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(54) Title: USE OF METHYLSULFONYLMETHANE AS A TASTE MASKING AGENT

(57) Abstract: Embodiments of the invention relate generally to the use of methylsulfonylmethane (MSM) to reduce an undesired flavor resulting from the ingestion of a bitter or off-tasting agent. MSM is combined with ingestible products in several embodiments to partially or fully mask the taste of certain ingredients.

USE OF METHYLSULFONYLMETHANE AS A TASTE MASKING AGENT

BACKGROUND OF THE INVENTION

Field of the Invention

[0001] Embodiments of the invention relate generally to the use of methylsulfonylmethane (MSM), and related compounds, to reduce the perceived bitter or other undesired flavor typically resulting from the ingestion of a bitter-tasting or off-tasting agent. Several embodiments of the invention are particularly surprising because MSM is perceived to have a bitter taste. Thus, the masking of a bitter (or other off-taste) by an agent that itself has a bitter taste is unexpected.

Description of the Related Art

[0002] Mammals can distinguish between sweet, sour, bitter, salty and umami (savory) tastes. The mammalian tongue, soft palate, upper esophagus and epiglottis are the site of taste receptors, or taste buds. When activated by an ingested substance, one or more types of taste buds send signaling information to the gustatory cortex of the cerebrum via the third, ninth, and tenth cranial nerves, generating a perception of taste.

[0003] Several foods or other ingestible products have a taste that is unpalatable to mammals. Of the taste modalities, bitter and/or off-tastes have traditionally held an important role in that many naturally occurring poisonous substances taste bitter or unpalatable to humans and other animals, suggesting that bitter and off-taste transduction evolved as a defense against ingestion of harmful substances.

[0004] A variety of agents present in food products, beverages, pharmaceuticals, cosmetics, and dietary supplements result in the perception of a bitter or off-taste when ingested alone, or even in combination with other ingredients. Among the more intensely bitter compounds are amides such as denatonium benzoate and alkaloids such as strychnine, caffeine, and quinine. Certain amino acids, some fatty acids, and even salts of ions such as potassium, calcium or magnesium can taste bitter or have an off-taste. Further, many plants, including nutritionally important vegetables such as arugula, broccoli, cauliflower, cabbage, kale, spinach, watercress, and bok choy are perceived as bitter or off-tasting. Additionally,

several grain products such as rye, buckwheat, wheat and quinoa are perceived as bitter or off-tasting. Likewise, several fruits such as grapefruit, olives and bitter melons are perceived as bitter or off-tasting. Further, many spices and herbs such as turmeric, marjoram, fenugreek and dandelion root are perceived as bitter or off-tasting. Similarly, some beverages like, coffee, herbal tea or certain alcoholic beverages are known to taste bitter or have an off-taste, sometimes as a result of the leaching of undesired agents into the final beverage during the brewing process. There is a need in the art to reduce the bitter or off-taste properties of ingestible products.

SUMMARY

[0005] Methylsulfonylmethane (MSM), also known as dimethyl sulfone, is an organosulfur compound with the formula $(CH3)_2SO_2$. MSM has largely been marketed and sold as a dietary supplement targeted as a treatment for osteoarthritis. MSM is a metabolite of dimethylsulfoxide (DMSO) and certain sulfur-containing amino acids. In several embodiments of the present invention, MSM is used to mask the bitter or off-taste of bitter or off-tasting agents, including those found in ingestible products. Several embodiments of the invention are surprising because MSM is perceived to have a bitter taste. Thus, the masking of a bitter (or other off-taste) by an agent that itself has a bitter taste is unexpected. An off-taste, as defined herein, shall be given its ordinary meaning and shall include tastes that are undesired, such as sour tastes, spicy tastes, metallic tastes, astringent, unpalatable, or any undesired taste. In several embodiments, an MSM related compound may be used instead of or in addition to MSM. Related compounds include, but are not limited, to DMSO and dimethylsulfide (DMS).

[0006] While portions of the mammalian population seek out bitter-tasting or off-tasting foods and drinks, to many mammals, bitter tastes and other off-tastes are generally rejected. In some instances, the long term effect of failure to ingest products or foods with containing a bitter or off-taste may be minimal. In others cases, for example, failure to consume certain bitter-tasting or off-tasting medications or foods having, for example, high anti-oxidant quantities, the consequences may be severe.

[0007] Thus there exists a need for an inexpensive, readily available, and effective means to reduce the bitter or off-taste associated with particular food products, beverages, pharmaceuticals, cosmetics, and dietary supplements.

[0008] Despite its use as a dietary supplement, based on Applicant's knowledge, until Applicant's invention, utility of MSM as a taste masking agent was unknown, due largely to the fact that MSM itself produces a bitter taste sensation. Notwithstanding the expectation that MSM would potentiate bitter tastes, Applicant has unexpectedly discovered that at certain concentrations, MSM masks the bitterness of other traditionally bitter-tasting agents. Likewise, despite having an undesired taste when consumed alone, MSM masks the off-taste when combined with off-tasting products.

[0009] Because MSM is a natural substance, the use of MSM is particularly advantageous according to several embodiments described herein. For example, MSM may be used in several food and beverage products that require or desire an "all-natural" ingredient list.

[0010] In one embodiment, the invention provides a composition for masking the taste of an ingestible product. In one embodiment, the invention comprises an ingestible product having a bitter or off-taste and MSM. MSM, in one embodiment, is provided in a range of about 0.1% to about 11% of the weight of the ingestible product (e.g., about 0.1-0.5%, 0.5-1%, 1-2%, 3-5%, 5-7%, 7-9%, or 9-11%). In other embodiments, MSM is provided in a range of about 11-25%. In one embodiment, DMSO and/or DMS are provided instead of or in addition to MSM to mask an undesired taste.

[0011] In one embodiment, the invention provides a composition for masking the bitter or off-taste of an ingestible product, wherein the ingestible product is a pharmaceutical. In one embodiment, the invention comprises an ingestible product having a bitter or off-taste and MSM. MSM, in one embodiment, is provided in a range of about 0.1% to about 11% of the weight of the ingestible product (e.g., about 0.1-0.5%, 0.5-1%, 1-2%, 3-5%, 5-7%, 7-9%, or 9-11%). In other embodiments, MSM is provided in a range of about 11-25%. In one embodiment, MSM coats the pharmaceutical. In other embodiments, MSM bonds or otherwise couples or adheres to the pharmaceutical. In yet other embodiments, MSM non-reactively combines with the pharmaceutical. The pharmaceutical includes, but is not limited

to, aspirin, acetaminophen, chlorhexidine, dextromethorphan, diphenhydramine, doxylamine, guaifenesin, ibuprofen, pseudoephedrine, sildenafil citrate, loperamide, and combinations thereof. In some embodiments, the pharmaceutical is an anti-anxiety drug or a sleep aid.

[0012] In one embodiment of the invention, a composition for reducing the bitter or off-taste of an ingestible product is provided. In one embodiment, the invention comprises an ingestible product having a bitter or off-taste, wherein the ingestible product is a nutritional supplement, and MSM. MSM is provided in a range of about 0.1% to about 11% of the weight of the nutritional supplement (e.g., about 0.1-0.5%, 0.5-1%, 1-2%, 3-5%, 5-7%, 7-9%, or 9-11%). In other embodiments, MSM is provided in a range of about 11-25%. In one embodiment, MSM coats the nutritional supplement.

[0013] In another embodiment of the invention, a method for masking the bitter taste of a bitter-tasting or off-tasting agent by mammals is provided. In one embodiment, the method comprises identifying one or more bitter-tasting or off-tasting agents that result in the perception of a bitter or off-taste when ingested, and combining an effective amount of MSM with the bitter-tasting or off-tasting agent to yield a combination comprising MSM and the bitter-tasting or off-tasting agent. MSM is provided in a range of about 0.1% to about 11% of the weight of the bitter-tasting or off-tasting agent (e.g., about 0.1-0.5%, 0.5-1%, 1-2%, 3-5%, 5-7%, 7-9%, or 9-11%). In other embodiments, MSM is provided in a range of about 0.5 – 50% or 11-25%). MSM masks the taste of the bitter-tasting or off-tasting agent when in combination with the agent according to one embodiment. MSM coats the bitter-tasting or off-tasting agent in one embodiment. The bitter-tasting or off-tasting agent includes, but is not limited to, chocolate, grain, fruit, vegetables, coffee, alcohol, beer, pharmaceuticals, nutritional supplements, and combinations thereof. In another embodiment, the bitter-tasting or off-tasting agent is a soap, shampoo or lip balm. In one embodiment, the bitter-tasting or off-tasting agent is stevia (including steviosides, Rebaudioside A, or other components or extracts of the stevia plant). In some embodiments, the combination is provided to a mammal for ingestion, with optional instructions for use for e.g., daily administration, administration with food, dose, etc. A kit comprising MSM and instructions for use may be provided in one embodiment.

[0014] In several embodiments, the invention comprises a method for masking the undesired taste of a bitter or off-tasting agent by mammals. In one embodiment, the method comprises identifying a bitter-tasting or off-tasting agent that results in the perception of a undesired taste and combining an effective amount of methylsulfonylmethane (MSM) with the bitter-tasting or off-tasting agent to yield a combination comprising the MSM and the bitter-tasting or off-tasting agent. The MSM is provided in a range of about 0.1% of the weight of the bitter-tasting agent or off-tasting agent (1000 ppm) to about 11% of the weight of the bitter-tasting agent or off-tasting agent (110,000 ppm). The MSM masks the undesired taste of the bitter-tasting or off-tasting agent when in combination with the bitter-tasting agent or off-tasting. The bitter-tasting or off-tasting agent includes, but Is not limited to, cocoa, coffee, pharmaceutical agents, vitamin supplements, artificial sweeteners, stevia, fruits, vegetables, beer and grains (such as comprises amaranth, millet, quinoa, sorghum, triticale, wheat, oat, bulgur, corn, rice, buckwheat, flax, kamut, rye, and spelt).

[0015] In some embodiments, the invention comprises a kit for masking an undesired taste of a bitter-tasting agent or off-tasting agent. In one embodiment, the kit comprises MSM and a bitter-tasting agent or off-tasting agent, wherein the MSM is provided in a range of about .25% of the weight of the bitter-tasting agent or off-tasting agent (2500 ppm) to about 3% (30,000 ppm) of the weight of the bitter-tasting agent or off-tasting agent; and instructions for combining the MSM with the bitter-tasting agent or off-tasting agent to mask the undesired taste of the bitter-tasting agent or off-tasting agent. In one embodiment, the kit comprises MSM and instructions for adding an effective amount of the supplied MSM to an ingestible product to mask an undesired taste. In another embodiment, the kit comprises MSM and instructions for using an effective amount of the supplied MSM with an ingestible product to mask an undesired taste.

[0016] In one embodiment, MSM alters the normal signal transduction pathway involved in perception of a bitter or off-taste after ingestion of the bitter-tasting or off-tasting agent, wherein the signal transduction pathway relays a biochemical signal from one or more taste receptors to a brain region of a mammal, and wherein the alteration of the normal signal transduction pathway by MSM reduces the bitter or off-taste perceived. In one embodiment, the biochemical signal is an alteration of a calcium or other ionic pathway (e.g., increase in

release of intracellular calcium). In one embodiment, the signal transduction pathway involves activation of a G-protein coupled receptor and a G-protein.**[0017]** In yet another embodiment of the invention, a method for masking the taste of a sweetening agent. In one embodiment, the method comprises identifying a sweetening agent, wherein the sweetening agent has one or more bitter or off-taste properties; and combining an effective amount of MSM with the sweetening agent to yield a combination comprising MSM and the sweetening agent. MSM is provided in a range of about 0.1% to about 25% of the weight of the sweetening agent (e.g., about 0.1-0.5%, 0.5-1%, 1-2%, 1-5%, 1-10%, 3-5%, 5-7%, 7-9%, 9-11%, 11-15%, 15-20%, 20-25%). MSM, according to several embodiments, masks one or more bitter or off-taste properties of the sweetening agent when in combination with the sweetening agent. The sweetening agent comprises stevia (including steviosides, Rebaudioside A, or other components or extracts of the stevia plant) in some embodiments.

[0018] MSM used according to any of the embodiments provided herein may be isolated, purified or processed. MSM that has been granted a GRAS (Generally Recognized As Safe) designation is used for several embodiments described herein.

DETAILED DESCRIPTION

[0019] In several embodiments described herein, formulations and/or combinations comprising MSM and at least one ingestible product are provided, wherein said MSM masks or otherwise reduces the bitter or other undesired components and/or flavor in said ingestible product. The ingestible product includes, but is not limited to, coffee, chocolate, grains, fruits, beer, pharmaceuticals, vegetable products, nutritional supplements, sweetening agents, and combinations thereof. Ingestible products also include foods and beverages that are perceived as bitter or off-tasting by certain populations of individuals. Addition of MSM to mask the bitter or off-taste of ingestible products is unexpected according to several embodiments described herein because MSM alone has a bitter taste. Thus, prior to Applicant's invention, it would be expected that MSM would exacerbate the bitter or off-taste of ingestible products, rather than decrease it. In any of the embodiments described herein, an MSM related compound may be used instead of or in addition to MSM. Related compounds include, but are not limited, to DMSO and DMS.

[0020] The term "mask" as used herein shall be given its ordinary meaning and shall also include partial and total reduction. For example, in some embodiments, MSM masks the bitter or undesired taste by reducing the undesired taste by about 1% to about 100%. In other embodiments, MSM masks the bitter taste by at least about 10%, 20%, 30%, 40%, 50%, 75%, 90%, 95% or 100%.

[0021] In some embodiments, MSM is added during the manufacturing process. In other embodiments, MSM is provided to end-user consumers for adding to foods, beverages and other ingestible products just prior to consumption. For example, MSM can be provided in small packets or salt-shaker type devices. MSM can be provided in any form suitable for consumption. For example, MSM can be provided as either a solid (e.g., granules, powder), semi-solid, or liquid form. In some embodiments, MSM is provided as a gel. In other embodiments, MSM is provided in an aerosol format. In yet other embodiments, MSM is provided as an emulsion. In several embodiments, an MSM coating is applied to the ingestible product. For example, MSM may be used to coat a pill, tablet, or other pharmaceutical agent. In certain embodiments, MSM is provided as a film that may be used, for example, to coat the taste buds prior to ingestion of a bitter product. In yet other embodiments, MSM is provided as a chew, candy, or gum for intake prior to the ingestion of bitter or off-tasting products.

[0022] In several embodiments, MSM is used to competitively bind bitter taste receptors. For example, by having a higher affinity for bitter taste receptors in the mouth than bitter or off-tasting agents, MSM can effectively block the receptors from coming into contact with those agents. In several embodiments, MSM is used to make certain substances (foods, medicines, etc.) more palatable to subjects having enhanced taste sensitivities, such as supertasters. In some embodiments, such subjects may have certain taste receptor polymorphisms that contribute to the enhanced taste sensitivity.

[0023] The use of MSM is particularly advantageous in several embodiments because it permits the manufacture of "all natural" products. MSM that has been granted a GRAS (Generally Recognized As Safe) designation is used for several embodiments described herein. In some embodiments, a flow agent is combined with MSM, and provided

in accordance with several embodiments herein. Flow agents include, but are not limited to, silicon dioxide.

[0024] The use of MSM is also advantageous in several embodiments because it does not add a caloric value to the ingestible product. For example, although sucrose may be used to counter certain bitter tastes, the addition of sucrose will increase the caloric content of the final product. The use of MSM is also advantageous in certain embodiments for which dilution is undesirable. For example, in certain medications such as cough syrup, the addition of a sugary syrup may be used to enhance flavor, but typically dilutes the medicament.

[0025] The use of MSM is also advantageous in several embodiments because plant-based products with bitter or off-tasting properties do not have to be genetically modified or selectively bred to reduce said bitter or off-tasting properties. In several embodiments, MSM is combined with plant-based products, including, but not limited to, grains, herbs and vegetables.

[0026] In some embodiments, MSM is combined with a non-sugar sweetener to reduce the bitter or off-note after taste. For example, in one embodiment, MSM is combined with stevia to mask the bitter or off-taste associated with stevia. In one embodiment, MSM is added during processing of the stevia plant and/or combined with stevia prior to packaging. In yet other embodiments, MSM is added to foods and beverages along with stevia to effectively mask the unpleasant taste sometimes associated with stevia. MSM is also combined with natural or artificial sweeteners (e.g., saccharin, aspartame, sucralose, and sugar alcohols, such as erythritol, maltitol, sorbitol, xylitol, lactitol, and isomalt) in other embodiments. MSM is combined with stevia (or other sweetening agent) in a range of about 0.1% to about 50% of the weight of the stevia (or other sweetening agent). In some embodiments, ratios of MSM: stevia (or other sweetening agent) are 1:100, 1:50, 1:25, 1:10, 1:5, 1:2 or 1:1. Stevia, as used herein, shall be given its ordinary meaning and shall include steviosides, Rebaudioside A (Reb-A), and other components or extracts of the stevia plant.

[0027] In several embodiments, the reduction of bitter or off-taste is quantified by tasting the target product before and after the addition of MSM, and comparing the bitter or off-taste. In other embodiments, particularly in embodiments in which MSM is combined

with beer, the effect of MSM is quantified using the International Bitterness Units (IBU) scale.

[0028] In several embodiments, MSM is combined with chocolate or other products containing cacao. In one embodiment, bitter or off-taste is reduced in chocolate containing at least 54% cacao content. In one embodiment, about 500 mg to about 600 mg of MSM is used per 49 g chocolate bar. In other embodiments, MSM is provided in a range of about 0.1% to about 11% of the total weight of the cocoa containing product. In several embodiments, MSM is added to hot chocolate mixes, cake mixes and other cocoa-containing products. According to one embodiment of the invention, a method of adding MSM to cocoa-based products is provided. In several embodiments, MSM is added during processing of the cocoa bean. In other embodiments, MSM is added during the product manufacturing process.

[0029] In several embodiments, MSM is combined with beer. In one embodiment, MSM is added as an ingredient in the process of brewing beer. In one preferred embodiment, the beer is an India Pale Ale or other bitter equivalent. In several embodiments, MSM is used to reduce or otherwise mask the bitter or off-taste of non-alcoholic or low-alcohol beer. According to one embodiment of the invention, a method of adding MSM to beer is provided. In several embodiments, MSM is added during the product manufacturing process.

[0030] In several embodiments, MSM is combined with coffee. In still other embodiments, MSM is added as an additive to other ingredients often used in coffee, such as cream or sugar. In several embodiments, about 0.25 g to about 1.0 g MSM is used per 6 oz. serving of brewed coffee. According to one embodiment of the invention, a method of adding MSM to coffee is provided. In several embodiments, MSM is mixed with coffee grounds, prior to brewing liquid coffee. In other embodiments, MSM is added after brewing of coffee. In other embodiments, about 0.25 g to about 1.0 g MSM is used per 6 oz. serving of tea.

[0031] In several embodiments, MSM is combined with a pharmaceutical agent. In one embodiment, a pharmaceutical active agent may be admixed with a quantity of MSM sufficient to reduce the bitter or off-taste of the active agent. For example, an oral

formulation comprising MSM and at least one of aspirin, acetaminophen, chlorhexidine, dextromethorphan, diphenhydramine, doxylamine, guaifenesin, ibuprofen, pseudoephedrine, sildenafil citrate, or loperamide is provided to reduce the bitter or off-taste of those drugs. With many bitter or off-tasting drugs, compliance is a significant issue. Many patients refuse to take a drug, or do not take a drug on a regular schedule because of the taste. Accordingly, masking the bitter or off-taste of a drug according to several embodiments herein may increase patient compliance. In one embodiment, MSM is added to children's medications to increase oral tolerability. According to one embodiment of the invention, a method of adding MSM to a pharmaceutical agent is provided. MSM is used to coat the pharmaceutical agent in several embodiments. In several embodiments, MSM is not considered an active agent, and does not affect the properties of the active ingredient in the pharmaceutical formulation. Because MSM also possesses other health benefits, a combination of MSM with another ingredients, according to one embodiment, is particularly advantageous because MSM not only masks the bitter or off-taste, but also enhances the quality of the combined product. In several embodiments, MSM is used to mask a prolonged undesired taste. For example, MSM is used to mask an unpleasant taste that lasts hours, days, weeks, months or longer (e.g., 1-7 days, 1-4 weeks, 1-12 months, or longer). The prolonged undesired taste may be caused by certain medications that either interfere with normal taste sensation and/or cause reflux. In some embodiments, a metallic taste is masked by MSM. In certain embodiments, MSM is provided in a form that coats the tongue (e.g., in aerosol or rinse format), thereby restoring normal taste function. Because olfaction can be integral to taste, MSM is also provided as a nasal spray or irrigation in certain embodiments. In some embodiments, MSM is provided with the product that causes an prolonged undesired taste. In other embodiments, a user is instructed to take MSM prior to, with or after ingestion of the product that causes a prolonged undesired taste. In several embodiments, MSM is provided in a kit with instructions for use on recommended administration. In some embodiments, MSM is provided in a form to coat taste receptors, e.g., as a dissolvable strip for placement in the mouth.

[0032] In several embodiments, MSM is combined with products containing whole grains. In still other embodiments, MSM is added as an additive to other ingredients

often used in whole grain products, such as yeast, flour or sugar. According to one embodiment of the invention, MSM is mixed with the whole grains early in the process. In other embodiments, MSM is added to the grains as they are milled into flour or other forms such as cracked, milled, whole, crushed, various grades of flour. In still other embodiments, MSM is added into the final process of manufacturing, baking or cooking the product. In other embodiments, about .25 g to about 3 g MSM is used per 12 oz. serving of various grain products and product forms. In some embodiments, MSM is used during processing or cooking of amaranth, millet, quinoa, sorghum, triticale, wheat, oat, bulgur, corn, rice, buckwheat, flax, kamut, rye, spelt, or combinations thereof.

[0033] In several embodiments, MSM is combined with a nutritional supplement. In one embodiment, MSM is combined with a vitamin or other supplements to mask the bitter or off-taste. Because MSM also possesses nutritional benefits, a combination of MSM with another nutritional supplement, according to one embodiment, is particularly advantageous because MSM not only masks the bitter or off-taste, but also enhances the nutritional quality of the nutritional supplement. In several embodiments, MSM is inactive. MSM is used to coat the nutritional supplement in some embodiments. In several embodiments, MSM is added to multi-vitamins, minerals, B-complex supplements, ascorbic acid, and omega-3 supplements.

[0034] Use of MSM according to several embodiments herein is particularly advantageous because MSM may reduce the need for encapsulation. Currently, encapsulation (e.g., microencapsulation) is used to mask the bitter or off-taste of certain ingredients, including drugs and nutritional supplements. Encapsulation may adversely impact the effectiveness of the ingredient and/or solubility. Thus, use of MSM may obviate the need for encapsulation, thus enhancing an ingredient's solubility, effectiveness and/or general bioavailability.

[0035] In other embodiments, MSM is combined with a cosmetic or other agent that comes in contact with the mouth. For example, in one embodiment, MSM is combined with a lip balm. In some embodiments, MSM is combined with toothpaste, soaps, shampoos, and other products that are intended for oral use or contact the mouth unintentionally. In some embodiments, MSM is added to dental products (e.g., irrigation fluids, fluoride

treatments, bleaching products) that are commonly used in a dentist's office. In one embodiment, about 0.1 g to about 1.0 g MSM is added for every 100 ml of dental product.

[0036] In several embodiments, MSM is incorporated into or combined with animal feed. In this context, MSM may mask bitter flavors that are typically present in one or more of the ingredients in animal feed. Either naturally derived or chemically derived ingredients of animal feed may yield a bitter or unpleasant taste to an animal, causing the animal to reject the feed. In some cases, feed ingredient options may be limited, and rejection or reduced consumption of feed due to bitter tastes could result in animal malnutrition. In certain embodiments, the feed is for canine consumption. MSM may also be incorporated into feed for consumption by other animals, including, but not limited to, felines, equines, swine, ovine, and bovine. In addition to its masking effects, MSM may also help contribute to the health of the animals consuming feed that includes MSM.

[0037] In several embodiments, MSM is provided solely as a dietary supplement for humans or animals. In some embodiments, MSM is provided in supplement form that is separate from the animal's food, and can be used for domesticated animals and livestock.

[0038] In several embodiments of the invention, MSM is combined with one or more of the following: amides (such as denatonium benzoate), alkaloids (such as strychnine, caffeine, and quinine), amino acids, fatty acids, salts of ions (such as potassium, calcium or magnesium), plants, grains, fruits, vegetables (such as arugula, broccoli, cauliflower, cabbage, watercress, and bok choy), non-alcoholic beverages (coffee, herbal tea, green tea), and alcoholic beverages. MSM derivatives or MSM metabolites are used in addition to or in place of MSM according to some embodiments herein. In any of the embodiments described herein, an MSM related compound may be used instead of or in addition to MSM. Related compounds include but are not limited to DMSO and DMS. In several embodiments, the related compounds are used in the same quantities are described herein for MSM. In other embodiments, the related compounds (e.g., DMSO or DMS) are combined with MSM and act synergistically with MSM. For example, the amount of DMSO and/or MSM may be reduced (e.g., by 75%, 50%, 40%, 30%, 20%, 10%, or 5%) to achieve the same effect when administered together, than if administered alone. For example if 2 grams of DMSO or

MSM alone achieved an effect, one would only need to use 0.5 grams of DMSO and MSM to achieve the same effect. Thus, the quantity of DMSO and MSM would be reduced by 50%.

[0039] In several of the embodiments described herein, MSM is used in a range from about 0.1% to about 25% of total weight of the ingestible product. In other embodiments, MSM is provided in a range from about 0.1% to about 15% of total weight. In several embodiments, MSM is provided at about 1% to about 10-11% of total weight. In some embodiments, the quantity of MSM masks the bitter or off-taste of the ingestible product, but does not exceed the level at which MSM contributes or increases the bitter taste. In some embodiments, MSM does not exceed 50%, 40%, 30%, 20%, or 15% of the total weight of the ingestible product.

[0040] In several embodiments, a method for reducing the bitter or off-taste of a traditionally bitter or off-tasting agent is provided. In one embodiment, the method comprises identifying a bitter-tasting or off-tasting agent that results in the perception of a bitter or off-taste when it is ingested alone, followed by combining MSM with the bitter-tasting or off-agent and providing that mixture to a subject for ingestion. After ingestion, such embodiments effectively reduce the bitter or off-taste perceived from ingesting the agent. In some embodiments, that effect is achieved by alterations in the normal signal transduction pathway involved in perception of a bitter or off-taste after ingestion of the bitter or off-tasting agent.

[0041] In certain embodiments the alteration of the normal signal transduction pathway comprise a competitive inhibition with the bitter or off-agent for the bitter or off-tasting agent receptor. In other embodiments, the methods as disclosed herein involve activation of a distinct pathway that influences the normal signal transduction pathway of bitter or off-tasting agents. In still other embodiments, the method as disclosed herein initiates a cascade of signals that potentiate or interrupts the signaling cascade initiated upon ingestion of a bitter or off-tasting agent.

[0042] Not wishing to be bound by any particular theory, Applicant believes that certain preferred embodiments reduce the perceived bitter or off-taste of bitter-tasting or off-tasting agents by interrupting or reducing the amount of calcium released in response to activation of a bitter or off-tasting agent sensing GPCR and gustducin G-protein.

[0043] In other embodiments, the steps of incorporating MSM into a product or mixture comprising one or more bitter or off-tasting agents is made more efficient by MSM functioning as a flow agent for liquid reactants.

[0044] In still further embodiments, the method as disclosed herein could be used to the reduce the bitterness or off-taste of foodstuffs meant for consumption by domestic animals, such as to increase the compliance for those animals who are overly selective on food type.

[0045] In some embodiments of the invention, MSM is used to mask an undesired taste of an ingestible product that already contains a small amount of MSM (e.g., naturally-occurring MSM). The exogenous MSM that is added to said ingestible product is in the range of about 100 – 500,000 times greater in weight or ppm than that found naturally (e.g., 100x-500x, 500x-1000x, 1000x-5000x, 5000x-10,000x, 10,000x-25,000x, 25,000x-50,000x, 50,000x-100,000x, 100,000x-500,000, and overlapping ranges thereof).

Signal Transduction

[0046] In several embodiments, MSM masks taste by affecting one or more signal pathways. Signaling mechanisms are varied among the taste modalities. Generally, salty and sour signal via ion channels, while sweet, bitter and umami signal through G-protein coupled receptors (GPCRs) and G proteins. There is some overlap in mechanisms, even within a single taste modality.

[0047] GPCRs are also known as seven transmembrane domain receptors, as their folded protein conformation traverses the lipid membrane in which they sit seven times. In their inactive state, GPCRs are associated with, and sometimes bound to a G protein. GPCRs that transduce bitterness were first identified in 2000 and further research has yielded nearly 40 related family members. This family is known as the T2R family of bitter receptors. See Roper S., Pflugers Arch – Eur J. Physiol, 454:759-776 (2007) which is incorporated herein by reference. Numerous studies of T2R function have demonstrated their role in transducing bitter tastes. Interestingly, more recent studies have shown that taste buds express various subsets of the T2R family, not the entire family. This further supports the concept that multiple mechanisms may be at work in different bitter-taste sensitive cells. It is possible

that other related or unrelated GPCR families also participate in the transduction of bitter tastes and, likewise, other off-tastes.

[0048] G protein is more correctly a common name for two distinct protein families. There are heterotrimeric G proteins which consist of alpha (α), beta (β), and gamma (γ) subunits. The second family is monomeric and homologous to the Gα subunit of heterotrimeric G proteins, known as the Ras superfamily of small GTPases. Both families are responsive to the activation of a GPCR and serve as intermediates in a signal transduction cascade whose effect is defined by the particular identity of the G-protein.

[0049] Upon binding of a ligand, for example a bitter or off-tasting agent, the GPCR undergoes a conformational change that enables the GPCR to function as a nucleotide exchange factor, replaceing guanosine diphosphate (GDP) with guanosine triphosphate (GTP) on the Gα subunit. This exchange is thought to either cause dissociation of dissociation of the Gα subunit, bound to GTP, from the Gβγ dimer and the GPCR or induce molecular rearrangement, reorganization, and pre-complexing of effector molecules, though the latter results are more theory based at present. Both Gα-GTP and Gβγ can then activate different signaling cascades (or second messenger pathways) and effector proteins, while the receptor is able to activate the next G protein.

[0050] The Gα subunit of heterotrimeric G proteins actually includes four main subfamilies, Gαs, Gαi, Gαq/11, and Gα12/13, which differ in the eventual outcome of GPCR activation, but all involve a similar mechanism of action. Gαs stimulates the production of cyclic adenosine monophosphate (cAMP) from adenosine triphosphate (ATP). This occurs as a result of direct Gαs stimulation of adenylate cyclase. cAMP then acts as a second messenger that interacts with and activates protein kinase A (PKA), which can produce a vast range of responses through phsophorylation of downstream targets, such as ion channels. Conversely, Gαi inhibits the production of cAMP from ATP, thereby reducing signal flow through those cascades that may rely on PKA activity, such as ion channels, particularly potassium channels.

[0051] Gαq/11 stimulates membrane-bound phospholipase C which cleaves a membrane bound phospholipid, phosphatidylinositol 4,5-bisphosphate (PIP_2) into two second messengers, inositol 1, 4, 5-trisphosphate (IP_3) and diacylglycerol (DAG).

[0052] Gα12/13 are involved in Rho family GTPase signaling and are regulators of cell migration through the control of cytoskeletal remodeling.

[0053] The Gβγ sometimes also have active functions, e.g., coupling to L-type calcium channels.

[0054] Gustducin, a heterotrimeric G-protein, has been implicated in transducing bitter tastes. Several expression studies have demonstrated co-localization of gustducin with T2Rs in taste cells and highly localized with IP_3 receptors in certain regions of taste cell deposition, such as the soft palate. Early functional studies confirmed that both cAMP and IP_3 were second messengers involved in bitter taste transduction and gustducin activation. Current models suggest that the decrease in cyclic nucleotides such as cAMP is triggered by activation of the Gα subunit of gustducin while the Gβγ dimer of gustducin operates through the IP_3 pathway.

[0055] Membrane bound PIP_2 is a target for some activated G proteins. Some G proteins stimulate phospholipase C, an enzyme that cleaves the PIP_2 into two molecules, a membrane resident DAG and a diffusible IP_3. DAG is a physiological activator of protein kinase C (PKC). The production of DAG in the membrane facilitates translocation of PKC from the cytosol to the plasma membrane where it can phoshphorylate many varied targets.

[0056] IP_3, on the other hand, diffuses away from the plasma membrane and can bind to one or more of its three IP_3 receptor (IP_3R) subtypes IP_3R1, IP_3R2, or IP_3R3 on the endoplasmic reticulum (ER). The activation of an IP_3R will induce a release of calcium ions from the intracellular stores located within the ER. Depending on the cell type in which IP_3 is produced, the effects of increased intracellular calcium can vary. For example, in muscle cells, increased calcium leads to activation of contraction protein complexes. Calcium is important in neurons, such as those relaying gustatory information from the taste buds to the cerebrum, because increased intracellular calcium is involved in increased release of neurotransmitters at synapses.

[0057] Due to these diverse effects, calcium is tightly regulated by transport proteins that serve to either move calcium ions across the plasma membrane to the exterior of a cell, or to sequester the calcium in intracellular storage sites, such as the ER. Resident proteins within these intracellular stores often serve as binding sinks for free calcium ions.

[0058] In addition to those discussed above, other possible mechanisms for taste transduction include channel blockage by bitter or off-tasting agents, direct action of bitter or off-tasting agents on cell-surface receptors, direct activation of G proteins by bitter or off-tasting agents, activation of one or more phosphodiesterase enzymes (PDE) or PDE inhibition. Thus, in several embodiments, MSM affects one or more of the pathways described herein. For example, MSM affects calcium or other ion flux and/or channels in some embodiments. In other embodiments, MSM affects IP_3 or IP_3 receptors. In yet other embodiments, MSM affects G-proteins or G-protein receptors, either by altering uptake, function, activity and/or binding.

EXAMPLES

[0059] Specific embodiments will be described with reference to the following examples which should be regarded in an illustrative rather than a restrictive sense.

Example 1- MSM Based Reduction of Bitterness or Off-Taste of Ingredients

[0060] Numerous ingredients that provide a health benefit to people and/or animals contained in foods, beverages, supplements, cosmetics, pharmaceuticals are also bitter or off-tasting and can be difficult or impossible to mask in the final formulation. This may not only decrease the palatability of the items, thereby reducing the intake of nutritionally beneficial ingredients, but can present an issue in regards to patient compliance in the instance of pharmaceuticals.

[0061] The purpose of Example 1 is to determine if MSM masks the bitterness or off-taste of ingredients that are normally have a bitter or undesired taste. The Example involves ingredients that are both dietary supplement and/or food ingredients (namely glucosamine, ashwagandha, and potassium chloride), hence making them more palatable and easier for formulation and/or market acceptance. In several embodiments, MSM in raw form, when mixed with ingredients that have a bitter or off-taste and are later incorporated into finished products, would reduce the perception of bitterness or off-note in the ingredients. In several embodiments, MSM is also used to mask the bitter or off-taste of bitter orange peel and vitamin B-12. In yet other embodiments, MSM is used to mask the bitter or off-taste of other nutraceuticals (including, but not limited to, minerals, herbs, amino acids, vitamins, soy, soy isolates, whey, whey isolates, protein bars, drinks, and shakes, etc.).

[0062] Three active ingredients that are used in dietary supplements and/or foods were selected for use in the test. Equal masses of each of the three ingredients were weighed on a scale in triplicate. Three different masses of MSM were weighed on an analytical balance such that MSM would constitute 3%, 10%, or 25% of the total weight of the MSM-ingredient mixture. The MSM was also weighed out in triplicate. Each ingredient was tasted alone (i.e. individually and without MSM). An appropriate amount of MSM was then thoroughly mixed with each of the 9 ingredient samples. The MSM-ingredient mixtures were tasted and the bitterness of each mixture was noted. (See Table 1)

[0063] In general, MSM had a positive effect on lowering the bitterness of various ingredients. Depending upon the level of masking that is desired and the benefit of flow-ability of the finished product, it appears that the general range of bitter masking for ingredients is between 3% and 25%. Certain ingredients bitter properties were significantly reduced at 10% MSM; while the 25% concentration of MSM tended to bring forth too much of MSM's natural bitterness.

[0064] More particularly, Ingredient #1, glucosamine, was a bitter, brown and pasty ingredient. When combined with MSM, 3% MSM masked the bitterness of the ingredient, but only slightly. In contrast, with 25% MSM, a slight bitter taste attributable to the MSM was perceived. However, at the intermediate 10% level of MSM, the bitter flavor of the ingredient was well-masked. Although bitterness was assessed in this experiment, according to several embodiments, other off-tastes are masked in other ingredients that contain an undesired taste (other than bitterness).

[0065] Ingredient #2, ashwagandha, consisted of black and brown granules and was simultaneously bitter and sour. At 3% MSM, no reduction in bitterness was perceived. Ten percent MSM yielded some masking of the bitterness. In one embodiment, 25% MSM resulted in good masking of the bitter taste of ingredient #2.

[0066] Ingredient #3, potassium chloride was an off-white chalky ingredient with a sharply bitter taste. Mixture of ingredient #3 with MSM to 3% total weight only slightly masked the bitterness of ingredient #3. MSM to 25% yielded a slight bitterness traceable to the MSM when tasted. The 10% level of MSM, however, provided good masking of the bitter flavor of ingredient #3.

[0067] These results demonstrate that MSM can effectively mask the bitter flavor of ingredients that vary not only in their physical characteristics but also in the degree of bitterness perceived upon their ingestion. Further, it was also observed that certain percentages of MSM also helped the active ingredient flow and handle better from a formulation perspective.

[0068] It is common for bitter or off-tasting ingredients to be microencapsulated in order to mask their taste. The result of this encapsulation is often a reduction of effectiveness of the ingredient and/or its insolubility. If the bitterness or off-taste can be reduced to an acceptable level by using MSM, then microencapsulation may not be necessary and thus increasing the bioavailability and applications of the various ingredients into finished product forms.

Table 1: Perception of Bitterness from Bitter Ingredients Mixed with MSM

Active Ingredient	Description	3% MSM	10% MSM	25% MSM
Ingredient #1 (glucosamine)	Very bitter, brown ingredient that acted pasty	Slight masking	Good masking	Slight MSM taste
Ingredient #2 (ashwagandha)	Combination of sour and bitter – brown and black granule ingredient	No masking	Some masking	Good
Ingredient #3 (potassium chloride)	Sharp bitter, off-white chalky ingredient	Slight masking	Good masking	Slight MSM taste

Example 2- MSM Based Reduction of Bitterness of Chocolate

[0069] Applicant's preliminary tests also showed that MSM reduces the bitter taste of chocolate. At certain concentrations for certain chocolates, MSM may lose the ability to mask the bitter taste and become unpalatable. Although bitterness was assessed in this chocolate experiment, according to several embodiments, other off-tastes are masked in other confectionaries that contain an undesired taste (other than bitterness).

[0070] MSM was weighed out into separate vessels in the following masses: 0.579g, 1.157g, 1.736g, 2.314g, 2.893g, 3.471g, 8.1g, 9.256g, 13.884g, 16.198g, 18.512g,

and 23.14g. Large chunks of 54% semi-sweet dark chocolate were cut from a single, uniform block. Thirteen individual 113.4g (1/4lb.) samples of chocolate were weighed out from the large chunks. Each of the thirteen samples were placed into a double boiler on a stove top and melted at a temperature ranging between 83 and 110° F. When the sample of chocolate was completely melted, one of the individual masses of MSM was added to the chocolate and thoroughly mixed. Each sample of chocolate with MSM was then spread onto parchment paper for cooling and later cut into pieces for taste testing.

[0071] The results of this experiment (See Table 2) demonstrate that there are different levels of MSM that can be used to mask the bitter flavor of dark chocolate. While lower percentages of MSM provided noticeable masking as compared to dark chocolate alone, higher percentages of MSM may yield a bitter flavor caused by MSM itself. The results of the present taste test experiment indicate that the range of 500-600 mg MSM per ounce of dark chocolate appear to provide the best taste results. In some embodiments, 0.1% to 10% MSM is used to mask the bitter taste of chocolate. In other embodiments, depending on the type of chocolate, higher or lower concentrations of MSM may be effective. In several embodiments, MSM masks one or more bitter properties of milk chocolate, cocoa nibs, unprocessed cocoa and processed cocoa (e.g., Dutch, alkalization or other processing).

Table 2. Effect of MSM on Bitterness of Dark Chocolate

MSM (g)	% MSM	MSM (mg/oz.)	MSM (mg/49g bar)	Taste Results
0	0	0	0	
0.579	0.5	144	250	Some Masking
1.157	1	286	500	Better Masking
1.736	1.5	428	750	Better Masking
2.314	2	567	1000	Best Masking
2.893	2.5	706	1250	Better Masking
3.471	3	842	1500	Better Masking
8.1	6.7	1890	3500	Some Masking
9.256	7.5	2140	4000	Some Masking
13.884	11	3090	6000	Upper Limit
16.198	12.5	3540	7000	MSM Bitter
18.512	14	3980	8000	MSM Bitter
23.14	17	4800	10000	MSM Bitter

[0072] Based on these initial results, additional taste tests were performed using the methods of preparation described above.

[0073] A first subsequent blind taste test was performed that involved 92 people who preferred the taste of milk chocolate over dark chocolate due to their perception of dark chocolate as bitter. These subjects tasted 54% dark chocolate with 1% MSM added and compared it to 54% dark chocolate alone. In comparing the two formulations, 82% of those tested preferred the dark chocolate with 1% MSM over the same dark chocolate with no MSM.

[0074] A second blind taste test with six individuals in the confectionary industry compared 54% dark chocolate with 2% MSM added with 54% dark chocolate alone. In comparing the two formulations, each of the six individuals preferred the 54% dark chocolate with 2% MSM added over the dark chocolate with no MSM.

[0075] Confirming the preliminary analysis discussed above, the subsequent taste tests indicate that, in several embodiments, the addition of MSM masks the bitter flavors of dark chocolate. In some embodiments, the masking effect is sufficient to overcome the pre-existing opinion of taste-tester that dark chocolate is bitter. In some embodiments, MSM in a concentration of about 0.5% to about 3% provide masking effects, including 1% and 2 % MSM.

Example 3- MSM Based Reduction of Bitterness of Coffee

[0076] Applicant's preliminary tests also showed that MSM appears to reduce the bitter taste of coffee. In Applicant's initial study, 6 of 8 blinded testers indicated that coffee including MSM at various concentrations was less bitter than coffee alone. These results confirm the earlier findings that MSM can reduce bitter flavors.

[0077] A subsequent blind taste test was performed with 23 subjects who preferred the taste of coffee with a creamer over black coffee due to their perception of black coffee as bitter. The test compared black coffee supplemented with .25% MSM (by weight) and black coffee with no MSM supplementation. Both formulations were created using the same brand of coffee and tap water. Both formulations were brewed using the same procedures and served to test subjects at similar temperatures. After tasting both formulations of coffee, 78% of those tested preferred the coffee with .25% MSM added over the same coffee with no MSM, based on the MSM-supplemented coffee tasting less bitter. Thus, in some embodiments, In some embodiments, 0.1% to 10% MSM is used to mask the bitter taste of coffee. In other embodiments, depending on the type of coffee, the temperature of the coffee, and the presence or absence of creamer and/or sweetener, higher or lower concentrations of MSM may be effective.

Example 4- MSM Based Reduction of Bitterness of Natural Sweeteners

[0078] Applicant's preliminary tests also showed that MSM reduces the undesired aftertaste of natural sweeteners, such as stevia-based sweeteners. Surprisingly, stevia-based sweeteners may, at certain concentrations, produce a bitter taste, aftertaste, or off-tasting

properties rather than the expected sweetening effect. This experiment assessed the ability of MSM to mask the bitter taste or off-taste of various stevia products.

[0079] MSM was weighed out into separate vessels in the following masses: 1g, 2g, 3g, and 4g. Five vessels were prepared for each of the four masses. Five uniform preparations of a sports drink formulation were prepared and each sweetened with 0.8g of one of five different varieties of stevia-based sweetener. Equal volumes (20 oz.; 600g) of the sweetened formulation were poured into 25 separate bottles. Five bottles did not receive any MSM (e.g., a control group). Five replicate bottles were prepared for each of the four masses of MSM. All bottles were thoroughly mixed and refrigerated before a blind taste test. Tasters ranked each drink sample for its perceived taste quality, i.e. lack of bitterness.

Table 3. Effect of MSM on Masking of Natural Sweeteners

Sweetener ID	MSM (g)				
	0	1	2	3	4
A	2nd best	neutral	Best	neutral	neutral
B	Best/2nd best	2nd best/Best	neutral	neutral	neutral
C	neutral	2nd best	Best	neutral	neutral
D	Best/2nd best	neutral	Best	neutral	neutral
E	2nd best/neutral	Best	Best	neutral	neutral

[0080] The results of this experiment (See Table 3) demonstrate that a varied range of MSM can be used to mask the bitter aftertaste or off-taste of a variety of natural sweeteners. Depending on the particular sweetener, it appears that 1-2 grams of MSM/600 g (0.17-0.33% MSM by total weight) of sweetened beverage provides substantial masking of the aftertaste of natural sweeteners in some embodiments. In several embodiments, 0.1 to 0.35% MSM is used to mask the bitter taste of stevia-based natural sweeteners (or other sweeteners). In other embodiments, depending on the particular sweetener, higher or lower concentrations of MSM may be effective. In still other embodiments, depending on the flavor of the beverage sweetened with a natural, but potentially bitter or off-tasting sweetener, higher or lower concentrations of MSM may be effective.

[0081] It will be understood by those of skill in the art that numerous and various modifications can be made without departing from the spirit of the present invention. Therefore, it should be clearly understood that the forms of the present invention are illustrative only and are not intended to limit the scope of the present invention.

WHAT IS CLAIMED IS:

1. A method for masking the undesired taste of a bitter or off-tasting agent, comprising:

identifying a bitter-tasting or off-tasting agent that results in the perception of a undesired taste; and

combining an effective amount of methylsulfonylmethane (MSM) with the bitter-tasting or off-tasting agent to yield a combination comprising said MSM and said bitter-tasting or off-tasting agent;

wherein said MSM is provided in a range of about 0.1% of the weight of the bitter-tasting agent or off-tasting agent (1000 ppm) to about 11% of the weight of the bitter-tasting agent or off-tasting agent (110,000 ppm);

wherein said MSM masks the undesired taste of said bitter-tasting or off-tasting agent when in combination with said bitter-tasting agent or off-tasting.

2. The method of Claim 1, wherein said bitter-tasting or off-tasting agent comprises at least one of cocoa or coffee.

3. The method of Claim 1, wherein said bitter-tasting or off-tasting agent comprises at least one grain.

4. The method of Claim 1, wherein said bitter-tasting or off-tasting agent comprises at least one of a pharmaceutical agent or a vitamin supplement.

5. The method of Claim 1, wherein said bitter-tasting or off-tasting agent comprises at least one of an artificial sweetener or stevia.

6. The method of Claim 1, wherein said bitter-tasting or off-tasting agent comprises at least one of a fruit or vegetable.

7. The method of Claim 1, wherein said bitter-tasting or off-tasting agent comprises beer.

8. The method of Claim 1, wherein said bitter-tasting or off-tasting agent comprises at least one of a soap, shampoo or lip balm.

9. The method of Claim 1, wherein said MSM coats said bitter-tasting or off-tasting agent.

10. The method of Claim 1, wherein said MSM bonds with said bitter-tasting or off-tasting agent.

11. The method of Claim 1,

wherein the MSM alters the normal signal transduction pathway involved in perception of a bitter taste or off-taste after ingestion of the bitter-tasting or off-tasting agent,

wherein said signal transduction pathway relays a biochemical signal from one or more taste receptors to a brain region of a mammal, and

wherein the alteration of the normal signal transduction pathway by MSM reduces the bitter taste or off-taste perceived.

12. The method of Claim 11, wherein the biochemical signal is an increase in release of intracellular calcium.

13. The method of Claim 11, wherein the signal transduction pathway involves activation of a G-protein coupled receptor and a G-protein.

14. A combination according to any one of the preceding claims, wherein said combination comprises said MSM in a range of about .25% of the weight of the bitter-tasting agent or off-tasting agent (2500 ppm) to about 3% (30,000 ppm) of the weight of the bitter-tasting agent or off-tasting agent.

15. A kit for masking an undesired taste of a bitter-tasting agent or off-tasting agent, wherein said kit comprises:

methylsulfonylmethane (MSM) and a bitter-tasting agent or off-tasting agent;

wherein said MSM is provided in a range of about .25% of the weight of the bitter-tasting agent or off-tasting agent (2500 ppm) to about 3% (30,000 ppm) of the weight of the bitter-tasting agent or off-tasting agent; and

instructions for combining the MSM with said bitter-tasting agent or off-tasting agent to mask the undesired taste of said bitter-tasting agent or off-tasting agent.

16. A composition for masking a bitter taste of cocoa, comprising:

cocoa; and

methylsulfonylmethane (MSM),

wherein said MSM is provided in a range of about .5% to about 3% of the weight of the cocoa.

17. A composition for masking a bitter taste of coffee, comprising:

coffee; and

methylsulfonylmethane (MSM),

wherein said MSM is provided in a range of about .25% to about 2% of the weight of the coffee.

18. A composition for masking a bitter taste of a grain, comprising:

one or more grains; and

methylsulfonylmethane (MSM),

wherein said MSM is provided in a range of about .25% to about 2% of the weight of said one or more grains.

19. The composition according to Claim 18, wherein said one or more grains comprises amaranth, millet, quinoa, sorghum, triticale, wheat, oat, bulgur, corn, rice, buckwheat, flax, kamut, rye, and spelt.

20. A composition for masking an undesired taste of a pharmaceutical, comprising:

one or more pharmaceuticals; and

methylsulfonylmethane (MSM),

wherein said MSM is provided in a range of about .1% to about 5% of the weight of said one or more pharmaceuticals.

21. The composition according to Claim 20, wherein said one or more pharmaceuticals comprises an anti-anxiety drug or sleep aid.

22. The composition according to Claim 20, wherein said one or more pharmaceuticals comprises aspirin, acetaminophen, chlorhexidine, dextromethorphan, diphenhydramine, doxylamine, guaifenesin, ibuprofen, pseudoephedrine, sildenafil citrate, and loperamide

23. A composition for masking an undesired taste of a nutritional supplement, comprising:

one or more nutritional supplements; and

methylsulfonylmethane (MSM),

wherein said MSM is provided in a range of about .1% to about 5% of the weight of said one or more nutritional supplements.

24. A composition for masking the taste of an ingestible product, comprising:

an ingestible product having a bitter taste or off-taste,

at least one of methylsulfonylmethane (MSM) or an MSM-related compound;

wherein said MSM or MSM-related compound is provided in a range of about 0.5% to about 50% of the weight of the ingestible product.

25. The composition of Claim 24, wherein said MSM-related compound is dimethylsulfoxide (DMSO) and/or dimethylsulfide (DMS).

26. A method for masking the taste of an ingestible product, comprising:

providing an ingestible product having a bitter taste or off-taste;

providing at least one of methylsulfonylmethane (MSM) or an MSM-related compound; and

combining said ingestible product with said MSM or MSM-related compound,

wherein said MSM or MSM-related compound is provided in a range of about 0.1% to about 50% of the weight of the ingestible product, and

wherein said MSM or MSM-related compound masks one or more bitter or off-tasting properties of said ingestible product when in combination with said ingestible product.

27. The method of Claim 26, wherein said MSM-related compound is dimethylsulfoxide (DMSO) and/or dimethylsulfide (DMS).

28. A method for masking a prolonged bitter taste or off-taste taste associated with ingestion of an ingestible product, comprising:

providing an ingestible product causing a prolonged bitter taste or off-taste; and

providing at least one of methylsulfonylmethane (MSM) or an MSM-related compound;

wherein said MSM or MSM-related compound is provided in a range of about 0.1% to about 50% of the weight of the ingestible product, and

wherein said MSM or MSM-related compound masks one or more prolonged bitter or off-tastes associated with ingestion of said ingestible product.

29. A composition for masking the taste of an ingestible product for non-human animal consumption, comprising:

an ingestible product having a bitter taste or off-taste; and

methylsulfonylmethane (MSM),

wherein said MSM is provided in a range of about 0.1% to about 11% of the weight of the ingestible product.

30. The composition of Claim 29, wherein said composition is suitable for administration for domesticated animals and livestock.

31. The composition of Claim 29, wherein said MSM is combined with said ingestible product.

32. The composition of Claim 29, wherein said ingestible product is animal feed.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 10/37503

A. CLASSIFICATION OF SUBJECT MATTER
IPC(8) - A23L 1/22 (2010.01)
USPC - 426/534
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
USPC: 426/534

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC: 426/534, 546; 514/711
(keyword limited; terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
PubWEST (PGPB,USPT,USOC,EPAB,JPAB); Google; PubMed
Search terms: methylsulfonylmethane, bitter, off-taste, taste, food, taste-masking, coffee, ambien, aspirin, pharmaceutical

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 4,616,039 A (HERSCHLER) 7 October 1986 (07.10.1986) col 1, ln 56-63; col 3, ln 57-61; col 6, ln 14-18; col 9, ln 34-38; col 10, ln 5-28, 51-67; col 11, ln 9-15, 31-32, 40-43, 50-56; col 13, ln 11-13; col 23, ln 51-57	1-20, 23-32 ---------- 21-22
X	US 2008/0057162 A1 (BRUCKER et al.) 6 March 2008 (06.03.2008) [0013], [0044], [0096]-[0102]	14, 15, 17, 24, 26, 28
Y	US 2005/0164987 A1 (BARBERICH) 28 July 2005 (28.07.2005) para [0121], [0124]	21
Y	US 2007/0122475 A1 (CORBO et al.) 31 May 2007 (31.05.2007) claims 1, 3	22
A	US 2003/0069202 A1 (KERN et al.) 10 April 2003 (10.04.2003)	1-32
A	JP 2005/110548 A (TAKAGAKI et al.) 28 April 2005 (28.04.2005)	1-32

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 July 2010 (23.07.2010)	13 AUG 2010
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