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(54) Title: COMPOSITIONS RELATED TO BIOACTIVE AGENTS THAT CONVERT FROM ANIONS TO MOLECULES

(57) Abstract: Various aspects of this patent document relate to bioactive compositions comprising anions that are converted into hydrophobic bioactive molecules either ex vivo prior to administration to a subject or in situ subsequent to administration to a subject. Such compositions display improved bioavailability and pharmacokinetics relative to compositions that comprise the hydrophobic bioactive molecules instead of the anions.

COMPOSITIONS RELATED TO BIOACTIVE AGENTS THAT CONVERT FROM ANIONS TO MOLECULES

CROSS-REFERENCE TO RELATED APPLICATIONS

This patent application claims priority to U.S. Provisional Patent Application No. 63/154,509, filed February 26, 2021; U.S. Provisional Patent Application No. 63/154,543, filed February 26, 2021; U.S. Provisional Patent Application No. 63/191,816, filed May 21, 2021; U.S. Provisional Patent Application No. 63/191,833, filed May 21, 2021; U.S. Provisional Patent Application No. 63/191,847, filed May 21, 2021; U.S. Provisional Patent Application No. 63/191,878, filed May 21, 2021; U.S. Provisional Patent Application No. 63/194,813, filed May 28, 2021; U.S. Provisional Patent Application No. 63/254,433, filed October 11, 2021; U.S. Provisional Patent Application No. 63/256,455, filed October 15, 2021; and U.S. Provisional Patent Application No. 63/282,125, filed November 22, 2021, each of which is incorporated by reference in its entirety.

BACKGROUND

The "Rule of Five" states that the logarithm base-10 of the octanol-water partition coefficient of a druglike molecule is generally no greater than 5. A generally-applicable strategy to overcome this feature of the Rule of Five is desirable.

SUMMARY

A chemical species having a logarithm base-10 of its octanol-water partition coefficient that is greater than 5 limits solubility in bodily fluids, which limits bioavailability. Many classes of hydrophobic bioactive molecules can be converted into anions that display improved octanol-water partition coefficients using simple acid/base chemistry. Such anions convert back into their parent bioactive molecules upon administration to a subject. Various aspects of this patent document relate to compositions that overcome the octanol-water partition coefficient limitation set forth in the Rule of Five using formulations that comprise an anionic form of a molecular bioactive agent.

DETAILED DESCRIPTION

Various aspects of this patent document relate to a composition comprising 2,6-diisopropylphenolate, for use as a medicament. In some embodiments, the composition is for use as a medicament to sedate or anesthetize the subject. In some embodiments, the composition is formulated to convert the 2,6-diisopropylphenolate into 2,6-diisopropylphenol in situ subsequent to administering the composition. In some embodiments, the composition is formulated to convert the 2,6-diisopropylphenolate into 2,6-diisopropylphenol ex vivo prior to administering the composition.

"Comprise" and "comprising" refer to an open set such that a composition that comprises 2,6-

diisopropylphenolate can also comprise water.

Various aspects of this patent document relate to a composition comprising 2,6-diisopropylphenolate, for use to manufacture a medicament.

In some embodiments, the composition comprises water, wherein the 2,6-diisopropylphenolate is dissolved in the water, and the water has a pH that is greater than 8.5. In some specific embodiments, the water has a pH that is greater than 9.5. In some very specific embodiments, the water has a pH that is greater than 10.5 and no greater than 13.5.

In some embodiments, the composition comprises the 2,6-diisopropylphenolate at a concentration of at least 15 grams per liter.

In some embodiments, the composition lacks triglycerides, fatty acids, and phospholipids at a combined concentration greater than 50 grams per liter.

In some embodiments, the composition comprises 2,6-diisopropylphenol, and the composition comprises the 2,6-diisopropylphenolate at a greater molar concentration than the 2,6-diisopropylphenol.

Various aspects of this patent document relate to a composition comprising 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide, for use as a medicament. In some embodiments, the composition is for use as a medicament to modulate international normalized ratio ("INR") in a subject. In some embodiments, the composition is for use to either prophylactically prevent or treat (a) thromboembolic events, (b) venous thrombus, (c) pulmonary embolism, (d) thromboembolic complications associated with atrial fibrillation or cardiac valve replacement in a subject, (e) myocardial infarction, (f) ischemic stroke, (g) ischemia-related death, or (h) two or more of the foregoing.

"INR" refers to prothrombin time ratio raised to the International Sensitivity Index for the prothrombin time assay, in which prothrombin time ratio is the prothrombin time of the subject divided by the prothrombin time of a normal control for the relevant assay.

In some embodiments, the composition is formulated for oral administration; the composition is formulated to allow the conversion of the 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide into 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-ol before the 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide reaches the stomach of the subject; and the composition is formulated to allow absorption of the 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-ol by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

In some embodiments, the composition is formulated for inhalational administration or injection.

Various aspects of this patent document relate to a composition comprising 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide, for use to manufacture a medicament.

In some embodiments, the composition is a liquid, and the 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide is dissolved in the liquid.

Various aspects of this patent document relate to a composition comprising an estrogen anion, for use as a medicament.

In some embodiments, the estrogen anion is (8R,9S,13S,14S,17S)-17-hydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide; (8R,9S,13S,14S,17R)-17-ethynyl-17-hydroxy-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-oxide; or (8R,9S,13S,14S,16R,17R)-16,17-dihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide.

In some embodiments, the estrogen anion has a conjugate acid that is an estrogen molecule; and the estrogen molecule has an acid dissociation constant in water of at least 50 femtomolar and no greater than 50 nanomolar for conversion of the estrogen molecule into the estrogen anion.

In some embodiments, the composition is formulated to allow the conversion of the estrogen anion into the estrogen molecule before the estrogen anion reaches the stomach of the subject; and the composition is formulated to allow absorption of the estrogen molecule by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

In some embodiments, the estrogen anion is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxopentyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxopentyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-ol; the estrogen anion is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxo-3-cyclopentylpropyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxo-3-cyclopentylpropyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-ol; the estrogen anion is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxoheptyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxoheptyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-ol; the estrogen anion is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxoundecanyl)oxy]-6,7,8,9,11,12,14,15,16,17-

decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxoundecanyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-ol; the estrogen anion is (8R,9S,13S,14S,17R)-17-hydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17R)- 13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,17-diol; the estrogen anion is (8S,9S,11S,13S,14S,17R)-17-ethynyl-17-hydroxy-11-methoxy-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8S,9S,11S,13S,14S,17R)-17-ethynyl-11-methoxy-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthren-3,17-diol; the estrogen anion is (8R,9S,13S,14S,16S,17R)-16,17-dihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,16S,17R)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,16,17-triol; the estrogen anion is (8R,9S,13S,14S,16S,17S)-16,17-dihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,16S,17S)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,16,17-triol; the estrogen anion is (8R,9S,13S,14S)-17-oxo-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S)-17-oxo-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-ol; the estrogen anion is (9S,13S,14S)-17-oxo-13-methyl-9,11,12,14,15,16-hexahydro-6H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (9S,13S,14S)-17-oxo-13-methyl-9,11,12,14,15,16-hexahydro-6H-cyclopenta[a]phenanthrene-3-ol; the estrogen anion is (13S,14S)-17-oxo-13-methyl-7,11,12,14,15,16-hexahydro-6H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S)-17-oxo-13-methyl-7,11,12,14,15,16-hexahydro-6H-cyclopenta[a]phenanthrene-3-ol; the estrogen anion is (13S,14S)-17-oxo-13-methyl-12,14,15,16-tetrahydro-11H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S)-17-oxo-13-methyl-12,14,15,16-tetrahydro-11H-cyclopenta[a]phenanthrene-3-ol; the estrogen anion is (9S,13S,14S,17S)-17-hydroxy-13-methyl-6,9,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (9S,13S,14S,17S)-13-methyl-6,9,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3,17-diol; the estrogen anion is (9S,13S,14S,17R)-17-hydroxy-13-methyl-6,9,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (9S,13S,14S,17R)-13-methyl-6,9,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3,17-diol; the estrogen anion is

(13S,14S,17S)-17-hydroxy-13-methyl-6,7,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S,17S)-13-methyl-6,7,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3,17-diol; the estrogen anion is (13S,14S,17R)-17-hydroxy-13-methyl-6,7,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S,17R)-13-methyl-6,7,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3,17-diol; the estrogen anion is (13S,14S,17S)-17-hydroxy-13-methyl-11,12,14,15,16,17-hexahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S,17S)-13-methyl-11,12,14,15,16,17- hexahydrocyclopenta[a]phenanthrene-3,17-diol; the estrogen anion is (13S,14S,17R)-17-hydroxy-13-methyl-11,12,14,15,16,17- hexahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S,17R)-13-methyl-11,12,14,15,16,17-hexahydrocyclopenta[a]phenanthrene-3,17-diol; the estrogen anion is (8R,9S,13S,14S,15R,16R,17R)-15,16,17-trihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,15R,16R,17R)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,15,16,17-tetrol; the estrogen anion is 4-[4-(4-hydroxyphenyl)hexa-2,4-dien-3-yl]phenolate, and the estrogen molecule is 4-[4-(4-hydroxyphenyl)hexa-2,4-dien-3-yl]phenol; the estrogen anion is 4-[4-(4-hydroxyphenyl)hex-3-en-3-yl]phenolate, and the estrogen molecule is 4-[4-(4-hydroxyphenyl)hex-3-en-3-yl]phenol; the estrogen anion is 4-[4-(4-methoxyphenyl)hex-3-en-3-yl]phenolate, and the estrogen molecule is 4-[4-(4-methoxyphenyl)hex-3-en-3-yl]phenol; the estrogen anion is 4-(4-{4-[(phenylmethyl)oxy]phenyl}hex-3-en-3-yl)phenolate, and the estrogen molecule is 4-(4-{4-[(phenylmethyl)oxy]phenyl}hex-3-en-3-yl)phenol; the estrogen anion is 4-[2-(4-hydroxyphenyl)vinyl]phenolate, and the estrogen molecule is 4-[2-(4-hydroxyphenyl)vinyl]phenol; the estrogen anion is 4-[3-(4-hydroxyphenyl)but-2-en-2-yl]phenolate, and the estrogen molecule is 4-[3-(4-hydroxyphenyl)but-2-en-2-yl]phenol; the estrogen anion is 4-[4-(4-hydroxyphenyl)hex-3-yl]phenolate, and the estrogen molecule is 4-[4-(4-hydroxyphenyl)hex-3-yl]phenol; the estrogen anion is 4-[3-ethyl-4-(4-hydroxyphenyl)hex-2-yl]phenolate, and the estrogen molecule is 4-[3-ethyl-4-(4-hydroxyphenyl)hex-2-yl]phenol; the estrogen anion is 4-[4-ethyl-5-(4-hydroxyphenyl)hex-3-yl]phenolate, and the estrogen molecule is 4-[4-ethyl-5-(4-hydroxyphenyl)hex-3-yl]phenol; or the estrogen anion is 4-[4-(4-hydroxy-3-methylphenyl)hex-3-yl]-2-methylphenolate; and the estrogen molecule is 4-[4-(4-hydroxy-3-methylphenyl)hex-3-yl]-2-methylphenol.

In some embodiments, the estrogen anion is (8R,9S,13S,14S,17S)-17-hydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17S)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,17-diol; the estrogen anion is (8R,9S,13S,14S,17R)-17-ethynyl-17-hydroxy-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17R)-17-ethynyl-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3,17-diol; or the estrogen anion is (8R,9S,13S,14S,16R,17R)-16,17-dihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,16R,17R)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,16,17-triol.

In some embodiments, the composition comprises the estrogen molecule; and the composition comprises the estrogen anion at a greater molar concentration than the estrogen molecule.

In some embodiments, the composition is formulated to convert the estrogen anion into the estrogen molecule in situ subsequent to administering the composition.

In some embodiments, the composition is formulated to convert the estrogen anion into the estrogen molecule ex vivo prior to administering the composition.

In some embodiments, the composition is for use as a medicament either as a contraceptive, to treat symptoms of menstruation, to treat dysmenorrhea, to treat menorrhagia, to treat polycystic ovary syndrome, to treat endometriosis, to treat female hypogonadism, to treat absence of menstruation, to treat symptoms of menopause, to provide perimenopausal or postmenopausal hormone replacement therapy, to provide feminizing hormone therapy, to treat hirsutism, to treat acne, or two or more of the foregoing. In some embodiments, the composition is for use as a medicament to treat a psychiatric condition or a neurodegenerative disease. In some embodiments, the composition is for use as a medicament to treat anxiety, schizophreniform disorder, schizophrenia, multiple sclerosis, mild cognitive impairment, or Alzheimer's disease. In some embodiments, the composition is for use as a medicament to treat inflammation, an autoimmune disease, or sepsis. In some embodiments, the composition is for use as a medicament to treat arthritis, inflammatory autoimmune-mediated arthritis, rheumatoid arthritis, juvenile idiopathic arthritis, polyarticular juvenile idiopathic arthritis, osteoarthritis, enthesitis-related arthritis, psoriatic arthritis, psoriasis, plaque psoriasis, hidradenitis suppurativa, sarcoidosis, pulmonary sarcoidosis, bone sarcoidosis, lupus, axial spondyloarthritis, ankylosing spondylitis, Dupuytren's

disease, uveitis, non-infectious uveitis, adhesive capsulitis, Sjogren's syndrome, inflammatory bowel disease, Crohn's disease, ulcerative colitis, or smoking-cessation-induced ulcerative colitis. In some embodiments, the composition is for use as a medicament to treat breast cancer, prostate cancer, or benign prostatic hyperplasia.

"Treat" refers to at least one of: to cure a health condition; to increase the probability that a health condition will be cured; to shorten the time over which a health condition is cured; to increase the probability that the time necessary to cure a health condition will be shortened; to decrease the severity of a health condition; to increase the probability that the severity of a health condition will decrease; to shorten the time over which the severity of a health condition is decreased; to increase the probability that the time necessary to decrease the severity of a health condition will be shortened; to inhibit a health condition from worsening; to increase the probability that a health condition will not worsen; to delay the worsening of a health condition; to increase the probability that the worsening of a health condition will be delayed; to inhibit the occurrence or recurrence of a health condition; to decrease the probability that a health condition will occur or reoccur; to delay the onset of a health condition; to increase the probability that the onset of a health condition will be delayed; to alleviate at least one symptom of a health condition; to increase the probability that at least one symptom of a health condition will be alleviated; to shorten the time over which at least one symptom of a health condition is alleviated; to increase the probability that the time necessary to alleviate at least one symptom of a health condition will be shortened; to decrease the severity of at least one symptom of a health condition; to increase the probability that the severity of at least one symptom of a health condition will be decreased; to shorten the time over which the severity of at least one symptom of a health condition is decreased; to increase the probability that the time necessary to decrease the severity of at least one symptom of a health condition will be shortened; to inhibit at least one symptom of a health condition from worsening; to increase the probability that at least one symptom of a health condition will not worsen; to delay the worsening of at least one symptom of a health condition; to increase the probability that the worsening of at least one symptom of a health condition will be delayed; to inhibit at least one symptom of a health condition from occurring or reoccurring; to decrease the probability that at least one symptom of a health condition will occur or reoccur; to delay the onset of at least one symptom of a health condition; and to increase the probability that the onset of at least one symptom of a health condition will be delayed.

In some embodiments, the composition is a liquid, and the estrogen anion is dissolved in the

liquid.

Various aspects of this patent document relate to a composition comprising a cannabinoid anion, for use as a medicament, wherein the cannabinoid anion has a conjugate acid that is a cannabinoid molecule; and the cannabinoid molecule has an acid dissociation constant in water of at least 50 femtomolar and no greater than 50 nanomolar for conversion of the cannabinoid molecule into the cannabinoid anion.

In some embodiments, the composition is formulated for oral or topical administration.

In some embodiments, the composition is formulated for oral administration; the composition is formulated to allow the conversion of the cannabinoid anion into the cannabinoid molecule before the cannabinoid anion reaches the stomach of the subject; and the composition is formulated to allow absorption of the cannabinoid molecule by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

In some embodiments, the composition is formulated to convert the cannabinoid anion into the cannabinoid molecule in situ subsequent to administering the composition to the subject.

In some embodiments, the composition is formulated to convert the cannabinoid anion into the cannabinoid molecule ex vivo prior to administering the composition to the subject.

In some embodiments, the composition comprises the cannabinoid molecule; and the composition comprises the cannabinoid anion at a greater molar concentration than the cannabinoid molecule.

In some embodiments, the cannabinoid anion is 3-hydroxy-2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-pentylphenolate, and the cannabinoid molecule is 2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-pentylbenzene-1,3-diol; the cannabinoid anion is 3-hydroxy-2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-propylphenolate, and the cannabinoid molecule is 2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-propylbenzene-1,3-diol; the cannabinoid anion is 2-geranyl-3-hydroxy-5-pentylphenolate, and the cannabinoid molecule is 2-geranyl-5-pentylbenzene-1,3-diol; the cannabinoid anion is 2-geranyl-3-hydroxy-5-propylphenolate, and the cannabinoid molecule is 2-geranyl-5-propylbenzene-1,3-diol; the cannabinoid anion is (6aR,10aR)-6,6,9-trimethyl-3-pentyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromene-1-oxide, and the cannabinoid molecule is (6aR,10aR)-6,6,9-trimethyl-3-pentyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromene-1-ol; the cannabinoid anion is (6aR,10aR)-6,6,9-trimethyl-3-propyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromene-1-oxide, and the cannabinoid molecule is (6aR,10aR)-6,6,9-trimethyl-3-propyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromene-1-ol;

the cannabinoid anion is 6,6,9-trimethyl-3-pentyl-6H-benzo[c]chromene-1-oxide, and the cannabinoid molecule is 6,6,9-trimethyl-3-pentyl-6H-benzo[c]chromene-1-ol; or the cannabinoid anion is 6,6,9-trimethyl-3-propyl-6H-benzo[c]chromene-1-oxide, and the cannabinoid molecule is 6,6,9-trimethyl-3-propyl-6H-benzo[c]chromene-1-ol.

In some embodiments, the cannabinoid anion is 3-hydroxy-2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-pentylphenolate or 3-hydroxy-2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-propylphenolate.

In some embodiments, the composition is a liquid, and the cannabinoid anion is dissolved in the liquid.

In some embodiments, the composition is for use as a medicament to prophylactically prevent or treat muscle cramping, muscle spasms, restless-legs syndrome, nystagmus, a dyskinetic movement disorder, tremor, seizures, epilepsy, muscular dystrophy, or inclusion body myositis. In some embodiments, the composition is for use as a medicament to arrest or reduce the severity of an active seizure. In some embodiments, the composition is for use as a medicament to reduce blood pressure. In some embodiments, the composition is for use as a medicament to prophylactically prevent or treat prehypertension or hypertension. In some embodiments, the composition is for use as a medicament to treat attention deficit hyperactivity disorder ("ADHD"), autism or an autism spectrum disorder, Asperger syndrome, fragile X syndrome, Down syndrome, a pervasive developmental disorder not otherwise specified ("PDD-NOS"), a childhood disintegrative disorder, or Tourette's syndrome. In some embodiments, the composition is for use as a medicament to treat anxiety, post-traumatic stress disorder ("PTSD"), depression, bipolar disorder, obsessive–compulsive disorder, schizophreniform disorder, schizophrenia, or psychosis. In some embodiments, the composition is for use as a medicament to treat pain or inflammation. In some embodiments, the composition is for use as a medicament to treat an autoimmune disorder. In some embodiments, the composition is for use as a medicament to treat arthritis, inflammatory autoimmune-mediated arthritis, rheumatoid arthritis, juvenile idiopathic arthritis, polyarticular juvenile idiopathic arthritis, osteoarthritis, enthesitis-related arthritis, psoriatic arthritis, psoriasis, plaque psoriasis, hidradenitis suppurativa, sarcoidosis, pulmonary sarcoidosis, bone sarcoidosis, lupus, axial spondyloarthritis, ankylosing spondylitis, Dupuytren's disease, uveitis, non-infectious uveitis, adhesive capsulitis, Sjogren's syndrome, inflammatory bowel disease, Crohn's disease, ulcerative colitis, or smoking-cessation-induced ulcerative colitis. In some embodiments, the composition is for use as a medicament to treat a neurodegenerative disease. In some embodiments,

the composition is for use as a medicament to treat Parkinson's Disease, Parkinsonian tremor, or both Parkinson's Disease and Parkinsonian tremor. In some embodiments, the composition is for use as a medicament to treat multiple sclerosis, mild cognitive impairment, Alzheimer's Disease, amyotrophic lateral sclerosis ("ALS"), or Huntington's disease. In some embodiments, the composition is for use as a medicament to treat obesity, metabolic syndrome, or diabetes mellitus. In some embodiments, the composition is for use as a medicament to treat a viral infection or a bacterial infection. In some embodiments, the composition is for use as a medicament to treat an infection caused by Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Acinetobacter baumannii, Moraxella catarrhalis, Legionella pneumophila, Staphylococcus aureus, Streptococcus pneumoniae, Enterococcus faecium, Clostridioides difficile, Mycobacterium tuberculosis, Neisseria gonorrhoeae, Cutibacterium acnes, or COVID-19.

Various aspects of this patent document relate to a composition comprising a substituted phenolate, for use as a medicament, wherein: the substituted phenolate has a conjugate acid that is a substituted phenol; the substituted phenol has an acid dissociation constant in water of at least 50 femtomolar and no greater than 50 nanomolar for conversion of the substituted phenol into the substituted phenolate; the composition is formulated to allow the conversion of the substituted phenolate into the substituted phenol before the substituted phenolate reaches the stomach of the subject; and the composition is formulated to allow absorption of the substituted phenol by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

In some embodiments, the composition comprises the substituted phenol, and the composition comprises the substituted phenolate at a greater molar concentration than the substituted phenol.

In some embodiments, the substituted phenol is 2-methoxy-4-(prop-2-enyl)phenol, and the substituted phenolate is 2-methoxy-4-(prop-2-enyl)phenolate. In some embodiments, the substituted phenol is 5-methyl-2-(prop-2-yl)phenol, and the substituted phenolate is 5-methyl-2-(prop-2-yl)phenolate. In some embodiments, the substituted phenol is 2-methyl-5-(prop-2-yl)phenol, and the substituted phenolate is 2-methyl-5-(prop-2-yl)phenolate. In some embodiments, the substituted phenol is 2-methoxy-4-({N-[(6E)-1-oxo-8-methylnon-6-enyl]amino}methyl)phenol, and the substituted phenolate is 2-methoxy-4-({N-[(6E)-1-oxo-8-methylnon-6-enyl]amino}methyl)phenolate. In some embodiments, the substituted phenol is 2-methoxy-4-[(5S)-3-oxo-5-hydroxydecanyl]phenol, and the substituted phenolate is 2-methoxy-4-[(5S)-3-oxo-5-

hydroxydecanyl]phenolate. In some embodiments, the substituted phenol is 4-formyl-2-methoxyphenol, and the substituted phenolate is 4-formyl-2-methoxyphenolate. In some embodiments, the substituted phenol is 4-formyl-2-ethoxyphenol, and the substituted phenolate is 4-formyl-2-ethoxyphenolate. In some embodiments, the substituted phenol is 4-(3-oxobutyl)phenol, and the substituted phenolate is 4-(3-oxobutyl)phenolate. In some embodiments, the substituted phenol is 2-methoxy-4-[3,5-dioxo-7-(4-hydroxy-3-methoxyphenyl)hepta-1,6-dieneyl]phenol, and the substituted phenolate is 2-methoxy-4-[3,5-dioxo-7-(4-hydroxy-3-methoxyphenyl)hepta-1,6-dieneyl]phenolate. In some embodiments, the substituted phenol is 2,6-diisopropylphenol, and the substituted phenolate is 2,6-diisopropylphenolate.

Various aspects of this patent document relate to a composition comprising an anion, for use as a medicament, wherein the composition is formulated to covert the anion into a molecule that has an acid dissociation constant in water of at least 50 femtomolar and no greater than 50 nanomolar for conversion of the molecule into the anion.

In some embodiments, the anion is dissolved in the composition at a concentration that is greater than the solubility of the molecule in water.

In some embodiments, the molecule has an octanol-water partition coefficient, and the logarithm base-10 of the octanol-water partition coefficient is greater than 1. In some specific embodiments, the logarithm base-10 of the octanol-water partition coefficient is greater than 3. In some very specific embodiments, the logarithm base-10 of the octanol-water partition coefficient is greater than 5.

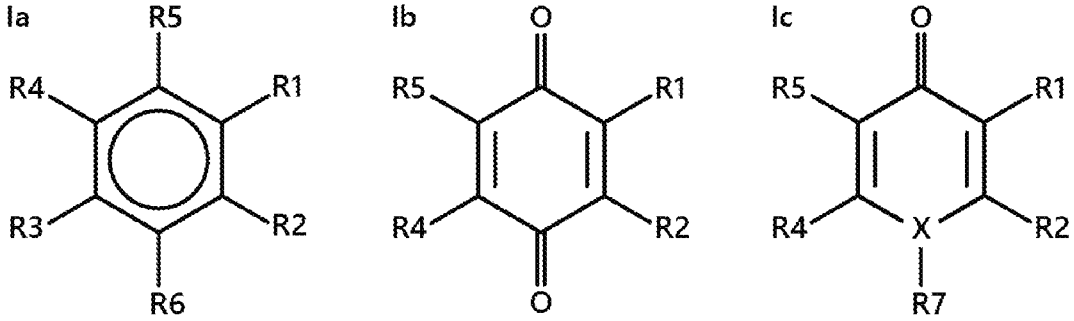
In some embodiments, the composition is formulated for oral administration; the composition is formulated to allow the conversion of the anion into the molecule before the anion reaches the stomach of the subject; and the composition is formulated to allow absorption of the molecule by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

In some embodiments, the composition is formulated to convert the anion into the molecule in situ subsequent to administering the composition.

In some embodiments, the composition is formulated to convert the anion into the molecule ex vivo prior to administering the composition.

In some embodiments, the composition comprises the molecule, and the composition comprises the anion at a greater molar concentration than the molecule.

In some embodiments, the anion has a general structure Ia, Ib, or Ic.



In some embodiments, (i) one of R1, R2, R3, and R4 is oxide; (ii) one of R1, R2, R3, R4, R5 and R6 is selected from hydro; hydroxy; methoxy; fluoro; chloro; bromo; and iodo; (iii) one of R1, R2, R3, R4, R5 and R6 is selected from hydro; hydroxy; hydroxymethyl; 2-hydroxyethyl; 1,2-dihydroxyethyl; 3-hydroxyprop-1-enyl; methyl; 2-methylprop-2-yl; methoxy; ethoxy; propoxy; butoxy; pentoxy; hexoxy; heptoxy; octanoxy; (prop-2-yl)oxy; isoprenyloxy; benzyloxy; [4-(prop-2-enyl)phenyl]oxy; fluoro; chloro; bromo; iodo; amino; and nitro; (iv) one of R1, R2, R3, R4, R5 and R6 is selected from hydro; hydroxy; methoxy; formyl; acetyl; 2-oxoethyl; 1-oxopropyl; 1-oxobutyl; (prop-2-yl)carbonyl; 3-oxobutyl; 3-oxobut-1-enyl; (methoxy)carbonyl; (ethoxy)carbonyl; (propoxy)carbonyl; (2-propoxy)carbonyl; (butoxy)carbonyl; (pentoxy)carbonyl; (hexoxy)carbonyl; and (heptoxy)carbonyl; (v) one of R1, R2, R3, R4, R5 and R6 is selected from hydro; methoxy; methyl; ethyl; propyl; butyl; pentyl; hexyl; heptyl; octanyl; nonanyl; decanyl; undecanyl; dodecanyl; tridecyl; tetradecyl; pentadecyl; prop-2-yl; but-2-yl; pent-2-yl; hex-2-yl; hept-2-yl; octan-2-yl; nonan-2-yl; decan-2-yl; 2-methylprop-2-yl; 2-methylbut-2-yl; 2-methylpent-2-yl; 2-methylhex-2-yl; 2-methylhept-2-yl; 2-methyloctan-2-yl; 2-methylnonan-2-yl; 2-methyldecan-2-yl; 3-methylbut-2-yl; 3-methylpent-2-yl; 3-methylhex-2-yl; 3-methylhept-2-yl; 3-methyloctan-2-yl; 3-methylnonan-2-yl; 3-methyldecan-2-yl; 2,4,4-trimethylpent-2-yl; vinyl; prop-1-enyl; prop-2-enyl; pentadec-8-enyl; 2-methylbut-1-en-3-yl; 3-methylbut-1-en-3-yl; 3-ethenyl-3,7-dimethylocta-1,6-dienyl; 4-ethenyl-4,7-dimethylocta-1,6-dien-2-yl; isoprenyl; geranyl; 3,7,11,15,19,23,27,31,35,39-decamethyltetraconta-2,6,10,14,18,22,26,30,34,38-decaenyl; phenyl; benzyl; and 2-phenylethyl; and (vi) one of R1, R2, R3, R4, R5 and R6 is selected from hydro; methyl; ethyl; propyl; 2-methylprop-2-yl; 2-methylbut-2-yl; isoprenyl; geranyl; 6-methylhept-5-en-2-yl; 6-methoxy-5-[(methoxy)carbonyl]-4-methylhexa-1,3,5-trienyl; 2-{[1-oxo-4-formyl-3-(2-oxoethyl)hex-4-enyl]oxy}ethyl; 3-oxobutyl; 3-oxobut-1-enyl; 3-oxooct-4-enyl; 3-oxodec-4-enyl; 3-oxododec-4-enyl; 3-oxotetradec-4-enyl; 3-oxohexadec-4-enyl; 3-oxo-5-hydroxyoctanyl; 3-oxo-5-hydroxydecanyl; 3-oxo-5-hydroxydodecanyl; 3-oxo-5-hydroxytetradecanyl; 3-oxo-5-

hydroxyhexadecanyl; [N-(1-oxononanyl)amino]methyl; {N-[1-oxo-12-(1-oxo-2-phenylethyl)octadec-9-enyl]amino}methyl; [N-(1-oxo-8-methylnon-6-enyl)amino]methyl; [N-(1-oxo-8-methylnonanyl)amino]methyl; [N-(1-oxo-7-methyloctanyl)amino]methyl; [N-(1-oxo-9-methyldec-6-enyl)amino]methyl; [N-(1-oxo-9-methyldecanyl)amino]methyl; [N-(1-oxo-8-methyldec-6-enyl)amino]methyl; 2-{[4-(4-hydroxyphenyl)but-2-yl]amino}ethyl; 3-{[2-(3,4-dihydroxyphenyl)ethyl]amino}butyl; 1-hydroxy-2-{[1-(4-hydroxyphenyl)prop-2-yl]amino}ethyl; 2-{[2-hydroxy-2-(3,5-dihydroxyphenyl)ethyl]amino}propyl; 4-{[1-oxo-3,7-dimethyl-9-(2,6,6-trimethylcyclohex-1-enyl)non-2,4,6,8-tetraenyl]amino; cyclohexyl; cycloheptyl; adamant-1-yl; adamant-2-yl; 3,3-dimethylcycolhexyl; 6,6-dimethyl-4-oxo-2-bicyclo[3.1.1]heptanyl; 3-hydroxycyclohexyl; 5-hydroxy-2-(3-hydroxypropyl)cyclohexyl; 6-(prop-1-en-2-yl)-3-methylcyclohex-2-enyl; 6-(prop-2-yl)-3-methylcyclohex-2-enyl; 6-(prop-1-en-2-yl)-3-methylcyclohex-3-enyl; 6-(prop-2-yl)-3-methylcyclohex-3-enyl; 4-hydroxy-3-(prop-2-enyl)phenyl; 6-hydroxy-3-(prop-2-enyl)phenyl; 4-methoxy-3-(prop-2-enyl)phenyl; (4-hydroxyphenyl)methyl; 2-(4-hydroxyphenyl)ethyl; 2-(3,5-dihydroxyphenyl)ethyl; 2-hydroxy-2-(3,4,5-trimethoxyphenyl)ethyl; 2-phenylethenyl; 2-(4-hydroxyphenyl)ethenyl; 2-(3,4-dihydroxyphenyl)ethenyl; 2-(3,5-dihydroxyphenyl)ethenyl; 2-(3,4,5-trimethoxyphenyl)ethenyl; 2-(4-hydroxyphenyl)prop-2-yl; 1-oxo-3-phenylpropyl; 1-oxo-3-(4-hydroxyphenyl)propyl; 3-oxo-3-(2,4,6-trihydroxyphenyl)propyl; 1-oxo-3-phenylprop-2-enyl; 3-oxo-3-(4-hydroxyphenyl)prop-1-enyl; 1-oxo-3-(4-hydroxyphenyl)prop-2-enyl; 3-oxo-3-(2,4-dihydroxyphenyl)prop-1-enyl; 1-oxo-3-(3,4-dihydroxy-2-methoxyphenyl)prop-2-enyl; 1-oxo-3-[4-hydroxy-3,5-bis(isoprenyl)phenyl]prop-2-enyl; 3-oxo-3-[3,5-dihydroxy-4-isoprenylphenyl]prop-1-enyl; 3-oxo-3-[4,6-dihydroxy-2-methoxy-5-isoprenylphenyl]prop-1-enyl; 2-(4-hydroxyphenyl)but-2-yl; 2,3-dimethyl-4-(3,4-dihydroxyphenyl)butyl; 2,3-dimethyl-4-(4-hydroxy-3-methoxyphenyl)butyl; 2,3-bis(hydroxymethyl)-4-(3-hydroxyphenyl)butyl; 2,3-bis(hydroxymethyl)-4-(4-hydroxy-3-methoxyphenyl)butyl; 3-(4-hydroxyphenyl)but-2-en-2-yl; 4-(4-hydroxyphenyl)hex-3-yl; 4-(4-hydroxy-3-methylphenyl)hex-3-yl; 3-ethyl-4-(4-hydroxyphenyl)hex-2-yl; 4-ethyl-5-(4-hydroxyphenyl)hex-3-yl; 4-(4-hydroxyphenyl)hex-3-en-3-yl; 3-(4-hydroxyphenyl)-2-methylpent-1-enyl; 1-(4-hydroxyphenyl)-2-methylpent-1-en-3-yl; 4-(4-methoxyphenyl)hex-3-en-3-yl; 4-{4-[(phenylmethyl)oxy]phenyl}hex-3-en-3-yl; 4-(4-hydroxyphenyl)hexa-2,4-dien-3-yl; 3-oxo-7-(4-hydroxyphenyl)hepta-1,4,6-trieneyl; 3-oxo-7-(4-hydroxyphenyl)hepta-1,3,6-trieneyl; 7-(4-hydroxyphenyl)-3,5-dioxohepta-1,6-dieneyl; 7-(4-hydroxy-3-methoxyphenyl)-3,5-dioxohepta-1,6-dieneyl; [6-oxo-2,4-dihydroxy-3,3-dimethyl-5-(1-oxo-2-methylpropyl)cyclohexa-1,4-

dienyl]methyl; [2,6-dihydroxy-4-methoxy-5-methyl-3-(1-oxo-2-methylpropyl)phenyl]methyl; [6-hydroxy-2,4-dimethoxy-5-methyl-3-(1-oxo-2-methylpropyl)phenyl]methyl; 1-oxo-3-[4-hydroxy-2-methoxy-3-isoprenylphenyl]prop-2-enyl; 1-oxo-3-[4-hydroxy-2-methoxy-3-(2-methylbut-1-en-3-yl)phenyl]prop-2-enyl; 1-oxo-3-[4-hydroxy-2-methoxy-5-(2-methylbut-1-en-3-yl)phenyl]prop-2-enyl; 1-oxo-3-[4-hydroxy-2-methoxy-5-(3-methylbut-1-en-3-yl)phenyl]prop-2-enyl; 1-oxo-3-[4-hydroxy-3,5-bis(isoprenyl)phenyl]prop-2-enyl; phenylcarbonyl; (4-methylphenyl)carbonyl; (2-hydroxyphenyl)carbonyl; (2,4-dihydroxyphenyl)carbonyl; (2-hydroxy-4-methoxyphenyl)carbonyl; [(3,3,5-trimethylcyclohexyl)oxy]carbonyl; [(3-hydroxy-4-methoxycarbonyl-2,5-dimethylphenyl)oxy]carbonyl; [(3-formyl-2,4-dihydroxy-6-methylphenyl)carbonyl]oxy; (4-hydroxyphenyl)-[2-(hydroxymethyl)phenyl]methyl; 1,7,7-trimethyl-2-bicyclo[2.2.1]heptyl; {4-oxo-5-[(3-hydroxyphenyl)methyl]-3-oxacyclopentyl}methyl; {2-oxo-5-[(3-hydroxyphenyl)methyl]-3-oxacyclopentyl}methyl; {2-oxo-3-[(3-methyoxy-4-hydroxyphenyl)methylidene]cyclohexylidene)methyl; 2-(4-methoxy-2-oxo-2H-pyran-6-yl)ethenyl; 4-[(4-hydroxy-3-methoxyphenyl)methyl]-3-(hydroxymethyl)tetrahydrofuran-2-yl; [2-(4-hydroxy-3-methoxyphenyl)-3-(hydroxymethyl)tetrahydrofuran-4-yl]methyl; {2-oxo-4-[(3,4-dimethoxyphenyl)methyl]tetrahydrofuran-3-yl}methyl; {2-oxo-4-[(3-methoxy-4-hydroxyphenyl)methyl]tetrahydrofuran-3-yl}methyl; {2-oxo-3-[(3-methoxy-4-hydroxyphenyl)methyl]tetrahydrofuran-4-yl}methyl; {2-oxo-4-[(3-methoxy-4-hydroxyphenyl)hydroxymethyl]tetrahydrofuran-3-yl}methyl; {2-oxo-3-[(3-methoxy-4-hydroxyphenyl)methyl]tetrahydrofuran-4-yl}hydroxymethyl; 7-[5,5-dimethyl-4-oxo-tetrahydrofuran-2-yl]-3-methylocta-2,6-dienyl; (1,2,4a-trimethyl-5-methylidene-3,4,6,7,8,8a-hexahydro-2H-naphthalen-1-yl)methyl; 3-hydroxy-7-hydroxymethyl-1,2,3,4,4a,5,6,7,8,8a-decahydronaphthalen-1-yl; 6-(4-hydroxy-3-methoxyphenyl)-1,3,3a,4,6,6a-hexahydrofuro[3,4-c]furan-3-yl; 6-(4-hydroxy-3,5-dimethoxyphenyl)-1,3,3a,4,6,6a-hexahydrofuro[3,4-c]furan-3-yl; 7-oxo-4-hydroxy-5-methyl-5,6-dihydro-4H-2-benzofuran-1-yl; 3-hydroxymethyl-7-methoxy-5-(3-oxoprop-1-enyl)-2,3-dihydro-1-benzofuran-2-yl; (2-ethyl-1-benzofuran-3-yl)carbonyl; (3-oxo-4-hydroxy-2-benzofuran-1-ylidene)methyl; (3-oxo-6-hydroxy-1-benzofuran-2-ylidene)methyl; (3-oxo-4,6-dihydroxy-1-benzofuran-2-ylidene)methyl; (3-oxo-6-hydroxy-4-methoxy-1-benzofuran-2-ylidene)methyl; 4-(1,3-benzodioxol-5-yl)-2,3-dimethylbutyl; 8-oxo-4-hydroxy-5a,6,8a,9-tetrahydro-5H-[2]benzofuro[5,6-f][1,3]benzodioxol-9-yl; 7-hydroxy-2H-chromen-3-yl; 4-oxo-7-methoxy-4H-chromen-2-yl; 1-oxo-8-hydroxy-3,4-dihydro-1H-isochromen-3-yl; (3,4,7-trihydroxy-3,4-dihydro-2H-chromen-3-yl)methyl; (4-oxo-5-hydroxy-6,7-dimethoxy-2,3-dihydro-4H-chromen-

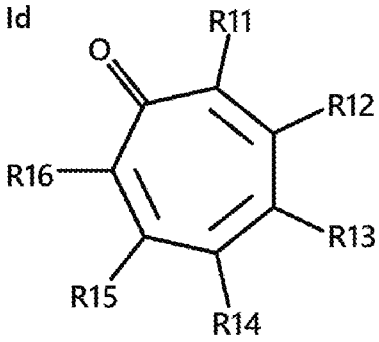
3-yl)methyl; [2-oxo-5-hydroxy-7-(2-methylnonan-2-yl)-2H-chromen-3-yl]methyl; 5,7-dihydroxy-8-(1-oxo-3-phenylprop-2-enyl)-2,2-dimethyl-2H-chromen-6-yl]methyl; 5,7-dimethoxy-8-(1-oxo-3-phenylprop-2-enyl)-2,2-dimethyl-2H-chromen-6-yl]methyl; 5,7-dihydroxy-8-(1-oxo-3-phenylprop-2-enyl)-2,2-dimethyl-3,4-dihydro-2H-chromen-6-yl; 4-oxo-5,7-dihydroxy-8-[2-hydroxy-5-(4-oxo-5,7-dihydroxy-4H-chromen-2-yl)phenyl]-4H-chromen-2-yl; 4-oxo-8-[6-(2,4-dihydroxybenzoyl)-5-(2,4-dihydroxyphenyl)-3-methylcyclohex-2-enyl]-5,7-dihydroxy-3-isoprenyl-4H-chromen-2-yl; 8-oxo-2-hydroxymethyl-5-methoxy-2,3-dihydropyrano[2,3-h][1,4]benzodioxin-3-yl; 9-oxo-5-methoxy-2-{[(acetyl)oxy]methyl}-2,3-dihydropyrano[3,2-h][1,4]benzodioxin-3-yl; 2-hydroxymethyl-7-(4-oxo-3,5,7-trihydroxy-2,3-dihydro-4H-chromen-2-yl)-2,3-dihydro-1,4-benzodioxin-3-yl; 8-oxo-9-hydroxy-[1,3]diolxolo[4,5-g]-4H-chromen-7-yl; 8-oxo-9-methoxy-[1,3]diolxolo[4,5-g]-4H-chromen-7-yl; 8,8-dimethyl-3,4-dihydro-2H-pyrano[2,3-f]chromen-3-yl; 4-oxo-5-hydroxy-6-isoprenyl-8,8-dimethylpyrano[2,3-h]-4H-chromen-3-yl; 7-hydroxy-3-hydroxymethyl-4-(4-oxo-3,5,7-trihydroxy-2,3-dihydro-4H-chromen-2-yl)-2,3-dihydro-1-benzofuran-2-yl; 7-hydroxy-3-hydroxymethyl-5-(4-oxo-3,5,7-trihydroxy-2,3-dihydro-4H-chromen-2-yl)-2,3-dihydro-1-benzofuran-2-yl; 2-oxo-3-hydroxy-8-(3,5,7-trihydroxy-4-oxo-2,3-dihydro-4H-chromen-2-yl)-4-oxatricyclo[4.3.1.$0^{3,7}$]dec-8-en-10-yl; 6,9,17,19,21-pentahydroxy-5-(4-hydroxyphenyl)-4,12,14-trioxapentacyclo[11.7.1.$0^{2,11}$.$0^{3,8}$.$0^{15,20}$]henicosa-2(11),3(8),9,15,17,19-hexaen-13-yl; 6,9,17,19,21-pentahydroxy-3-(4-hydroxyphenyl)-4,12,14-trioxapentacyclo[11.7.1.$0^{2,11}$.$0^{3,8}$.$0^{15,20}$]henicosa-2(11),3(8),9,15,17,19-hexaen-5-yl; N-(4-phenyl)carbamoyl; N-(4-hydroxyphenyl)carbamoyl; [(2-hydroxyphenyl)carbonyl]amino; 1-oxo-icosa-5,8,11,14-tetraenyl)amino; N-(4-chlorophenyl)carbamoyl; 1-oxo-2-(2,6-dioxopiperidin-4-yl)ethyl; 1-hydroxy-2-{[4-(4-hydroxyphenyl)butyl]amino}ethyl; 4-{[2-hydroxy-2-(3,4-dihydroxyphenyl)ethyl]amino}butyl; [(4-oxo-1,4-dihydroquinolin-3-yl)carbonyl]amino; 3,5-dioxo-4-butyl-2-phenylpyrazolidin-1-yl; (2-{[4-hydroxy-3,5-di(2-methylprop-2-yl)phenyl]sulfanyl}propan-2-yl)sulfanyl; (3-chloro-6-hydroxyphenyl)methyl; (2,4-dichlorophenyl)methyl; 3-(3-fluoro-4-hydroxyphenyl)pent-2-yl; and 2-(3-fluoro-4-hydroxyphenyl)pent-3-yl. In the case of general structures Ib and Ic, which lack R3 and R6, one of R1, R2, R4, and R5 is selected from group (i) oxide, and the other three of R1, R2, R4, and R5 are each independently selected from group (ii), (iii), (iv), (v), and (vi) such that each of R1, R2, R4, and R5 is independently selected from a different group, and none of R1, R2, R4, and R5 are selected from two of groups (ii), (iii), (iv), (v), and (vi). In some embodiments, X is selected from O and N, wherein when X is O, then R7 is absent; and when X is N, then R7 is selected from hydro

and methyl. In some embodiments, the anion has a molecular weight that is greater than 108 grams per mole. In some specific embodiments, the anion has a general structure Ia; R1 is oxide; R2 is hydro, methyl, 2-methylprop-2-yl, geranyl, hydroxy, methoxy, ethoxy, hydroxymethyl, formyl, or amino; and each of R3, R5, and R6 is hydro. In some specific embodiments, the anion has a general structure Ia; R1 is oxide; and at least 4 of R2, R3, R4, R5, and R6 are independently selected from hydro, hydroxy, and methoxy. In some very specific embodiments, the anion has a general structure Ia, Ib, or Ic, and the molecule is abnormal cannabidiol; acetosyringone; actiphenol; adipostatin A; aleuritin; alpha-kosin; alpha-peltatin; AM404; amentoflavone; amylmetacresol; apocynin; arbutamine; arctigenin; ascofuranone; aspidinol; atranorin; aureusidin; bakuchiol; balanophonin; benzarone; benzbromarone; benzestrol; benziodarone; benzophenone-2; benzophenone-6; benzoresorcinol; beta-kosin; beta-resorcylaldehyde; bifluranol; bilobol; bisdemethoxycurcumin; bisphenol A; bisphenol B; bisphenol F; bromosalicylchloranilide; bromosaligenin; butylated hydroxyanisole; butylated hydroxytoluene; butylparaben; cannabicyclohexanol; cannabidiol; cannabidiphorol; cannabidivarin; cannabigerol; cannabigerovarin; canolol; capsaicin; carvacrol; chavibetol; chavicol; clofoctol; clorophene; combretastatin; combretastatin A-1; combretastatin A-4; combretastatin B-1; coniferyl alcohol; cotoin; CP 55,244; CP 55,940; (C6)-CP 47,497; (C7)-CP 47,497; (C9)-CP 47,497; curcumin; cyclovalone; DB-2073; deferiprone; dehydroequol; demethoxycurcumin; dianol; dichlorophen; dienestrol; diethylstilbestrol; diethylstilbestrol monobenzyl ether; dihydrocapsaicin; dihydrokanakugiol; dihydroresveratrol; dimethylheptyl cannabidiol; dimethylstilbestrol; dioxybenzone; dobutamine; DOPAL; DOPEG; drupanol; durantin A; embelin; enterodiol; enterolactone; ethyl maltol; ethyl vanillin; ethylparaben; eugenol; fenoterol; fenretinide; flopropione; fumigatin; gentisyl alcohol; geranin A; geranylhydroquinone; [6]-gingerol; glabridin; guaiacol; heminordihydroguaiaretic acid; heptylparaben; hexestrol; homocapsaicin I; homocapsaicin II; homodihydrocapsaicin; homosalate; homovanillyl alcohol; honokiol; HU-331; hydroxymatairesinol; hydroxytyrosol; ilimaquinone; irilone; irisolone; isoeugenol; isoliquiritigenin; isosilybin A; isosilybin B; isosilychristin; ivacaftor; kanakugiol; kuwanon G; lariciresinol; leptosidin; leptosphaerin A; leptosphaerin B; licochalcone A; licochalcone B; licochalcone C; licochalcone D; licochalcone E; licochalcone F; macelignan; magnolol; maltol; matairesinol; mequinol; mestilbol; meta-cresol; methestrol; methylparaben; mexenone; monobenzone; nonivamide; nordihydrocapsaicin; nordihydroguaiaretic acid; O-1602; O-1871; obovatol; octabenzone; oleocanthal; olivetol; ortho-benzylphenol; orthocaine; ortho-cresol; ortho-phenylphenol; osajin; osalmid; oxybenzone; oxyphenbutazone; para-anol; para-benzylphenol; para-

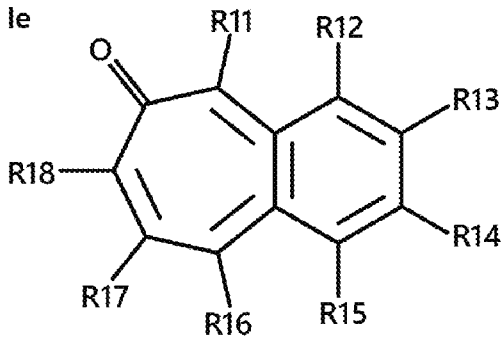
cresol; para-tert-pentyl-phenol; para-vinylguaiacol; paroxypropione; parvaquone; perezone; phenolphthalol; phenylacetylrinvanil; phloretin; piceatannol; pinoresinol; pinosylvin; pinosylvin monomethyl ether; pomiferin; probucol; propofol; propyl gallate; propylparaben; protocatechualdehyde; PSB-SB-487; pseudoisoeugenol; pterostilbene; raspberry ketone; resacetophenone; resveratrol; rottlerin; rottlerin 5,7-dimethyl ether; salicyl alcohol; salicylaldehyde; salicylanilide; sappanol; scillavone B; secoisolariciresinol; selligueain A; shogaol; silybin A; silybin B; silychristin; silydianin; sinapyl alcohol; sophoradin; sparassol; stilbestrol; strobilurin F; sulfuretin; syringaldehyde; syringaresinol; syringol; tetrahydrorottlerin; thunberginol F; thunberginol G; thymol; tithonine; tolcapone; tyrosol; ubiquinol; uliginosin A; vanillin; vanillyl alcohol; xanthohumol; xanthoxylin; xibornol; zingerone; 1,7-bis(4-hydroxyphenyl)-1,4,6-heptatrien-3-one; 11-hydroxyyangonin; 11-methoxy-12-hydroxydehydrokavain; 2,5-di-tert-pentyl-hydroquinone; 3-methoxy-4-hydroxyphenylglycol; 4,6-di-tert-butyl-meta-cresol; 4'-fluorocannabidiol; 4-hexylresorcinol; 4-hydroxyphenylacetaldehyde; 4-O-methylhonokiol; or 5-chloro-2-hydroxybenzophenone.

In some embodiments, the anion has a general structure Id or Ie.

Id

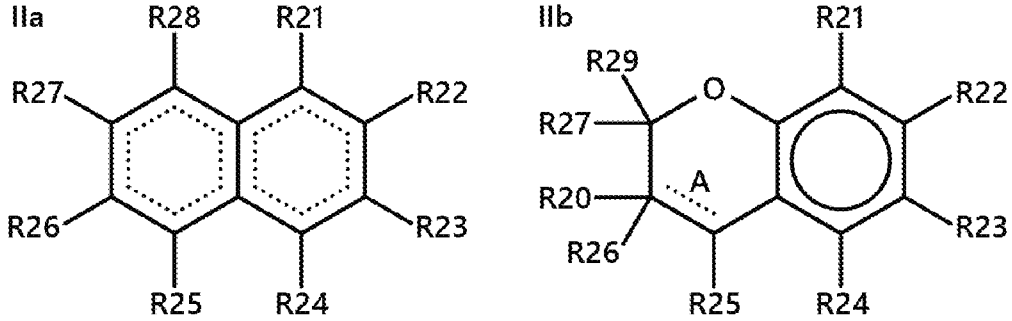


Ie



In some embodiments, general structures Id and Ie each comprise one oxide group, wherein one of R11, R12, R13, R14, R15, R16, R17, and R18 is oxide; one or two of R11, R12, R13, R14, R15, R16, R17, and R18 are independently selected hydro, methyl, ethyl, propyl, prop-2-yl, prop-1-enyl, prop-2-enyl, isoprenyl, and geranyl; and every other one of R11, R12, R13, R14, R15, R16, R17, and R18 is independently selected from hydro, hydroxy, and methoxy. In the case of general structure Id, which lacks R17 and R18, one of R11, R12, R13, R14, R15, and R16 is oxide; one or two of R11, R12, R13, R14, R15, and R16 are independently selected hydro, methyl, ethyl, propyl, prop-2-yl, prop-1-enyl, prop-2-enyl, isoprenyl, and geranyl; and every other one of R11, R12, R13, R14, R15, and R16 is independently selected from hydro, hydroxy, and methoxy. In some specific embodiments, the molecule is anthranol; procerin; purpurogallin; alpha-thujaplicin; beta-thujaplicin; or gamma-thujaplicin.

In some embodiments, the anion has a general structure IIa or IIb.

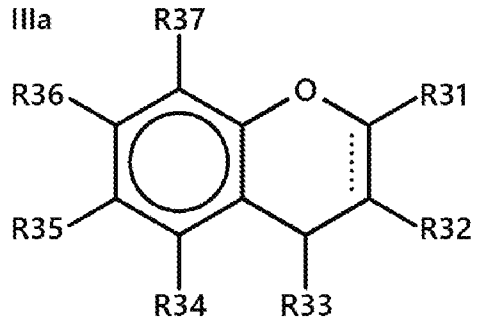


In some embodiments, (i) exactly one of R21, R22, R23, R24, R25, and R26 is oxide; (ii) exactly one of R21, R22, R23, R24, R25, R26, R27, and R28 is selected from hydro; methyl; ethyl; propyl; butyl; pentyl; hexyl; heptyl; isoprenyl; geranyl; 2-methylnonan-2-yl; 3,7,11,15-tetramethylhexadec-2-enyl; 1-hydroxy-4-methylpent-3-enyl; cyclohexyl; [4-(2-methylprop-2-yl)cyclohexyl]methyl; {5-oxo-1,3-dihydroxy-6,6-dimethyl-4-[(prop-2-yl)carbonyl]cyclohexa-1,3-dien-2-yl}methyl; 4-(4-chlorophenyl)cyclohexyl; phenyl; benzyl; 2-phenylethyl; 8-formyl-1,6,7-trihydroxy-5-(prop-2-yl)-3-methylnaphthalen-2-yl; 7-hydroxy-2H-chromene-3-yl; and 2,2-dimethyl-5-hydroxy-2H-chromen-8-yl, and every other one of R21, R22, R23, R24, R25, R26, R27, and R28 is independently selected from hydro; hydroxy; methyl; ethyl; propyl; prop-2-yl; methoxy; formyl; acetyl; 2-oxopropyl; (prop-2-yl)carbonyl; and oxo; and (iii) R21, R22, R23, R24, R25, R26, R27, and R28 comprise exactly 0, 1, or 2 oxo groups. In the case of general structure IIb, which lacks R28, (i) exactly one of R21, R22, R23, R24, R25, and R26 is oxide; (ii) exactly one of R21, R22, R23, R24, R25, R26, and R27 is selected from hydro; methyl; ethyl; propyl; butyl; pentyl; hexyl; heptyl; isoprenyl; geranyl; 2-methylnonan-2-yl; 3,7,11,15-tetramethylhexadec-2-enyl; 1-hydroxy-4-methylpent-3-enyl; cyclohexyl; [4-(2-methylprop-2-yl)cyclohexyl]methyl; {5-oxo-1,3-dihydroxy-6,6-dimethyl-4-[(prop-2-yl)carbonyl]cyclohexa-1,3-dien-2-yl}methyl; 4-(4-chlorophenyl)cyclohexyl; phenyl; benzyl; 2-phenylethyl; 8-formyl-1,6,7-trihydroxy-5-(prop-2-yl)-3-methylnaphthalen-2-yl; 7-hydroxy-2H-chromene-3-yl; and 2,2-dimethyl-5-hydroxy-2H-chromen-8-yl, and every other one of R21, R22, R23, R24, R25, R26, and R27 is independently selected from hydro; hydroxy; methyl; ethyl; propyl; prop-2-yl; methoxy; formyl; acetyl; 2-oxopropyl; (prop-2-yl)carbonyl; and oxo; and (iii) R21, R22, R23, R24, R25, R26, and R27 comprise exactly 0, 1, or 2 oxo groups. General structure IIa comprises exactly 10 implicit carbon atoms that are each depicted by a junction of three lines in general structure IIa; and each dotted line in general structure IIa depicts an optional double bond that is selected such that each of the 10 implicit carbon atoms is bonded to exactly one other atom of general structure IIa with a double bond. General

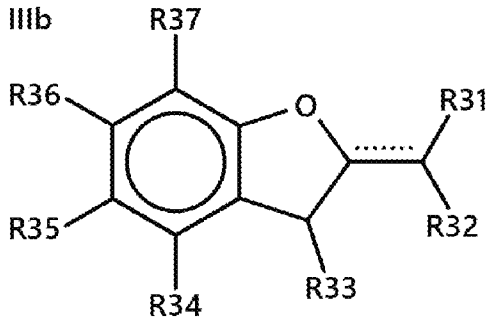
structure IIb comprises a dotted line that is labeled with the letter "A" that depicts (i) a required double bond when R26 is oxide; (ii) a required single bond when either R25 or R26 is oxo; and (iii) an optional double bond when R26 is neither oxo nor oxide. In some embodiments, when R26 is oxo or the dotted line that is labeled with the letter "A" depicts a double bond, then R20 is absent. In some embodiments, when R26 is not oxo and the dotted line that is labeled with the letter "A" depicts a single bond, then R20 is selected from hydro; 4-hydroxyphenyl; (2-hydroxyphenyl)methyl; and (3,4-dihydroxyphenyl)methyl. In some embodiments, when R27 is oxo, then R29 is absent; and when R27 is not oxo, then R29 is selected from hydro; methyl; 4-methylpent-3-enyl; 4,8,12-trimethyltridecyl; and 4,8,12-trimethyltrideca-3,7,11-trieneyl. In some specific embodiments, the molecule is alkannin; atovaquone; buparvaquone; cannabichromene; dehydroequol; glabrene; gossypol; javanicin; juglone; lapachol; lawsone; menadiol; naphthazarin; naphthoresorcinol; 2-naphthol; phthiocol; phylloquinol; plumbagin; PSB-SB-487; sappanol; spinochrome B; or uliginosin B. In some specific embodiments, the molecule is alpha-tocopherol; beta-tocopherol; gamma-tocopherol; delta-tocopherol; zeta2-tocopherol; eta-tocopherol; alpha-tocotrienol; beta-tocotrienol; gamma-tocotrienol; or delta-tocotrienol.

In some embodiments, the anion has a general structure IIIa or IIIb.

IIIa



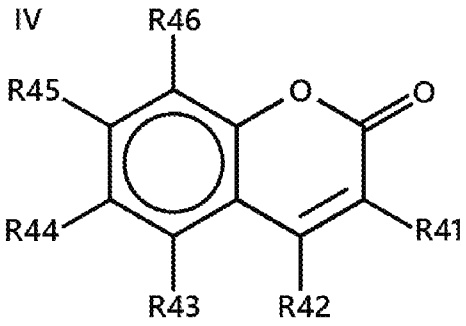
IIIb



In some embodiments, one of R31 and R32 is selected from phenyl; 2-hydroxyphenyl; 3-hydroxyphenyl; 4-hydroxyphenyl; 2,4-dihydroxyphenyl; 2,6-dihydroxyphenyl; 3,4-dihydroxyphenyl; 3,5-dihydroxyphenyl; 3,4,5-trihydroxyphenyl; 3-hydroxy-4-methoxyphenyl; 4-hydroxy-3-methoxyphenyl; 3,4-dihydroxy-5-methyoxyphenyl; 3,5-dihydroxy-4-methyoxyphenyl; 3-hydroxy-4,5-dimethoxyphenyl; 4-hydroxy-3,5-dimethoxyphenyl; 2-methoxyphenyl; 3-methoxyphenyl; 4-methoxyphenyl; 2,4-dimethoxyphenyl; 2,6-dimethoxyphenyl; 3,4-dimethoxyphenyl; 3,5-dimethoxyphenyl; 3,4,5-trimethoxyphenyl; (3,4-dihydroxyphenyl)methyl; 1,3-benzodioxol-5-yl; 4,6-dimethoxy-3,5,11-trimethyltrideca-7,9,11-trienyl; 5-hydroxy-3,4-dimethoxybicyclo[4.2.0]octa-1,3,5-triene-1,7-diyl; and 2-oxo-3-hydroxy-10-(4-hydroxy-3-methoxyphenyl)-4-oxatricyclo[4.3.1.$0^{3,7}$]dec-8-en-8-yl, and the other one of R31 and R32 is

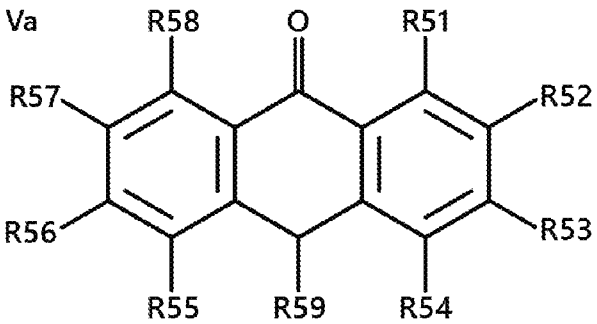
selected from hydro; methyl; isoprenyl; geranyl; hydroxy; methoxy; and [(3,4,5-trihydroxyphenyl)carbonyl]oxy. In some embodiments, R33 is selected from hydro; hydroxy; and oxo. In some embodiments, one of R34, R35, R36, and R37 is an oxide group, and the other three of R34, R35, R36, and R37 are each independently selected from hydro; methyl; isoprenyl; geranyl; 5-methyl-2-(prop-1-en-2-yl)hex-4-enyl; 3,7-dimethylocta-2,6-dien-1-yl; hydroxy; and methoxy. Each dotted line in general structure IIIa and IIIb depicts an optional double bond. In some specific embodiments, the molecule is acacetin; acerosin; afzelechin; alnetin; ampelopsin; apiforol; apigenin; aromadendrin; artocarpetin; aureusidin; axillarin; azaleatin; baicalein; baptigenin; biochanin A; blumeatin; butin; calycosin; cannflavin A; cannflavin B; cannflavin C; catechin; chrysin; chrysoeriol; cirsilineol; cirsiliol; cirsimaritin; corymbosin; coumafuryl; daidzein; datiscetin; derrubone; dihydrokaempferide; dihydrokaempferol; dihydromorin; 4',7-dihydroxyflavone; 7,8-dihydroxyflavone; diosmetin; echioidinin; epiafzelechin; epicatechin; epicatechin gallate; epigallocatechin; epigallocatechin gallate; equol; eriodictyol; ermanin; eupatilin; eupatorin; FBL-03G; fisetin; fisetinidol; formononetin; fustin; galangin; gallocatechin; garbanzol; gardenin A; gardenin B; gardenin C; gardenin D; gardenin E; genistein; 5-O-methylgenistein; genkwanin; geraldone; glycitein; gossypetin; guibourtinidol; hesperetin; hispidulin; homoeriodictyol; 6-hydroxyflavone; hymenoxin; hypolaetin; irigenin; isorhamnetin; isosakuranetin; isoscutellarein; isosilychristin; isoxanthohumol; jaceosidin; kaempferol; 4'-O-methylkaempferol; laricitrin; leucocyanidin; leucofisetinidin; leucopelargonidin; leucopeonidin; liquiritigenin; luteoforol; luteolin; 6-hydroxyluteolin; luteone; mearnsetin; meciadanol; melacacidin; mesquitol; methylchrysin; mikanin; morin; myricetin; naringenin; negletein; nepetin; nevadensin; nodifloretin; norartocarpetin; norwogonin; O-806; onopordin; oritin; orobol; oroxylin A; ourateacatechin; pachypodol; pectolinarigenin; pedalitin; pilloin; pinobanksin; pinocembrin; pinostrobin; poriol; pratensein; pratol; primetin; primuletin; prunetin; pseudobaptigenin; psi-tectorigenin; quercetagetin; quercetin; retusin; rhamnazin; rhamnetin; robinetinidol; sakuranetin; scaposin; scillavone A; scillavone B; scutellarein; serpyllin; silychristin; silydianin; sophoraflavanone G; sorbifolin; spinacetin; sterubin; stigmatellin; sudachitin; sulfuretin; syringetin; taxifolin; techtochrysin; tectorigenin; tithonine; tricetin; tricin; velutin; wighteone; wightin; wogonin; xanthomicrol; or zapotinin.

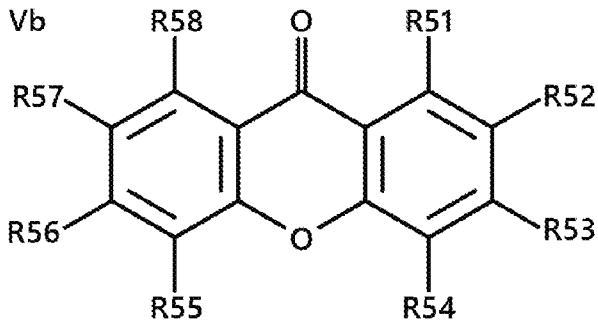
In some embodiments, the anion has a general structure IV.



In some embodiments, (i) exactly one of R41, R42, R43, R44, R45, and R46 is an oxide group; (ii) exactly one of R41, R42, R43, R44, R45, and R46 is selected from hydro; isoprenyl; geranyl; 1-phenylpropyl; (3,7-dimethyloct-2-enyl)oxy; 3-oxo-1-(furan-2-yl)butyl; (2-oxo-4-hydroxy-2H-chromen-3-yl)methyl; 1-(2-oxo-4-hydroxy-2H-chromen-3-yl)ethyl; 2-oxo-2-ethoxy-1-(2-oxo-4-hydroxy-2H-chromen-3-yl)ethyl; 3-hydroxy-3-[4-(4-bromophenyl)phenyl]-1-phenylpropyl; 3-hydroxy-3-(4-chlorophenyl)-1-(5-chlorothiophene-2-yl)propyl; 1,2,3,4-tetrahydronaphthalen-1-yl; 3-(4-phenyl)phenyl-1,2,3,4-tetrahydronaphthalen-1-yl; 3-[4-(4-bromophenyl)phenyl]-1,2,3,4-tetrahydronaphthalen-1-yl; and 3-[4-({[4-(trifluoromethyl)phenyl]methyl}oxy)phenyl]-1,2,3,4-tetrahydronaphthalen-1-yl; and (iii) every other one of R41, R42, R43, R44, R45, and R46 is independently selected from hydro; hydroxy; methyl; and methoxy. In some specific embodiments, the molecule is brodifacoum; bromadiolone; coumatetralyl; daphnetin; dicoumarol; difenacoum; esculetin; ethyl biscoumacetate; ethylidene dicoumarol; ferujol; flocoumafen; fraxetin; 4-hydroxycoumarin; hymecromone; ostruthin; phenprocoumon; scopoletin; tioclomarol; or umbelliferone.

In some embodiments, the anion has a general structure Va or Vb.



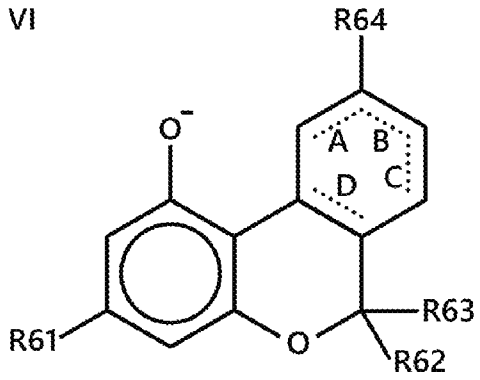


In some embodiments, (i) exactly one of R51, R52, R53, R54, R55, R56, R57, and R58 is an oxide group; exactly one or two of R51, R52, R53, R54, R55, R56, R57, and R58 are independently selected from hydro, isoprenyl, and geranyl; and every other one of R51, R52, R53, R54, R55, R56, R57, and R58 is independently selected from hydro, hydroxy, methyl, hydroxymethyl, methoxy, and formyl; and (ii) R59 is selected from hydro and oxo. In some specific embodiments, the

molecule is alizarin; alizarin 1-methyl ether; alizarin 2-methyl ether; aloe emodin; anthragallol; anthralin; anthrapurpurin; 1,6-dihydroxyanthraquinone; anthrarobin; anthrarufin; beta-mangostin; chrysarobin; 9-hydroxychrysarobin; 3-hydroxychrysazin; damnacanthal; danthron; emodin; euxanthone; flavopurpurin; gamma-mangostin; 3,6-dimethylmangostin; 6-deoxy-gamma mangostin; gentisin; mangostin; oxyanthrarufin; oxychrysazin; parietin; purpurin; purpurin 1-methyl ether; purpurin 2,4-dimethyl ether; purpurin 2-methyl ether; purpuroxanthin; quinalizarin; quinizarin; or rubiadin.

In some embodiments, the anion has a general structure VI.

VI

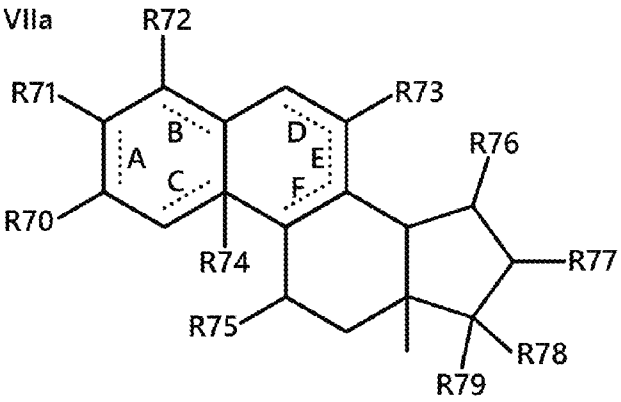


In some embodiments, R61 is selected from hydro; methyl; ethyl; propyl; butyl; pentyl; hexyl; heptyl; octyl; nonyl; decyl; prop-2-yl; but-2-yl; pent-2-yl; hex-2-yl; hept-2-yl; octan-2-yl; nonan-2-yl; decan-2-yl; 2-methylpropyl; 2-methylbutyl; 2-methylpentyl; 2-methylhexyl; 2-methylheptyl; 2-methyloctyl; 2-methylnonyl; 2-methyldecyl; 2-methylprop-2-yl; 2-methylbut-2-yl; 2-methylpent-2-yl; 2-methylhex-2-yl; 2-methylhept-2-yl; 2-methyloctan-2-yl; 2-methylnonan-2-yl; 2-methyldecan-2-yl; 3-methylbut-2-yl; 3-methylpent-2-yl; 3-methylhex-2-yl; 3-methylhept-2-yl; 3-methyloctan-2-yl; 3-methylnonan-2-yl; 3-methyldecan-2-yl; 2,3-dimethylbut-2-yl; 2,3-dimethylpent-2-yl; 2,3-dimethylhex-2-yl; 2,3-dimethylhept-2-yl; 2,3-dimethyloctan-2-yl; 2,3-dimethylnonan-2-yl; 2,3-dimethyldecan-2-yl; cyclopropyl; 1-methylcyclopropyl; 1-ethylcyclopropyl; 1-propylcyclopropyl; 1-butylcyclopropyl; 1-pentylcyclopropyl; 1-hexylcyclopropyl; 1-heptylcyclopropyl; 1-octylcyclopropyl; 1-nonylcyclopropyl; cyclobutyl; 1-methylcyclobutyl; 1-ethylcyclobutyl; 1-propylcyclobutyl; 1-butylcyclobutyl; 1-pentylcyclobutyl; 1-hexylcyclobutyl; 1-heptylcyclobutyl; 1-octylcyclobutyl; cyclopentyl; 1-methylcyclopentyl; 1-ethylcyclopentyl; 1-propylcyclopentyl; 1-butylcyclopentyl; 1-pentylcyclopentyl; 1-hexylcyclopentyl; 1-heptylcyclopentyl; cyclohexyl; 1-methylcyclohexyl; 1-ethylcyclohexyl; 1-propylcyclohexyl; 1-butylcyclohexyl; 1-pentylcyclohexyl; 1-hexylcyclohexyl; ethenyl; prop-1-enyl; but-1-enyl; pent-1-enyl; hex-1-enyl; hept-1-enyl; octan-1-enyl; nonan-1-enyl; decan-1-enyl; ethynyl; prop-1-ynyl; but-1-ynyl; pent-1-ynyl; hex-1-ynyl; hept-

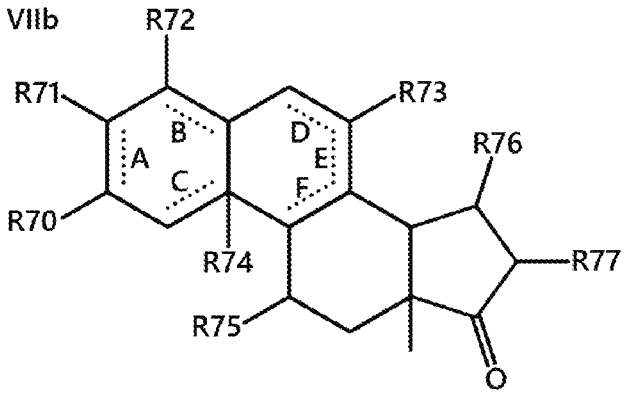
1-ynyl; octan-1-ynyl; nonan-1-ynyl; decan-1-ynyl; 2-phenylethyl; 2-phenylprop-2-yl; adamant-1-yl; adamant-2-yl; 6-bromohex-2-enyl; 6-bromohex-2-ynyl; 2-methyl-6-bromohex-2-yl; 6-cyanohex-2-enyl; and 6-cyanohex-2-ynyl. In some embodiments, R62 is selected from hydro and methyl. In some embodiments, R63 is selected from hydro; methyl; 3-hydroxypropyl; 3-hydroxyprop-1-enyl; and 3-hydroxyprop-1-ynyl. In some embodiments, R64 is selected from hydro; methyl; hydroxy; hydroxymethyl; and oxo. In some embodiments, the dotted lines that are labeled with A, B, C, and D in general structure VI depict four optional double bonds that are selected such that A, B, C, and D depict either (i) zero double bonds; (ii) one double bond that occurs at the dotted line that is labeled with either A, B, or D; or (iii) three double bonds that occur at the dotted lines that are labeled with A, C, and D. In some specific embodiments, the molecule is AM-087; AM-2389; AM-4030; AM-411; AM-905; AM-906; AM-919; AM-938; AMG-1; AMG-36; AMG-41; canbisol; cannabinol; 11-nor-9beta-hydroxyhexahydrocannabinol; delta8-tetrahydrocannabinol; dexanabinol; dimethylheptylpyran; HU-210; HU-243; KM-233; nabilone; perrottetinene; synhexyl; tetrahydrocannabinol; 11-hydroxytetrahydrocannabinol; tetrahydrocannabinol-C4; tetrahydrocannabiorcol; tetrahydrocannabiphorol; or tetrahydrocannabivarin.

In some embodiments, the anion has a general structure VIIa or VIIb.

VIIa



VIIb

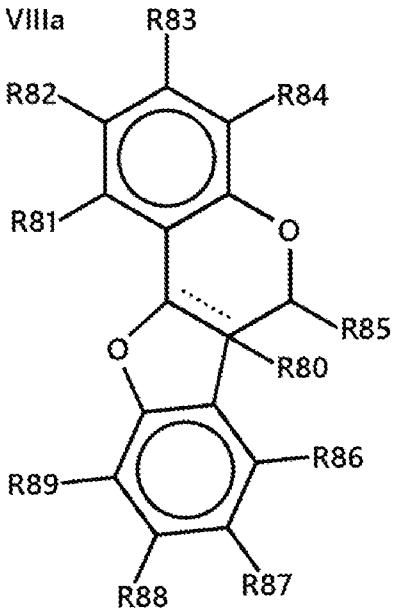


In some embodiments, R70 is selected from hydro, formyl, and cyano. In some embodiments, R71 is selected from oxo and oxide. When R70 is formyl or cyano, then R71 is oxide, R72 is hydro, and the dotted lines that are labelled with A, B, C, D, E, and F depict one double bond that occurs at A. When R70 is hydro and R71 is oxo, then R72 is oxide, and the dotted lines that are labelled with A, B, C, D, E, and F depict one double bond that occurs at B. When R70 is hydro and R71 is oxide, then R72 is selected from is hydro and hydroxy, and the dotted lines that are labelled with A, B, C, D, E, and F depict either (i) three double bonds that occur at A, B, and C, (ii) four double bonds that occur at either A, B, C, and E or A, B, C, and F, or (iii) five double bonds that occur at A, B, C, D, and F. In some embodiments, R73 is selected from hydro and 9-[(4,4,5,5,5-

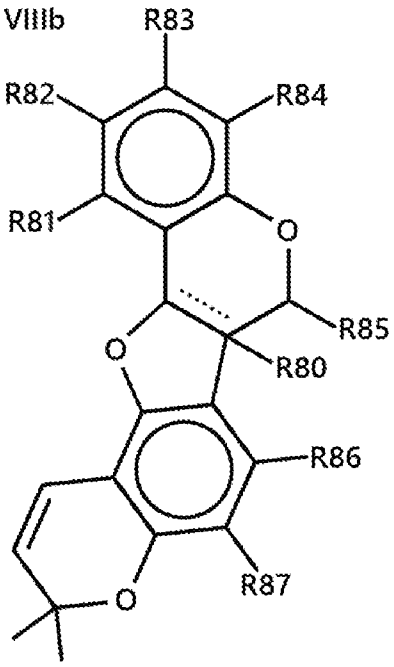
pentafluoropentyl)sulfinyl]nonanyl. In some embodiments, R74 is selected from hydro and methyl. In some embodiments, R75 is selected from hydro, hydroxy, and methoxy. In some embodiments, R76 and R77 are each independently selected from hydro and hydroxy. In some embodiments, R78 is selected from hydro, methyl, ethyl, ethenyl, and ethynyl. In some embodiments, R79 is selected from hydroxy, acetyloxy; (1-oxopropyl)oxy; (1-oxobutyl)oxy; (1-oxopentyl)oxy, (1-oxohexyl)oxy; (1-oxoheptyl)oxy, (1-oxooctanyl)oxy, (1-oxononanyl)oxy, (1-oxodecanyl)oxy, (1-oxoundecanyl)oxy, [1-oxo-3-(cyclopentyl)propyl]oxy, and [(2-methylprop-2-yl)amino]carbonyl. In some specific embodiments, R71 is oxide; R70 and R72 are hydro; and the dotted lines labeled with A, B, and C depict exactly 3 double bonds. In some very specific embodiments, the molecule is 17alpha-dihydroequilin; 17beta-dihydroequilin; 16-epiestriol; 17-epiestriol; 16,17-epiestriol; equilenin; equilin; estradiol; alpha-estradiol; estriol; estrone; ethinyl estradiol; formestane; fulvestrant; isoestradiol; 8-isoestrone; moxestrol; oxabolone; oxymesterone; or oxymetholone. In some very specific embodiments, the molecule is estradiol enanthate; estradiol undecylate; estradiol valerate; estradiol 17beta-cyclopentanepropanoate; or oxabolone 17-cyclopentanepropionate.

In some embodiments, the anion has a general structure VIIIa, VIIIb, VIIIc, VIIId, VIIIe, or VIIIf.

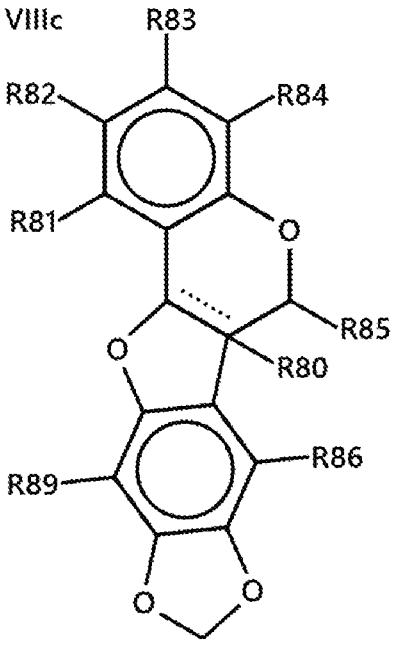
VIIIa

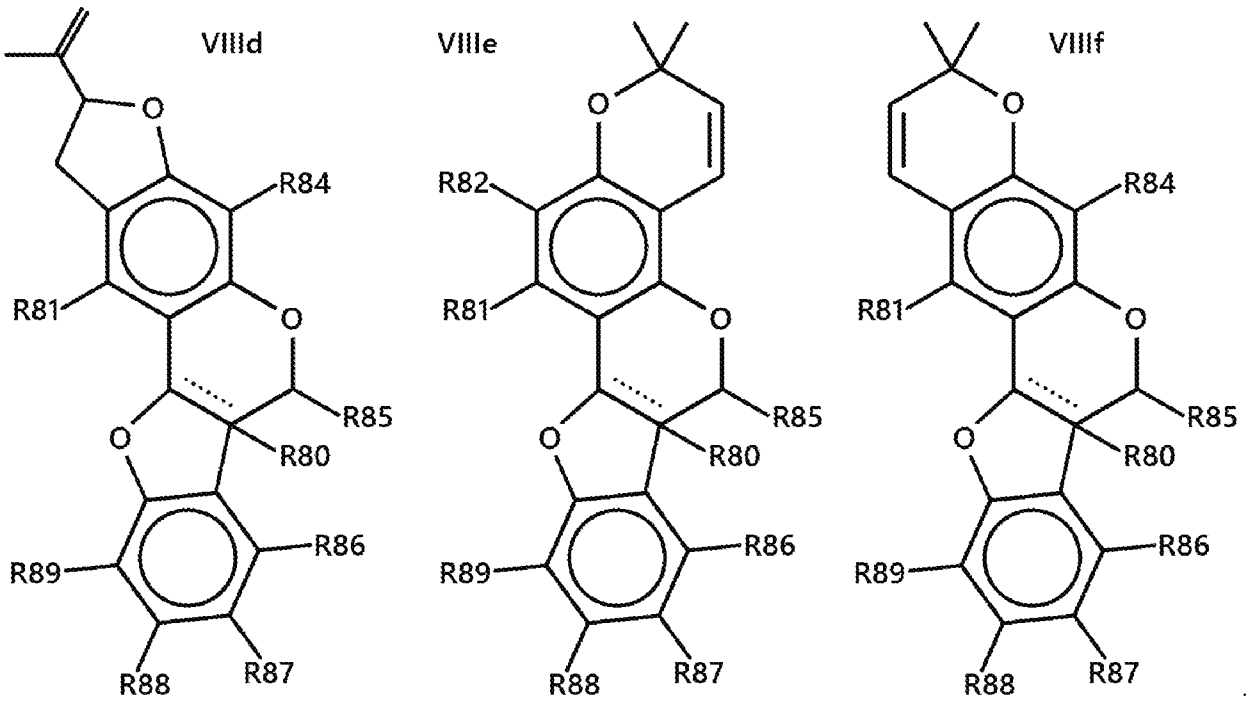


VIIIb



VIIIc





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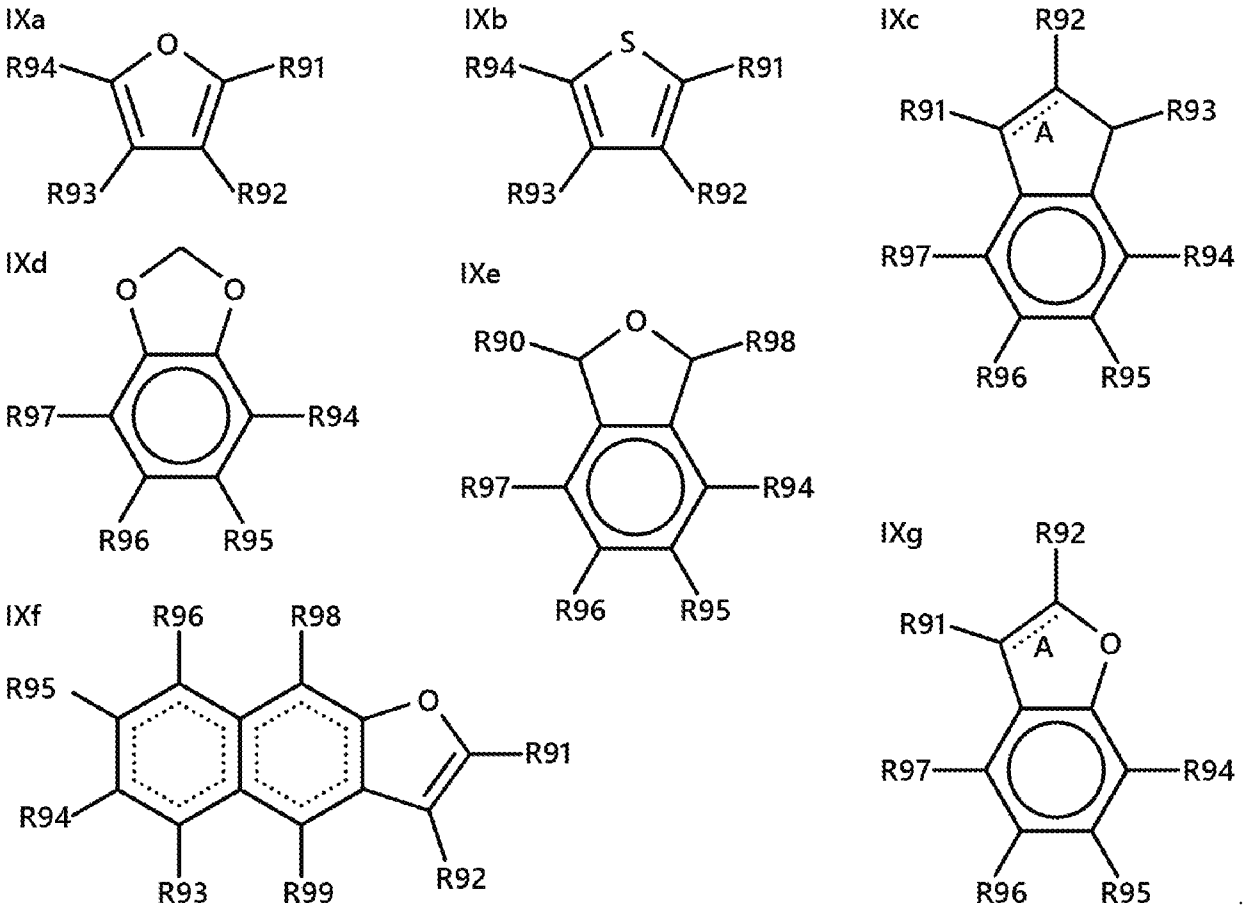
Each dotted line in general structures VIIIa, VIIIb, VIIIc, VIIId, VIIIe, and VIIIf depicts an optional double bond, wherein when the double bond is selected, then R80 is absent; and when the double bond is not selected, then R80 is selected from hydro and hydroxy. General structures VIIIa, VIIIb, VIIIc, VIIId, VIIIe, and VIIIf each comprise one oxide group, wherein one of R81, R82, R83, R84, R86, R87, R88, and R89 is oxide; one or two of R81, R82, R83, R84, R86, R87, R88, and R89 are independently selected from hydro, isoprenyl, geranyl, and 4-hydroxy-3-methylbutyl; and every other one of R81, R82, R83, R84, R86, R87, R88, and R89 is independently selected from hydro, hydroxy, and methoxy. In some embodiments, when R80 is absent or hydro, then R85 is selected from hydro, hydroxy, and oxo; and when R80 is hydroxy, then R85 is hydro. In some specific embodiments, the double bond in general structures VIIIa, VIIIb, VIIIc, VIIId, VIIIe, and VIIIf is selected, and R85 is selected from hydro and oxo. In some specific embodiments, double bond in general structures VIIIa, VIIIb, VIIIc, VIIId, VIIIe, and VIIIf is not selected, and R85 is hydro. In some specific embodiments, either R83 is oxide and R88 is hydroxy or methoxy; R88 is oxide and R83 is hydroxy or methoxy; or R83 and R88 are each independently selected from hydroxy and methoxy. In some specific embodiments, R86 is hydro. In some very specific embodiments, the molecule is cabenegrin A-I, cabenegrin A-II, coumestrol, glyceollin I, glyceollin II, glyceollin III, glyceollin IV, glycinol, glycyrrhizol A, medicagol, medicarpin, phaseolin, plicadin, psoralidin, or wedelolactone.

In some embodiments, the anion has a general structure IXa, IXb, IXc, IXd, IXe, IXf, or IXg.



;

General structures IXa, IXb, IXc, IXd, IXe, IXf, and IXg each comprise an oxide group, wherein (i) one of R91, R92, R93, R94, R95, R96, and R97 is oxide; (ii) two of R91, R92, R93, R94, R95, R96, and R97 are independently selected from hydro, ethyl, propyl, prop-2-yl, ethenyl, prop-1-enyl, prop-2-enyl, propen-2-yl, 2-methylprop-1-enyl, isoprenyl, formyl, acetyl, (ethoxy)carbonyl, (propoxy)carbonyl, 2-hydroxprop-2-yl, phenyl, 4-hydroxyphenyl, 3,4-dihydroxyphenyl, 3-hydroxy-4-methoxyphenyl, 4-hydroxy-3-methoxyphenyl, 4-oxo-3,5,7-trihydroxy-2,3-dihydro-4H-chromen-2-yl, 2-[1-oxo-7,8-dihydroxy-3-(methoxycarbonyl)-1H-isochromen-6-yl]ethyl, fluoro, chloro, bromo, and iodo; and (iii) every other one of R91, R92, R93, R94, R95, R96, and R97 is independently selected from hydro, hydroxy, hydroxymethyl, methoxy, and methyl. In some embodiments, R90 is selected from hydro, hydroxy, oxo, (phenyl)methylidene, (4-hydroxyphenyl)methylidene, and (3,4-hydroxyphenyl)methylidene. In some embodiments, R98 is selected from hydro, hydroxy, and oxo; when R98 is oxo, then R99 is oxo; and when R98 is hydro or hydroxy, then R99 is selected from hydro and hydroxy. Each dotted line labeled with "A" in general structures IXc and IXg depicts an optional double bond. General structure IXf comprises exactly 12 implicit carbon atoms that are each depicted by a junction of three lines in general

structure IXf; and each dotted line in general structure IXf depicts an optional double bond that is selected such that each of the 12 implicit carbon atoms is bonded to exactly one other atom of general structure IXf with a double bond. In some specific embodiments, the molecule is chlorindanol; collinomycin; euparin; isomaltol; isosilychristin; mutisianthol; protiofate; sesamol; silychristin; or thunberginol F.

In some embodiments, a composition disclosed anywhere in this patent document comprises water and hydroxide. In some embodiments, a composition disclosed anywhere in this patent document comprises ethanol and ethoxide. In some embodiments, a composition disclosed anywhere in this patent document comprises 1,2-propanediol and one or both of 1-hydroxypropane-2-oxide and 2-hydroxypropane-1-oxide. In some embodiments, a composition disclosed anywhere in this patent document comprises 1,2,3-propanetriol and one or both of 1,3-dihydroxypropane-2-oxide and 2,3-dihydroxypropane-1-oxide. In some embodiments, a composition disclosed anywhere in this patent document comprises lithium cation ("Li+"); sodium cation ("Na+"); potassium cation ("K+"); magnesium cation ("Mg++"); calcium cation ("Ca++"); zinc cation ("Zn++"); manganese cation ("Mn++"); iron (II) cation ("Fe++"); iron (III) cation ("Fe+++"); copper (I) cation ("Cu+"); copper (II) cation ("Cu++"); ammonium ("NH_4+"); protonated ethanolamine; choline; protonated lysine; protonated arginine; or protonated sphingosine. In some specific embodiments, a composition disclosed anywhere in this patent document comprises sodium cation. In some specific embodiments, a composition comprises potassium cation.

In some embodiments, the composition comprises a salt, and the salt comprises the anion.

In some embodiments, the composition is formulated for administration to a human.

In some embodiments, the composition is formulated for veterinary use.

What is claimed is:

1. A composition comprising 2,6-diisopropylphenolate, for use as a medicament.

2. The composition of claim 1, for use as a medicament to sedate or anesthetize the subject.

3. The composition of claim 1 or 2, wherein the composition is formulated to convert the 2,6-diisopropylphenolate into 2,6-diisopropylphenol in situ subsequent to administering the composition.

4. The composition of claim 1 or 2, wherein the composition is formulated to convert the 2,6-diisopropylphenolate into 2,6-diisopropylphenol ex vivo prior to administering the composition.

5. A composition comprising 2,6-diisopropylphenolate, for use to manufacture a medicament.

6. The composition of any one of claims 1-5, comprising water; wherein the 2,6-diisopropylphenolate is dissolved in the water; and the water has a pH that is greater than 8.5.

7. The composition of any one of claims 1-6, comprising the 2,6-diisopropylphenolate at a concentration of at least 15 grams per liter.

8. The composition of any one of claims 1-7, wherein the composition lacks triglycerides, fatty acids, and phospholipids at a combined concentration greater than 50 grams per liter.

9. The composition of any one of claims 1-8, comprising 2,6-diisopropylphenol, wherein the composition comprises the 2,6-diisopropylphenolate at a greater molar concentration than the 2,6-diisopropylphenol.

10. A composition comprising 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide, for use as a medicament.

11. The composition of claim 10, for use as a medicament to modulate international normalized ratio ("INR") in a subject.

12. The composition of claim 10 or 11, for use to either prophylactically prevent or treat (a) thromboembolic events, (b) venous thrombus, (c) pulmonary embolism, (d) thromboembolic complications associated with atrial fibrillation or cardiac valve replacement in a subject, (e) myocardial infarction, (f) ischemic stroke, (g) ischemia-related death, or (h) two or more of the foregoing.

13. The composition of any one of claims 10-12, wherein the composition is formulated for oral administration; the composition is formulated to allow the conversion of the 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide into 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-ol before the 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide reaches the stomach of the subject; and the composition is formulated to allow absorption of the 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-ol

by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

14. The composition of any one of claims 10-12, wherein the composition is formulated for inhalational administration or injection.

15. A composition comprising 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide, for use to manufacture a medicament.

16. The composition of any one of claims 10-15, wherein the composition is a liquid, and the 2-oxo-3-(1-phenylpropyl)-2H-chromen-4-oxide is dissolved in the liquid.

17. A composition comprising an estrogen anion, for use as a medicament.

18. The composition of claim 17, wherein the estrogen anion is (8R,9S,13S,14S,17S)-17-hydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide; (8R,9S,13S,14S,17R)-17-ethynyl-17-hydroxy-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-oxide; or (8R,9S,13S,14S,16R,17R)-16,17-dihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide.

19. The composition of claim 17 or 18, wherein the estrogen anion has a conjugate acid that is an estrogen molecule; and the estrogen molecule has an acid dissociation constant in water of at least 50 femtomolar and no greater than 50 nanomolar for conversion of the estrogen molecule into the estrogen anion.

20. The composition of claim 19, wherein the composition is formulated to allow the conversion of the estrogen anion into the estrogen molecule before the estrogen anion reaches the stomach of the subject; and the composition is formulated to allow absorption of the estrogen molecule by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

21. The composition of claim 19 or 20, wherein:

the estrogen anion is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxopentyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxopentyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-ol;

the estrogen anion is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxo-3-cyclopentylpropyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule

is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxo-3-cyclopentylpropyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-ol;

the estrogen anion is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxoheptyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxoheptyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-ol;

the estrogen anion is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxoundecanyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17S)-13-methyl-17-[(1-oxoundecanyl)oxy]-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthren-3-ol;

the estrogen anion is (8R,9S,13S,14S,17R)-17-hydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17R)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,17-diol;

the estrogen anion is (8S,9S,11S,13S,14S,17R)-17-ethynyl-17-hydroxy-11-methoxy-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8S,9S,11S,13S,14S,17R)-17-ethynyl-11-methoxy-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthren-3,17-diol;

the estrogen anion is (8R,9S,13S,14S,16S,17R)-16,17-dihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,16S,17R)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,16,17-triol;

the estrogen anion is (8R,9S,13S,14S,16S,17S)-16,17-dihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,16S,17S)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,16,17-triol;

the estrogen anion is (8R,9S,13S,14S)-17-oxo-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S)-17-oxo-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-ol;

the estrogen anion is (9S,13S,14S)-17-oxo-13-methyl-9,11,12,14,15,16-hexahydro-6H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (9S,13S,14S)-17-oxo-13-methyl-9,11,12,14,15,16-hexahydro-6H-cyclopenta[a]phenanthrene-3-ol;

the estrogen anion is (13S,14S)-17-oxo-13-methyl-7,11,12,14,15,16-hexahydro-6H-

cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S)-17-oxo-13-methyl-7,11,12,14,15,16-hexahydro-6H-cyclopenta[a]phenanthrene-3-ol;

the estrogen anion is (13S,14S)-17-oxo-13-methyl-12,14,15,16-tetrahydro-11H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S)-17-oxo-13-methyl-12,14,15,16-tetrahydro-11H-cyclopenta[a]phenanthrene-3-ol;

the estrogen anion is (9S,13S,14S,17S)-17-hydroxy-13-methyl-6,9,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (9S,13S,14S,17S)-13-methyl-6,9,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3,17-diol;

the estrogen anion is (9S,13S,14S,17R)-17-hydroxy-13-methyl-6,9,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (9S,13S,14S,17R)-13-methyl-6,9,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3,17-diol;

the estrogen anion is (13S,14S,17S)-17-hydroxy-13-methyl-6,7,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S,17S)-13-methyl-6,7,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3,17-diol;

the estrogen anion is (13S,14S,17R)-17-hydroxy-13-methyl-6,7,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S,17R)-13-methyl-6,7,11,12,14,15,16,17-octahydrocyclopenta[a]phenanthrene-3,17-diol;

the estrogen anion is (13S,14S,17S)-17-hydroxy-13-methyl-11,12,14,15,16,17-hexahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S,17S)-13-methyl-11,12,14,15,16,17- hexahydrocyclopenta[a]phenanthrene-3,17-diol;

the estrogen anion is (13S,14S,17R)-17-hydroxy-13-methyl-11,12,14,15,16,17-hexahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (13S,14S,17R)-13-methyl-11,12,14,15,16,17-hexahydrocyclopenta[a]phenanthrene-3,17-diol;

the estrogen anion is (8R,9S,13S,14S,15R,16R,17R)-15,16,17-trihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,15R,16R,17R)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,15,16,17-tetrol;

the estrogen anion is 4-[4-(4-hydroxyphenyl)hexa-2,4-dien-3-yl]phenolate, and the estrogen molecule is 4-[4-(4-hydroxyphenyl)hexa-2,4-dien-3-yl]phenol;

the estrogen anion is 4-[4-(4-hydroxyphenyl)hex-3-en-3-yl]phenolate, and the estrogen molecule is 4-[4-(4-hydroxyphenyl)hex-3-en-3-yl]phenol;

the estrogen anion is 4-[4-(4-methoxyphenyl)hex-3-en-3-yl]phenolate, and the estrogen molecule

is 4-[4-(4-methoxyphenyl)hex-3-en-3-yl]phenol;

the estrogen anion is 4-(4-{4-[(phenylmethyl)oxy]phenyl}hex-3-en-3-yl)phenolate, and the estrogen molecule is 4-(4-{4-[(phenylmethyl)oxy]phenyl}hex-3-en-3-yl)phenol;

the estrogen anion is 4-[2-(4-hydroxyphenyl)vinyl]phenolate, and the estrogen molecule is 4-[2-(4-hydroxyphenyl)vinyl]phenol;

the estrogen anion is 4-[3-(4-hydroxyphenyl)but-2-en-2-yl]phenolate, and the estrogen molecule is 4-[3-(4-hydroxyphenyl)but-2-en-2-yl]phenol;

the estrogen anion is 4-[4-(4-hydroxyphenyl)hex-3-yl]phenolate, and the estrogen molecule is 4-[4-(4-hydroxyphenyl)hex-3-yl]phenol;

the estrogen anion is 4-[3-ethyl-4-(4-hydroxyphenyl)hex-2-yl]phenolate, and the estrogen molecule is 4-[3-ethyl-4-(4-hydroxyphenyl)hex-2-yl]phenol;

the estrogen anion is 4-[4-ethyl-5-(4-hydroxyphenyl)hex-3-yl]phenolate, and the estrogen molecule is 4-[4-ethyl-5-(4-hydroxyphenyl)hex-3-yl]phenol;

the estrogen anion is 4-[4-(4-hydroxy-3-methylphenyl)hex-3-yl]-2-methylphenolate; and the estrogen molecule is 4-[4-(4-hydroxy-3-methylphenyl)hex-3-yl]-2-methylphenol;

the estrogen anion is (8R,9S,13S,14S,17S)-17-hydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17S)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,17-diol;

the estrogen anion is (8R,9S,13S,14S,17R)-17-ethynyl-17-hydroxy-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,17R)-17-ethynyl-13-methyl-7,8,9,11,12,14,15,16-octahydro-6H-cyclopenta[a]phenanthrene-3,17-diol; or

the estrogen anion is (8R,9S,13S,14S,16R,17R)-16,17-dihydroxy-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3-oxide, and the estrogen molecule is (8R,9S,13S,14S,16R,17R)-13-methyl-6,7,8,9,11,12,14,15,16,17-decahydrocyclopenta[a]phenanthrene-3,16,17-triol.

22. The composition of any one of claims 19-21, comprising the estrogen molecule, wherein the composition comprises the estrogen anion at a greater molar concentration than the estrogen molecule.

23. The composition of any one of claims 19-22, wherein the composition is formulated to convert the estrogen anion into the estrogen molecule in situ subsequent to administering the composition.

24. The composition of any one of claims 19-22, wherein the composition is formulated to convert

the estrogen anion into the estrogen molecule ex vivo prior to administering the composition.

25. The composition of any one of claims 17-24, for use as a medicament either as a contraceptive, to treat symptoms of menstruation, to treat dysmenorrhea, to treat menorrhagia, to treat polycystic ovary syndrome, to treat endometriosis, to treat female hypogonadism, to treat absence of menstruation, to treat symptoms of menopause, to provide perimenopausal or postmenopausal hormone replacement therapy, to provide feminizing hormone therapy, to treat hirsutism, to treat acne, or two or more of the foregoing.

26. The composition of any one of claims 17-24, for use as a medicament to treat a psychiatric condition or a neurodegenerative disease.

27. The composition of any one of claims 17-24, for use as a medicament to treat anxiety, schizophreniform disorder, schizophrenia, multiple sclerosis, mild cognitive impairment, or Alzheimer's disease.

28. The composition of any one of claims 17-24, for use as a medicament to treat inflammation, an autoimmune disease, or sepsis.

29. The composition of any one of claims 17-24, for use as a medicament to treat arthritis, inflammatory autoimmune-mediated arthritis, rheumatoid arthritis, juvenile idiopathic arthritis, polyarticular juvenile idiopathic arthritis, osteoarthritis, enthesitis-related arthritis, psoriatic arthritis, psoriasis, plaque psoriasis, hidradenitis suppurativa, sarcoidosis, pulmonary sarcoidosis, bone sarcoidosis, lupus, axial spondyloarthritis, ankylosing spondylitis, Dupuytren's disease, uveitis, non-infectious uveitis, adhesive capsulitis, Sjogren's syndrome, inflammatory bowel disease, Crohn's disease, ulcerative colitis, or smoking-cessation-induced ulcerative colitis.

30. The composition of any one of claims 17-24, for use as a medicament to treat breast cancer, prostate cancer, or benign prostatic hyperplasia.

31. The composition of any one of claims 17-30, wherein the composition is a liquid, and the estrogen anion is dissolved in the liquid.

32. A composition comprising a cannabinoid anion, for use as a medicament, wherein the cannabinoid anion has a conjugate acid that is a cannabinoid molecule; and the cannabinoid molecule has an acid dissociation constant in water of at least 50 femtomolar and no greater than 50 nanomolar for conversion of the cannabinoid molecule into the cannabinoid anion.

33. The composition of claim 32, wherein the composition is formulated for oral or topical administration.

34. The composition of claim 32 or 33, wherein the composition is formulated for oral

administration; the composition is formulated to allow the conversion of the cannabinoid anion into the cannabinoid molecule before the cannabinoid anion reaches the stomach of the subject; and the composition is formulated to allow absorption of the cannabinoid molecule by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

35. The composition of any one of claims 32-34, wherein the composition is formulated to convert the cannabinoid anion into the cannabinoid molecule in situ subsequent to administering the composition to the subject.

36. The composition of any one of claims 32-33, wherein the composition is formulated to convert the cannabinoid anion into the cannabinoid molecule ex vivo prior to administering the composition to the subject.

37. The composition of any one of claims 32-36, wherein the composition comprises the cannabinoid molecule; and the composition comprises the cannabinoid anion at a greater molar concentration than the cannabinoid molecule.

38. The composition of any one of claims 32-37, wherein:

the cannabinoid anion is 3-hydroxy-2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-pentylphenolate, and the cannabinoid molecule is 2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-pentylbenzene-1,3-diol;

the cannabinoid anion is 3-hydroxy-2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-propylphenolate, and the cannabinoid molecule is 2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-propylbenzene-1,3-diol;

the cannabinoid anion is 2-geranyl-3-hydroxy-5-pentylphenolate, and the cannabinoid molecule is 2-geranyl-5-pentylbenzene-1,3-diol;

the cannabinoid anion is 2-geranyl-3-hydroxy-5-propylphenolate, and the cannabinoid molecule is 2-geranyl-5-propylbenzene-1,3-diol;

the cannabinoid anion is (6aR,10aR)-6,6,9-trimethyl-3-pentyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromene-1-oxide, and the cannabinoid molecule is (6aR,10aR)-6,6,9-trimethyl-3-pentyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromene-1-ol;

the cannabinoid anion is (6aR,10aR)-6,6,9-trimethyl-3-propyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromene-1-oxide, and the cannabinoid molecule is (6aR,10aR)-6,6,9-trimethyl-3-propyl-6a,7,8,10a-tetrahydro-6H-benzo[c]chromene-1-ol;

the cannabinoid anion is 6,6,9-trimethyl-3-pentyl-6H-benzo[c]chromene-1-oxide, and the

cannabinoid molecule is 6,6,9-trimethyl-3-pentyl-6H-benzo[c]chromene-1-ol; or

the cannabinoid anion is 6,6,9-trimethyl-3-propyl-6H-benzo[c]chromene-1-oxide, and the cannabinoid molecule is 6,6,9-trimethyl-3-propyl-6H-benzo[c]chromene-1-ol.

39. The composition of any one of claims 32-38, wherein the cannabinoid anion is 3-hydroxy-2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-pentylphenolate or 3-hydroxy-2-[(1R,6R)-6-isopropenyl-3-methylcyclohex-2-enyl]-5-propylphenolate.

40. The composition of any one of claims 32-38, wherein the cannabinoid anion is 2-geranyl-3-hydroxy-5-propylphenolate.

41. The composition of any one of claims 32-38, wherein the cannabinoid anion is 2-geranyl-3-hydroxy-5-pentylphenolate.

42. The composition of any one of claims 32-39, wherein the composition is a liquid, and the cannabinoid anion is dissolved in the liquid.

43. The composition of any one of claims 32-40, for use as a medicament to prophylactically prevent or treat muscle cramping, muscle spasms, restless-legs syndrome, nystagmus, a dyskinetic movement disorder, tremor, seizures, epilepsy, muscular dystrophy, or inclusion body myositis.

44. The composition of any one of claims 32-40, for use as a medicament to arrest or reduce the severity of an active seizure.

45. The composition of any one of claims 32-40, for use as a medicament to reduce blood pressure.

46. The composition of any one of claims 32-40, for use as a medicament to prophylactically prevent or treat prehypertension or hypertension.

47. The composition of any one of claims 32-40, for use as a medicament to treat attention deficit hyperactivity disorder (“ADHD”), autism or an autism spectrum disorder, Asperger syndrome, fragile X syndrome, Down syndrome, a pervasive developmental disorder not otherwise specified (“PDD-NOS”), a childhood disintegrative disorder, or Tourette’s syndrome.

48. The composition of any one of claims 32-40, for use as a medicament to treat anxiety, post-traumatic stress disorder (“PTSD”), depression, bipolar disorder, obsessive–compulsive disorder, schizophreniform disorder, schizophrenia, or psychosis.

49. The composition of any one of claims 32-40, for use as a medicament to treat pain or inflammation.

50. The composition of any one of claims 32-40, for use as a medicament to treat an autoimmune disorder.

51. The composition of any one of claims 32-40, for use as a medicament to treat arthritis,

inflammatory autoimmune-mediated arthritis, rheumatoid arthritis, juvenile idiopathic arthritis, polyarticular juvenile idiopathic arthritis, osteoarthritis, enthesitis-related arthritis, psoriatic arthritis, psoriasis, plaque psoriasis, hidradenitis suppurativa, sarcoidosis, pulmonary sarcoidosis, bone sarcoidosis, lupus, axial spondyloarthritis, ankylosing spondylitis, Dupuytren's disease, uveitis, non-infectious uveitis, adhesive capsulitis, Sjogren's syndrome, inflammatory bowel disease, Crohn's disease, ulcerative colitis, or smoking-cessation-induced ulcerative colitis.

52. The composition of any one of claims 32-40, for use as a medicament to treat a neurodegenerative disease.

53. The composition of any one of claims 32-40, for use as a medicament to treat Parkinson's Disease, Parkinsonian tremor, or both Parkinson's Disease and Parkinsonian tremor.

54. The composition of any one of claims 32-40, for use as a medicament to treat multiple sclerosis, mild cognitive impairment, Alzheimer's Disease, amyotrophic lateral sclerosis ("ALS"), or Huntington's disease.

55. The composition of any one of claims 32-40, for use as a medicament to treat obesity, metabolic syndrome, or diabetes mellitus.

56. The composition of any one of claims 32-40, for use as a medicament to treat a viral infection or a bacterial infection.

57. The composition of any one of claims 32-40, for use as a medicament to treat an infection caused by Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Acinetobacter baumannii, Moraxella catarrhalis, Legionella pneumophila, Staphylococcus aureus, Streptococcus pneumoniae, Enterococcus faecium, Clostridioides difficile, Mycobacterium tuberculosis, Neisseria gonorrhoeae, Cutibacterium acnes, or COVID-19.

58. A composition comprising a substituted phenolate, for use as a medicament, wherein: the substituted phenolate has a conjugate acid that is a substituted phenol; the substituted phenol has an acid dissociation constant in water of at least 50 femtomolar and no greater than 50 nanomolar for conversion of the substituted phenol into the substituted phenolate; the composition is formulated to allow the conversion of the substituted phenolate into the substituted phenol before the substituted phenolate reaches the stomach of the subject; and the composition is formulated to allow absorption of the substituted phenol by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

59. The composition of claim 58, wherein the composition comprises the substituted phenol, and

the composition comprises the substituted phenolate at a greater molar concentration than the substituted phenol.

60. The composition of claim 58 or 59, wherein the substituted phenol is 2-methoxy-4-(prop-2-enyl)phenol, and the substituted phenolate is 2-methoxy-4-(prop-2-enyl)phenolate.

61. The composition of claim 58 or 59, wherein the substituted phenol is 5-methyl-2-(prop-2-yl)phenol, and the substituted phenolate is 5-methyl-2-(prop-2-yl)phenolate.

62. The composition of claim 58 or 59, wherein the substituted phenol is 2-methyl-5-(prop-2-yl)phenol, and the substituted phenolate is 2-methyl-5-(prop-2-yl)phenolate.

63. The composition of claim 58 or 59, wherein the substituted phenol is 2-methoxy-4-({N-[(6E)-1-oxo-8-methylnon-6-enyl]amino}methyl)phenol, and the substituted phenolate is 2-methoxy-4-({N-[(6E)-1-oxo-8-methylnon-6-enyl]amino}methyl)phenolate.

64. The composition of claim 58 or 59, wherein the substituted phenol is 2-methoxy-4-[(5S)-3-oxo-5-hydroxydecanyl]phenol, and the substituted phenolate is 2-methoxy-4-[(5S)-3-oxo-5-hydroxydecanyl]phenolate.

65. The composition of claim 58 or 59, wherein the substituted phenol is 4-formyl-2-methoxyphenol, and the substituted phenolate is 4-formyl-2-methoxyphenolate.

66. The composition of claim 58 or 59, wherein the substituted phenol is 4-formyl-2-ethoxyphenol, and the substituted phenolate is 4-formyl-2-ethoxyphenolate.

67. The composition of claim 58 or 59, wherein the substituted phenol is 4-(3-oxobutyl)phenol, and the substituted phenolate is 4-(3-oxobutyl)phenolate.

68. The composition of claim 58 or 59, wherein the substituted phenol is 2-methoxy-4-[3,5-dioxo-7-(4-hydroxy-3-methoxyphenyl)hepta-1,6-dieneyl]phenol, and the substituted phenolate is 2-methoxy-4-[3,5-dioxo-7-(4-hydroxy-3-methoxyphenyl)hepta-1,6-dieneyl]phenolate.

69. The composition of claim 58 or 59, wherein the substituted phenol is 2,6-diisopropylphenol, and the substituted phenolate is 2,6-diisopropylphenolate.

70. A composition comprising an anion, for use as a medicament, wherein the composition is formulated to covert the anion into a molecule that has an acid dissociation constant in water of at least 50 femtomolar and no greater than 50 nanomolar for conversion of the molecule into the anion.

71. The composition of claim 70, wherein the anion is dissolved in the composition at a concentration that is greater than the solubility of the molecule in water.

72. The composition of claim 70 or 71, wherein the molecule has an octanol-water partition

coefficient, and the logarithm base-10 of the octanol-water partition coefficient is greater than 1.

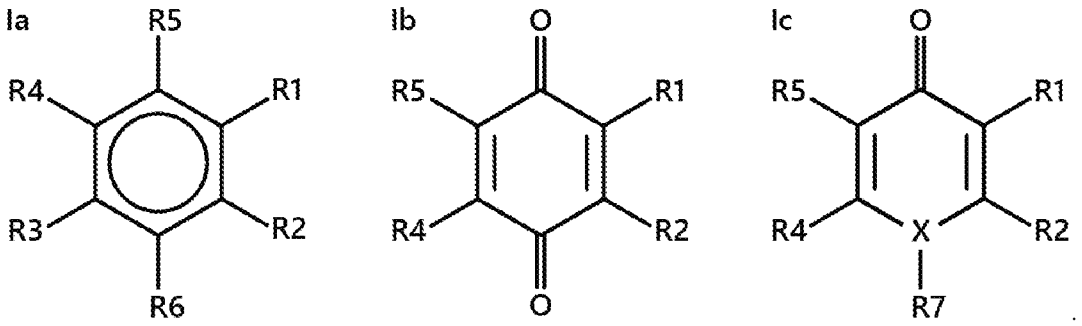
73. The composition of any one of claims 70-72, wherein the composition is formulated for oral administration; the composition is formulated to allow the conversion of the anion into the molecule before the anion reaches the stomach of the subject; and the composition is formulated to allow absorption of the molecule by the epithelial lining of the gastrointestinal tract between the lips and the stomach, excluding the stomach and the outer surfaces of the lips, and including the esophagus and the inner surfaces of the lips.

74. The composition of any one of claims 70-73, wherein the composition is formulated to convert the anion into the molecule in situ subsequent to administering the composition.

75. The composition of any one of claims 70-72, wherein the composition is formulated to convert the anion into the molecule ex vivo prior to administering the composition.

76. The composition of any one of claims 70-75, wherein the composition comprises the molecule, and the composition comprises the anion at a greater molar concentration than the molecule.

77. The composition of any one of claims 70-76, wherein the anion has a general structure Ia, Ib, or Ic



;

one of R1, R2, R3, and R4 is oxide;

one of R1, R2, R3, R4, R5 and R6 is selected from hydro; hydroxy; methoxy; fluoro; chloro; bromo; and iodo;

one of R1, R2, R3, R4, R5 and R6 is selected from hydro; hydroxy; hydroxymethyl; 2-hydroxyethyl; 1,2-dihydroxyethyl; 3-hydroxyprop-1-enyl; methyl; 2-methylprop-2-yl; methoxy; ethoxy; propoxy; butoxy; pentoxy; hexoxy; heptoxy; octanoxy; (prop-2-yl)oxy; isoprenyloxy; benzyloxy; [4-(prop-2-enyl)phenyl]oxy; fluoro; chloro; bromo; iodo; amino; and nitro;

one of R1, R2, R3, R4, R5 and R6 is selected from hydro; hydroxy; methoxy; formyl; acetyl; 2-oxoethyl; 1-oxopropyl; 1-oxobutyl; (prop-2-yl)carbonyl; 3-oxobutyl; 3-oxobut-1-enyl; (methoxy)carbonyl; (ethoxy)carbonyl; (propoxy)carbonyl; (2-propoxy)carbonyl; (butoxy)carbonyl; (pentoxy)carbonyl; (hexoxy)carbonyl; and (heptoxy)carbonyl;

one of R1, R2, R3, R4, R5 and R6 is selected from hydro; methoxy; methyl; ethyl; propyl; butyl; pentyl; hexyl; heptyl; octanyl; nonanyl; decanyl; undecanyl; dodecanyl; tridecyl; tetradecyl; pentadecyl; prop-2-yl; but-2-yl; pent-2-yl; hex-2-yl; hept-2-yl; octan-2-yl; nonan-2-yl; decan-2-yl; 2-methylprop-2-yl; 2-methylbut-2-yl; 2-methylpent-2-yl; 2-methylhex-2-yl; 2-methylhept-2-yl; 2-methyloctan-2-yl; 2-methylnonan-2-yl; 2-methyldecan-2-yl; 3-methylbut-2-yl; 3-methylpent-2-yl; 3-methylhex-2-yl; 3-methylhept-2-yl; 3-methyloctan-2-yl; 3-methylnonan-2-yl; 3-methyldecan-2-yl; 2,4,4-trimethylpent-2-yl; vinyl; prop-1-enyl; prop-2-enyl; pentadec-8-enyl; 2-methylbut-1-en-3-yl; 3-methylbut-1-en-3-yl; 3-ethenyl-3,7-dimethylocta-1,6-dienyl; 4-ethenyl-4,7-dimethylocta-1,6-dien-2-yl; isoprenyl; geranyl; 3,7,11,15,19,23,27,31,35,39-decamethyltetraconta-2,6,10,14,18,22,26,30,34,38-decaenyl; phenyl; benzyl; and 2-phenylethyl;

one of R1, R2, R3, R4, R5 and R6 is selected from hydro; methyl; ethyl; propyl; 2-methylprop-2-yl; 2-methylbut-2-yl; isoprenyl; geranyl; 6-methylhept-5-en-2-yl; 6-methoxy-5-[(methoxy)carbonyl]-4-methylhexa-1,3,5-trienyl; 2-{[1-oxo-4-formyl-3-(2-oxoethyl)hex-4-enyl]oxy}ethyl; 3-oxobutyl; 3-oxobut-1-enyl; 3-oxooct-4-enyl; 3-oxodec-4-enyl; 3-oxododec-4-enyl; 3-oxotetradec-4-enyl; 3-oxohexadec-4-enyl; 3-oxo-5-hydroxyoctanyl; 3-oxo-5-hydroxydecanyl; 3-oxo-5-hydroxydodecanyl; 3-oxo-5-hydroxytetradecanyl; 3-oxo-5-hydroxyhexadecanyl; [N-(1-oxononanyl)amino]methyl; {N-[1-oxo-12-(1-oxo-2-phenylethyl)octadec-9-enyl]amino}methyl; [N-(1-oxo-8-methylnon-6-enyl)amino]methyl; [N-(1-oxo-8-methylnonanyl)amino]methyl; [N-(1-oxo-7-methyloctanyl)amino]methyl; [N-(1-oxo-9-methyldec-6-enyl)amino]methyl; [N-(1-oxo-9-methyldecanyl)amino]methyl; [N-(1-oxo-8-methyldec-6-enyl)amino]methyl; 2-{[4-(4-hydroxyphenyl)but-2-yl]amino}ethyl; 3-{[2-(3,4-dihydroxyphenyl)ethyl]amino}butyl; 1-hydroxy-2-{[1-(4-hydroxyphenyl)prop-2-yl]amino}ethyl; 2-{[2-hydroxy-2-(3,5-dihydroxyphenyl)ethyl]amino}propyl; 4-{[1-oxo-3,7-dimethyl-9-(2,6,6-trimethylcyclohex-1-enyl)non-2,4,6,8-tetraenyl]amino; cyclohexyl; cycloheptyl; adamant-1-yl; adamant-2-yl; 3,3-dimethylcycolhexyl; 6,6-dimethyl-4-oxo-2-bicyclo[3.1.1]heptanyl; 3-hydroxycyclohexyl; 5-hydroxy-2-(3-hydroxypropyl)cyclohexyl; 6-(prop-1-en-2-yl)-3-methylcyclohex-2-enyl; 6-(prop-2-yl)-3-methylcyclohex-2-enyl; 6-(prop-1-en-2-yl)-3-methylcyclohex-3-enyl; 6-(prop-2-yl)-3-methylcyclohex-3-enyl; 4-hydroxy-3-(prop-2-enyl)phenyl; 6-hydroxy-3-(prop-2-enyl)phenyl; 4-methoxy-3-(prop-2-enyl)phenyl; (4-hydroxyphenyl)methyl; 2-(4-hydroxyphenyl)ethyl; 2-(3,5-dihydroxyphenyl)ethyl; 2-hydroxy-2-(3,4,5-trimethoxyphenyl)ethyl; 2-phenylethenyl; 2-(4-hydroxyphenyl)ethenyl; 2-(3,4-dihydroxyphenyl)ethenyl; 2-(3,5-dihydroxyphenyl)ethenyl; 2-(3,4,5-trimethoxyphenyl)ethenyl; 2-

(4-hydroxyphenyl)prop-2-yl; 1-oxo-3-phenylpropyl; 1-oxo-3-(4-hydroxyphenyl)propyl; 3-oxo-3-(2,4,6-trihydroxyphenyl)propyl; 1-oxo-3-phenylprop-2-enyl; 3-oxo-3-(4-hydroxyphenyl)prop-1-enyl; 1-oxo-3-(4-hydroxyphenyl)prop-2-enyl; 3-oxo-3-(2,4-dihydroxyphenyl)prop-1-enyl; 1-oxo-3-(3,4-dihydroxy-2-methoxyphenyl)prop-2-enyl; 1-oxo-3-[4-hydroxy-3,5-bis(isoprenyl)phenyl]prop-2-enyl; 3-oxo-3-[3,5-dihydroxy-4-isoprenylphenyl]prop-1-enyl; 3-oxo-3-[4,6-dihydroxy-2-methoxy-5-isoprenylphenyl]prop-1-enyl; 2-(4-hydroxyphenyl)but-2-yl; 2,3-dimethyl-4-(3,4-dihydroxyphenyl)butyl; 2,3-dimethyl-4-(4-hydroxy-3-methoxyphenyl)butyl; 2,3-bis(hydroxymethyl)-4-(3-hydroxyphenyl)butyl; 2,3-bis(hydroxymethyl)-4-(4-hydroxy-3-methoxyphenyl)butyl; 3-(4-hydroxyphenyl)but-2-en-2-yl; 4-(4-hydroxyphenyl)hex-3-yl; 4-(4-hydroxy-3-methylphenyl)hex-3-yl; 3-ethyl-4-(4-hydroxyphenyl)hex-2-yl; 4-ethyl-5-(4-hydroxyphenyl)hex-3-yl; 4-(4-hydroxyphenyl)hex-3-en-3-yl; 3-(4-hydroxyphenyl)-2-methylpent-1-enyl; 1-(4-hydroxyphenyl)-2-methylpent-1-en-3-yl; 4-(4-methoxyphenyl)hex-3-en-3-yl; 4-{4-[(phenylmethyl)oxy]phenyl}hex-3-en-3-yl; 4-(4-hydroxyphenyl)hexa-2,4-dien-3-yl; 3-oxo-7-(4-hydroxyphenyl)hepta-1,4,6-trieneyl; 3-oxo-7-(4-hydroxyphenyl)hepta-1,3,6-trieneyl; 7-(4-hydroxyphenyl)-3,5-dioxohepta-1,6-dieneyl; 7-(4-hydroxy-3-methoxyphenyl)-3,5-dioxohepta-1,6-dieneyl; [6-oxo-2,4-dihydroxy-3,3-dimethyl-5-(1-oxo-2-methylpropyl)cyclohexa-1,4-dienyl]methyl; [2,6-dihydroxy-4-methoxy-5-methyl-3-(1-oxo-2-methylpropyl)phenyl]methyl; [6-hydroxy-2,4-dimethoxy-5-methyl-3-(1-oxo-2-methylpropyl)phenyl]methyl; 1-oxo-3-[4-hydroxy-2-methoxy-3-isoprenylphenyl]prop-2-enyl; 1-oxo-3-[4-hydroxy-2-methoxy-3-(2-methylbut-1-en-3-yl)phenyl]prop-2-enyl; 1-oxo-3-[4-hydroxy-2-methoxy-5-(2-methylbut-1-en-3-yl)phenyl]prop-2-enyl; 1-oxo-3-[4-hydroxy-2-methoxy-5-(3-methylbut-1-en-3-yl)phenyl]prop-2-enyl; 1-oxo-3-[4-hydroxy-3,5-bis(isoprenyl)phenyl]prop-2-enyl; phenylcarbonyl; (4-methylphenyl)carbonyl; (2-hydroxyphenyl)carbonyl; (2,4-dihydroxyphenyl)carbonyl; (2-hydroxy-4-methoxyphenyl)carbonyl; [(3,3,5-trimethylcyclohexyl)oxy]carbonyl; [(3-hydroxy-4-methoxycarbonyl-2,5-dimethylphenyl)oxy]carbonyl; [(3-formyl-2,4-dihydroxy-6-methylphenyl)carbonyl]oxy; (4-hydroxyphenyl)-[2-(hydroxymethyl)phenyl]methyl; 1,7,7-trimethyl-2-bicyclo[2.2.1]heptyl; {4-oxo-5-[(3-hydroxyphenyl)methyl]-3-oxacyclopentyl}methyl; {2-oxo-5-[(3-hydroxyphenyl)methyl]-3-oxacyclopentyl}methyl; {2-oxo-3-[(3-methyoxy-4-hydroxyphenyl)methylidene]cyclohexylidene)methyl; 2-(4-methoxy-2-oxo-2H-pyran-6-yl)ethenyl; 4-[(4-hydroxy-3-methoxyphenyl)methyl]-3-(hydroxymethyl)tetrahydrofuran-2-yl; [2-(4-hydroxy-3-methoxyphenyl)-3-(hydroxymethyl)tetrahydrofuran-4-yl]methyl; {2-oxo-4-[(3,4-dimethoxyphenyl)methyl]tetrahydrofuran-3-yl}methyl; {2-oxo-4-[(3-methoxy-4-

hydroxyphenyl)methyl]tetrahydrofuran-3-yl}methyl; {2-oxo-3-[(3-methoxy-4-hydroxyphenyl)methyl]tetrahydrofuran-4-yl}methyl; {2-oxo-4-[(3-methoxy-4-hydroxyphenyl)hydroxymethyl]tetrahydrofuran-3-yl}methyl; {2-oxo-3-[(3-methoxy-4-hydroxyphenyl)methyl]tetrahydrofuran-4-yl}hydroxymethyl; 7-[5,5-dimethyl-4-oxo-tetrahydrofuran-2-yl]-3-methylocta-2,6-dienyl; (1,2,4a-trimethyl-5-methylidene-3,4,6,7,8,8a-hexahydro-2H-naphthalen-1-yl)methyl; 3-hydroxy-7-hydroxymethyl-1,2,3,4,4a,5,6,7,8,8a-decahydronaphthalen-1-yl; 6-(4-hydroxy-3-methoxyphenyl)-1,3,3a,4,6,6a-hexahydrofuro[3,4-c]furan-3-yl; 6-(4-hydroxy-3,5-dimethoxyphenyl)-1,3,3a,4,6,6a-hexahydrofuro[3,4-c]furan-3-yl; 7-oxo-4-hydroxy-5-methyl-5,6-dihydro-4H-2-benzofuran-1-yl; 3-hydroxymethyl-7-methoxy-5-(3-oxoprop-1-enyl)-2,3-dihydro-1-benzofuran-2-yl; (2-ethyl-1-benzofuran-3-yl)carbonyl; (3-oxo-4-hydroxy-2-benzofuran-1-ylidene)methyl; (3-oxo-6-hydroxy-1-benzofuran-2-ylidene)methyl; (3-oxo-4,6-dihydroxy-1-benzofuran-2-ylidene)methyl; (3-oxo-6-hydroxy-4-methoxy-1-benzofuran-2-ylidene)methyl; 4-(1,3-benzodioxol-5-yl)-2,3-dimethylbutyl; 8-oxo-4-hydroxy-5a,6,8a,9-tetrahydro-5H-[2]benzofuro[5,6-f][1,3]benzodioxol-9-yl; 7-hydroxy-2H-chromen-3-yl; 4-oxo-7-methoxy-4H-chromen-2-yl; 1-oxo-8-hydroxy-3,4-dihydro-1H-isochromen-3-yl; (3,4,7-trihydroxy-3,4-dihydro-2H-chromen-3-yl)methyl; (4-oxo-5-hydroxy-6,7-dimethoxy-2,3-dihydro-4H-chromen-3-yl)methyl; [2-oxo-5-hydroxy-7-(2-methylnonan-2-yl)-2H-chromen-3-yl]methyl; 5,7-dihydroxy-8-(1-oxo-3-phenylprop-2-enyl)-2,2-dimethyl-2H-chromen-6-yl]methyl; 5,7-dimethoxy-8-(1-oxo-3-phenylprop-2-enyl)-2,2-dimethyl-2H-chromen-6-yl]methyl; 5,7-dihydroxy-8-(1-oxo-3-phenylprop-2-enyl)-2,2-dimethyl-3,4-dihydro-2H-chromen-6-yl; 4-oxo-5,7-dihydroxy-8-[2-hydroxy-5-(4-oxo-5,7-dihydroxy-4H-chromen-2-yl)phenyl]-4H-chromen-2-yl; 4-oxo-8-[6-(2,4-dihydroxybenzoyl)-5-(2,4-dihydroxyphenyl)-3-methylcyclohex-2-enyl]-5,7-dihydroxy-3-isoprenyl-4H-chromen-2-yl; 8-oxo-2-hydroxymethyl-5-methoxy-2,3-dihydropyrano[2,3-h][1,4]benzodioxin-3-yl; 9-oxo-5-methoxy-2-{[(acetyl)oxy]methyl}-2,3-dihydropyrano[3,2-h][1,4]benzodioxin-3-yl; 2-hydroxymethyl-7-(4-oxo-3,5,7-trihydroxy-2,3-dihydro-4H-chromen-2-yl)-2,3-dihydro-1,4-benzodioxin-3-yl; 8-oxo-9-hydroxy-[1,3]diolxolo[4,5-g]-4H-chromen-7-yl; 8-oxo-9-methoxy-[1,3]diolxolo[4,5-g]-4H-chromen-7-yl; 8,8-dimethyl-3,4-dihydro-2H-pyrano[2,3-f]chromen-3-yl; 4-oxo-5-hydroxy-6-isoprenyl-8,8-dimethylpyrano[2,3-h]-4H-chromen-3-yl; 7-hydroxy-3-hydroxymethyl-4-(4-oxo-3,5,7-trihydroxy-2,3-dihydro-4H-chromen-2-yl)-2,3-dihydro-1-benzofuran-2-yl; 7-hydroxy-3-hydroxymethyl-5-(4-oxo-3,5,7-trihydroxy-2,3-dihydro-4H-chromen-2-yl)-2,3-dihydro-1-benzofuran-2-yl; 2-oxo-3-hydroxy-8-(3,5,7-trihydroxy-4-oxo-2,3-dihydro-4H-chromen-2-yl)-4-oxatricyclo[4.3.1.$0^{3,7}$]dec-8-en-10-yl; 6,9,17,19,21-pentahydroxy-5-(4-

hydroxyphenyl)-4,12,14-trioxapentacyclo[11.7.1. $0^{2,11}.0^{3,8}.0^{15,20}$]henicosa-2(11),3(8),9,15,17,19-hexaen-13-yl; 6,9,17,19,21-pentahydroxy-3-(4-hydroxyphenyl)-4,12,14-trioxapentacyclo[11.7.1.$0^{2,11}.0^{3,8}.0^{15,20}$]henicosa-2(11),3(8),9,15,17,19-hexaen-5-yl; N-(4-phenyl)carbamoyl; N-(4-hydroxyphenyl)carbamoyl; [(2-hydroxyphenyl)carbonyl]amino; 1-oxo-icosa-5,8,11,14-tetraenyl)amino; N-(4-chlorophenyl)carbamoyl; 1-oxo-2-(2,6-dioxopiperidin-4-yl)ethyl; 1-hydroxy-2-{[4-(4-hydroxyphenyl)butyl]amino}ethyl; 4-{[2-hydroxy-2-(3,4-dihydroxyphenyl)ethyl]amino}butyl; [(4-oxo-1,4-dihydroquinolin-3-yl)carbonyl]amino; 3,5-dioxo-4-butyl-2-phenylpyrazolidin-1-yl; (2-{[4-hydroxy-3,5-di(2-methylprop-2-yl)phenyl]sulfanyl}propan-2-yl)sulfanyl; (3-chloro-6-hydroxyphenyl)methyl; (2,4-dichlorophenyl)methyl; 3-(3-fluoro-4-hydroxyphenyl)pent-2-yl; and 2-(3-fluoro-4-hydroxyphenyl)pent-3-yl;

X is selected from O and N, wherein when X is O, then R7 is absent; and when X is N, then R7 is selected from hydro and methyl; and

the anion has a molecular weight that is greater than 108 grams per mole.

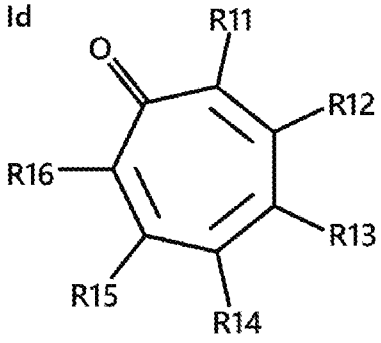
78. The composition of claim 77, wherein the anion has a general structure Ia; R1 is oxide; R2 is hydro, methyl, 2-methylprop-2-yl, geranyl, hydroxy, methoxy, ethoxy, hydroxymethyl, formyl, or amino; and each of R3, R5, and R6 is hydro.

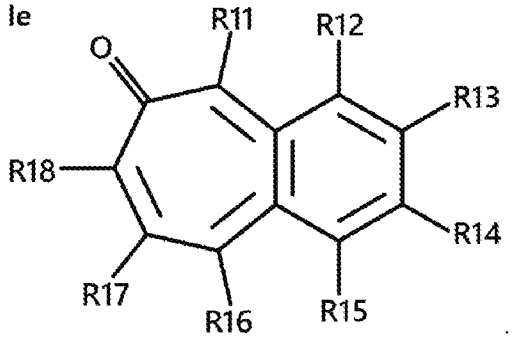
79. The composition of claim 77 or 78, wherein the anion has a general structure Ia; R1 is oxide; and at least 4 of R2, R3, R4, R5, and R6 are independently selected from hydro, hydroxy, and methoxy.

80. The composition of any one of claims 70-77, wherein the molecule is abnormal cannabidiol; acetosyringone; actiphenol; adipostatin A; aleuritin; alpha-kosin; alpha-peltatin; AM404; amentoflavone; amylmetacresol; apocynin; arbutamine; arctigenin; ascofuranone; aspidinol; atranorin; aureusidin; bakuchiol; balanophonin; benzarone; benzbromarone; benzestrol; benziodarone; benzophenone-2; benzophenone-6; benzoresorcinol; beta-kosin; beta-resorcylaldehyde; bifluranol; bilobol; bisdemethoxycurcumin; bisphenol A; bisphenol B; bisphenol F; bromosalicylchloranilide; bromosaligenin; butylated hydroxyanisole; butylated hydroxytoluene; butylparaben; cannabicyclohexanol; cannabidiol; cannabidiphorol; cannabidivarin; cannabigerol; cannabigerovarin; canolol; capsaicin; carvacrol; chavibetol; chavicol; clofoctol; clorophene; combretastatin; combretastatin A-1; combretastatin A-4; combretastatin B-1; coniferyl alcohol; cotoin; CP 55,244; CP 55,940; (C6)-CP 47,497; (C7)-CP 47,497; (C9)-CP 47,497; curcumin; cyclovalone; DB-2073; deferiprone; dehydroequol; demethoxycurcumin; dianol; dichlorophen;

dienestrol; diethylstilbestrol; diethylstilbestrol monobenzyl ether; dihydrocapsaicin; dihydrokanakugiol; dihydroresveratrol; dimethylheptyl cannabidiol; dimethylstilbestrol; dioxybenzone; dobutamine; DOPAL; DOPEG; drupanol; durantin A; embelin; enterodiol; enterolactone; ethyl maltol; ethyl vanillin; ethylparaben; eugenol; fenoterol; fenretinide; flopropione; fumigatin; gentisyl alcohol; geranin A; geranylhydroquinone; [6]-gingerol; glabridin; guaiacol; heminordihydroguaiaretic acid; heptylparaben; hexestrol; homocapsaicin I; homocapsaicin II; homodihydrocapsaicin; homosalate; homovanillyl alcohol; honokiol; HU-331; hydroxymatairesinol; hydroxytyrosol; ilimaquinone; irilone; irisolone; isoeugenol; isoliquiritigenin; isosilybin A; isosilybin B; isosilychristin; ivacaftor; kanakugiol; kuwanon G; lariciresinol; leptosidin; leptosphaerin A; leptosphaerin B; licochalcone A; licochalcone B; licochalcone C; licochalcone D; licochalcone E; licochalcone F; macelignan; magnolol; maltol; matairesinol; mequinol; mestilbol; meta-cresol; methestrol; methylparaben; mexenone; monobenzone; nonivamide; nordihydrocapsaicin; nordihydroguaiaretic acid; O-1602; O-1871; obovatol; octabenzone; oleocanthal; olivetol; ortho-benzylphenol; orthocaine; ortho-cresol; ortho-phenylphenol; osajin; osalmid; oxybenzone; oxyphenbutazone; para-anol; para-benzylphenol; para-cresol; para-tert-pentyl-phenol; para-vinylguaiacol; paroxypropione; parvaquone; perezone; phenolphthalol; phenylacetylrinvanil; phloretin; piceatannol; pinoresinol; pinosylvin; pinosylvin monomethyl ether; pomiferin; probucol; propofol; propyl gallate; propylparaben; protocatechualdehyde; PSB-SB-487; pseudoisoeugenol; pterostilbene; raspberry ketone; resacetophenone; resveratrol; rottlerin; rottlerin 5,7-dimethyl ether; salicyl alcohol; salicylaldehyde; salicylanilide; sappanol; scillavone B; secoisolariciresinol; selligueain A; shogaol; silybin A; silybin B; silychristin; silydianin; sinapyl alcohol; sophoradin; sparassol; stilbestrol; strobilurin F; sulfuretin; syringaldehyde; syringaresinol; syringol; tetrahydrorottlerin; thunberginol F; thunberginol G; thymol; tithonine; tolcapone; tyrosol; ubiquinol; uliginosin A; vanillin; vanillyl alcohol; xanthohumol; xanthoxylin; xibornol; zingerone; 1,7-bis(4-hydroxyphenyl)-1,4,6-heptatrien-3-one; 11-hydroxyyangonin; 11-methoxy-12-hydroxydehydrokavain; 2,5-di-tert-pentyl-hydroquinone; 3-methoxy-4-hydroxyphenylglycol; 4,6-di-tert-butyl-meta-cresol; 4'-fluorocannabidiol; 4-hexylresorcinol; 4-hydroxyphenylacetaldehyde; 4-O-methylhonokiol; or 5-chloro-2-hydroxybenzophenone.

81. The composition of any one of claims 70-76, wherein the anion has a general structure Id or Ie

Id 

Ie 

;

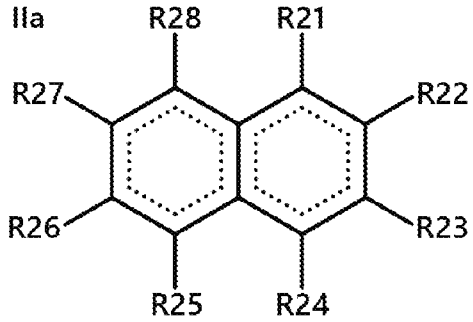
general structures Id and Ie each comprise one oxide group, wherein one of R11, R12, R13, R14, R15, R16, R17, and R18 is oxide;

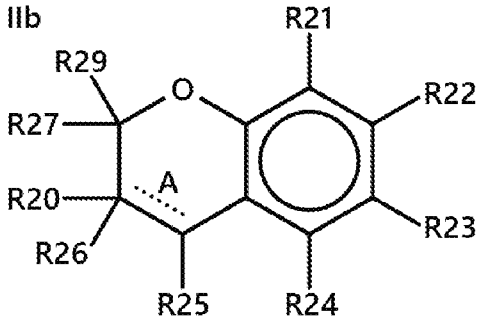
one or two of R11, R12, R13, R14, R15, R16, R17, and R18 are independently selected hydro, methyl, ethyl, propyl, prop-2-yl, prop-1-enyl, prop-2-enyl, isoprenyl, and geranyl; and

every other one of R11, R12, R13, R14, R15, R16, R17, and R18 is independently selected from hydro, hydroxy, and methoxy.

82. The composition of any one of claims 70-76 and 81, wherein the molecule is anthranol; procerin; purpurogallin; alpha-thujaplicin; beta-thujaplicin; or gamma-thujaplicin.

83. The composition of any one of claims 70-76, wherein the anion has a general structure IIa or IIb

IIa 

IIb 

;

exactly one of R21, R22, R23, R24, R25, and R26 is oxide;

exactly one of R21, R22, R23, R24, R25, R26, R27, and R28 is selected from hydro; methyl; ethyl; propyl; butyl; pentyl; hexyl; heptyl; isoprenyl; geranyl; 2-methylnonan-2-yl; 3,7,11,15-tetramethylhexadec-2-enyl; 1-hydroxy-4-methylpent-3-enyl; cyclohexyl; [4-(2-methylprop-2-yl)cyclohexyl]methyl; {5-oxo-1,3-dihydroxy-6,6-dimethyl-4-[(prop-2-yl)carbonyl]cyclohexa-1,3-dien-2-yl}methyl; 4-(4-chlorophenyl)cyclohexyl; phenyl; benzyl; 2-phenylethyl; 8-formyl-1,6,7-trihydroxy-5-(prop-2-yl)-3-methylnaphthalen-2-yl; 7-hydroxy-2H-chromene-3-yl; and 2,2-dimethyl-5-hydroxy-2H-chromen-8-yl, and every other one of R21, R22, R23, R24, R25, R26, R27, and R28 is independently selected from hydro; hydroxy; methyl; ethyl; propyl; prop-2-yl; methoxy; formyl; acetyl; 2-oxopropyl; (prop-2-yl)carbonyl; and oxo;

R21, R22, R23, R24, R25, R26, R27, and R28 comprise exactly 0, 1, or 2 oxo groups;

general structure IIa comprises exactly 10 implicit carbon atoms that are each depicted by a junction of three lines in general structure IIa;

each dotted line in general structure IIa depicts an optional double bond that is selected such that each of the 10 implicit carbon atoms is bonded to exactly one other atom of general structure IIa with a double bond;

general structure IIb comprises a dotted line that is labeled with the letter "A" and that depicts (i) a required double bond when R26 is oxide; (ii) a required single bond when either R25 or R26 is oxo; and (iii) an optional double bond when R26 is neither oxo nor oxide;

when R26 is oxo or the dotted line that is labeled with the letter "A" depicts a double bond, then R20 is absent;

when R26 is not oxo and the dotted line that is labeled with the letter "A" depicts a single bond, then R20 is selected from hydro; 4-hydroxyphenyl; (2-hydroxyphenyl)methyl; and (3,4-dihydroxyphenyl)methyl;

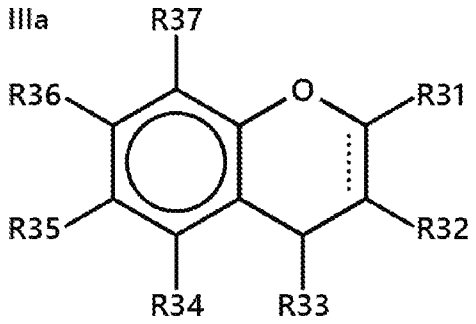
when R27 is oxo, then R29 is absent; and

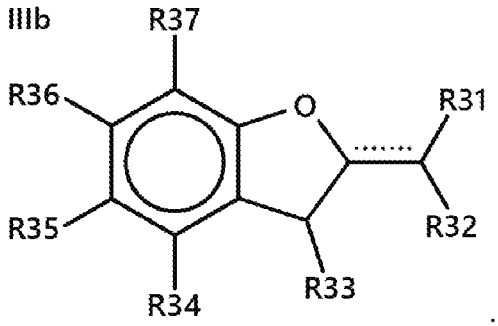
when R27 is not oxo, then R29 is selected from hydro; methyl; 4-methylpent-3-enyl; 4,8,12-trimethyltridecyl; and 4,8,12-trimethyltrideca-3,7,11-trieneyl.

84. The composition of any one of claims 70-76 and 83, wherein the molecule is alkannin; atovaquone; buparvaquone; cannabichromene; dehydroequol; glabrene; gossypol; javanicin; juglone; lapachol; lawsone; menadiol; naphthazarin; naphthoresorcinol; 2-naphthol; phthiocol; phylloquinol; plumbagin; PSB-SB-487; sappanol; spinochrome B; or uliginosin B.

85. The composition of any one of claims 70-76 and 83, wherein the molecule is alpha-tocopherol; beta-tocopherol; gamma-tocopherol; delta-tocopherol; zeta2-tocopherol; eta-tocopherol; alpha-tocotrienol; beta-tocotrienol; gamma-tocotrienol; or delta-tocotrienol.

86. The composition of any one of claims 70-76, wherein the anion has a general structure IIIa or IIIb

IIIa 

IIIb 

;

one of R31 and R32 is selected from phenyl; 2-hydroxyphenyl; 3-hydroxyphenyl; 4-hydroxyphenyl; 2,4-dihydroxyphenyl; 2,6-dihydroxyphenyl; 3,4-dihydroxyphenyl; 3,5-dihydroxyphenyl; 3,4,5-trihydroxyphenyl; 3-hydroxy-4-methoxyphenyl; 4-hydroxy-3-methoxyphenyl; 3,4-dihydroxy-5-methyoxyphenyl; 3,5-dihydroxy-4-methyoxyphenyl; 3-hydroxy-4,5-dimethoxyphenyl; 4-hydroxy-3,5-dimethoxyphenyl; 2-methoxyphenyl; 3-methoxyphenyl; 4-methoxyphenyl; 2,4-dimethoxyphenyl; 2,6-dimethoxyphenyl; 3,4-dimethoxyphenyl; 3,5-dimethoxyphenyl; 3,4,5-trimethoxyphenyl; (3,4-dihydroxyphenyl)methyl; 1,3-benzodioxol-5-yl; 4,6-dimethoxy-3,5,11-trimethyltrideca-7,9,11-trienyl; 5-hydroxy-3,4-dimethoxybicyclo[4.2.0]octa-1,3,5-triene-1,7-diyl; and 2-oxo-3-hydroxy-10-(4-hydroxy-3-methoxyphenyl)-4-oxatricyclo[4.3.1.$0^{3,7}$]dec-8-en-8-yl, and the other one of R31 and R32 is selected from hydro; methyl; isoprenyl; geranyl; hydroxy; methoxy; and [(3,4,5-trihydroxyphenyl)carbonyl]oxy;

R33 is selected from hydro; hydroxy; and oxo;

one of R34, R35, R36, and R37 is an oxide group, and the other three of R34, R35, R36, and R37 are each independently selected from hydro; methyl; isoprenyl; geranyl; 5-methyl-2-(prop-1-en-2-yl)hex-4-enyl; 3,7-dimethylocta-2,6-dien-1-yl; hydroxy; and methoxy; and

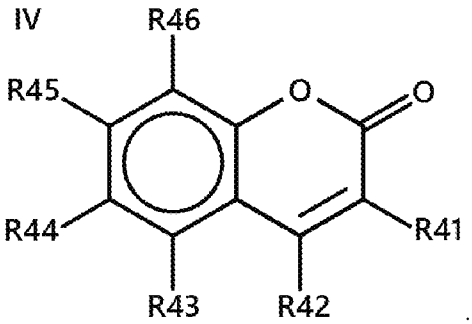
each dotted line depicts an optional double bond.

87. The composition of any one of claims 70-76 and 86, wherein the molecule is acacetin; acerosin; afzelechin; alnetin; ampelopsin; apiforol; apigenin; aromadendrin; artocarpetin; aureusidin; axillarin; azaleatin; baicalein; baptigenin; biochanin A; blumeatin; butin; calycosin; cannflavin A; cannflavin B; cannflavin C; catechin; chrysin; chrysoeriol; cirsilineol; cirsiliol; cirsimaritin; corymbosin; coumafuryl; daidzein; datiscetin; derrubone; dihydrokaempferide; dihydrokaempferol; dihydromorin; 4',7-dihydroxyflavone; 7,8-dihydroxyflavone; diosmetin; echioidinin; epiafzelechin; epicatechin; epicatechin gallate; epigallocatechin; epigallocatechin gallate; equol; eriodictyol; ermanin; eupatilin; eupatorin; FBL-03G; fisetin; fisetinidol; formononetin; fustin; galangin; gallocatechin; garbanzol; gardenin A; gardenin B; gardenin C; gardenin D; gardenin E; genistein; 5-O-methylgenistein; genkwanin; geraldone; glycitein; gossypetin; guibourtinidol; hesperetin; hispidulin; homoeriodictyol; 6-hydroxyflavone; hymenoxin; hypolaetin; irigenin; isorhamnetin; isosakuranetin; isoscutellarein; isosilychristin; isoxanthohumol; jaceosidin; kaempferol; 4'-O-methylkaempferol; laricitrin; leucocyanidin; leucofisetinidin; leucopelargonidin; leucopeonidin; liquiritigenin; luteoforol; luteolin; 6-hydroxyluteolin; luteone; mearnsetin; meciadanol; melacacidin; mesquitol; methylchrysin; mikanin; morin; myricetin; naringenin; negletein; nepetin; nevadensin; nodifloretin; norartocarpetin; norwogonin; O-806; onopordin; oritin; orobol; oroxylin

A; ourateacatechin; pachypodol; pectolinarigenin; pedalitin; pilloin; pinobanksin; pinocembrin; pinostrobin; poriol; pratensein; pratol; primetin; primuletin; prunetin; pseudobaptigenin; psi-tectorigenin; quercetagetin; quercetin; retusin; rhamnazin; rhamnetin; robinetinidol; sakuranetin; scaposin; scillavone A; scillavone B; scutellarein; serpyllin; silychristin; silydianin; sophoraflavanone G; sorbifolin; spinacetin; sterubin; stigmatellin; sudachitin; sulfuretin; syringetin; taxifolin; techtochrysin; tectorigenin; tithonine; tricetin; tricin; velutin; wighteone; wightin; wogonin; xanthomicrol; or zapotinin.

88. The composition of any one of claims 70-76, wherein the anion has a general structure IV

IV



;

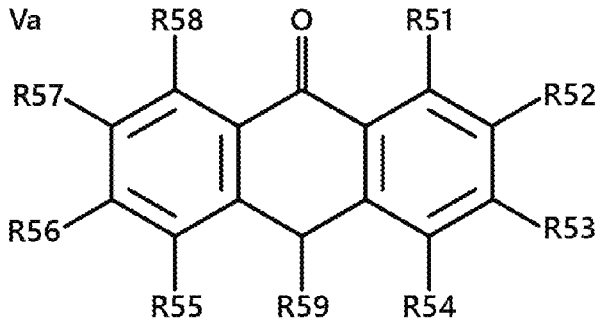
exactly one of R41, R42, R43, R44, R45, and R46 is an oxide group;

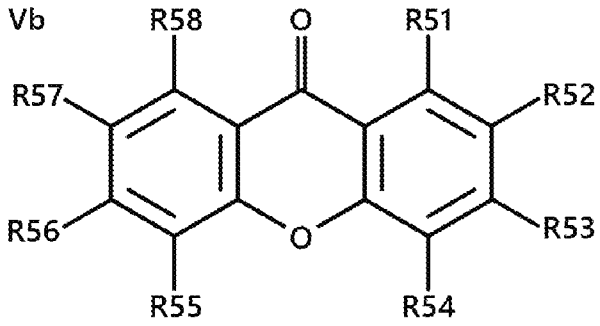
exactly one of R41, R42, R43, R44, R45, and R46 is selected from hydro; isoprenyl; geranyl; 1-phenylpropyl; (3,7-dimethyloct-2-enyl)oxy; 3-oxo-1-(furan-2-yl)butyl; (2-oxo-4-hydroxy-2H-chromen-3-yl)methyl; 1-(2-oxo-4-hydroxy-2H-chromen-3-yl)ethyl; 2-oxo-2-ethoxy-1-(2-oxo-4-hydroxy-2H-chromen-3-yl)ethyl; 3-hydroxy-3-[4-(4-bromophenyl)phenyl]-1-phenylpropyl; 3-hydroxy-3-(4-chlorophenyl)-1-(5-chlorothiophene-2-yl)propyl; 1,2,3,4-tetrahydronaphthalen-1-yl; 3-(4-phenyl)phenyl-1,2,3,4-tetrahydronaphthalen-1-yl; 3-[4-(4-bromophenyl)phenyl]-1,2,3,4-tetrahydronaphthalen-1-yl; and 3-[4-({[4-(trifluoromethyl)phenyl]methyl}oxy)phenyl]-1,2,3,4-tetrahydronaphthalen-1-yl; and

every other one of R41, R42, R43, R44, R45, and R46 is independently selected from hydro; hydroxy; methyl; and methoxy.

89. The composition of any one of claims 70-76 and 88, wherein the molecule is brodifacoum; bromadiolone; coumatetralyl; daphnetin; dicoumarol; difenacoum; esculetin; ethyl biscoumacetate; ethylidene dicoumarol; ferujol; flocoumafen; fraxetin; 4-hydroxycoumarin; hymecromone; ostruthin; phenprocoumon; scopoletin; tioclomarol; or umbelliferone.

90. The composition of any one of claims 70-76, wherein the anion has a general structure Va or Vb





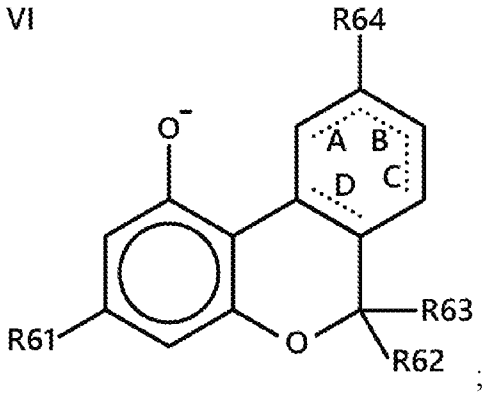
;

exactly one of R51, R52, R53, R54, R55, R56, R57, and R58 is an oxide group; exactly one or two of R51, R52, R53, R54, R55, R56, R57, and R58 are independently selected from hydro, isoprenyl, and geranyl; and every other one of R51, R52, R53, R54, R55, R56, R57, and R58 is independently selected from hydro, hydroxy, methyl, hydroxymethyl, methoxy, and formyl; and

R59 is selected from hydro and oxo.

91. The composition of any one of claims 70-76 and 90, wherein the molecule is alizarin; alizarin 1-methyl ether; alizarin 2-methyl ether; aloe emodin; anthragallol; anthralin; anthrapurpurin; 1,6-dihydroxyanthraquinone; anthrarobin; anthrarufin; beta-mangostin; chrysarobin; 9-hydroxychrysarobin; 3-hydroxychrysazin; damnacanthal; danthron; emodin; euxanthone; flavopurpurin; gamma-mangostin; 3,6-dimethylmangostin; 6-deoxy-gamma mangostin; gentisin; mangostin; oxyanthrarufin; oxychrysazin; parietin; purpurin; purpurin 1-methyl ether; purpurin 2,4-dimethyl ether; purpurin 2-methyl ether; purpuroxanthin; quinalizarin; quinizarin; or rubiadin.

92. The composition of any one of claims claim 70-76, wherein the anion has a general structure VI



;

R61 is selected from hydro; methyl; ethyl; propyl; butyl; pentyl; hexyl; heptyl; octyl; nonyl; decyl; prop-2-yl; but-2-yl; pent-2-yl; hex-2-yl; hept-2-yl; octan-2-yl; nonan-2-yl; decan-2-yl; 2-methylpropyl; 2-methylbutyl; 2-methylpentyl; 2-methylhexyl; 2-methylheptyl; 2-methyloctyl; 2-methylnonyl; 2-methyldecyl; 2-methylprop-2-yl; 2-methylbut-2-yl; 2-methylpent-2-yl; 2-methylhex-2-yl; 2-methylhept-2-yl; 2-methyloctan-2-yl; 2-methylnonan-2-yl; 2-methyldecan-2-yl; 3-methylbut-2-yl; 3-methylpent-2-yl; 3-methylhex-2-yl; 3-methylhept-2-yl; 3-methyloctan-2-yl; 3-

methylnonan-2-yl; 3-methyldecan-2-yl; 2,3-dimethylbut-2-yl; 2,3-dimethylpent-2-yl; 2,3-dimethylhex-2-yl; 2,3-dimethylhept-2-yl; 2,3-dimethyloctan-2-yl; 2,3-dimethylnonan-2-yl; 2,3-dimethyldecan-2-yl; cyclopropyl; 1-methylcyclopropyl; 1-ethylcyclopropyl; 1-propylcyclopropyl; 1-butylcyclopropyl; 1-pentylcyclopropyl; 1-hexylcyclopropyl; 1-heptylcyclopropyl; 1-octylcyclopropyl; 1-nonylcyclopropyl; cyclobutyl; 1-methylcyclobutyl; 1-ethylcyclobutyl; 1-propylcyclobutyl; 1-butylcyclobutyl; 1-pentylcyclobutyl; 1-hexylcyclobutyl; 1-heptylcyclobutyl; 1-octylcyclobutyl; cyclopentyl; 1-methylcyclopentyl; 1-ethylcyclopentyl; 1-propylcyclopentyl; 1-butylcyclopentyl; 1-pentylcyclopentyl; 1-hexylcyclopentyl; 1-heptylcyclopentyl; cyclohexyl; 1-methylcyclohexyl; 1-ethylcyclohexyl; 1-propylcyclohexyl; 1-butylcyclohexyl; 1-pentylcyclohexyl; 1-hexylcyclohexyl; ethenyl; prop-1-enyl; but-1-enyl; pent-1-enyl; hex-1-enyl; hept-1-enyl; octan-1-enyl; nonan-1-enyl; decan-1-enyl; ethynyl; prop-1-ynyl; but-1-ynyl; pent-1-ynyl; hex-1-ynyl; hept-1-ynyl; octan-1-ynyl; nonan-1-ynyl; decan-1-ynyl; 2-phenylethyl; 2-phenylprop-2-yl; adamant-1-yl; adamant-2-yl; 6-bromohex-2-enyl; 6-bromohex-2-ynyl; 2-methyl-6-bromohex-2-yl; 6-cyanohex-2-enyl; and 6-cyanohex-2-ynyl;

R62 is selected from hydro and methyl;

R63 is selected from hydro; methyl; 3-hydroxypropyl; 3-hydroxyprop-1-enyl; and 3-hydroxyprop-1-ynyl;

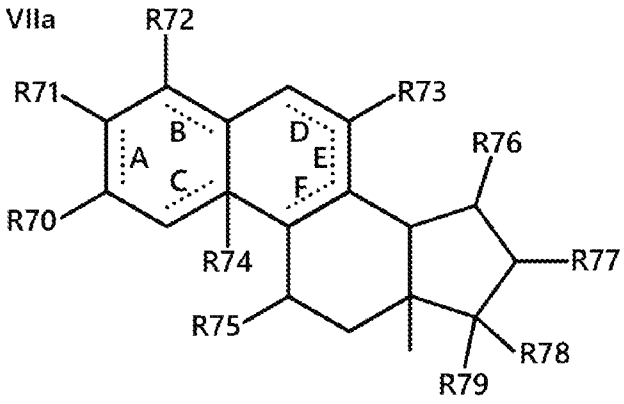
R64 is selected from hydro; methyl; hydroxy; hydroxymethyl; and oxo; and

the dotted lines that are labeled with A, B, C, and D depict four optional double bonds that are selected such that A, B, C, and D depict either (i) zero double bonds; (ii) one double bond that occurs at the dotted line that is labeled with either A, B, or D; or (iii) three double bonds that occur at the dotted lines that are labeled with A, C, and D.

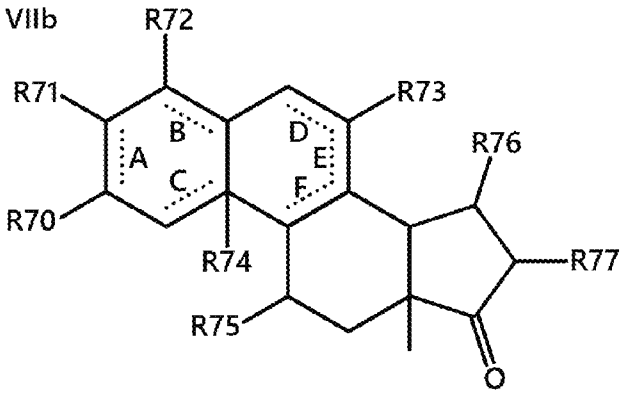
93. The composition of any one of claims 70-76 and 92, wherein the molecule is AM-087; AM-2389; AM-4030; AM-411; AM-905; AM-906; AM-919; AM-938; AMG-1; AMG-36; AMG-41; canbisol; cannabinol; 11-nor-9beta-hydroxyhexahydrocannabinol; delta8-tetrahydrocannabinol; dexanabinol; dimethylheptylpyran; HU-210; HU-243; KM-233; nabilone; perrottetinene; synhexyl; tetrahydrocannabinol; 11-hydroxytetrahydrocannabinol; tetrahydrocannabinol-C4; tetrahydrocannabiorcol; tetrahydrocannabiphorol; or tetrahydrocannabivarin.

94. The composition of any one of claims 70-76, wherein the anion has a general structure VIIa or VIIb

VIIa



VIIb



;

R70 is selected from hydro, formyl, and cyano;

R71 is selected from oxo and oxide;

when R70 is formyl or cyano, then R71 is oxide, R72 is hydro, and the dotted lines that are labelled with A, B, C, D, E, and F depict one double bond that occurs at A;

when R70 is hydro and R71 is oxo, then R72 is oxide, and the dotted lines that are labelled with A, B, C, D, E, and F depict one double bond that occurs at B;

when R70 is hydro and R71 is oxide, then R72 is selected from is hydro and hydroxy, and the dotted lines that are labelled with A, B, C, D, E, and F depict either (i) three double bonds that occur at A, B, and C, (ii) four double bonds that occur at either A, B, C, and E or A, B, C, and F, or (iii) five double bonds that occur at A, B, C, D, and F;

R73 is selected from hydro and 9-[(4,4,5,5,5-pentafluoropentyl)sulfinyl]nonanyl;

R74 is selected from hydro and methyl;

R75 is selected from hydro, hydroxy, and methoxy;

R76 and R77 are each independently selected from hydro and hydroxy;

R78 is selected from hydro, methyl, ethyl, ethenyl, and ethynyl; and

R79 is selected from hydroxy, acetyloxy; (1-oxopropyl)oxy; (1-oxobutyl)oxy; (1-oxopentyl)oxy, (1-oxohexyl)oxy; (1-oxoheptyl)oxy, (1-oxooctanyl)oxy, (1-oxononanyl)oxy, (1-oxodecanyl)oxy, (1-oxoundecanyl)oxy, [1-oxo-3-(cyclopentyl)propyl]oxy, and [(2-methylprop-2-yl)amino]carbonyl.

95. The composition of claim 94, wherein R71 is oxide; R70 and R72 are hydro; and the dotted lines labeled with A, B, and C depict exactly 3 double bonds.

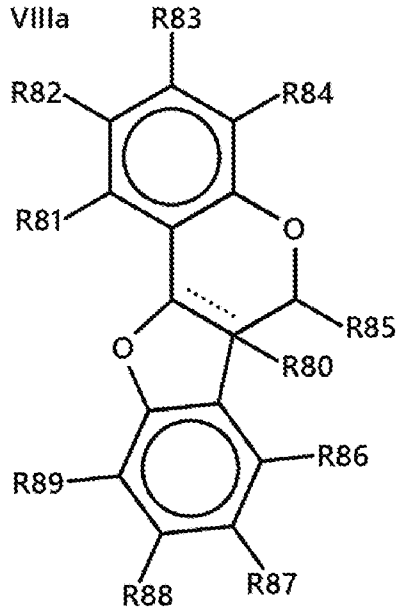
96. The composition of any one of claims 70-76 or 94, wherein the molecule is 17alpha-dihydroequilin; 17beta-dihydroequilin; 16-epiestriol; 17-epiestriol; 16,17-epiestriol; equilenin; equilin; estradiol; alpha-estradiol; estriol; estrone; ethinyl estradiol; formestane; fulvestrant; isoestradiol; 8-isoestrone; moxestrol; oxabolone; oxymesterone; or oxymetholone.

97. The composition of any one of claims 70-76 or 94, wherein the molecule is estradiol enanthate;

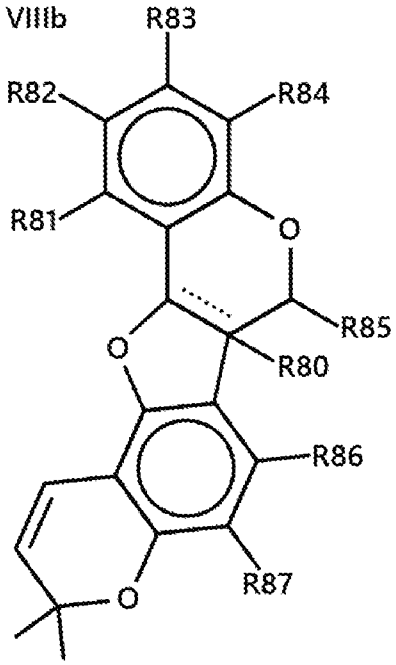
estradiol undecylate; estradiol valerate; estradiol 17beta-cyclopentanepropanoate; or oxabolone 17-cyclopentanepropionate.

98. The composition of any one of claims 70-76, wherein the anion has a general structure VIIIa, VIIIb, VIIIc, VIIId, VIIIe, or VIIIf

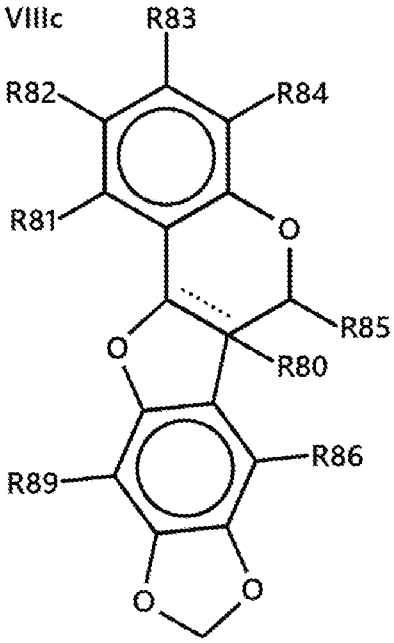
VIIIa



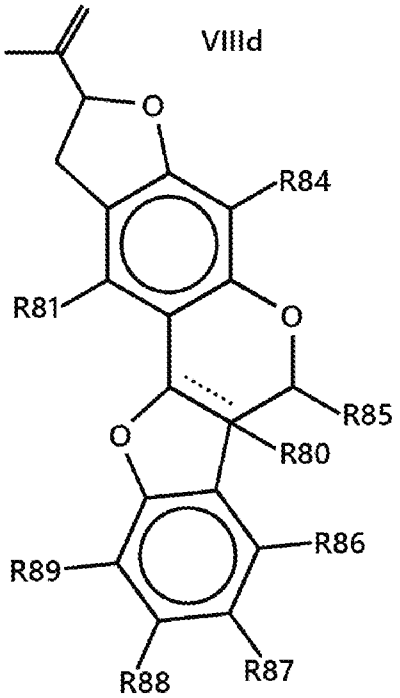
VIIIb



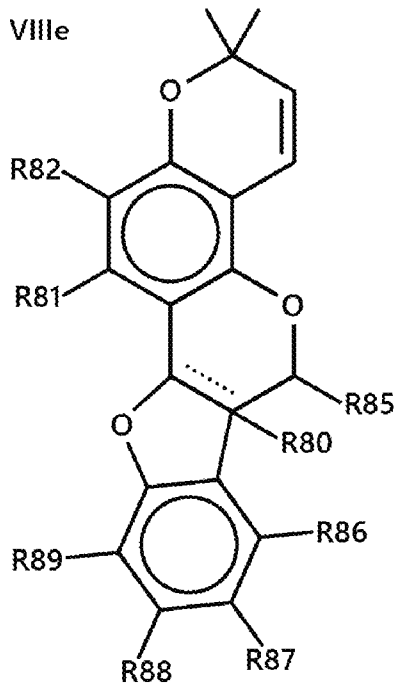
VIIIc



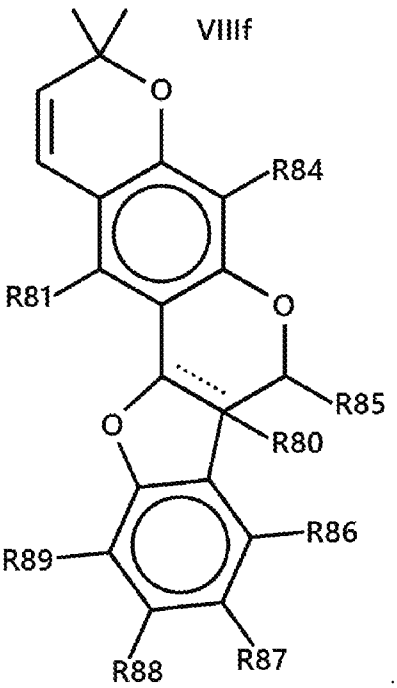
VIIId



VIIIe



VIIIf



;

each dotted line depicts an optional double bond, wherein when the double bond is selected, then R80 is absent; and when the double bond is not selected, then R80 is selected from hydro and hydroxy;

general structures VIIIa, VIIIb, VIIIc, VIIId, VIIIe, and VIIIf each comprise one oxide group, wherein one of R81, R82, R83, R84, R86, R87, R88, and R89 is oxide; one or two of R81, R82, R83, R84, R86, R87, R88, and R89 are independently selected from hydro, isoprenyl, geranyl, and 4-hydroxy-3-methylbutyl; and every other one of R81, R82, R83, R84, R86, R87, R88, and R89 is independently selected from hydro, hydroxy, and methoxy; and

when R80 is absent or hydro, then R85 is selected from hydro, hydroxy, and oxo; and when R80 is hydroxy, then R85 is hydro.

99. The composition of claim 98, wherein:

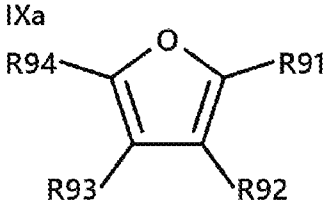
when the double bond is selected, then R85 is selected from hydro and oxo; and when the double bond is not selected, then R85 is hydro;

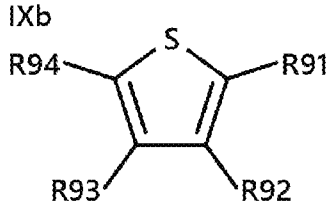
either R83 is oxide and R88 is hydroxy or methoxy; R88 is oxide and R83 is hydroxy or methoxy; or R83 and R88 are each independently selected from hydroxy and methoxy; and

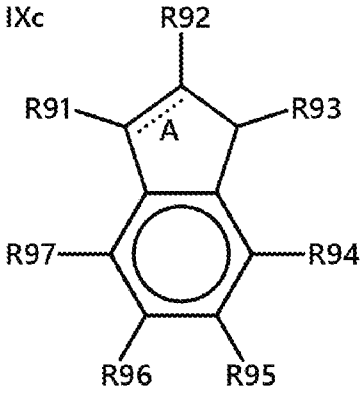
R86 is hydro.

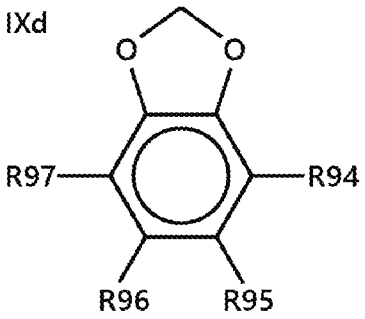
100. The composition of any one of claims 70-76, 98, and 99, wherein the molecule is cabenegrin A-I, cabenegrin A-II, coumestrol, glyceollin I, glyceollin II, glyceollin III, glyceollin IV, glycinol, glycyrrhizol A, medicagol, medicarpin, phaseolin, plicadin, psoralidin, or wedelolactone.

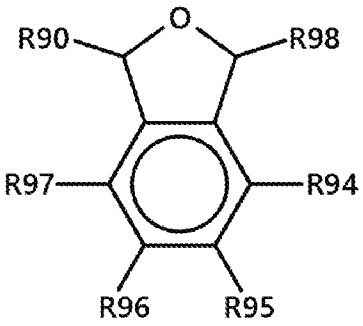
101. The composition of any one of claims 70-76, wherein the anion has a general structure IXa, IXb, IXc, IXd, IXe, IXf, or IXg

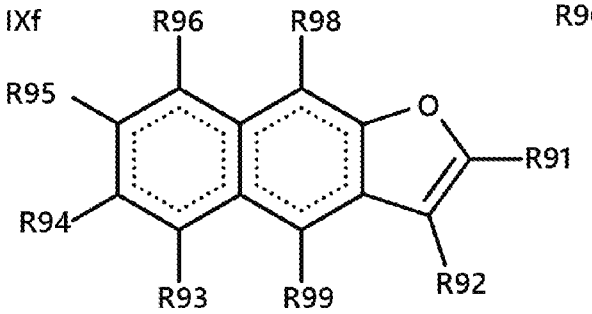
IXa 

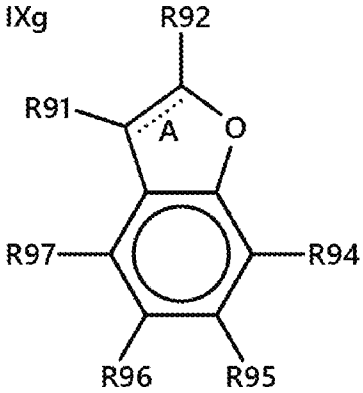
IXb 

IXc 

IXd 

IXe 

IXf 

IXg 

;

general structures IXa, IXb, IXc, IXd, IXe, IXf, and IXg each comprise an oxide group, wherein one of R91, R92, R93, R94, R95, R96, and R97 is oxide; two of R91, R92, R93, R94, R95, R96, and R97 are independently selected from hydro, ethyl, propyl, prop-2-yl, ethenyl, prop-1-enyl, prop-2-enyl, propen-2-yl, 2-methylprop-1-enyl, isoprenyl, formyl, acetyl, (ethoxy)carbonyl, (propoxy)carbonyl, 2-hydroxprop-2-yl, phenyl, 4-hydroxyphenyl, 3,4-dihydroxyphenyl, 3-hydroxy-4-methoxyphenyl, 4-hydroxy-3-methoxyphenyl, 4-oxo-3,5,7-trihydroxy-2,3-dihydro-4H-chromen-2-yl, 2-[1-oxo-7,8-dihydroxy-3-(methoxycarbonyl)-1H-isochromen-6-yl]ethyl, fluoro, chloro, bromo, and iodo; and every other one of R91, R92, R93, R94, R95, R96, and R97 is independently selected from hydro, hydroxy, hydroxymethyl, methoxy, and methyl;

R90 is selected from hydro, hydroxy, oxo, (phenyl)methylidene, (4-hydroxyphenyl)methylidene, and (3,4-hydroxyphenyl)methylidene;

R98 is selected from hydro, hydroxy, and oxo; when R98 is oxo, then R99 is oxo; and when R98 is hydro or hydroxy, then R99 is selected from hydro and hydroxy;

each dotted line labeled with "A" depicts an optional double bond;

general structure IXf comprises exactly 12 implicit carbon atoms that are each depicted by a

junction of three lines in general structure IXf; and

each dotted line in general structure IXf depicts an optional double bond that is selected such that each of the 12 implicit carbon atoms is bonded to exactly one other atom of general structure IXf with a double bond.

102. The composition of any one of claims 70-76 or 101, wherein the molecule is chlorindanol; collinomycin; euparin; isomaltol; isosilychristin; mutisianthol; protiofate; sesamol; silychristin; or thunberginol F.

103. The composition of any one of claims 1-102, wherein the composition comprises water and hydroxide.

104. The composition of any one of claims 1-103, wherein the composition comprises ethanol and ethoxide.

105. The composition of any one of claims 1-104, wherein the composition comprises 1,2-propanediol and one or both of 1-hydroxypropane-2-oxide and 2-hydroxypropane-1-oxide.

106. The composition of any one of claims 1-104, wherein the composition comprises 1,2,3-propanetriol and one of both of 1,3-dihydroxypropane-2-oxide and 2,3-dihydroxypropane-1-oxide.

107. The composition of any one of claims 1-106, wherein the composition comprises lithium cation ("Li+"); sodium cation ("Na+"); potassium cation ("K+"); magnesium cation ("Mg++"); calcium cation ("Ca++"); zinc cation ("Zn++"); manganese cation ("Mn++"); iron (II) cation ("Fe++"); iron (III) cation ("Fe+++"); copper (I) cation ("Cu+"); copper (II) cation ("Cu++"); ammonium ("NH_4+"); protonated ethanolamine; choline; protonated lysine; protonated arginine; or protonated sphingosine.

108. The composition of any one of claims 1-107, wherein the composition comprises sodium cation.

109. The composition of any one of claims 1-108, wherein the composition comprises potassium cation.

110. The composition of any one of claims 1-109, wherein the composition comprises a salt, and the salt comprises the anion.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2022/015960

A. CLASSIFICATION OF SUBJECT MATTER

(see extra sheet)

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)

A61K, A61P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Espacenet, Google, PatSearch, STN Online, Reaxys, USPTO

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 8962696 B2 (HARRIS STEVEN B.et al.), 24.02.2015, claims	1-5, 58-69
Y	WO 1994/018188 A1 (THE UPJOHN COMPANY), 18.08.1994, abstract, p.47 lines 8-29, claim 7	10-15
X	CA 2612380 C (WARNER CHILCOTT COMPANY, INC., 28.12.2006, abstract, claims	17-18
Y		19-20
Y	EP 3061450 A1 (SYMRISE AG), 31.08.2016, claims 1-8, 15-16, [0001], [0030]-[0058]	32-34, 36, 70-72
Y	АЛЕКСЕЕВ К.В., ТИХОНОВА Н.В., БЛЫНСКАЯ Е.В. и др. ТЕХНОЛОГИЯ ПОВЫШЕНИЯ БИОЛОГИЧЕСКОЙ И ФАРМАЦЕВТИЧЕСКОЙ ДОСТУПНОСТИ ЛЕКАРСТВЕННЫХ ВЕЩЕСТВ, ВЕСТНИК НОВЫХ МЕДИЦИНСКИХ ТЕХНОЛОГИЙ, 2012, том XIX, № 4, p. 43-47 (ALEKSEEV K.V. et al. Technology of raising the avaliability of biologic and pharmaceutical drugs. Journal of New Medical Technologies, 2012, Vol. XIX, No. 4, p. 43-47)	1-5, 10-15, 19-20, 32-34, 36, 58-72

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"D" document cited by the applicant in the international application

"E" earlier document 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
22 April 2022 (22.04.2022)	19 May 2022 (19.05.2022)

Name and mailing address of the ISA/RU:	Authorized officer
Federal Institute of Industrial Property, Berezhkovskaya nab., 30-1, Moscow, G-59, GSP-3, Russia, 125993 Facsimile No: (8-495) 531-63-18, (8-499) 243-33-37	O. Fokina Telephone No. (8-499) 240-25-91

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2022/015960

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	VERHOEF T. I., RAGIA G., DE Boer A., BARALLON R., KOLOVOU G., KOLOVOU V. MAITLAND-VAN DER ZEE A. H. A Randomized Trial of Genotype-Guided Dosing of Acenocoumarol and Phenprocoumon. New England Journal of Medicine (2013), 369(24), pp. 2304-2312. doi:10.1056/nejmoa1311388, abstract, p.2305 1st column, 1st paragraph	1-5, 10-15, 19-20, 32-34, 36, 58-72
P, X	WO 2021/158575 A1 (NATURAL EXTRACTION SYSTEMS, LLC), 12.08.2021	1-5, 10-12, 15, 17-20, 32-34, 36, 58-72

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 2022/015960

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☒ Claims Nos.: 6-9, 13-14, 16, 21-31, 35, 37-57, 73-110
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying additional fees, this Authority did not invite payment of additional fees.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
☐ No protest accompanied the payment of additional search fees.

A61K31/05 (2006.01)
A61K31/352 (2006.01)
A61K 31/565 (2006.01)
A61K 9/08 (2006.01)
A61K 38/22 (2006.01)
A61K 47/55 (2006.01)
A61K 31/566 (2006.01)
A61P 9/10 (2006.01)
A61P 25/20 (2006.01)
A61P 7/02 (2006.01)
A61P 1/00 (2006.01)
A61P 15/00 (2006.01)
A61P 15/18 (2006.01)