limiting examples include sucralose in combination with choline chloride in citrate buffer, D-gluconic acid sodium salt, guanidine HCl, D-glucosamine HCl, amiloride HCl, or combinations thereof.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving organic acid additive is provided. Non-limiting examples include sucralose in combination with fumaric acid, malic acid, tartaric acid, citric acid, adipic acid, ascorbic acid, tannic acid, lauric arginate, or combinations thereof.

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In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition. Non-limiting examples
5 include sucralose in combination with glycine, L-alanine, L-serine, L-threonine, β -alanine, L-aspartic acid, L-glutamic acid, L-lysine, glycine and L-alanine mixture, salt derivatives or combinations thereof.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving surfactant additive is provided. Non-limiting examples
10 include sucralose in combination with dioctyl sulfosuccinate sodium, cetylpyridinium chloride, hexadecyltrimethylammonium bromide, sucrose oleate, polysorbate 20, polysorbate 80, lecithin, or combinations thereof.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving polymer additive is provided. Non-limiting examples
15 include sucralose in combination with cationic polymers such as polyethyleneimine, poly-L-lysine (e.g., poly-L- α -lysine or poly-L- ϵ -lysine), poly-L-ornithine (e.g., poly-L- α -ornithine or poly-L- ϵ -ornithine), chitosan, or combinations thereof.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving polymer additive and at least one sweet taste improving
20 polyol additive is provided. In a particular embodiment, the at least one sweet taste improving polymer additive is present in an amount from about 30 to about 2,000 ppm of the composition, and the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. Non-limiting examples
25 include sucralose in combination with a hydrocolloid, such as a gum acacia seyal, and erythritol.

In one embodiment, a composition comprising sucralose in combination with at least one sweet taste improving protein or protein hydrolysate additive is provided. Non-limiting examples include sucralose in combination with bovine serum albumin (BSA), whey protein or combinations thereof.

30 In another embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive and at least one sweet taste

improving inorganic acid salt additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition, and the at least one sweet taste improving inorganic acid salt additive is present in an amount from about 25 to about 5,000 ppm of the composition. Non-limiting examples include sucralose in combination with glycine and alum; sucralose in combination with glycine and potassium chloride; sucralose in combination with glycine and sodium chloride; sucralose in combination with glycine, potassium phosphate, and potassium chloride; and sucralose in combination with glycine, sodium chloride, and potassium chloride.

In another embodiment, a composition comprising sucralose in combination with at least one sweet taste improving carbohydrate additive and at least one sweet taste improving inorganic acid salt additive is provided. In a particular embodiment, the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition, and the at least one sweet taste improving inorganic acid salt additive is present in an amount from about 25 to about 5,000 ppm of the composition. Non-limiting examples include sucralose in combination with fructose, sucrose, or glucose and alum; sucralose in combination with fructose, sucrose, or glucose and potassium chloride; sucralose in combination with fructose, sucrose, or glucose and sodium chloride; sucralose in combination with fructose, sucrose, or glucose, potassium phosphate, and potassium chloride; and sucralose in combination with fructose, sucrose, or glucose, sodium chloride, and potassium chloride.

In another embodiment, a composition comprising sucralose in combination with at least one sweet taste improving bitter additive and at least one sweet taste improving inorganic salt additive is provided. A non-limiting example include sucralose in combination with urea and sodium chloride.

In another embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving polyamino acid additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition, and the at least one sweet taste improving polyamino acid additive is present in an amount from about 30 to about 2,000 ppm of the

composition. Non-limiting examples include sucralose in combination with glycine and poly-L- α -lysine; and sucralose in combination with glycine and poly-L- ϵ -lysine.

In another embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving organic acid additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition and the at least one sweet taste improving organic acid additive is present in an amount from about 10 to about 5,000 ppm of the composition. A non-limiting example includes sucralose in combination with glycine and sodium gluconate.

In another embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving carbohydrate additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition and the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition. A non-limiting example includes sucralose in combination with L-alanine and fructose.

In another embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive, at least one sweet taste improving polyol additive, at least one sweet taste improving inorganic salt additive, and at least one sweet taste improving organic acid salt additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition, the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition, the at least one sweet taste improving inorganic salt additive is present in an amount from about 25 to about 5,000 ppm of the composition, and the at least one sweet taste improving organic acid salt additive is present in an amount from about 20 to about 50,000 ppm of the composition. A non-limiting example includes sucralose in combination with erythritol, glycine, KCl, KH_2PO_4 , and choline chloride.

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In another embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive, at least one sweet taste improving carbohydrate additive, and at least one sweet taste improving polyol additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition, the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition, and the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. A non-limiting example includes sucralose in combination with L-alanine, fructose, and erythritol.

In another embodiment, a composition comprising sucralose in combination with at least one sweet taste improving amino acid additive, at least one sweet taste improving polyol, additive, and at least one sweet taste improving inorganic acid salt additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition, the at least one sweet taste

improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition, and the at least one sweet taste improving inorganic acid salt additive is present in an amount from about 25 to about 5,000 ppm of the composition. A non-limiting example includes sucralose in combination with erythritol, glycine, KCl, and KH_2PO_4 .

In another embodiment, a composition comprising sucralose in combination with a sweet taste improving inorganic acid salt additive is provided. A non-limiting example includes sucralose in combination with sodium chloride.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving polyol additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 ppm to about 25,000 ppm of the composition, and the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. In a still

more particular embodiment, the at least one sweet taste improving amino acid additive is glycine or lysine, and the at least one sweet taste improving polyol additive is erythritol.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving protein or protein hydrolysate additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition, and the at least one sweet taste improving protein hydrolysate additive is present in an amount from about 200 to about 50,000 ppm of the composition. In a still more particular embodiment, the at least one sweet taste improving amino acid additive is glycine or lysine, and the at least one sweet taste improving protein or protein hydrolysate additive is a protein, a hydrolysate, or a reaction product of a hydrolysate of proteins containing glycine, alanine, serine, leucine, valine, isoleucine, proline, or threonine.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving protein or protein hydrolysate additive, and at least one sweet taste improving polyol additive is provided. In a particular embodiment, the at least one sweet taste improving protein or protein hydrolysate additive is present in an amount from about 200 to about 50,000 ppm of the composition and at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. In a still more particular embodiment, the at least one sweet taste improving protein or protein hydrolysate additive is a protein, a hydrolysate, or a reaction product of a hydrolysate of proteins containing glycine, alanine, serine, leucine, valine, isoleucine, proline, or threonine, and the at least one sweet taste improving polyol additive is erythritol.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving carbohydrate additive is provided. In a particular embodiment, the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition. In a still more particular embodiment, the composition comprises neotame and D-fructose.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving polyol additive is provided. In a particular embodiment,

the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. Non-limiting examples include neotame in combination with propylene glycol, erythritol, or combinations thereof.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving carbohydrate additive and at least one sweet taste improving polyol additive is provided. In a particular embodiment, the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition and at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. Non-limiting examples include neotame in combination with tagatose, fructose or sucrose and erythritol.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving inorganic salt additive is provided. Non-limiting examples include neotame in combination with NaCl, KCl, NaHSO₄.H₂O, NaH₂PO₄, MgSO₄, KAl(SO₄)₂ (alum), magnesium chloride, magnesium phosphate, KCl and KH₂PO₄, or other combinations thereof.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving organic acid salt additive is provided. Non-limiting examples include neotame in combination with choline chloride in citrate buffer, D-gluconic acid sodium salt, guanidine HCl, D-glucosamine HCl, amiloride HCl, or combinations thereof.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving organic acid additive is provided. Non-limiting examples include neotame in combination with fumaric acid, malic acid, tartaric acid, citric acid, adipic acid, ascorbic acid, tannic acid, lauric arginate, or combinations thereof.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 15,000 ppm of the composition. Non-limiting examples include neotame in combination with glycine, L-alanine, L-serine, L-threonine, β-alanine,

aminobutyric acid (alpha-, beta-, or gamma- isomers), L-aspartic acid, L-glutamic acid, L-lysine, glycine and L-alanine mixture, salt derivatives or combinations thereof.

In one embodiment, a composition comprising neotame combination with at least one sweet taste improving surfactant additive is provided. Non-limiting examples include neotame in combination with dioctyl sulfosuccinate sodium, cetylpyridinium chloride, hexadecyltrimethylammonium bromide, sucrose oleate, polysorbate 20, polysorbate 80, lecithin, or combinations thereof.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving polymer additive is provided. Non-limiting examples include neotame in combination with cationic polymer such as polyethyleneimine, poly-L-ornithine, poly-L-lysine (e.g., poly-L- α -lysine or poly-L- ϵ -lysine), poly-L-ornithine (e.g., poly-L- α -ornithine or poly-L- ϵ -ornithine), chitosan, or combinations thereof.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving polymer additive and at least one sweet taste improving polyol additive is provided. In a particular embodiment, the at least one sweet taste improving polymer additive is present in an amount from about 30 to about 2,000 ppm of the composition and the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition. Non-limiting examples include neotame in combination with a hydrocolloid, such as a gum acacia seyal, and erythritol.

In one embodiment, a composition comprising neotame in combination with at least one sweet taste improving protein or protein hydrolysate additive is provided. Non-limiting examples include neotame in combination with bovine serum albumin (BSA), whey protein or combinations thereof.

In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving inorganic acid salt additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition and the at least one sweet taste improving inorganic acid salt additive is present in an amount from about 25 to about 5,000 ppm of the composition. Non-limiting examples include neotame in combination with glycine and alum; neotame

in combination with glycine and potassium chloride; neotame in combination with glycine and sodium chloride; neotame in combination with glycine, potassium phosphate, and potassium chloride; and neotame in combination with glycine, sodium chloride, and potassium chloride.

5 In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving carbohydrate additive and at least one sweet taste improving inorganic acid salt additive is provided. In a particular embodiment, the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition and the at least one sweet taste improving
10 inorganic acid salt additive is present in an amount from about 25 to about 5,000 ppm of the composition. Non-limiting examples include neotame in combination with fructose, sucrose, or glucose and alum; neotame in combination with fructose, sucrose, or glucose and potassium chloride; neotame in combination with fructose, sucrose, or glucose and sodium chloride; neotame in combination with fructose, sucrose, or glucose, potassium
15 phosphate, and potassium chloride; and neotame in combination with fructose, sucrose, or glucose, sodium chloride, and potassium chloride.

In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving bitter additive and at least one sweet taste improving inorganic salt additive is provided. A non-limiting example includes neotame in
20 combination with urea and sodium chloride.

In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving polyamino acid additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about
25 25,000 ppm of the composition and the at least one sweet taste improving polyamino acid additive is present in an amount from about 30 to about 2,000 ppm of the composition. Non-limiting examples include neotame in combination with glycine and poly-L- α -lysine; and neotame in combination with glycine and poly-L- ϵ -lysine.

In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving
30 organic acid additive is provided. In a particular embodiment, the at least one sweet taste

improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition and the at least one sweet taste improving organic acid additive is present in an amount from about 10 to about 5,000 ppm of the composition. A non-limiting example includes neotame in combination with glycine and sodium gluconate.

5 In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive and at least one sweet taste improving carbohydrate additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition and the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition. A non-limiting example includes neotame in combination with L-alanine and fructose.

10 In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive, at least one sweet taste improving polyol additive, at least one sweet taste improving inorganic salt additive, and at least one sweet taste improving organic acid salt additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition, the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition, the at least one sweet taste improving inorganic salt additive is present in an amount from about 25 to about 5,000 ppm of the composition, and the at least one sweet taste improving organic acid salt additive is present in an amount from about 20 to about 10,000 ppm of the composition. A non-limiting example includes neotame in combination with erythritol, glycine, KCl, KH_2PO_4 , and choline chloride.

15 In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive, at least one sweet taste improving carbohydrate additive, and at least one sweet taste improving polyol additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition, the at least one sweet taste improving carbohydrate additive is present in an amount from about 1,000 to about 100,000 ppm of the composition, and the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the

composition. A non-limiting example includes neotame in combination with L-alanine, fructose, and erythritol.

In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving amino acid additive, at least one sweet taste improving polyol, additive, and at least one sweet taste improving inorganic acid salt additive is provided. In a particular embodiment, the at least one sweet taste improving amino acid additive is present in an amount from about 100 to about 25,000 ppm of the composition, the at least one sweet taste improving polyol additive is present in an amount from about 400 to about 80,000 ppm of the composition, and the at least one sweet taste improving inorganic acid salt additive is present in an amount from about 25 to about 5,000 ppm of the composition. A non-limiting example includes neotame in combination with erythritol, glycine, KCl, and KH_2PO_4 .

In another embodiment, a composition comprising neotame in combination with a sweet taste improving inorganic acid salt additive is provided. A non-limiting example includes neotame in combination with sodium chloride.

In one embodiment, a composition is provided comprising at least one synthetic sweetener chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, or N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester in combination with at least one sweet taste improving polyol additive and at least one sweet taste improving organic acid additive. Desirably, the at least one sweet taste improving polyol additive is present in an amount from about 20,000 to about 50,000 ppm of the composition and the at least one sweet taste improving organic acid additive is present in an amount from about 10 to about 5,000 ppm of the composition. Wherein more than one sweet taste improving organic acid additive is present in the composition, the plurality of sweet taste improving organic acid additives are present in an amount from about 500 to about 2,500 ppm of the composition, more particularly in an amount from about 500 to about 1,500 ppm of the composition. In a particular embodiment, the sweetener composition described hereinabove further comprises at least one sweet taste improving inorganic acid additive, at least one sweet taste improving inorganic acid salt

additive, at least one sweet taste improving organic acid salt additive, or combinations thereof.

In another embodiment, a composition comprising neotame in combination with at least one sweet taste improving polyol additive and at least one sweet taste improving organic acid additive is provided. In a particular embodiment, the neotame is present in the composition in an amount from about 2 to about 20 ppm, more desirably in an amount from about 10 to about 15 ppm. Desirably, the at least one sweet taste improving polyol additive is present in an amount from about 20,000 to about 50,000 ppm of the composition and the at least one sweet taste improving organic acid additive is present in an amount from about 10 to about 5,000 ppm of the composition. In a particularly desirable embodiment, the at least one sweet taste improving polyol additive is present in an amount from about 30,000 to about 40,000 ppm and the at least one sweet taste improving organic acid additive is present in an amount from about 500 to about 2,500 ppm of the composition. In a particular embodiment, a plurality of sweet taste improving organic acid additives are present in the sweetener composition in an amount from about 500 to about 2,500 ppm of the composition, the plurality of organic acid additives comprising a mixture of lactic acid in an amount from about 40 to about 250 ppm, citric acid in an amount from about 150 to about 460 ppm, malic acid in an amount from about 150 to about 460 ppm, and tartaric acid in an amount from about 150 to about 460 ppm. A non-limiting example includes neotame in combination with erythritol, lactic acid, citric acid, malic acid, tartaric acid, or combinations thereof. In a particular embodiment, the composition comprises 34,000 ppm of erythritol, 80 ppm of lactic acid, 310 ppm of citric acid, 310 ppm of malic acid, 310 ppm of tartaric acid, and 15 ppm of neotame. The composition optionally also may include flavorants such as caramel, vanilla, or other such flavorants as described herein, or combinations thereof. In a particular embodiment, such a composition is a carbonated soft drink, such as a cola, although other types of beverages are contemplated as well. Those of ordinary skill in the art should appreciate that the amounts of the sweet taste improving organic acids in a carbonated beverage may be modified to obtain a pH from about 2.3 to about 3.5. In addition, those of ordinary skill in the art also should appreciate that sweet taste improving inorganic acid additives, such as phosphoric acid, benzoic acid, and sorbic acid, may be used individually or in combination in a carbonated beverage in order to obtain a pH from about 2.3 to about 3.5.

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In another embodiment, the composition comprising neotame in combination with at least one sweet taste improving polyol additive and at least one sweet taste improving organic acid additive described hereinabove further comprises at least one sweet taste improving inorganic acid additive. Desirably, at least one sweet taste improving inorganic acid additive is present in an amount from about 25 to about 5,000 ppm of the composition. Non-limiting examples of sweet taste improving inorganic acid additives include phosphoric acid, benzoic acid, sorbic acid, and combinations thereof.

In yet another embodiment, the composition comprising neotame in combination with at least one sweet taste improving polyol additive and at least one sweet taste improving organic acid additive described hereinabove further comprises at least one sweet taste improving inorganic acid salt additive and/or at least one sweet taste improving organic acid salt additive. Desirably, the at least one sweet taste improving inorganic acid salt additive is present in an amount from about 25 to about 5,000 ppm of the composition, more desirably in an amount from about 50 to about 250 ppm, most desirably in an amount of about 150 ppm. Desirably, the at least one sweet taste improving organic acid salt additive is present in an amount from about 20 to about 10,000 ppm of the composition, more desirably in an amount from about 50 to about 350 ppm, most desirably in an amount of about 148 ppm. Non-limiting examples include neotame in combination with erythritol, sodium chloride or magnesium chloride, and lactic acid, citric acid, malic acid, tartaric acid, or combinations thereof; neotame in combination with erythritol, potassium citrate or sodium citrate, and lactic acid, citric acid, malic acid, tartaric acid, or combinations thereof; or neotame in combination with erythritol, sodium chloride and sodium citrate, lactic acid, citric acid, malic acid, and tartaric acid, or combinations thereof.

In another embodiment, the composition comprising neotame in combination with at least one sweet taste improving polyol additive, at least one sweet taste improving inorganic acid additive, and at least one sweet taste improving organic acid additive described hereinabove further comprises at least one sweet taste improving inorganic acid salt additive and/or at least one sweet taste improving organic acid salt additive. Desirably, the at least one sweet taste improving inorganic acid salt additive is present in an amount from about 25 to about 5,000 ppm of the composition, more desirably in an amount from about 50 to about 250 ppm, most desirably in an amount of about 150 ppm.

Desirably, the at least one sweet taste improving organic acid salt additive is present in an amount from about 20 to about 10,000 ppm of the composition, more desirably in an amount from about 50 to about 350 ppm, most desirably in an amount of about 148 ppm. Non-limiting examples include neotame in combination with erythritol, phosphoric acid, sodium chloride or magnesium chloride, and lactic acid, citric acid, malic acid, tartaric acid, or combinations thereof; neotame in combination with erythritol, phosphoric acid, potassium citrate or sodium citrate, and lactic acid, citric acid, malic acid, tartaric acid, or combinations thereof; or neotame in combination with erythritol, phosphoric acid, sodium chloride and sodium citrate, lactic acid, citric acid, malic acid, and tartaric acid, or combinations thereof.

The desired weight ratio of synthetic sweetener to sweet taste improving composition(s) will depend on the synthetic sweetener, and the sweetness and other characteristics desired in the final product or orally ingestible edible composition. Synthetic sweeteners vary greatly in their potency, ranging from about 30 times more potent than sucrose to about 8,000 times more potent than sucrose on a weight basis. In general, the weight ratio of the synthetic sweetener to sweet taste improving composition may for example range from between 10,000:1 to about 1:10,000; a further non-limiting example may range from about 9,000:1 to about 1:9,000; yet another example may range from about 8,000:1 to about 1:8,000; a further example may range from about 7,000:1 to about 1:7,000; another example may range from about 6,000:1 to about 1:6000; in yet another example may range from about 5,000:1 to about 1:5,000; in yet another example may range from about 4,000:1 to about 1:4,000; in yet another example may range from about 3,000:1 to about 1:3,000; in yet another example may range from about 2,000:1 to about 1:2,000; in yet another example may range from about 1,500:1 to about 1:1,500; in yet another example may range from about 1,000:1 to about 1:1,000; in yet another example may range from about 900:1 to about 1:900; in yet another example may range from about 800:1 to about 1:800; in yet another example may range from about 700:1 to about 1:700; in yet another example may range from about 600:1 to about 1:600; in yet another example may range from about 500:1 to about 1:500; in yet another example may range from about 400:1 to about 1:400; in yet another example may range from about 300:1 to about 1:300; in yet another example may range from about 200:1 to about 1:200; in yet another example may range from about 150:1 to about 1:150; in yet another

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example may range from about 100:1 to about 1:100; in yet another example may range from about 90:1 to about 1:90; in yet another example may range from about 80:1 to about 1:80; in yet another example may range from about 70:1 to about 1:70; in yet another example may range from about 60:1 to about 1:60; in yet another example may range from about 50:1 to about 1:50; in yet another example may range from about 40:1 to about 1:40; in yet another example may range from about 30:1 to about 1:30; in yet another example may range from about 20:1 to about 1:20; in yet another example may range from about 15:1 to about 1:15; in yet another example may range from about 10:1 to about 1:10; in yet another example may range from about 9:1 to about 1:9; in yet another example may range from about 8:1 to about 1:8; in yet another example may range from about 7:1 to about 1:7; in yet another example may range from about 6:1 to about 1:6; in yet another example may range from about 5:1 to about 1:5; in yet another example may range from about 4:1 to about 1:4; in yet another example may range from about 3:1 to about 1:3; in yet another example may range from about 2:1 to about 1:2; and in yet another example may be at about 1:1; depending on the particular synthetic sweetener selected.

It is contemplated that the combination of at least one synthetic sweetener and at least one sweet taste improving composition may be carried out in any pH range that does not materially or adversely affect the taste of a synthetic sweetener or the orally ingestible composition which comprises a synthetic sweetener. A non-limiting example of the pH range may be from about 2 to about 8. A further example includes a pH range from about 2 to about 5.

One of ordinary skill in the art may combine at least one synthetic sweetener and at least one sweet taste improving composition in any manner which does not materially or adversely affect the taste of the orally ingestible composition. For example, a synthetic sweetener may be added to the orally ingestible composition before the sweet taste improving composition. In another example, a synthetic sweetener may be added to the orally ingestible composition after the sweet taste improving composition. In yet another example, a synthetic sweetener may be added to the orally ingestible composition simultaneously with the sweet taste improving composition.

In another embodiment, a synthetic sweetener may be combined with the sweet taste improving composition prior to being added to the orally ingestible composition. For example, a synthetic sweetener may be in a pure, diluted, or concentrated form as a liquid or solid.

(e.g., solution), solid (e.g., powder, chunk, pellet, grain, block, crystalline, or the like), suspension, gas state, or combinations thereof may be contacted with the sweet taste improving composition which may be in a pure, diluted, or concentrated form as a liquid (e.g., solution), solid (e.g., powder, chunk, pellet, grain, block, crystalline, or the like),
5 suspension, gas state, or combinations thereof before both are contacted with an orally ingestible composition. In yet another embodiment, when there are more than one synthetic sweetener or more than one sweet taste improving composition, each component of the synthetic sweetener and the sweet taste improving composition may be added simultaneously, in an alternating pattern, in a random pattern, or any other pattern which
10 will not adversely affect the taste of the orally ingestible composition.

3. Orally Ingestible Sweetened Compositions

As explained hereinabove, sweetened compositions in accordance with embodiments of this invention comprise a sweetenable composition, at least one synthetic sweetener, and at least one sweet taste improving composition. A multitude of suitable
15 sweetenable compositions are described hereinabove.

Generally, the amount of synthetic sweetener present in a sweetened composition varies widely depending on the particular type of sweetened composition and its desired sweetness. Those of ordinary skill in the art can readily discern the appropriate amount of sweetener to put in the sweetened composition. In a particular embodiment, the at least
20 one synthetic sweetener is present in the sweetened composition in an amount in the range of about 1 to about 5,000 ppm of the sweetened composition, and the at least one sweet taste improving composition is present in the sweetened composition in an amount in the range of about 0.1 to about 100,000 ppm of the sweetened composition.

In one embodiment, suitable amounts of synthetic sweetener for sweetenable
25 compositions comprise a range from about 1 ppm to 60 ppm for alitame; from about 10 ppm to about 600 ppm for aspartame; from about 1 ppm to about 20 ppm for neotame; from about 10 ppm to about 500 ppm for acesulfame potassium; from about 50 ppm to about 5,000 ppm for cyclamate; from about 10 ppm to about 500 ppm for saccharin; from about 5 ppm to about 250 ppm for sucralose; from about 1 ppm to about 20 ppm for N-[N-
30 [3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester; from about 1 ppm to about 20 ppm for N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-

methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester; and from about 1 ppm to about 20 ppm for N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester.

In a particular embodiment, an orally ingestible composition comprises a carbonated beverage comprising at least one synthetic sweetener and at least one sweet taste improving composition; wherein the at least one synthetic sweetener is chosen from sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof; and wherein the at least one sweet taste improving composition is selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

IV. Examples

The present invention is further illustrated by the following examples, which are not to be construed in any way as imposing limitations upon the scope thereof. On the contrary, it is to be clearly understood that resort may be had to various other embodiments, modifications, and equivalents thereof which, after reading the description therein, may suggest themselves to those skilled in the art without departing from the spirit of the present invention and/or the scope of the appended claims. Unless otherwise specified, %'s are by weight.

A. Example Set A

An exemplary method of sensory evaluation is provided in the following protocol, similar to that described hereinabove. In this test protocol, none of the samples were swallowed. All samples were expectorated and the mouth was rinsed with water after the tasting. In step 1, the 10% sucrose control sample was tasted by distributing ca. 10mL of sample quickly throughout the oral cavity, wherein the maximal "Sweetness Intensity" was measured. This intensity is defined as a 10 on a 0-15 scale where 0 is defined as no perceptible sweetness and 15, the sweetness of 15% sucrose. The "Overall Quality" of the taste was also measured in the sucrose control and was defined as a 6 on a 1-9 scale. Immediately upon sensing maximal sweetness, the sample was expectorated, the mouth was rinsed with water and the rate of sweetness decay ("Sweetness Linger") and "Sweetness Onset" were measured, where attention was focused on the sweetness 2-3 min after the water rinse. The sweetness linger was rated by a panel of experts in the sensory evaluation of foods and beverages using the following scale: 0 = no sweetness linger, 1 = very slight sweetness linger, 2 = slight sweetness linger, 3 = moderate sweetness linger, 4 = moderately high sweetness linger, 5 = high sweetness linger. The sweetness onset was rated by a panel of experts using the following scale: 1 = quick onset, 2 = moderate onset, 3 = slow onset. After sample tasting was complete, a salty oyster cracker was chewed followed by a water rinse, and at least 5 minutes followed before tasting the next sample.

The "Sweetness Linger" rating for sucrose observed by this protocol was defined as 0 and the "Sweetness Onset" was defined as 1. The Sweetness Onset and Sweetness Linger of a neotame control sample were defined as 3 and 5, respectively.

Following calibration with the sucrose and neotame control samples, the experimental samples were tasted by the same protocol, always allowing sufficient time between samples to ensure re-equilibration of the sensory system. Re-tasting of control samples during the course of the experiment was allowed and encouraged.

The comparison taste test was performed between two controls and addition of sweet taste improving additive on the onset and/or sweetness linger.

Control Samples

The formulation for a base neotame solution at pH 2.5 is described as follows:

12 mg of Neotame was dissolved in one liter of carbon-treated water and phosphoric acid (75%) was added until a pH between 2.4 and 2.5 was reached. The sweetness onset of this solution was determined to be 3 and the sweetness linger was determined to be 5.

10 g of sugar was dissolved in 100 ml of carbon treated water and phosphoric acid (75%) was added until a pH between 2.4 and 2.5 was reached. The sweetness onset of this solution was determined to be 1 and the sweetness linger was determined to be 1.

In Examples A1-A7, where there are ranges provided, the beverage samples were made with 5-7 levels from the top to the bottom of the range, using a 1:1 dilution of the corresponding sweet taste improving compositions. The sweetness linger rating reported was the most sugar-like in sweetness linger (the lowest numerical value) attained of all the samples (i.e., the shortest sweetness linger).

Example A1

17 mg of neotame was dissolved in one liter of carbon-treated water and phosphoric acid (75%) was added until a pH between 2.4 and 2.5 was reached. 15,000 ppm of glycine was then mixed with the base solution. The sweetness onset of this solution was determined to be 1 and the sweetness linger was determined to be 1. This formulation was found to have sugar-like taste characteristics.

Example A2

17 mg of neotame was dissolved in one liter of carbon-treated water and phosphoric acid (75%) was added until a pH between 2.4 and 2.5 was reached. 7,000 ppm of glycine was then mixed with the base solution. The sweetness onset of this solution was determined to be 1 and the sweetness linger was determined to be 2. This formulation was found to have sugar-like taste characteristics.

Example A3

17 mg of neotame was dissolved in one liter of carbon-treated water and phosphoric acid (75%) was added until a pH between 2.4 and 2.5 was reached. 3,750 ppm to 5,000 ppm of glycine was then mixed with the base solution. The sweetness onset of

this solution was determined to be 1 and the sweetness linger was determined to be 3. This formulation was found to have sugar-like taste characteristics.

Example A4

17 mg of neotame was dissolved in one liter of carbon-treated water and phosphoric acid (75%) was added until a pH between 2.4 and 2.5 was reached. 5,000 ppm of glycine and 2,500 ppm of L-alanine were then mixed with the base solution. The sweetness onset of this solution was determined to be 1 and the sweetness linger was determined to be 3. This formulation was found to have sugar-like taste characteristics.

Example A5

12 mg of neotame was dissolved in one liter of carbon-treated water and phosphoric acid (75%) was added until a pH between 2.4 and 2.5 was reached. 7,000 ppm of glycine was then mixed with the base solution. The sweetness onset of this solution was determined to be 1 and the sweetness linger was determined to be 2. This formulation was found to have sugar-like taste characteristics.

Example A6

12 mg of neotame was dissolved in one liter of carbon-treated water and phosphoric acid (75%) was added until a pH between 2.4 and 2.5 was reached. 3,750 ppm to 5,000 ppm of glycine was then mixed with the base solution. The sweetness onset of this solution was determined to be 1 and the sweetness linger was determined to be 3. This formulation was found to have sugar-like taste characteristics.

Example A7

12 mg of neotame was dissolved in one liter of carbon-treated water and phosphoric acid (75%) was added until a pH between 2.4 and 2.5 was reached. 5,000 ppm of glycine and 2,500 ppm of L-Alanine were then mixed with the base solution. The sweetness onset of this solution was determined to be 1 and the sweetness linger was determined to be 3. This formulation was found to have sugar-like taste characteristics.

B. Example Set B**Example B1**

10 mg of neotame was dissolved in one liter of carbon-treated water. 25,000 ppm of NaCl was then mixed with the base solution. The sweetness onset of this solution was

determined to be 1 and the sweetness linger was determined to be 1. This formulation was found to have sugar-like taste characteristics.

Example B2

10 mg of neotame was dissolved in one liter of carbon-treated water. 1,000 ppm of NaCl was then mixed with the base solution. The sweetness onset of this solution was determined to be 2 and the sweetness linger was determined to be 4. This formulation was found to have sugar-like taste characteristics.

Example B3

10 mg of neotame was dissolved in one liter of carbon-treated water. 10,000 ppm of NaCl was then mixed with the base solution. The sweetness onset of this solution was determined to be 1 and the sweetness linger was determined to be 2. This formulation was found to have sugar-like taste characteristics.

Example B4

10 mg of neotame was dissolved in one liter of carbon-treated water. 5,000 ppm of NaCl was then mixed with the base solution. The sweetness onset of this solution was determined to be 1 and the sweetness linger was determined to be 3. This formulation was found to have sugar-like taste characteristics.

C. Example Set C**Example C1**

20 A composition comprising from 1 ppm to 100 ppm of sodium salt of glutamic acid was added to 300 ml of a cola beverage containing sucralose. The sweetness linger was reduced.

Example C2

25 A composition comprising from 1 ppm to 130 ppm of sodium salt of glutamic acid or 50 ppm sodium salt of glutamic acid and 10 ppm of a mixture of the nucleotides IMP and GMP were added to 300 ml of a cola beverage containing sucralose. The sweetness linger was reduced.

D. Example Set D

30 In examples D1 to D100, a single synthetic sweetener or a combination of synthetic sweeteners may be selected from the following group and added in an amount

within the specified ranges: 1 ppm to 60 ppm of alitame; 10 ppm to 600 ppm of aspartame; 1 ppm to 20 ppm of neotame; 10 ppm to 500 ppm of acesulfame potassium; 50 ppm to 5000 ppm of cyclamate; 10 ppm to 500 ppm of saccharin; 5 ppm to 250 ppm of sucralose; 1 ppm to 20 ppm of N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester; 1 ppm to 20 ppm of N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester; and 1 ppm to 20 ppm of N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester.

Example D1

10 A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Gum acacia seyal is then mixed with the base solution.

Example D2

15 5% sucrose and a synthetic sweetener are dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Erythritol is then mixed with the base solution.

Example D3

20 5% sucrose and a synthetic sweetener are dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. D-Tagatose is then mixed with the base solution.

Example D4

5% sucrose and a synthetic sweetener are dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Erythritol and D-tagatose are then mixed with the base solution.

Example D5

25 3.3% sucrose and a synthetic sweetener are dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Erythritol is then mixed with the base solution.

Example D6

3.3% sucrose and a synthetic sweetener are dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Erythritol and D-tagatose are then mixed with the base solution.

5 Example D7

A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Erythritol, glycine, potassium chloride and potassium dihydrogen phosphate are then mixed with the base solution.

Example D8

10 A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Glycine, potassium chloride and potassium dihydrogen phosphate are then mixed with the base solution.

Example D9

15 A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Erythritol, fructose, potassium chloride and potassium dihydrogen phosphate are then mixed with the base solution.

Example D10

20 A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Fructose, potassium chloride and potassium dihydrogen phosphate are then mixed with the base solution.

Example D11

A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Erythritol and gum acacia seyal are then mixed with the base solution.

25 Example D12

A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Gum acacia seyal is then mixed with the base solution.

Example D13

A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Erythritol, glycine, alanine, potassium chloride and potassium dihydrogen phosphate are then mixed with the base solution.

5 Example D14

A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a diet lemon-lime beverage. Glycine, alanine, potassium chloride and potassium dihydrogen phosphate are then mixed with the base solution.

Example D15

10 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. D-Gluconic acid is then mixed with the base solution.

Example D16

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. D-Gluconic acid, potassium salt is then mixed with the base solution.

Example D17

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L-threonine is then mixed with the base solution.

Example D18

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L-Serine is then mixed with the base solution.

25 Example D19

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L-alanine is then mixed with the base solution.

Example D20

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine is then mixed with the base solution.

5 Example D21

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. β -alanine is then mixed with the base solution.

Example D22

10 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine and poly-L- α -lysine are then mixed with the base solution.

Example D23

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine and poly-L- ϵ -lysine are then mixed with the base solution.

Example D24

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Adipic acid is then mixed with the base solution.

Example D25

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Poly-L- α -lysine (molecular weight ~ 63,000) is then mixed with the base solution.

25 Example D26

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Poly-L- α -lysine (molecular weight ~ 6,000) is then mixed with the base solution.

Example D27

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Poly-L- α -lysine (molecular weight ~ 83,000) is then mixed with the base solution.

5 Example D28

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Poly-L- α -lysine (molecular weight ~ 1,300,000) is then mixed with the base solution.

Example D29

10 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Fruitaric acid is then mixed with the base solution.

Example D30

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Tartaric acid is then mixed with the base solution.

Example D31

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Sodium bisulfate is then mixed with the base solution.

Example D32

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Lauric arginate is then mixed with the base solution.

25 Example D33

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L-lysine is then mixed with the base solution.

Example D34

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Guanidine hydrochloride is then mixed with the base solution.

5 Example D35

A synthetic sweetener is dissolved in a citric acid/potassium citrate composition equivalent to that in a lemon-lime beverage is dissolved in one liter carbon-treated water and phosphoric acid, 75%, (~0.43 mL) is added until the pH reached between pH 2.4 and 2.5. Urea and sodium chloride is then mixed with the base solution.

10 Example D36

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Urea is then mixed with the base solution.

Example D37

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Choline chloride is then mixed with the base solution.

Example D38

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. D-glucosamine hydrochloride is then mixed with the base solution.

Example D39

25 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Poly-L-ε-lysine is then mixed with the base solution.

Example D40

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine, sodium chloride and potassium chloride are then mixed with the base solution.

Example D41

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine and aluminum sulfate (alum) are then mixed with the base solution.

5 Example D42

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine and potassium chloride are then mixed with the base solution.

Example D43

10 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine and sodium gluconate are then mixed with the base solution.

Example D44

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Polyethylenimine is then mixed with the base solution.

Example D45

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Chitosan is then mixed with the base solution.

Example D46

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Poly-L-ornithine is then mixed with the base solution.

25 Example D47

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Magnesium chloride is then mixed with the base solution.

Example D48

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Whey protein (concentrate 34%) is then mixed with the base solution.

5 Example D49

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Fumaric acid, malic acid and tartaric acid are then mixed with the base solution.

Example D50

10 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Trehalose is then mixed with the base solution.

Example D51

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Fructooligosaccharide (55%) is then mixed with the base solution.

Example D52

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Acacia Senegal is then mixed with the base solution.

Example D53

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. β -Cyclodextrin is then mixed with the base solution.

25 Example D54

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Fibersol-2 is then mixed with the base solution.

Example D55

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycerol is then mixed with the base solution.

5 Example D56

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Collagen (unflavored gelatin) is then mixed with the base solution.

Example D57

10 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. D-Fructose is then mixed with the base solution.

Example D58

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Potassium dihydrogen phosphate is then mixed with the base solution.

Example D59

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Potassium chloride and potassium dihydrogen phosphate are then mixed with the base solution.

Example D60

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Sodium gluconate is then mixed with the base solution.

25 Example D61

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Potassium tartrate monohydrate is then mixed with the base solution.

Example D62

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Sodium tartrate dihydrate is then mixed with the base solution.

5 Example D63

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glucoheptonic acid, sodium salt is then mixed with the base solution.

Example D64

10 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L-sodium lactate is then mixed with the base solution.

Example D65

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Potassium benzoate is then mixed with the base solution.

Example D66

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Malic acid is then mixed with the base solution.

Example D67

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Hydroxycitric acid is then mixed with the base solution.

25 Example D68

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Salicylic acid is then mixed with the base solution.

Example D69

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Caffeic acid is then mixed with the base solution.

5 Example D70

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Succinic acid is then mixed with the base solution.

Example D71

- 10** A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Dihydroxybenzoic acid is then mixed with the base solution.

Example D72

- 15** A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Citric acid is then mixed with the base solution.

Example D73

- 20** A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Creatine is then mixed with the base solution.

Example D74

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Theanine is then mixed with the base solution.

25 Example D75

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glucosamine hydrochloride is then mixed with the base solution.

Example D76

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Taurine is then mixed with the base solution.

5 Example D77

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L- α -aminobutyric acid is then mixed with the base solution.

Example D78

10 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. 4-Hydroxy-L-proline is then mixed with the base solution.

Example D79

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L-glutamine is then mixed with the base solution.

Example D80

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine is then mixed with the base solution.

Example D81

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L-Alanine is then mixed with the base solution.

25 Example D82

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Propylene glycol alginate is then mixed with the base solution.

Example D83

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Soluble rice protein is then mixed with the base solution.

5 Example D84

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L-Alanyl-L-glutamine is then mixed with the base solution.

Example D85

10 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine and Poly-L- α -Lysine are then mixed with the base solution.

Example D86

15 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine and potassium chloride are then mixed with the base solution.

Example D87

20 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Glycine and sodium chloride are then mixed with the base solution.

Example D88

25 A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Erythritol, glycine, potassium chloride, potassium dihydrogen phosphate, and choline chloride are then mixed with the base solution.

Example D89

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. L-Alanine, fructose, and erythritol are then mixed with the base solution.

Example D90

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Enzyme modified rutin Sannmelin™ AO (San-Ei Gen F.F.I., Inc., Osaka, Japan) is then mixed with the base solution.

Example D91

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Naringin is then mixed with the base solution.

Example D92

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Quinine is then mixed with the base solution.

Example D93

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Viridiflorol is then mixed with the base solution.

Example D94

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Grape skin extract is then mixed with the base solution.

Example D95

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Symrise™ Natural Flavor Mask for Sweeteners, 164126 (Symrise™, Holzminden, Germany) is then mixed with the base solution.

Example D96

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Natural Advantage™ Bitterness Blocker 9 (Natural Advantage, Freehold, New Jersey, U.S.A.) is then mixed with the base solution.

Example D97

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Natural Advantage™ Bitterness Blocker 2 (Natural Advantage, Freehold, New Jersey, U.S.A.) is then mixed with the base solution.

Example D98

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Natural Advantage™ Bitterness Blocker 1 (Natural Advantage, Freehold, New Jersey, U.S.A.) is then mixed with the base solution.

Example D99

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. Natural Advantage™ Bitterness Blocker 10 (Natural Advantage, Freehold, New Jersey, U.S.A.) is then mixed with the base solution.

Example D100

A synthetic sweetener is dissolved in one liter of carbon-treated water and phosphoric acid (75%) is added until a pH between pH 2.4 and 2.5 is reached. AMP is then mixed with the base solution.

While the invention has been described in detail with respect to specific embodiments thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing, may readily conceive of alterations to, variations of, and equivalents to these embodiments. Accordingly, the scope of the present invention should be assessed as that of the appended claims and any equivalents thereof.

CLAIMS

1. A sweetener composition comprising:
at least one synthetic sweetener; and
5 at least one sweet taste improving composition selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers,
10 flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.
2. The sweetener composition of claim 1,
wherein the at least one sweet taste improving composition is present in the sweetener composition in an amount effective for the sweetener composition to impart an
15 osmolality from 10 mOsmole/L to 500 mOsmole/L to an aqueous solution of the sweetener composition, and
wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous solution of sucrose by weight.
- 20 3. The sweetener composition of claim 1, wherein the at least one sweet taste improving composition imparts a more sugar-like flavor profile to the sweetener composition than a synthetic sweetener composition without the at least one sweet taste improving composition.
- 25 4. The sweetener composition of claim 1, wherein the at least one sweet taste improving composition imparts a more sugar-like temporal profile to the sweetener composition than a synthetic sweetener composition without the at least one sweet taste improving composition.

5. The sweetener composition of claim 1, further comprising at least one second sweet taste improving composition different from the first sweet taste improving composition and selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.
6. The sweetener composition of claim 5,
wherein the at least one first sweet taste improving composition and the at least one second sweet taste improving composition are present in the sweetener composition in an amount effective for the sweetener composition to impart an osmolarity from 10 mOsmole/L to 500 mOsmole/L to an aqueous solution of the sweetener composition, and
wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous solution of sucrose by weight.
7. The sweetener composition of claim 1, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.
8. The sweetener composition of claim 1, wherein the at least one synthetic sweetener is neotame.
9. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is a polyol.

10. The sweetener composition of claim 9, wherein the at least one polyol comprises erythritol.
11. The sweetener composition of claim 9, wherein the at least one polyol comprises xylitol.
- 5 12. The sweetener composition of claim 1, wherein the at least one sweet taste improving composition comprises at least one amino acid.
13. The sweetener composition of claim 12, wherein the at least one amino acid comprises glycine, alanine, proline, hydroxyproline, glutamine, or combinations thereof.
14. The sweetener composition of claim 1, wherein the at least one first sweet taste
10 improving composition is a polyamino acid.
15. The sweetener composition of claim 14, wherein the at least one polyamino acid comprises poly-L-aspartic acid, poly-L- α -lysine, poly-L- ϵ -lysine, poly-L- α -ornithine, poly-L- ϵ -ornithine, poly-L-arginine, salts thereof, or combinations thereof.
- 15 16. The sweetener composition of claim 1, wherein the at least one sweet taste improving composition comprises at least one inorganic salt.
17. The sweetener composition of claim 16, wherein the at least one inorganic salt comprises a sodium, potassium, calcium, or magnesium salt.
18. The sweetener composition of claim 16, further comprising at least one inorganic
20 phosphate.
19. The sweetener composition of claim 18, wherein the at least one inorganic phosphate comprises a sodium, potassium, calcium, or magnesium phosphate.
20. The sweetener composition of claim 16, further comprising at least one inorganic chloride.
- 25 21. The sweetener composition of claim 20, wherein the at least one inorganic chloride comprises a sodium, potassium, calcium, or magnesium chloride.

22. The sweetener composition of claim 1, wherein the at least one sweet taste improving composition comprises at least one carbohydrate.

23. The sweetener composition of claim 22, wherein the at least one carbohydrate comprises sucrose, high fructose corn syrup, glucose, or sucrose.

5 24. The sweetener composition of claim 23, wherein the at least one carbohydrate is present in the composition in an amount from about 10,000 ppm to about 80,000 ppm of the composition.

25. The sweetener composition of claim 1, wherein the at least one first sweet taste
10 improving composition is a sugar acid or salt thereof.

26. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is an inorganic acid.

15 27. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is a bitter compound.

28. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is an astringent compound.

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29. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is a protein or protein hydrolysate.

30. The sweetener composition of claim 1, wherein the at least one first sweet taste
25 improving composition is a surfactant.

31. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is an emulsifier.

30 32. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is a flavonoid.

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33. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is an alcohol.
- 5 34. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is a synthetic sweetener different from the at least one synthetic sweetener.
- 10 35. The sweetener composition of claim 1, wherein the at least one first sweet taste improving composition is a polymer selected from the group consisting of polylysine, polyorthinine, polyethylenimine, chitosan, sucrose ester, sorbic acid ester, sorbitan, sorbitan ester, anionic detergent, polysorbate, polyethylene sorbitan ester, propylene glycolmonoester, glycerol monoester, polyglycerol ester, polyethylene ester, complex ester, cationic detergent, gum acacia senegal, gum acacia seyal, anionic polymers, 15 polyethylene glycol, lecithins, inositol phosphate, saponins, and combinations thereof.
- 20 36. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprises at least one polyol and the at least one second sweet taste improving composition comprises at least one amino acid.
37. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprises at least one carbohydrate and the at least one second sweet taste improving composition comprises at least one amino acid.
- 25 38. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprises at least one carbohydrate and the at least one second sweet taste improving composition comprises at least one inorganic salt.
- 30 39. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprises at least one inorganic salt and the at least one second sweet taste improving composition comprises at least one amino acid.

40. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprises at least one protein or protein hydrolysate and the at least one second sweet taste improving composition comprises at least one amino acid.

5 41. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprises at least one polyol and the at least one second sweet taste improving composition comprises at least one protein or protein hydrolysate.

42. The sweetener composition of claim 5, wherein the at least one first sweet taste
10 improving composition comprises at least one polyol and at least one second sweet taste improving composition comprises at least one carbohydrate.

43. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprises at least one polyol and the at least one second sweet
15 taste improving composition comprises at least one inorganic salt.

44. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprising at least one polyol and the at least one second sweet taste improving composition comprises at least one polymer.

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45. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprises at least one bitter compound and the at least one second sweet taste improving composition comprises at least one inorganic salt.

25 46. The sweetener composition of claim 5, wherein the at least one first sweet taste improving composition comprises at least one amino acid and the at least one second sweet taste improving composition comprises at least one polyamino acid.

47. The sweetener composition of claim 5, further comprising at least one third sweet taste improving composition different than the at least one first sweet taste improving composition and the at least one second sweet taste improving composition and selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

48. The sweetener composition of claim 47, wherein the at least one first sweet taste improving composition comprises at least one polyol, the at least one second sweet taste improving composition comprises at least one carbohydrate, and the at least one third sweet taste improving composition comprises at least one inorganic salt.

49. The sweetener composition of claim 47, wherein the at least one first sweet taste improving composition comprises at least one carbohydrate, the at least one second sweet taste improving composition comprises at least one amino acid, and the at least one third sweet taste improving composition comprises at least one inorganic salt.

50. The sweetener composition of claim 47, wherein the at least one first sweet taste improving composition comprises at least one polyol, the at least one second sweet taste improving composition comprises at least one amino acid, and the at least one third sweet taste improving composition comprises at least one carbohydrate.

51. The sweetener composition of claim 47, wherein the at least one first sweet taste improving composition comprises at least one polyol, the at least one second sweet taste improving composition comprises at least one amino acid, and the at least one third sweet taste improving composition comprises at least one inorganic salt.

52. The sweetener composition of claim 47, further comprising at least one first sweet taste improving composition different than the at least one first sweet taste improving composition, the at least one second sweet taste improving composition, the at least one third sweet taste improving composition, and selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavonoids, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

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53. The sweetener composition of claim 52, wherein the at least one first sweet taste improving composition comprises at least one polyol, the at least one second sweet taste improving composition comprises at least one amino acid, and the at least one third sweet taste improving composition comprises at least one inorganic salt, and the at least fourth sweet taste improving composition comprises at least one organic acid salt.

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54. The sweetener composition of claim 5, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-(2-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.

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55. The sweetener composition of claim 47, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.

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56. The sweetener composition of claim 52, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.
57. A sweetener composition comprising:
at least one synthetic sweetener; and
at least one sweet taste improving composition selected from the group consisting of glutamic acid, inosine monophosphate, guanosine monophosphate, and combinations thereof.
58. The sweetener composition of claim 57, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.
59. The sweetener composition of claim 57, wherein the at least one synthetic sweetener is sucralose.
60. The sweetener composition of claim 57, wherein the at least one sweet taste improving composition is glutamic acid.
61. The sweetener composition of claim 57, wherein the at least one sweet taste improving composition is inosine monophosphate.

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62. The sweetener composition of claim 57, wherein the at least one sweet taste improving composition is guanosine monophosphate.

5 63. The sweetener composition of claim 57, wherein the at least one sweet taste improving composition comprises a mixture of glutamic acid, inosine monophosphate, and guanosine monophosphate.

10 64. The sweetener composition of claim 57, wherein the at least one sweet taste improving composition comprises a mixture of glutamic acid and inosine monophosphate.

65. The sweetener composition of claim 57, wherein the at least one sweet taste improving composition comprises a mixture of glutamic acid and guanosine monophosphate.

15 66. The sweetener composition of claim 57, wherein the at least one sweet taste improving composition comprises a mixture of inosine monophosphate and guanosine monophosphate.

20 67. A method for imparting a more sugar-like temporal profile, a more sugar-like flavor profile, or both to a synthetic sweetener, comprising combining at least one synthetic sweetener with at least one sweet taste improving composition selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, 25 astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

68. The method of claim 67,

wherein the at least one sweet taste improving composition is added to the synthetic sweetener in an amount effective for the synthetic sweetener and the at least one sweet taste improving composition in combination to impart an osmolarity from 10 mOsmole/L to 500 mOsmole/L to an aqueous solution of the combination; and

wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous solution of sucrose by weight.

69. The method of claim 67, wherein the at least one sweet taste improving composition imparts a more sugar-like flavor profile to the synthetic sweetener and the at least one sweet taste improving composition in combination than a synthetic sweetener composition without the at least one sweet taste improving composition.

70. The method of claim 67, wherein the at least one sweet taste improving composition imparts a more sugar-like temporal profile to the synthetic sweetener and the at least one sweet taste improving composition in combination than a synthetic sweetener composition without the at least one sweet taste improving composition.

71. The method of claim 67, further comprising combining with the at least one synthetic sweetener and at least one first sweet taste improving composition, at least one second sweet taste improving composition different from the first sweet taste improving composition and selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

72. The method of claim 71,

wherein at least one synthetic sweetener, the at least one first sweet taste improving composition, and the at least one second sweet taste improving composition are present in an amount effective for the synthetic sweetener, at least one first sweet taste
5 improving composition, and at least one second sweet taste improving composition in combination to impart an osmolarity from 10 mOsmole/L to 500 mOsmole/L to an aqueous solution of the combination, and

wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous
10 solution of sucrose by weight.

73. The method of claim 67, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-
15 methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.

20 74. The method of claim 67, wherein the at least one synthetic sweetener is neotame.

75. The method of claim 71, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-
25 methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.

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76. The method of claim 71, further comprising combining with the at least one synthetic sweetener, the at least one first sweet taste improving composition, and the at least one second sweet taste improving composition a third sweet taste improving composition different than the at least one first sweet taste improving composition and at least one second sweet taste improving composition, wherein the at least one third sweet taste improving composition is selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

77. A sweetened composition comprising:
a sweetenable composition,
at least one synthetic sweetener, and
at least one sweet taste improving composition selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

78. The sweetened composition of claim 77,
wherein the at least one sweet taste improving composition is present in the sweetened composition in an amount effective for the at least one synthetic sweetener and at least one sweet taste improving composition in combination to impart an osmolarity from 10 mOsmole/L to 500 mOsmole/L to an aqueous solution of the combination, and
wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous solution of sucrose by weight.

79. The sweetened composition of claim 77, wherein the at least one sweet taste improving composition imparts a more sugar-like flavor profile to the sweetened composition than a synthetic sweetener without the at least one sweet taste improving composition.

80. The sweetened composition of claim 77, wherein the at least one sweet taste improving composition imparts a more sugar-like temporal profile to the sweetened composition than a synthetic sweetener without the at least one sweet taste improving composition.

81. The sweetened composition of claim 77, further comprising at least one second sweet taste improving composition different from the at least one first sweet taste improving composition and selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

82. The sweetened composition of claim 81,
wherein the at least one synthetic sweetener, the at least one first sweet taste improving composition, and the at least one second sweet taste improving composition in combination are present in the sweetened composition in an amount effective for the combination to impart an osmolarity from 10 mOsmole/L to 500 mOsmole/L to an aqueous solution of the combination, and

wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous solution of sucrose by weight.

83. The sweetened composition of claim 77, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.

84. The sweetened composition of claim 77, wherein the at least one synthetic sweetener is neotame.

85. The sweetened composition of claim 77, wherein the sweetenable composition is selected from the group consisting of foods, beverages, pharmaceuticals, tobacco, nutraceuticals, oral hygienic products, and cosmetic products.

86. The sweetened composition of claim 81, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.

87. The sweetened composition of claim 81, wherein the sweetenable composition is selected from the group consisting of foods, beverages, pharmaceuticals, tobacco, nutraceuticals, oral hygienic products, and cosmetic products.

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88. A method for imparting a more sugar-like temporal profile, a more sugar-like flavor profile, or both to a synthetic sweetener sweetened composition comprising combining with a sweetenable composition, at least one synthetic sweetener, and at least one sweet taste improving composition selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

89. The method of claim 88,

wherein the at least one synthetic sweetener and the at least one sweet taste improving composition are combined with the sweetenable composition in an amount effective for the at least one synthetic sweetener and at least one sweet taste improving composition in combination to impart an osmolarity from 10 mOsmole/L to 500 mOsmole/L to an aqueous solution of the combination, and

wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous solution of sucrose by weight.

90. The method of claim 88, wherein the at least one sweet taste improving composition imparts a more sugar-like flavor profile to the sweetened composition than a synthetic sweetener without the at least one sweet taste improving composition.

91. The method of claim 88, wherein the at least one sweet taste improving composition imparts a more sugar-like temporal profile to the sweetened composition than a synthetic sweetener without the at least one sweet taste improving composition.

92. The method of claim 88, further comprising combining with sweetenable composition, the at least one synthetic sweetener, and at least one first sweet taste improving composition, at least one second sweet taste improving composition different from the first sweet taste improving composition and selected from the group consisting of carbohydrates, polyols, amino acids and their corresponding salts, polyamino acids and their corresponding salts, sugar acids and their corresponding salts, organic acids, inorganic acids, organic salts, inorganic salts, bitter compounds, flavorants, astringent compounds, polymers, proteins or protein hydrolysates, surfactants, emulsifiers, flavonoids, alcohols, natural high-potency sweeteners, and combinations thereof.

93. The method of claim 92,

wherein the at least one synthetic sweetener, the at least one first sweet taste improving composition, and the at least one second sweet taste improving composition in combination are combined with the sweetened composition in an amount effective for the combination to impart an osmolarity from 10 mOsmole/L to 500 mOsmole/L to an aqueous solution of the combination, and

wherein the synthetic sweetener is present in the aqueous solution in an amount sufficient to impart a maximum sweetness intensity equivalent to that of a 10% aqueous solution of sucrose by weight.

94. The method of claim 88, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.

95. The method of claim 88, wherein the at least one synthetic sweetener is neotame.

96. The method of claim 88, wherein the sweetenable composition is selected from the group consisting of foods, beverages, pharmaceuticals, tobacco, nutraceuticals, oral hygienic products, and cosmetic products.
- 5 97. The method of claim 92, wherein the at least one synthetic sweetener is selected from the group consisting of sucralose, potassium acesulfame, aspartame, alitame, saccharin, neohesperidin dihydrochalcone, cyclamate, neotame, N-[N-[3-(3-hydroxy-4-methoxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, N-[N-[3-(3-hydroxy-4-methoxyphenyl)-3-methylbutyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester,
- 10 N-[N-[3-(3-methoxy-4-hydroxyphenyl)propyl]-L- α -aspartyl]-L-phenylalanine 1-methyl ester, and salts thereof.
98. The method of claim 92, wherein the at least one synthetic sweetener is neotame.
- 15 99. The method of claim 92, wherein the sweetenable composition is selected from the group consisting of foods, beverages, pharmaceuticals, tobacco, nutraceuticals, oral hygienic products, and cosmetic products.