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(54) Title: METHOD FOR TREATING HYPERURICEMIA IN PATIENTS WITH GOUT USING HALOFENATE OR HALOFENIC ACID AND AN ANTI-INFLAMMATORY AGENT

(57) Abstract: Disclosed herein are pharmaceutical compositions, methods and kits for lowering the serum uric acid level of a subject and for the treatment of a condition associated with elevated serum uric acid levels comprising administering a composition comprising a urate-lowering agent and an anti-inflammatory agent. In some aspects the urate-lowering agent is (-)- halofenate, (-)- halofenic acid, or a pharmaceutically acceptable salts thereof. In some aspects the second agent is an anti-inflammatory agent, or a pharmaceutically acceptable salt thereof.

Patent Application

Method for Treating Hyperuricemia in Patients with Gout Using Halofenate or Halofenic Acid
and an Anti-Inflammatory Agent

RELATED APPLICATIONS

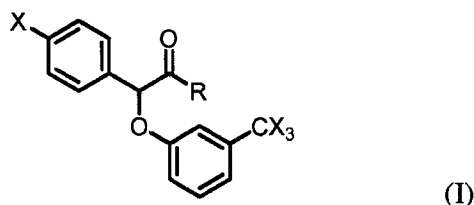
This application claims the benefit of U.S. Provisional Application No. 61/624,186, filed April 13, 2012, the content of which is incorporated herein by reference in its entirety.

BACKGROUND

[0001] Conditions associated with elevated serum uric acid levels (hyperuricemia) include disorders of urate crystal deposition such as gout arthropathy and tophi, urolithiasis (urinary tract stones), urate nephropathy, as well as the sequelae of these disorders. Hyperuricemia is associated with an increased risk of developing gout arthropathy, and the risk of gout increases with the degree and duration of the hyperuricemia. In addition to gout arthropathy, chronic hyperuricemia may lead to the deposition of uric acid crystals in the urinary tract, renal parenchyma, and soft tissues, resulting in urolithiasis, urate nephropathy with chronic kidney disease, and soft tissue tophi, respectively. A gout flare is a symptom of gout associated with a sudden onset of pain and inflammation, especially in peripheral joints such as the toes or fingers. Gout flares are often characterized by sudden onset and excruciating pain. Because of limitations and disadvantages of current uric acid lowering agents in treating gout and in treating or preventing gout flares, more effective methods, compositions and therapies are needed.

SUMMARY

[0002] In one embodiment, the present application discloses a pharmaceutical composition comprising a first therapeutic agent and a second therapeutic agent, wherein the first therapeutic agent is a urate-lowering agent, and the second therapeutic agent is an anti-inflammatory agent. In another embodiment, the first therapeutic agent is a compound of Formula (I)



wherein R is selected from the group consisting of arylC₁₋₆alkoxy-, (C₁₋₆alkyl)₂NC₁₋₆alkoxy-, C₁₋₆alkyl-NHC₁₋₆alkoxy-, C₁₋₆alkylC(O)NHC₁₋₆alkoxy-, arylC(O)NHC₁₋₆alkoxy-, C₁₋₆alkyl-

Patent Application

NHC(O)NHC₁₋₆alkoxy-, aryloxyC₁₋₆alkoxy- and C₁₋₆alkylNHC(O)NHphenoxy-; and each X is independently a halogen; or a pharmaceutically acceptable salt thereof.

[0003] In another embodiment, the application discloses a method of lowering the serum uric acid level of a subject with hyperuricemia, the method comprising concomitantly administering to the subject a first therapeutic agent and a second therapeutic agent, wherein the first therapeutic agent is selected from the group consisting of (-)-halofenate, (-)-halofenic acid, and pharmaceutically acceptable salts thereof; and the second therapeutic agent is colchicine. In another embodiment, there is provided a method for treating a gout flare experienced by a subject comprising concomitantly administering to the subject a first therapeutic agent and a second therapeutic agent, wherein the first therapeutic agent is selected from the group consisting of (-)-halofenate, (-)-halofenic acid, and pharmaceutically acceptable salts thereof; and the second therapeutic agent is colchicine. In another embodiment, there is provided a method for reducing the number, duration, frequency or intensity of one or more gout flares experienced by a subject comprising concomitantly administering to the subject a first therapeutic agent and a second therapeutic agent, wherein: the first therapeutic agent is selected from the group consisting of (-)-halofenate, (-)-halofenic acid, and pharmaceutically acceptable salts thereof; and the second therapeutic agent is colchicine.

[0005] In another embodiment, there is provided a method for the treatment of hyperuricemia in a subject with gout comprising concomitantly administering to the subject a first therapeutic agent and a second therapeutic agent, wherein: the first therapeutic agent is selected from the group consisting of (-)-halofenate, (-)-halofenic acid, and pharmaceutically acceptable salts thereof; and the second therapeutic agent is colchicine. Other aspects are provided below.

[0003] Current available uric acid lowering agents and other therapeutic agents in development have limitations in their ability to lower serum uric acid to a desirable level while preventing the occurrence of a gout flare or reducing the number, duration, frequency or intensity of such flares, and their use may be limited by various adverse side effects or toxicities. For example, certain agents including allopurinol and febuxostat, when used to treat hyperuricemia at commonly prescribed doses, often fail to reach the common therapeutic target of serum uric acid levels of 6 mg/dL or less. These agents may also increase the occurrence of gout flares, especially shortly after they are administered. Advantages of the compositions, methods, and kits disclosed herein

Patent Application

over currently available uric acid lowering agents at commonly prescribed doses and treatment methods using such agents may include improved therapeutic benefits; a synergistic effect on lowering uric acid (i.e., an additive or over-additive effect as compared to the effects of single-agent therapies); beneficial effects on other conditions associated with hyperuricemia and urate crystal deposition; the ability to both lower serum uric acid and treat flares or prevent flares from occurring, and provoking fewer or less intense side effects. In some aspects, the synergistic effect allows dose reduction or dosing interval extension relative to a currently available uric acid lowering agent taken individually at prescribed doses.

DETAILED DESCRIPTION

[0004] As utilized in accordance with the present disclosure, the following terms, unless otherwise indicated, shall be understood to have the following meanings:

[0005] “About” when qualifying a number, generally refers to a range of plus or minus ten percent of that value or number, unless indicated otherwise. Without limiting the application of the doctrine of equivalents as to the scope of the claims, each number should be construed in light of such factors as the number of reported significant digits and the manner or method (e.g. instrumentation, sample preparation, etc.) used to obtain that number.

[0006] “Administering” or “administration” refers to the act of giving a drug, prodrug, or therapeutic agent to a subject. Exemplary routes of administration are discussed below.

[0007] “Acute gout” refers to gout present in a subject with at least one gouty symptom (e.g., podagra or other gouty arthritis, gout flare, gouty attack).

[0008] “Anti-inflammatory agent” refers to an agent or combination of agents that may be used to relieve swelling, pain, and other symptoms of inflammation. Non-exclusive examples of such agents are disclosed herein.

[0009] “Arhalofenate” refers to (-)-halofenate, i.e. (-)-(R)-(4-chloro-phenyl)-(3-trifluoromethyl-phenoxy)-acetic acid 2-acetylamino-ethyl ester.

[0010] “Chronic gout” refers to gout present in a subject having recurrent or prolonged gout flares, tophus formation, chronic inflammatory arthritis, or joint deterioration associated with gout, and includes the periods following recovery from acute gout and between acute gout attacks (i.e. intercritical gout).

Patent Application

[0011] "Composition" or, interchangeably, "formulation" refers to a preparation that contains a mixture of various excipients and key ingredients that provide a relatively stable, desirable, and useful form of a compound or drug.

[0012] The prefixes "d" and "l" or (+) and (-) are employed to designate the sign of rotation of plane-polarized light by the compound, with (+) or d- meaning that the compound is "dextrorotatory" and with (-) or l- meaning that the compound is "levorotatory". For a given chemical structure, these isomers or "optical isomers" are identical except that they are mirror images of one another. In describing an optically active compound, the prefixes R and S are used to denote the absolute configuration of the molecule about its chiral center(s). There is no correlation between the nomenclature for the absolute stereochemistry and for the rotation of an enantiomer (i.e., the R- isomer can also be the l- isomer). A specific optical isomer can also be referred to as an "enantiomer," and a mixture of such isomers is often called an "enantiomeric" or "racemic" mixture. *See, e.g.,* A. Streitwieser, & C.H. Heathcock, INTRODUCTION TO ORGANIC CHEMISTRY, 2nd Edition, Chapter 7 (MacMillan Publishing Co., U.S.A. 1981). The optical rotation $[\alpha]_D$ of (-)-halofenate was measured in methyl alcohol.

[0013] "Elevated serum uric acid level" refers to a serum uric acid level greater than normal and, in patients with gout, generally refers to a serum uric acid level greater than or equal to about 6 mg/dL. In some instances, elevated serum uric acid levels are above the mean level in a given population, such as those of a particular gender or age.

[0014] "Effective amount" refers to an amount required (i) at least partly to attain the desired response in a subject; (ii) to delay or to prevent the onset of a particular condition being treated in a subject; or (iii) or to inhibit or to prevent the progression of a particular condition being treated in a subject. The effective amount for a particular subject varies depending upon the health and physical condition of the subject to be treated, the taxonomic group of individual to be treated, the degree of protection desired, the formulation of the composition, the assessment of the medical situation, and other relevant factors. It is expected that the amount will fall in a relatively broad range that can be determined through routine trials.

[0015] "Flare" or "gout flare" refers to a symptom of gout associated with a sudden onset of pain and inflammation, especially in peripheral joints such as the toes or fingers.

Patent Application

[0016] “Gout” refers to a group of disorders or symptoms most often associated with the build up of uric acid due to an overproduction of uric acid or a reduced ability of the kidney to excrete uric acid. Gout is often characterized by the deposition of urate crystals (uric acid or salts thereof, e.g. monosodium urate) in the joints (gouty arthropathy) or soft tissue (tophi). “Gout” as used herein includes acute gout, chronic gout, moderate gout, refractory gout and severe gout.

[0017] “Gout-associated inflammation” refers to local or systemic inflammation due to immune responses to the deposition of urate crystals.

[0018] “Halofenate” refers to the compound of Formula (III), i.e., (4-chlorophenyl)-(3-trifluoromethylphenoxy)-acetic acid 2-acetylaminethyl ester (also referred to as the 2-acetamidoethyl ester of 4-chlorophenyl-(3-trifluoromethylphenoxy)-acetic acid. The term halofenate and the corresponding chemical names include both the (+) and (-) enantiomer of compounds of Formula (III) as well as mixtures thereof, unless otherwise specified.

[0019] “Halofenic acid” and “CPTA” refer to the compound of Formula (IV), i.e. 4-chlorophenyl-(3-trifluoromethylphenoxy)-acetic acid [also referred to as 2-(4-chlorophenyl)-2-(3-(trifluoromethyl)phenoxy)acetic acid] as well as its pharmaceutically acceptable salts. The term halofenic acid and the corresponding chemical names include both the (+) and (-) enantiomer of compounds of Formula (II) as well as mixtures thereof, unless otherwise specified.

[0020] “Hyperuricemia” refers to an elevated serum uric acid level (see above).

[0021] “Lower,” when used to describe chemical substituents of compounds of Formulae (I) and (II) are as defined herein. In one aspect, the substituent may include a lower aralkoxy, di-lower alkylamino-lower alkoxy, lower alkanamido, lower alkoxy, benzamido-lower alkoxy, ureido-lower alkoxy, N'-lower alkyl-ureido-lower alkoxy, carbamoyl-lower alkoxy, halophenoxy substituted lower alkoxy, carbonyl-lower alkylamino, N,N-di-lower alkylamino-lower alkylamino, halo substituted lower alkylamino, hydroxy substituted lower alkylamino, lower alkanolyloxy substituted lower alkylamino, lower alkoxy-carbonylamino, phenyl-lower alkyl, lower alkanamido-lower alkyl, and benzamido-lower alkyl refers to groups having from one to six carbon atoms. For example, “lower alkoxy” means C₁₋₆alkoxy and “lower alkyl” means C₁₋₆alkyl.

[0022] “Moderate gout” refers to gout present in a subject having at least two gout flares in the past 12 months.

Patent Application

[0023] “Pharmaceutically acceptable” refers to that which is useful in preparing a pharmaceutical composition that is generally safe, non-toxic, and neither biologically nor otherwise undesirable, and includes that which is acceptable for veterinary or human pharmaceutical use.

[0024] “Pharmaceutically acceptable salt” includes pharmaceutically acceptable acid addition salts and pharmaceutically acceptable base addition salts and includes both solvated and unsolvated forms. Representative non-limiting lists of pharmaceutically acceptable salts can be found in S.M. Berge *et al.*, *J. Pharma Sci.*, 66(1), 1-19 (1977), and *Remington: The Science and Practice of Pharmacy*, R. Hendrickson, ed., 21st edition, Lippincott, Williams & Wilkins, Philadelphia, PA, (2005), at p. 732, Table 38-5, both of which are hereby incorporated by reference herein.

[0025] “Pharmaceutically acceptable acid addition salt” refers to salts formed with inorganic acids such as hydrochloric acid, hydrobromic acid, sulfuric acid, nitric acid, phosphoric acid and the like, and organic acids such as acetic acid, trifluoroacetic acid, propionic acid, glycolic acid, pyruvic acid, oxalic acid, maleic acid, malonic acid, succinic acid, fumaric acid, tartaric acid, citric acid, benzoic acid, cinnamic acid, mandelic acid, methanesulfonic acid, ethanesulfonic acid, p-toluenesulfonic acid, salicylic acid, and the like.

[0026] “Pharmaceutically acceptable base addition salt” refers to salts prepared from the addition of an inorganic base or an organic base to the free acid. Salts derived from inorganic bases include, but are not limited to, the sodium, potassium, lithium, ammonium, calcium, magnesium, iron, zinc, copper, manganese, aluminum salts and the like. Salts derived from organic bases include, but are not limited to, salts of primary, secondary, and tertiary amines, substituted amines including naturally occurring substituted amines, cyclic amines and basic ion exchange resins, such as isopropylamine, trimethylamine, diethylamine, triethylamine, tripropylamine, ethanolamine, 2-dimethylaminoethanol, 2-diethylaminoethanol, dicyclohexylamine, lysine, arginine, histidine, caffeine, procaine, hydrabamine, choline, betaine, ethylenediamine, glucosamine, methylglucamine, theobromine, purines, piperazine, piperidine, N-ethylpiperidine, polyamine resins and the like.

[0027] “Refractory gout” refers to gout in patients who are unresponsive or poorly responsive, or have experienced or are at an increased risk of experiencing an adverse event, after being

Patent Application

administered either (1) an anti-inflammatory or (2) a urate lowering agent. The terms “unresponsive” and “poorly responsive” in this context include (1) no or insignificant lowering of serum uric acid, (2) failure to reach a target serum uric acid level (e.g. as determined by a physician or other medical practitioner), and (3) the persistence of one or more gouty conditions or symptoms such as gout flares, gouty tophi, gouty arthritis, or other associated conditions regardless of any lowering of serum uric acid levels.

[0028] “Subject” and “patient” refer to animals such as mammals, including humans, other primates, domesticated animals (e.g. dogs, cats), farm animals (e.g. horses, cattle, goats, sheep, pigs), rats and mice.

[0029] “Severe gout” refers to gout present in a subject having tophaceous deposits in the joints, skin, or kidneys resulting in chronic arthritis, joint destruction, subcutaneous tophi, or kidney dysfunction, and, in some cases, with subsequent deformity and/or disability.

[0030] “Substantially free from” when used in reference to (-)-halofenate or (-)-halofenic acid (or a salt thereof) being substantially free from the corresponding (+) enantiomer (i.e. (+)-halofenate, (+)-halofenic acid, or a salt thereof) refers to a composition containing a high proportion of a compound’s (-) enantiomer in relation to the (+) enantiomer. In one embodiment, the term means that by weight, the compound included in the composition is at least 85% (-) enantiomer and at most 15% (+) enantiomer. In one embodiment, the term means that by weight, the compound included in the composition is at least 90% (-) enantiomer and at most 10% (+) enantiomer. In other embodiments, the term means that by weight, the compound included in the composition is at least 91% (-) enantiomer and at most 9% (+) enantiomer, at least 92% (-) enantiomer and at most 8% (+) enantiomer, at least 93% (-) enantiomer and at most 7% (+) enantiomer, at least 94% (-) enantiomer and at most 6% (+) enantiomer, at least 95% (-) enantiomer and at most 5% (+) enantiomer, at least 96% (-) enantiomer and at most 4% (+) enantiomer, at least 97% (-) enantiomer and at most 3% (+) enantiomer, at least 98% (-) enantiomer and at most 2% (+) enantiomer, or at least 99% (-) enantiomer or greater than 99% (-) enantiomer. Other percentages of the (-) and (+) enantiomers may also be provided. These percentages are based upon the amount of the enantiomer relative to the total amount of both enantiomers of the compound in the composition.

Patent Application

[0031] “Therapeutically effective dose,” “therapeutically effective amount,” or, interchangeably, “pharmacologically acceptable dose” and “pharmacologically acceptable amount” mean that a sufficient amount of a therapeutic agent, therapeutic agents, or metabolites thereof will be present in order to achieve a desired result, e.g., lowering uric acid levels to a target goal or treating gout in its various forms or treating conditions associated with hyperuricemia.

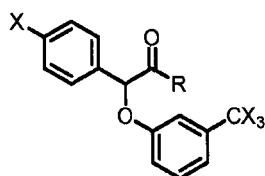
[0032] “Treatment” and “treating” of a disease, disorder, condition or symptom refer to (1) preventing or reducing the risk of developing the disease, disorder or condition, i.e., causing the clinical symptoms of the disease, disorder or condition not to develop in a subject who may be exposed to or predisposed to the disease, disorder or condition but who does not yet experience or display symptoms of the disease, disorder or condition (i.e. prophylaxis); (2) inhibiting the disease, disorder or condition, i.e., arresting or reducing the development of the disease, disorder or condition or its clinical symptoms; and (3) relieving the disease, disorder or condition, i.e., causing regression, reversal, or amelioration of the disease, disorder or condition or reducing the number, frequency, duration or severity of its clinical symptoms. The term “management” may be used synonymously.

[0033] “Urate” refers to uric acid (7,9-dihydro-1H-purine-2,6,8(3H)-trione) and ions and salts thereof.

[0034] A “urate-lowering agent” refers to a compound of any of Formulae (I), (II), (III), or (IV) or a therapeutically acceptable salt or prodrug thereof; and the urate-lowering agents as disclosed herein.

[0035] This application describes compositions, kits and methods for the treatment of hyperuricemia, that is, for lowering serum uric acid levels. One aspect of the current disclosure relates to a composition comprising a first therapeutic agent and a second therapeutic agent, wherein the first therapeutic agent is a urate-lowering agent, and the second therapeutic agent is an anti-inflammatory agent. In another aspect of the composition, the first therapeutic agent is a compound of Formula (I)

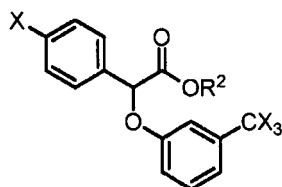
Patent Application



(I)

wherein R is selected from the group consisting of arylC₁₋₆alkoxy-, (C₁₋₆alkyl)₂NC₁₋₆alkoxy-, C₁₋₆alkyl-NHC₁₋₆alkoxy-, C₁₋₆alkylC(O)NHC₁₋₆alkoxy-, arylC(O)NHC₁₋₆alkoxy-, C₁₋₆alkyl-NHC(O)NHC₁₋₆alkoxy-, aryloxyC₁₋₆alkoxy- and C₁₋₆alkylNHC(O)NHphenoxy-; and each X is independently a halogen; or a pharmaceutically acceptable salt thereof.

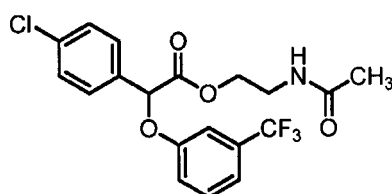
[0036] In certain aspects, the urate-lowering agent is a compound of Formula (II)



(II)

wherein R² is selected from the group consisting of phenyl-lower alkyl, lower alkanamido-lower alkyl, and benzamido-lower alkyl; and each X is independently a halogen, or a pharmaceutically acceptable salt thereof.

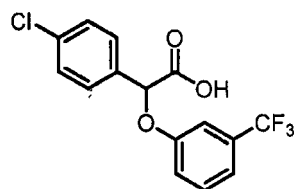
[0037] In other aspects, the urate-lowering agent is a compound of Formula (III), also referred to as halofenate,



(III)

or a pharmaceutically acceptable salt thereof.

[0038] In other aspects, the urate-lowering agent is a compound of Formula (IV), also referred to as halofenic acid,



(IV)

Patent Application

or a pharmaceutically acceptable salt thereof. It should also be noted that any carbon atom with unsatisfied valences in the formulae and examples herein is assumed to have the hydrogen atom to satisfy the valences.

[0039] In certain embodiments, the compound is a compound that generates the compound of Formula (IV) or a pharmaceutically acceptable salt thereof via a chemical reaction after being administered, as discussed in more detail below.

[0040] Another aspect provides for methods of treating a condition associated with an elevated serum uric acid level comprising administering to a subject in need thereof a pharmaceutical composition comprising a urate-lowering agent, wherein said urate-lowering agent is a compound of Formulae (I), (II), (III) or (IV) or a pharmaceutically acceptable salt thereof; and an anti-inflammatory agent. Another aspect provides a method of lowering the serum uric acid level in a subject comprising administering to a subject in need thereof a pharmaceutical composition comprising a urate-lowering agent, wherein said urate-lowering agent is a compound of Formulae (I), (II), (III) or (IV) or a pharmaceutically acceptable salt thereof, and agents as disclosed herein; and an anti-inflammatory agent.

[0041] In certain embodiments, the urate-lowering agent is (-)-halofenate (i.e. (-)-(*R*)-(4-chloro-phenyl)-(3-trifluoromethyl-phenoxy)-acetic acid 2-acetylamino-ethyl ester, also referred to as arhalofenate). In other embodiments, the urate-lowering agent is (-)-halofenic acid (i.e. (-)-4-chlorophenyl-(3-trifluoromethylphenoxy) acetic acid) or a pharmaceutically acceptable salt thereof. In certain embodiments, the (-)-halofenate, (-)-halofenic acid, or pharmaceutically acceptable salt thereof is substantially free from the corresponding (+) enantiomer. In certain aspects of each of the above embodiments, the anti-inflammatory agent is colchicine.

[0042] The enantiomers (stereoisomers) of compounds of Formulae (I), (II), (III) or (IV) and pharmaceutically acceptable salt thereof can be prepared by using reactants or reagents or catalysts in their single enantiomeric form in the process wherever possible or by resolving the mixture of stereoisomers by conventional methods including use of microbial resolution, resolving the diastereomeric salts formed with chiral acids or chiral bases and chromatography using chiral supports. *See*, also U.S. Patent No. 7,199,259 (Daugis), U.S. Patent Nos. 6,646,004; 6,624,194; 6,613,802; and 6,262,118 (each to Luskey et al.), U.S. Patent No. 7,714,131 (Zhu et

Patent Application

al.), U.S. Patent No. 7,432,394 (Cheng et al.) and U.S. Publication No. 2010/0093854 (Broggini et al.) each of which are incorporated herein by reference in their entireties.

[0043] The chemical synthesis of racemic mixtures of (3-trihalomethylphenoxy) (4-halophenyl) acetic acid derivatives can also be performed by the methods described in U.S. Patent No. 3,517,050, the teachings of which are incorporated herein by reference. The individual enantiomers can be obtained by resolution of the racemic mixture of enantiomers using conventional means known to and used by those of skill in the art. *See, e.g.,* Jaques, J., *et al.*, in *Enantiomers, Racemates, and Resolutions*, John Wiley and Sons, New York (1981). Other standard methods of resolution known to those skilled in the art, including but not limited to, simple crystallization and chromatographic resolution, can also be used (*see, e.g., Stereochemistry of Carbon Compounds* (1962) E. L. Eliel, McGraw Hill; J. Lochmuller, *Chromatography*, 113, 283-302 (1975)). Additionally, halofenate, halofenic acid, or a pharmaceutically acceptable salt thereof, *i.e.*, the optically pure isomers, can be prepared from the racemic mixture by enzymatic biocatalytic resolution. Enzymatic biocatalytic resolution has been generally described previously (*see, e.g.,* U.S. Patent Nos. 5,057,427 and 5,077,217, the disclosures of which are incorporated herein by reference). Other generic methods of obtaining enantiomers include stereospecific synthesis (*see, e.g.,* A.J. Li *et al.*, *Pharm. Sci.* 86, 1073-77 (1997)).

[0044] One embodiment provides a composition comprising a pharmaceutically acceptable salt of halofenate or halofenic acid. The neutral forms of the therapeutic agents may be regenerated by contacting the salt with a base or acid and isolating the parent therapeutic agent in the conventional manner. The parent form of the therapeutic agent differs from the various salt forms in certain physical properties, such as solubility in polar solvents, but otherwise the salts are equivalent to the parent form.

[0045] In one embodiment, the urate-lowering agent may be any agent that lowers serum uric acid levels. The urate-lowering agents may include inhibitors of uric acid production (e.g. xanthine oxidase inhibitors and purine nucleoside phosphorylase inhibitors), uricosuric agents and uricases. For example, in some embodiments, the urate-lowering agent is a xanthine oxidase inhibitor. Xanthine oxidase inhibitors lower the amount of urate in blood by decreasing the synthesis of uric acid. Xanthine oxidase is involved in purine metabolism and inhibiting the

Patent Application

enzyme reduces uric acid levels. Xanthine oxidase inhibitors include, but are not limited to: allopurinol, febuxostat, oxypurinol, tisopurine, an inositol and propolis. In some embodiments, the xanthine oxidase inhibitor is allopurinol, febuxostat, oxypurinol, tisopurine, inositol, phytic acid, myo-inositol, kaempferol, myricetin4 and quercetin. Allopurinol (1,5-dihydro-4H-pyrazolo [3,4-d]pyrimidin-4-one), a xanthine oxidase inhibitor, is the current first line standard of care for lowering urate levels. Another xanthine oxidase inhibitor, febuxostat (2-(3-cyano-4-isobutoxyphenyl)-4-methyl-1,3-thiazole-5-carboxylic acid), has been approved for treatment of gout.

[0046] In other embodiments, the urate-lowering agent is a purine nucleoside phosphorylase (PNP) inhibitor. Purine nucleoside phosphorylase inhibitors represent a relatively new approach to lowering serum uric acid levels in patient with hyperuricemia, gout, and related conditions. In some embodiments, the PNP inhibitor is forodesine (BCX-1777) (BioCryst Pharmaceuticals, Inc.). In other embodiments, the PNP inhibitor is BCX-4208 (7-(((3R,4R)-3-hydroxy-4-(hydroxymethyl)pyrrolidin-1-yl)methyl)-3H-pyrrolo[3,2-d]pyrimidin-4(5H)-one) (BioCryst Pharmaceuticals, Inc.). BCX4208 monotherapy administered at 40, 80, 120, 160 and 240 mg/day has been shown to rapidly and significantly reduced serum uric acid in gout patients.

[0047] In some embodiments, the urate-lowering agent is a uricosuric agent. Uricosuric agents enhance renal excretion of uric acid and generally act by lowering the absorption of uric acid from the kidney proximal tubule back to the blood, e.g., by inhibiting urate transporters, e.g., SLC22A12. Uricosuric agents include, but are not limited to, probenecid, 2-((5-bromo-4-(4-cyclopropylnaphthalen-1-yl)-4H-1,2,4-triazol-3-yl)thio)acetic acid (RDEA594, lesinurad), potassium 4-(2-((5-bromo-4-(4-cyclopropylnaphthalen-1-yl)-4H-1,2,4-triazol-3-yl)thio)acetamido)-3-chlorobenzoate (RDEA806), RDEA684, benzbromarone, sulfinpyrazone, amlodipine, atorvastatin, fenofibrate, guaifenesin, losartan, adrenocorticotrophic hormone, and cortisone. Probenecid is the most commonly used uricosuric agent in the U.S. and may be given in combination with allopurinol to some gout patients. Benzbromarone and sulfinpyrazone are also used as first line uricosuric agents. Guaifenesin, losartan, atorvastatin, amlodipine, adrenocorticotrophic hormone (ACTH or corticotropin), fenofibrate and cortisone also have uricosuric effects. In one embodiment, the urate-lowering (e.g. (-)-halofenate, (-)-halofenic acid or a pharmaceutically acceptable salt thereof) is administered before, concurrently or subsequent

Patent Application

to administration of an anti-inflammatory agent. In one embodiment, the urate-lowering agent is administered before the anti-inflammatory agent. In another embodiment, the anti-inflammatory agent is administered before the urate-lowering agent. In another embodiment, sequential administration may be staggered in time. In one embodiment, a urate-lowering agent (e.g. (-)-halofenate, (-)-halofenic acid or a pharmaceutically acceptable salt thereof) is administered before, concurrently or subsequent to administration of the anti-inflammatory agent.

[0048] In some embodiments, the urate-lowering agent is a uricase enzyme, or a fragment or pegylated derivative thereof. Uricase or urate oxidase enzymes are found in many mammals but not in humans. They can lower uric acid levels by converting uric acid into allantoin, a benign end metabolite which is easily excreted in the urine. Uricase enzymes include, but are not limited to, rasburicase or a pegylated uricase enzyme (PEG-uricase). In some embodiments, the pegylated uricase enzyme is Krystexxa® (PURICASE®; pegloticase) (Savient Pharmaceuticals, Inc.) which is approved in the U.S. for the treatment of chronic gout in adult patients refractory to conventional therapy.

[0049] In one embodiment, the anti-inflammatory agent is colchicine. Colchicine, having the chemical name of (-)-N-[(7S,12aS)-1,2,3,10-tetramethoxy-9-oxo-5,6,7,9-tetrahydrobenzo[a]heptalen-7-yl]-acetamide, N-[(7S)-1, 2, 3, 10-tetramethoxy-9-oxo-5,6,7,9-tetrahydrobenzo[a]heptalen-7-yl] acetamide, or (S) N-(5,6,7,9-tetrahydro- 1,2,3,10-tetramethoxy-9-oxobenzo [alpha] heptalen-7-yl) acetamide, is an alkaloid found in extracts of *Colchicum autumnale*, *Gloriosa superba* and other plants. While the exact mechanism of action of colchicine is not known, colchicine does decrease the inflammatory response to urate crystal deposition by inhibiting migration of leukocytes, to interfere with urate deposition by decreasing lactic acid production of leukocytes, to interfere with kinin formation, and to diminish phagocytosis and subsequent inflammatory processes. Thus, colchicine is referred to as an anti-inflammatory agent in this application. In another embodiment, the anti-inflammatory agent may be a non-steroidal anti-inflammatory drugs (NSAIDS), steroids, or similar medicaments to treat or manage gout flares.

[0050] In one embodiment, the first therapeutic agent is administered before, concurrently or subsequent to administration of the second therapeutic agent. For example, halofenate, halofenic

Patent Application

acid or a pharmaceutically acceptable salt thereof can be administered before, concurrently or subsequent to administration of an anti-inflammatory agent such as colchicine.

[0051] The present disclosure also provides for methods of treating one or more conditions associated with an elevated serum uric acid level, i.e. hyperuricemia, the methods comprising administering to a subject in need thereof a pharmaceutical composition comprising a urate-lowering agent, wherein the urate-lowering agent is a compound of Formulae (I), (II), (III) or (IV) or a pharmaceutically acceptable salt thereof; and an anti-inflammatory agent. In another embodiment, the methods of the present application may be used for the treatment of acute gout flares, and for the prophylaxis of gout flares. Conditions associated with hyperuricemia include, but are not limited to gout; acute gout; chronic gout; moderate gout; refractory gout; severe gout; deposition of uric acid crystals in the urinary tract, renal parenchyma, soft tissues, joints, cartilage or bones; urolithiasis; urate nephropathy; tophi; podagra; acute inflammatory gouty arthritis; joint destruction; urinary tract infections; renal impairment; chronic kidney disease; kidney stones; local inflammation; systemic inflammation; immune-related disorders; cardiovascular disease including peripheral vascular disease, coronary artery disease and cerebrovascular disease; insulin resistance; diabetes; fatty liver disease; dementia including vascular dementia; dyslipidemia; preeclampsia; hypertension; obesity; muscle spasm; localized swelling; pain including joint pain, muscle fatigue; and stress feelings.

[0052] A variety of factors increase the risk that a patient will have gout or will experience one or more of its symptoms. In addition to hyperuricemia, these factors include obesity, diabetes, chronic kidney failure, hypertension, use of diuretic drugs and certain other drugs (e.g. salicylates, pyrazinamide, ethambutol, nicotinic acid, cyclosporin, 2-ethylamino-1,3,4-thiadiazole, fructose and cytotoxic agents), overeating or fasting, a high purine diet, a high fructose diet, exposure to lead, consumption of red meat and protein, alcohol intake, and injury or recent surgery. Acute gout can be precipitated by perioperative ketosis in surgical patients, reduced body temperature, e.g., while sleeping, and by dehydration, e.g., by use of diuretic drugs. Genetic risk factors for gout and hyperuricemia have also been identified.

[0053] In various embodiments, the methods described herein may be used to treat any of the aforementioned conditions or disorders. That is, in one embodiment, the condition associated with an elevated serum uric acid level is gout. In some embodiments, the subject has acute gout.

Patent Application

In some embodiments, the subject has chronic gout. In some embodiments the subject has moderate gout. In some embodiments the subject has refractory gout. In some embodiments the subject has severe gout. For example, one method provides for the management of hyperuricemia in a subject with gout. Certain methods provide for the treatment or management of hyperuricemia in a subject with gout comprising administering a pharmaceutical composition comprising a urate-lowering agent and an anti-inflammatory agent. In some embodiments the urate-lowering agent is (-)-halofenate, (-)-halofenic acid or a pharmaceutically acceptable salt thereof, and the anti-inflammatory agent is colchicine. In certain embodiments, the treatment can be for about four weeks or longer, for about one month or longer, for about 12 weeks or longer, for about three months or longer, for about six months or longer, for about one year or longer, for about two years or longer, for about five years or longer, for about 10 years or longer. In certain embodiments, the treatment can be indefinite, e.g. for the remainder of the lifetime of the subject. In certain embodiments the urate-lowering agent is selected from the group consisting of a uric acid synthesis inhibitor, a uricase, and a uricosuric agent, and pharmaceutically acceptable salts thereof. In certain embodiments the urate-lowering agent may be allopurinol or febuxostat.

[0054] In various embodiments the methods comprise treating gout. In some embodiments, the methods comprise treating gout by preventing gout flares. In another embodiment the method comprises reducing the number, frequency, duration or severity of one or more gout flares. In another embodiment the method comprises preventing, reducing or reversing uric acid crystal formation. In some embodiments of the methods for treating uric acid crystal formation, the uric acid crystal formation is in one or more of the joints, under skin, and kidney. In some embodiments, the formations include tophaceous deposits. In some embodiments, the subject has uric acid crystal formation determined by aspiration of tophi or by aspiration of synovial fluid of an inflamed joint. In another embodiment the method comprises reducing uric acid burden. In another embodiment the method comprises reducing the size or number of tophi. The size or number of tophi may be assessed by known methods, for example, use of CT scans.

[0055] This application also provides methods of lowering the serum uric acid level, treating a subject having a condition associated with an elevated serum uric acid level, and treating hyperuricemia in a subject with gout, in subjects with refractory gout. In certain embodiments,

Patent Application

the subject is refractory to allopurinol, 2-((5-bromo-4-(4-cyclopropylnaphthalen-1-yl)-4H-1,2,4-triazol-3-yl)thio)acetic acid (RDEA594, lesinurad), 2-(3-cyano-4-isobutoxyphenyl)-4-methyl-1,3-thiazole-5-carboxylic acid (febuxostat), or BCX4208. In some embodiments the subject is refractory to allopurinol. For example, in one embodiment, the subject is refractory to allopurinol administered at from 100 mg/day to 800 mg/day (e.g. from 100 mg/day to 300 mg/day) for about one month or longer, about three months or longer, about one year or longer, etc. In certain embodiments the subject has mild or moderate chronic kidney disease (CKD2-3). In other embodiments the subject has severe chronic kidney disease (CKD4). In other embodiments, the subject is on aspirin or diuretic therapy.

[0056] In one embodiment, the methods described herein may be accomplished by the administration of a compound that generates the compound of Formula (IV) or a salt thereof via a chemical reaction after being administered. Such compounds include prodrugs of the compound of Formula (IV). Prodrugs of a compound are prepared by modifying functional groups present in the compound in such a way that the modifications may be cleaved *in vivo* to release the parent compound, or an active metabolite. For example, prodrugs include compounds wherein a hydroxy, amino, or sulfhydryl group in a compound is bonded to any group that may be cleaved *in vivo* to regenerate the free hydroxyl, amino, or sulfhydryl group, respectively. Certain prodrugs may increase the bioavailability of the compounds of the embodiments when such compounds are administered to a subject (e.g., by allowing an orally administered compound to be more readily absorbed into the blood) or which enhance delivery of the parent compound to a certain organ or tissue (e.g., kidneys, adipose tissue, liver, muscles or joints) relative to the parent species. Prodrugs of the compound of Formula (IV) include esters, amides, and carbamates (e.g., N, N-dimethylaminocarbonyl) of the hydroxy functional group of the compound of Formula (IV). The compounds of Formulae (I), (II), and (III) are non-limiting examples of prodrugs of the compound of Formula (IV). Further examples of prodrugs can be found in J. Rautio et al. *Prodrugs: design and clinical applications*, Nat. Rev. Drug Discov., 7, 255-270 (2008); Edward B. Roche, ed., *Bioreversible Carriers in Drug Design*, American Pharmaceutical Association and Pergamon Press, (1987); and T. Higuchi and V. Stella, *Prodrugs as Novel Delivery Systems*, Vol. 14 of the A.C.S. Symposium Series (1975), each of which are hereby incorporated by reference herein.

Patent Application

[0057] In various embodiments, the compositions, methods, and kits described herein lower serum uric acid levels in a subject by about 5%, about 10%, about 15%, about 20%, about 25%, about 30%, about 35%, about 40%, about 45%, about 50%, about 55%, about 60%, about 65%, about 70%, about 75%, about 80%, about 85%, about 90% or more, as compared to serum uric acid levels in the subject prior to administering the methods described herein. In various embodiments, serum uric acid levels are decreased about 5% to about 50%, decreased by about 25% to about 75%, or decreased by about 50% to about 99%. Methods to determine serum uric acid levels are well known in the art and are often measured as part of a standard chemistry panel of blood serum samples.

[0058] In some embodiments, the compositions, methods, and kits of the present disclosure lower serum uric acid levels in a subject to about 7 mg/dL or less, to about 6.8 mg/dL or less, to about 6 mg/dL or less, to about 5 mg/dL or less, to about 4 mg/dL or less, or to about 3 mg/dL or less as compared to serum uric acid levels in the subject prior to administering the methods or compositions described herein. In some embodiments, the methods of the present disclosure lower serum uric acid levels in a subject by 0.1, 0.2, 0.3, 0.4, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, 8.5, 9.0, 9.5 or 10.0 mg/dL, or greater, as compared to serum uric acid levels in the subject prior to administering the methods or compositions described herein. In further embodiments, the methods described herein lower serum uric acid levels by between 0.1 and 10.0 mg/dL, between 0.5 and 6.0 mg/dL, between 1.0 and 4.0 mg/dL or between 1.5 and 2.5 mg/dL. The appropriate serum uric acid level may vary depending on the subject, and may vary for a given subject over time, depending upon the subject's overall medical condition. Similarly, the appropriate serum uric acid level for one group of subjects sharing a common medical condition may be different from that which is appropriate for a different group of subjects sharing a different medical condition. Thus, it may be advisable to reduce the serum uric acid level of a given group of subjects to, for example, below about 5 mg/dL, and to reduce the serum uric acid level of a different group of subjects to, for example, below about 4 mg/dL. In certain embodiments, the methods of the present disclosure decrease a serum uric acid level in the subject by an amount sufficient to result in the disappearance, reduction, amelioration, or the prevention of the onset, of one or more conditions associated with elevated serum uric acid over a certain timeframe, for example about four weeks or longer, about one month or longer, about

Patent Application

three months or longer, about one year or longer, about two years or longer, etc. For example, a method can decrease the serum uric acid level in a subject by an amount sufficient to result in the disappearance or reduction of tophi over about four weeks or longer, about one month or longer, about three months or longer, about one year or longer, about two years or longer, etc.

[0059] In further embodiments, the methods of the present disclosure comprise administering a pharmaceutical composition comprising a urate-lowering agent and an anti-inflammatory agent, as described herein, to a subject whose serum uric acid level is at least about 4 mg/dL, at least about 5 mg/dL, at least about 6 mg/dL, at least about 6.8 mg/dL, at least about 7 mg/dL, at least about 8 mg/dL, at least about 9 mg/dL, at least about 10 mg/dL, or at least about 11 mg/dL. Again, the amount of decrease of serum uric acid level that is appropriate may vary depending on the subject, depending upon the subject's overall medical condition. Similarly, the amount of decrease of serum uric acid level that is appropriate for one group of subjects sharing a common medical condition may be different from that which is appropriate for a different group of subjects sharing a different medical condition.

[0060] The therapeutic agents and combinations thereof disclosed herein are contemplated to exhibit therapeutic activity when administered in an amount which can depend on the particular case. The variation in amount can depend, for example, on the subject being treated and the active ingredients chosen. A broad range of doses can be applicable. Dosage regimes may be adjusted to provide the optimum therapeutic response. For example, several divided doses may be administered daily, weekly, monthly or other at suitable time intervals or the dose may be proportionally reduced as indicated by the exigencies of the situation. Such dosages are optionally altered depending on a number of variables, not limited to the activity of the one or more active ingredients used, the disease or condition to be treated, the mode of administration, the requirements of the individual subject, the severity of the disease or condition being treated, and the judgment of the practitioner.

[0061] As described throughout, the present disclosure contemplates combination therapy and methods of concomitant administration (or concurrent administration) of a urate-lowering agent and an anti-inflammatory agent, wherein the urate-lowering agent and the anti-inflammatory agent are described above. Combination therapy and concomitant administration refer to the administration of the two agents (i.e., a urate-lowering agent and an anti-inflammatory agent, as

Patent Application

described above) in any manner in which the pharmacological effects of both are manifested in the subject at the same time. Thus, such administration does not require that a single pharmaceutical composition, the same type of formulation, the same dosage form, or even the same route of administration be used for administration of both the urate-lowering agents and the anti-inflammatory agent, or that the two agents be administered at the same time. Such administration may be accomplished most conveniently by the same dosage form and the same route of administration, at substantially the same time. For example, the urate-lowering agent, e.g. halofenate, halofenic acid, or a pharmaceutically acceptable salt thereof, and an anti-inflammatory agent, e.g. colchicine, can be administered to the human subject together in a single oral dosage composition, such as a tablet or capsule, or each agent can be administered in separate oral dosage formulations. One advantage with separate formulations is an added flexibility in dosing, i.e. the dosage of the urate-lowering agent and the anti-inflammatory agent can be changed independently, quickly, and easily. Where separate dosage formulations are used, the urate-lowering agent and the anti-inflammatory agent can be administered at essentially the same time (i.e., simultaneously or concurrently), or at separately staggered times (i.e., sequentially).

[0062] Depending on factors such as the diagnosis, symptoms, and therapeutic goals of a particular subject, a wide range of dosages of the urate-lowering agent and the anti-inflammatory agent can be contemplated. In various embodiments, the urate-lowering agent may be administered from about 10 mg to about 1000 mg per day. For example, halofenate, halofenic acid, or a pharmaceutically acceptable salt thereof may be administered at about 100 mg/day, about 200 mg/day, about 300 mg/day, about 400 mg/day, about 500 mg/day, about 600 mg/day, about 700 mg/day, about 800 mg/day, about 900 mg/day, or about 1000 mg/day. In embodiments where the anti-inflammatory agent is colchicine, the colchicine may be administered from about 0.1 mg to about 2.0 mg per day.

[0063] As described above, in certain embodiments the urate-lowering agent is arhalofenate (i.e. (-)-halofenate) and wherein the anti-inflammatory agent is colchicine, the following daily dosages may be administered: arhalofenate 100 mg/day, colchicine 0.1 mg/day; arhalofenate 100 mg/day, colchicine 0.2 mg/day; arhalofenate 100 mg/day, colchicine 0.3 mg/day; arhalofenate 100 mg/day, colchicine 0.4 mg/day; arhalofenate 100 mg/day, colchicine 0.5

Patent Application

mg/day; arhalofenate 700 mg/day, colchicine 0.1 mg/day; arhalofenate 700 mg/day, colchicine 0.2 mg/day; arhalofenate 700 mg/day, colchicine 0.3 mg/day; arhalofenate 700 mg/day, colchicine 0.4 mg/day; arhalofenate 700 mg/day, colchicine 0.5 mg/day; arhalofenate 700 mg/day, colchicine 0.6 mg/day; arhalofenate 700 mg/day, colchicine 0.7 mg/day; arhalofenate 700 mg/day, colchicine 0.8 mg/day; arhalofenate 700 mg/day, colchicine 0.9 mg/day; arhalofenate 700 mg/day, colchicine 1.0 mg/day; arhalofenate 800 mg/day, colchicine 0.1 mg/day; arhalofenate 800 mg/day, colchicine 0.2 mg/day; arhalofenate 800 mg/day, colchicine 0.3 mg/day; arhalofenate 800 mg/day, colchicine 0.4 mg/day; arhalofenate 800 mg/day, colchicine 0.5 mg/day; arhalofenate 800 mg/day, colchicine 0.6 mg/day; arhalofenate 800 mg/day, colchicine 0.7 mg/day; arhalofenate 800 mg/day, colchicine 0.8 mg/day; arhalofenate 800 mg/day, colchicine 0.9 mg/day; arhalofenate 800 mg/day, colchicine 1.0 mg/day; arhalofenate 900 mg/day, colchicine 0.1 mg/day; arhalofenate 900 mg/day, colchicine 0.2 mg/day; arhalofenate 900 mg/day, colchicine 0.3 mg/day; arhalofenate 900 mg/day, colchicine 0.4 mg/day; arhalofenate 900 mg/day, colchicine 0.5 mg/day; arhalofenate 900 mg/day, colchicine 0.6 mg/day; arhalofenate 900 mg/day, colchicine 0.7 mg/day; arhalofenate 900 mg/day, colchicine 0.8 mg/day; arhalofenate 900 mg/day, colchicine 0.9 mg/day; arhalofenate 900 mg/day, colchicine 1.0 mg/day; arhalofenate 1000 mg/day, colchicine 0.1 mg/day; arhalofenate 1000 mg/day, colchicine 0.2 mg/day; arhalofenate 1000 mg/day, colchicine 0.3 mg/day; arhalofenate 1000 mg/day, colchicine 0.4 mg/day; arhalofenate 1000 mg/day, colchicine 0.5 mg/day; arhalofenate 1000 mg/day, colchicine 0.6 mg/day; arhalofenate 1000 mg/day, colchicine 0.7 mg/day; arhalofenate 1000 mg/day, colchicine 0.8 mg/day; arhalofenate 1000 mg/day, colchicine 0.9 mg/day; or arhalofenate 1000 mg/day, colchicine 1.0 mg/day.

[0064] Also as described above, in certain embodiments the urate-lowering agent is febuxostat. The currently recommended daily dosage of febuxostat is 40 mg/day or 80 mg/day in the United States, and 40 mg/day, 80 mg/day or 120 mg/day in certain other countries. When administered as the urate-lowering agent as described herein (i.e. when an anti-inflammatory agent is also administered), the dosage range of febuxostat may be within, above, or below the currently recommended daily dosage, as provided above and as appropriate for the subject being treated. By way of non-limiting example, in certain embodiments wherein the urate-lowering agent is febuxostat and the anti-inflammatory agent is colchicine, the following daily dosages may be

Patent Application

administered: febuxostat 20 mg/day, colchicine 0.1 mg/day; febuxostat 40 mg/day, colchicine 0.1 mg/day; febuxostat 60 mg/day, colchicine 0.1 mg/day; febuxostat 80 mg/day, colchicine 0.1 mg/day; febuxostat 100 mg/day, colchicine 0.1 mg/day; febuxostat 120 mg/day, colchicine 0.1 mg/day; febuxostat 20 mg/day, colchicine 0.2 mg/day; febuxostat 40 mg/day, colchicine 0.2 mg/day; febuxostat 60 mg/day, colchicine 0.2 mg/day; febuxostat 80 mg/day, colchicine 0.2 mg/day; febuxostat 100 mg/day, colchicine 0.2 mg/day; febuxostat 120 mg/day, colchicine 0.2 mg/day; febuxostat 20 mg/day, colchicine 0.3 mg/day; febuxostat 40 mg/day, colchicine 0.3 mg/day; febuxostat 60 mg/day, colchicine 0.3 mg/day; febuxostat 80 mg/day, colchicine 0.3 mg/day; febuxostat 100 mg/day, colchicine 0.3 mg/day; febuxostat 120 mg/day, colchicine 0.3 mg/day; febuxostat 20 mg/day, colchicine 0.4 mg/day; febuxostat 40 mg/day, colchicine 0.4 mg/day; febuxostat 60 mg/day, colchicine 0.4 mg/day; febuxostat 80 mg/day, colchicine 0.4 mg/day; febuxostat 100 mg/day, colchicine 0.4 mg/day; febuxostat 120 mg/day, colchicine 0.4 mg/day; febuxostat 20 mg/day, colchicine 0.5 mg/day; febuxostat 40 mg/day, colchicine 0.5 mg/day; febuxostat 60 mg/day, colchicine 0.5 mg/day; febuxostat 80 mg/day, colchicine 0.5 mg/day; febuxostat 100 mg/day, colchicine 0.5 mg/day; febuxostat 120 mg/day, colchicine 0.5 mg/day; febuxostat 20 mg/day, colchicine 0.6 mg/day; febuxostat 40 mg/day, colchicine 0.6 mg/day; febuxostat 60 mg/day, colchicine 0.6 mg/day; febuxostat 80 mg/day, colchicine 0.6 mg/day; febuxostat 100 mg/day, colchicine 0.6 mg/day; febuxostat 120 mg/day, colchicine 0.6 mg/day; febuxostat 20 mg/day, colchicine 0.8 mg/day; febuxostat 40 mg/day, colchicine 0.8 mg/day; febuxostat 60 mg/day, colchicine 0.8 mg/day; febuxostat 80 mg/day, colchicine 0.8 mg/day; febuxostat 100 mg/day, colchicine 0.8 mg/day; febuxostat 120 mg/day, colchicine 0.8 mg/day; febuxostat 20 mg/day, colchicine 1.0 mg/day; febuxostat 40 mg/day, colchicine 1.0 mg/day; febuxostat 60 mg/day, colchicine 1.0 mg/day; febuxostat 80 mg/day, colchicine 1.0 mg/day; febuxostat 100 mg/day, colchicine 1.0 mg/day; or febuxostat 120 mg/day, colchicine 1.0 mg/day. In certain embodiments the urate-lowering agent is allopurinol. The currently recommended daily dosage of allopurinol is 100 mg/day or 800 mg/day. When administered as the urate-lowering agent as described herein with colchicine, the dosage range of allopurinol may be within, above, or below the currently recommended daily dosage, as provided above and as appropriate for the subject being treated. By way of non-limiting example, in certain embodiments wherein the urate-lowering agent is allopurinol and the anti-inflammatory agent is

Patent Application

colchicine, the following daily dosages may be administered: allopurinol 100 mg/day, colchicine 0.1 mg/day; allopurinol 200 mg/day, colchicine 0.1 mg/day; allopurinol 300 mg/day, colchicine 0.1 mg/day; allopurinol 400 mg/day, colchicine 0.1 mg/day; allopurinol 500 mg/day, colchicine 0.1 mg/day; allopurinol 600 mg/day, colchicine 0.1 mg/day; allopurinol 700 mg/day, colchicine 0.1 mg/day; allopurinol 800 mg/day, colchicine 0.1 mg/day; allopurinol 100 mg/day, colchicine 0.2 mg/day; allopurinol 200 mg/day, colchicine 0.2 mg/day; allopurinol 300 mg/day, colchicine 0.2 mg/day; allopurinol 400 mg/day, colchicine 0.2 mg/day; allopurinol 500 mg/day, colchicine 0.2 mg/day; allopurinol 600 mg/day, colchicine 0.2 mg/day; allopurinol 700 mg/day, colchicine 0.2 mg/day; allopurinol 800 mg/day, colchicine 0.2 mg/day; allopurinol 100 mg/day, colchicine 0.3 mg/day; allopurinol 200 mg/day, colchicine 0.3 mg/day; allopurinol 300 mg/day, colchicine 0.3 mg/day; allopurinol 400 mg/day, colchicine 0.3 mg/day; allopurinol 500 mg/day, colchicine 0.3 mg/day; allopurinol 600 mg/day, colchicine 0.3 mg/day; allopurinol 700 mg/day, colchicine 0.3 mg/day; allopurinol 800 mg/day, colchicine 0.3 mg/day; allopurinol 100 mg/day, colchicine 0.4 mg/day; allopurinol 200 mg/day, colchicine 0.4 mg/day; allopurinol 300 mg/day, colchicine 0.4 mg/day; allopurinol 400 mg/day, colchicine 0.4 mg/day; allopurinol 500 mg/day, colchicine 0.4 mg/day; allopurinol 600 mg/day, colchicine 0.4 mg/day; allopurinol 700 mg/day, colchicine 0.4 mg/day; allopurinol 800 mg/day, colchicine 0.4 mg/day; allopurinol 100 mg/day, colchicine 0.5 mg/day; allopurinol 200 mg/day, colchicine 0.5 mg/day; allopurinol 300 mg/day, colchicine 0.5 mg/day; allopurinol 400 mg/day, colchicine 0.5 mg/day; allopurinol 500 mg/day, colchicine 0.5 mg/day; allopurinol 600 mg/day, colchicine 0.5 mg/day; allopurinol 700 mg/day, colchicine 0.5 mg/day; allopurinol 800 mg/day, colchicine 0.5 mg/day; allopurinol 100 mg/day, colchicine 0.6 mg/day; allopurinol 200 mg/day, colchicine 0.6 mg/day; allopurinol 300 mg/day, colchicine 0.6 mg/day; allopurinol 400 mg/day, colchicine 0.6 mg/day; allopurinol 500 mg/day, colchicine 0.6 mg/day; allopurinol 600 mg/day, colchicine 0.6 mg/day; allopurinol 700 mg/day, colchicine 0.6 mg/day; allopurinol 800 mg/day, colchicine 0.6 mg/day; allopurinol 100 mg/day, colchicine 0.8 mg/day; allopurinol 200 mg/day, colchicine 0.8 mg/day; allopurinol 300 mg/day, colchicine 0.8 mg/day; allopurinol 400 mg/day, colchicine 0.8 mg/day; allopurinol 500 mg/day, colchicine 0.8 mg/day; allopurinol 600 mg/day, colchicine 0.8 mg/day; allopurinol 700 mg/day, colchicine 0.8 mg/day; allopurinol 800 mg/day, colchicine 0.8 mg/day; allopurinol 100 mg/day, colchicine 1.0 mg/day; allopurinol 200 mg/day, colchicine 1.0 mg/day; allopurinol 300 mg/day, colchicine

Patent Application

1.0 mg/day; allopurinol 400 mg/day, colchicine 1.0 mg/day; allopurinol 500 mg/day, colchicine 1.0 mg/day; allopurinol 600 mg/day, colchicine 1.0 mg/day; allopurinol 700 mg/day, colchicine 1.0 mg/day; or allopurinol 800 mg/day, colchicine 1.0 mg/day. In certain embodiments the urate-lowering agent is lesinurad (2-((5-bromo-4-(4-cyclopropyl)naphthalen-1-yl)-4*H*-1,2,4-triazol-3-yl)thio)acetic acid, RDEA594). The currently recommended daily dosage of lesinurad is 200 to 600 mg/day. When administered as the urate-lowering agent as described herein with colchicine, the dosage range of lesinurad may be within, above, or below the currently recommended daily dosage, as provided above and as appropriate for the subject being treated. By way of non-limiting example, in certain embodiments wherein the urate-lowering agent is lesinurad and the anti-inflammatory agent is colchicine, the following daily dosages may be administered (in short hand notation with lesinurad followed by colchicine): that is, lesinurad 200 mg/day, colchicine 0.1 mg/day; 300 mg/day, 0.1 mg/day; 400 mg/day, 0.1 mg/day; 500 mg/day, 0.1 mg/day; 600 mg/day, 0.1 mg/day; lesinurad 200 mg/day, colchicine 0.2 mg/day; 300 mg/day, 0.2 mg/day; 400 mg/day, 0.2 mg/day; 500 mg/day, 0.2 mg/day; 600 mg/day, 0.2 mg/day; lesinurad 200 mg/day, colchicine 0.3 mg/day; 300 mg/day, 0.3 mg/day; 400 mg/day, 0.3 mg/day; 500 mg/day, 0.3 mg/day; 600 mg/day, 0.3 mg/day; lesinurad 200 mg/day, colchicine 0.4 mg/day; 300 mg/day, 0.4 mg/day; 400 mg/day, 0.4 mg/day; 500 mg/day, 0.4 mg/day; 600 mg/day, 0.4 mg/day; lesinurad 200 mg/day, colchicine 0.5 mg/day; 300 mg/day, 0.5 mg/day; 400 mg/day, 0.5 mg/day; 500 mg/day, 0.5 mg/day; 600 mg/day, 0.5 mg/day; lesinurad 200 mg/day, colchicine 0.6 mg/day; 300 mg/day, 0.6 mg/day; 400 mg/day, 0.6 mg/day; 500 mg/day, 0.6 mg/day; 600 mg/day, 0.6 mg/day; lesinurad 200 mg/day, colchicine 0.8 mg/day; 300 mg/day, 0.8 mg/day; 400 mg/day, 0.8 mg/day; 500 mg/day, 0.8 mg/day; 600 mg/day, 0.8 mg/day; lesinurad 200 mg/day, colchicine 1.0 mg/day; 300 mg/day, 1.0 mg/day; 400 mg/day, 1.0 mg/day; 500 mg/day, 1.0 mg/day; or 600 mg/day, 1.0 mg/day.

[0065] In certain embodiments the urate-lowering agent is RDEA806 (potassium 4-(2-((5-bromo-4-(4-cyclopropyl)naphthalen-1-yl)-4*H*-1,2,4-triazol-3-yl)thio)acetamido)-3-chlorobenzoate). The currently tested daily dosage of RDE806 is 400 to 1,000 mg/day. When administered as the urate-lowering agent as described herein with colchicine, the dosage range of RDE806 may be within, above, or below the currently recommended daily dosage, as provided above and as appropriate for the subject being treated. By way of non-limiting example, in

Patent Application

certain embodiments wherein the urate-lowering agent is RDE806 and the anti-inflammatory agent is colchicine, the following daily dosages may be administered (in short hand notation with RDE806 followed by colchicine): that is, RDE806 400 mg/day, colchicine 0.1 mg/day; 600 mg/day, 0.1 mg/day; 800 mg/day, 0.1 mg/day; 1000 mg/day, 0.1 mg/day; 400 mg/day, 0.2 mg/day; 600 mg/day, 0.2 mg/day; 800 mg/day, 0.2 mg/day; 1000 mg/day, 0.2 mg/day; 400 mg/day, 0.3 mg/day; 600 mg/day, 0.3 mg/day; 800 mg/day, 0.3 mg/day; 1000 mg/day, 0.3 mg/day; 400 mg/day, 0.4 mg/day; 600 mg/day, 0.4 mg/day; 800 mg/day, 0.4 mg/day; 1000 mg/day, 0.4 mg/day; 400 mg/day, 0.5 mg/day; 600 mg/day, 0.5 mg/day; 800 mg/day, 0.5 mg/day; 1000 mg/day, 0.5 mg/day; 400 mg/day, 0.6 mg/day; 600 mg/day, 0.6 mg/day; 800 mg/day, 0.6 mg/day; 1000 mg/day, 0.6 mg/day; 400 mg/day, 0.8 mg/day; 600 mg/day, 0.8 mg/day; 800 mg/day, 0.8 mg/day; 1000 mg/day, 0.8 mg/day; 400 mg/day, 1.0 mg/day; 600 mg/day, 1.0 mg/day; 800 mg/day, 1.0 mg/day; or 1000 mg/day, 1.0 mg/day. Similarly, the urate-lowering agent that may be used with colchicine is selected from the group consisting of RDEA684, benzbromarone, sulfapyrazone, amlodipine, atorvastatin, fenofibrate, guaifenesin, losartan, adrenocorticotrophic hormone and cortisone. In addition, guaifenesin, losartan, atorvastatin, amlodipine, adrenocorticotrophic hormone (ACTH or corticotropin), fenofibrate and cortisone also have uricosuric effects, and may be used with colchicines as described herein.

[0066] Other dose ranges within the ranges described above for each of the urate-lowering agent and the anti-inflammatory agent may be readily envisaged. Also, fixed-dose pharmaceutical compositions wherein the amount of drug in the dose corresponds to the mg/day amounts listed above (e.g. a composition comprising 100 mg of arhalofenate and 0.1 mg of colchicines, etc.) can be easily envisaged. One of skill in the art will appreciate that the dose and dosing regimen may be adjusted when therapeutic agents are used in combination. When such combinations are used, the dose of one or more of the agents may be reduced to a level below the level required for a desired efficacy when the one or more agents are used alone. Similarly, the dosing regimen may be modified, e.g., to synchronize the dosing of the one or more therapeutic agents to facilitate improved patient ease of use and compliance. Alternately, the dosing regimen of the one or more therapeutic agents can be sequential, e.g., to reduce the combined load of the agents at a given time. For example, in certain embodiments, the dose of the urate-lowering agent (e.g. allopurinol, febuxostat, or the other urate-lowering agents described herein) can be

Patent Application

adjusted to a lower level than that currently recommended when the urate-lowering agent is administered with the anti-inflammatory agent.

[0067] Dose titration or dose escalation protocols may be employed to determine the proper or optimal dose to administer to a subject. For example, dose titration or escalation studies may select for doses that improve efficacy or tolerability. Dose titration or escalation allows for the gradual adjusting of the dose administered until the desired effect is achieved. Dose titration gradually decreases the dosage administered while dose escalation gradually increases the dose administered. Methods of dose titration and escalation are well known in the art. As a non-limiting example, a subject may be administered 200 mg/day halofenate, halofenic acid, or a pharmaceutically acceptable salt thereof every day and measured for serum uric acid levels on a daily basis. The dosage may be increased or decreased, for example, on a weekly basis. The subject may be monitored for a period of, for example, 2 to 12 weeks to find the desired dose.

[0068] Further embodiments of the pharmaceutical compositions, methods and kits describe herein comprise a third therapeutic agent. In some of these embodiments the third therapeutic agent is another urate-lowering agent. For example, a pharmaceutical composition can comprise a first therapeutic agent, a second therapeutic agent, and a third therapeutic agent, wherein the first therapeutic agent is a compound of Formula (I) described above, the second therapeutic agent is an anti-inflammatory agent, e.g. colchicine, and the third therapeutic agent is another urate-lowering agent (i.e. a urate-lowering agent which is not the first therapeutic agent), e.g. a xanthine oxidase inhibitor (e.g. febuxostat, allopurinol, etc.), a PNP inhibitor (e.g. forodesine, BCX4208, etc.), or a uricosuric (probenicid, lesinurad, RDEA806, RDEA684, etc.). For example, a pharmaceutical composition can comprise a first therapeutic agent, a second therapeutic agent, and a third therapeutic agent, wherein the first therapeutic agent is selected from the group consisting of (-)-halofenate, (-)-halofenic acid, and pharmaceutically acceptable salts thereof; the second therapeutic agent is colchicine; and the third therapeutic agent is febuxostat. By way of non-limiting example, a pharmaceutical composition can comprise from about 100 mg to about 1000 mg of (-)-halofenate, from about 0.1 to about 2.0 mg colchicine, and from about 40 mg to about 120 mg of febuxostat.

[0069] In accordance with the compositions, methods and kits described herein, the urate-lowering agent and the anti-inflammatory agent may be administered in any manner in which the

Patent Application

pharmacological effects of both are likely to be manifested in the subject at approximately the same time. Such administration does not require that a single pharmaceutical composition, the same type of formulation, the same dosage form, or even the same route of administration be used for administration of both the urate-lowering agent and the anti-inflammatory agent, or that the two agents be administered at the same time. That is, in various embodiments, the urate-lowering agent and the anti-inflammatory agent described herein may be present in a single dosage form (e.g. a single tablet or capsule for oral administration), and in other embodiments the urate-lowering agent may be present in a first dosage form (e.g., a first tablet or capsule) and the anti-inflammatory agent may be present in a second dosage form (e.g. a second tablet or capsule). The dosage forms may include the urate-lowering agent and the anti-inflammatory agent in doses according to the examples provided above. A single dosage form (e.g., a single tablet or capsule) may include a single daily supply of the urate-lowering agent and the anti-inflammatory agent, or a fraction thereof, e.g. one-half of a daily supply, one-third a daily supply, one-fourth a daily supply, etc. For example, the pharmaceutical composition described herein can be in a single tablet comprising 200 mg of arhalofenate and 0.5 mg of colchicine. By way of further example, the pharmaceutical composition described herein can be in a single tablet comprising 200 mg of arhalofenate and 0.8 mg of colchicine. Other dosage forms within the scope of this disclosure may be readily envisaged.

[0070] In unit dosage form, the formulation may be divided into unit doses containing appropriate quantities of the one or more active ingredients. In some embodiments, the unit dosage is in the form of a package containing discrete quantities of the formulation. Non-limiting examples include packaged tablets or capsules, and powders in vials or ampoules. In some embodiments, aqueous suspension compositions are packaged in single-dose non-reclosable containers. Alternatively, multiple-dose reclosable containers are used, in which case it is typical to include a preservative in the composition. By way of example only, formulations for parenteral injection are presented in unit dosage form, which include, but are not limited to ampoules, or in multi dose containers, with an added preservative. Tablets, troches, pills, capsules and the like may also contain the components as listed hereafter: a binder such as gum, acacia, corn starch or gelatin; excipients such as dicalcium phosphate; a disintegrating agent such as corn starch, potato starch, alginic acid and the like; a lubricant such as magnesium stearate;

Patent Application

and a sweetening agent such as sucrose, lactose or saccharin may be added or a flavoring agent such as peppermint, oil of wintergreen, or cherry flavoring. When the dosage unit form is a capsule, it may contain, in addition to materials of the above type, a liquid carrier. Various other materials may be present as coatings or to otherwise modify the physical form of the dosage unit. For instance, tablets, pills, or capsules may be coated with shellac, sugar or both. A syrup or elixir may contain one or more active ingredients, sucrose as a sweetening agent, methyl and propylparabens as preservatives, a dye and flavoring such as cherry or orange flavor. In some embodiments as disclosed herein, additional ingredients, for example, nonsteroidal anti-inflammatory drugs or colchicine, ingredients for treating other related indications, or inert substances such as artificial coloring agents are added. Of course, any material used in preparing any dosage unit form should be pharmaceutically pure and substantially non-toxic in the amounts employed. In addition, the one or more active ingredients may be incorporated into sustained-release preparations and formulations as described herein.

[0071] The pharmaceutical compositions of the present disclosure may be administered once daily (QD), twice daily (BID), three times daily (TID) or four times per day (QID). In one embodiment, the pharmaceutical composition of the present disclosure is administered once daily (QD). In another embodiment, the pharmaceutical composition of the present disclosure is administered twice daily (BID).

[0072] This disclosure also describes articles of manufacture such as kits comprising a composition comprising a urate-lowering agent and an anti-inflammatory agent as described above. In some embodiments the urate-lowering agent in the kit is (-)-halofenate (i.e. arhalofenate). In some embodiments the anti-inflammatory agent in the kit is colchicine. In other embodiments the urate-lowering agent in the kit is febuxostat. The kits can include the compositions packaged for distribution and in quantities sufficient to carry out the methods described herein. Kits may also include instructions (e.g. a package insert, package label, etc.) for using the kit components in one or more methods described herein. For example, a kit may comprise dosage forms of a urate-lowering agent and an anti-inflammatory agent described herein, and instructions for prescribing, administering or otherwise using the dosage forms to lower serum uric acid levels. In some embodiments a kit is for a subject with hyperuricemia or a condition associated with hyperuricemia (e.g., gout) to use in the self-administration of the

Patent Application

pharmaceutical composition, wherein the kit comprises a container housing a plurality of dosage forms containing a urate-lowering agent and an anti-inflammatory agent described herein and instructions for carrying out drug administration therewith. In one embodiment, a kit comprises a first dosage form comprising halofenate, halofenic acid, or a pharmaceutically acceptable salt thereof in one or more of the forms identified above and at least a second dosage form comprising one or more of the forms identified above, in quantities sufficient to carry out the methods of the present disclosure. The second dosage form, and any additional dosage forms (e.g., a third, fourth or fifth dosage form) can comprise any active ingredient disclosed herein for the treatment of a hyperuricemic disorder (e.g., gout). All dosage forms together can comprise a therapeutically effective amount of each compound for the treatment of a condition associated with hyperuricemia (e.g., gout). In some embodiments a kit is for a subject with a condition associated with hyperuricemia (e.g., gout) to use in the self-administration of at least one oral agent, wherein the kit comprises a container housing a plurality of said oral agents and instructions for carrying out drug administration therewith. The embodiments of this application are characterized by the specification and by the features of the Claims of this application as filed, and of corresponding pharmaceutical compositions, methods and uses of these compounds.

Examples**Example 1: Clinical Trial**

[0073] This is a randomized, double-blind, placebo-controlled study to evaluate the safety and efficacy of daily oral doses of between 400 to 600 mg of arhalofenate (i.e., (-)-halofenate) in combination with 0.5 mg oral doses of colchicine will be conducted in approximately 90 gout patients with inadequate hypouricemic (uric acid lowering) response to allopurinol alone. Approximately 45 of these 90 patients will participate in an allopurinol/oxypurinol serial PK sample collection sub-study.

[0074] The 90 patients will be randomized in total; approximately 30 to each of 3 study arms in the following manner (1:1:1):

- 1) Arhalofenate 400 mg (plus colchicine 0.5 mg)
- 2) Arhalofenate 600 mg (plus colchicine 0.5 mg)
- 3) Placebo (plus colchicine 0.5 mg)

[0075] Dose/Route/Regimen

Patent Application

[0076] Patients in all treatment groups will take allopurinol 300 mg once daily by mouth starting at Week -3 through the final study follow-up visit, as background therapy for prophylaxis of gout flares. Patients in all treatment groups will also take colchicine 0.5 mg once daily by mouth starting at Week -3 during the run-in and continuing through Week 4. Patients who fail to achieve target serum uric acid lowering on allopurinol alone will be randomized into the study.

[0077] The randomized treatment regimens will be the following (Day 1 through Week 4):

- Treatment Group #1: Arhalofenate 400 mg (plus colchicine)
- Treatment Group #2: Arhalofenate 600 mg (plus colchicine)
- Treatment Group #3: Placebo (plus colchicine)

[0078] Analysis

[0079] All participating patients who will have received treatment in any dose group and for whom the primary PK data are considered to be sufficient and interpretable will be analyzed in the PK analyses. For patients included in the serial PK subset, allopurinol and oxypurinol pharmacokinetics in the presence and absence of arhalofenate at both doses will be determined from the repeat dose (Week 3, Visit 5) plasma concentrations, including the following PK parameters, as appropriate:

- Exposure, or area under the concentration-time curve (AUC₀₋₂₄, AUC_{0-last}, AUC_{0-inf})
- Maximum concentration (C_{max})
- Time to reach maximum concentration (T_{max})
- Terminal elimination half-life (t_{1/2})

[0080] Safety

[0081] The interpretation of the safety and tolerability will be made based on the assessment of safety parameters evaluated throughout the study, including clinical laboratory tests, 12-lead ECGs, vital signs, physical examination, concomitant medication review, and AEs (excluding medical events, which are "AEs" captured before dosing on Day 1). The reporting of the safety data is descriptive, and will include all patients receiving at least one dose of arhalofenate or allopurinol. Descriptive analysis will include the incidence and type of AEs by treatment group including tabulation by severity, as well as actual data and changes in laboratory, vital signs, and 12-lead ECG measurements from pre-dosing to all post-dosing time points.

Patent Application

[0082] Pharmacodynamics

[0083] The effects of each of the three treatment groups will be assessed as the absolute and percent change from baseline to each of the selected post-dosing time points for the following endpoints:

- sUA at Week 4 of treatment
- The proportion of patients achieving a sUA < 6 mg/dL
- The proportion of patients achieving a sUA < 5 mg/dL
- The proportion of patients achieving a sUA < 4 mg/dL

Example 2: Clinical Trial

[0084] This study evaluates the safety and efficacy of single oral doses of between 400 to 600 mg of arhalofenate in combination with 0.6 mg oral doses of colchicine in approximately 10 to 15 gout patients for the treatment of hyperuricemia in patients with gout.

[0085] In addition to allopurinol 300 mg daily for flare prophylaxis, all patients will receive febuxostat and arhalofenate in the following order during the Treatment Phase:

- Days 1 through 7: colchicine 0.6 mg orally once daily (febuxostat only period)
- Days 8 through 21: colchicine 0.6 mg plus arhalofenate 400 mg orally once daily (colchicine plus arhalofenate 400 mg period)
- Days 22 through 35: colchicine 0.6 mg plus arhalofenate 600 mg orally once daily (colchicine plus arhalofenate 600 mg period)

[0086] The sUA level will be assessed on the last day of each treatment period (Day 7, Day 21, and Day 35); on these days, sUA samples will be collected at four different time points: pre-dose (fasting), 2 hours post-dose, 6 hours post-dose, and 10 hours post-dose (prior to evening meal).

[0087] Dose/Route/Regimen

- Allopurinol: 300 mg /oral/daily from Day -16 through Day 49
- Colchicine: 0.6 mg/oral/daily from Day 1 through Day 35
- Arhalofenate: 400 mg/oral daily from Day 8 through Day 21; 600 mg/oral/daily from Day 22 through Day 35

[0088] Duration of Treatment

- Phase 1: Screening Phase: 1 to 4 weeks

Patent Application

- Phase 2: Run-in/Stabilization Phase: ≥ 2 weeks
- Phase 3: Treatment Phase: 5 weeks
- Phase 4: Follow-up Phase: 2 weeks

[0089] Analysis**[0090]** Safety

[0091] The interpretation of the safety and tolerability will be made based on the assessment of safety parameters evaluated throughout the study, including clinical laboratory tests, 12-lead ECGs, vital signs, physical examination, concomitant medication review, and AEs. The reporting of the safety data is descriptive, and will include all patients receiving at least one dose of arhalofenate. Descriptive analysis will include the incidence and type of AEs including tabulation by severity, as well as actual data and changes in laboratory, vital signs, and 12-lead ECG measurements. Listings of clinically significant abnormal laboratory data will be presented. The case report form (CRF)-captured ECG and physical exam will be summarized using categorical statistical method.

[0092] Pharmacodynamics

[0093] The effects of each of the febuxostat plus arhalofenate combination treatment periods will be assessed as the change from baseline (Day 1) to end of treatment period for the following endpoints:

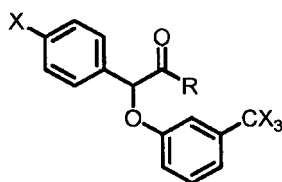
- The proportion of patients achieving a sUA < 6 mg/dL
- The proportion of patients achieving a sUA < 5 mg/dL
- The proportion of patients achieving a sUA < 4 mg/dL
- The proportion of patients achieving a sUA < 3 mg/dL
- Absolute and percent change in sUA

[0094] While the foregoing description describes specific embodiments, those with ordinary skill in the art will appreciate that various modifications and alternatives can be developed. Accordingly, the particular embodiments and examples described above are meant to be illustrative only, and not to limit the scope of the invention, which is to be given the full breadth of the appended claims, and any and all equivalents thereof.

Patent Application

WHAT IS CLAIMED IS:

1. A pharmaceutical composition comprising a first therapeutic agent and a second therapeutic agent,
wherein the first therapeutic agent is a urate-lowering agent, and
the second therapeutic agent is an anti-inflammatory agent.
2. The pharmaceutical composition of Claim 1, wherein the first therapeutic agent is a compound of Formula (I)

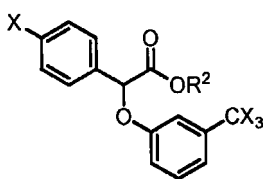


(I)

wherein:

R is selected from the group consisting of arylC₁₋₆alkoxy-, (C₁₋₆alkyl)₂NC₁₋₆alkoxy-, C₁₋₆alkyl-NHC₁₋₆alkoxy-, C₁₋₆alkylC(O)NHC₁₋₆alkoxy-, arylC(O)NHC₁₋₆alkoxy-, C₁₋₆alkyl-NHC(O)NHC₁₋₆alkoxy-, aryloxyC₁₋₆alkoxy- and C₁₋₆alkylNHC(O)NHphenoxy-; and
each X is independently a halogen or a pharmaceutically acceptable salt thereof.

3. The pharmaceutical composition of Claim 1, wherein the first therapeutic agent is a compound of Formula (II)



(II)

wherein R² is selected from the group consisting of arylC₁₋₆alkyl-, C₁₋₆alkylC(O)NHC₁₋₆alkyl-, arylC(O)NHC₁₋₆alkyl-, and each X is independently a halogen or a pharmaceutically acceptable salt thereof.

4. The pharmaceutical composition of Claim 1, wherein the first therapeutic agent is selected from the group consisting of halofenate, halofenic acid and pharmaceutically acceptable salts thereof.

Patent Application

5. The pharmaceutical composition of Claim 1, wherein the first therapeutic agent is selected from the group consisting of (-)-halofenate, (-)-halofenic acid and pharmaceutically acceptable salts thereof.
6. The pharmaceutical composition of Claim 5, wherein the first therapeutic agent is (-)-halofenate.
7. The pharmaceutical composition of Claim 1, wherein the second therapeutic agent is colchicine.
8. The pharmaceutical composition of Claim 1, having a fixed dose combination.
9. The pharmaceutical composition of Claim 1, comprising from about 100 mg to about 1000 mg, or from about 200 mg to about 800 mg of the first therapeutic agent.
10. The pharmaceutical composition of Claim 7, comprising from about 0.1 mg to 2.0 mg, or from about 0.3 mg to about 1.2 mg of colchicine.
11. The pharmaceutical composition of Claim 1, comprising 600 mg of (-)-halofenate and 0.6 mg of colchicine.
12. The pharmaceutical composition of Claim 1, further comprising a pharmaceutically acceptable diluent or carrier.
13. A method for treating a gout flare experienced by a subject comprising concomitantly or sequentially administering to the subject a first therapeutic agent and a second therapeutic agent, wherein:
 - the first therapeutic agent is selected from the group consisting of (-)-halofenate, (-)-halofenic acid, and pharmaceutically acceptable salts thereof; and
 - the second therapeutic agent is colchicine.
14. A method for reducing the number, duration, frequency or intensity of gout flares experienced by a subject comprising concomitantly or sequentially administering to the subject a first therapeutic agent and a second therapeutic agent, wherein:

Patent Application

the first therapeutic agent is selected from the group consisting of (-)-halofenate, (-)-halofenic acid, and pharmaceutically acceptable salts thereof; and
the second therapeutic agent is colchicine.

15. A method for the treatment of hyperuricemia in a subject with gout comprising concomitantly or sequentially administering to the subject a first therapeutic agent and a second therapeutic agent, wherein:

the first therapeutic agent is selected from the group consisting of (-)-halofenate, (-)-halofenic acid, and pharmaceutically acceptable salts thereof; and
the second therapeutic agent is colchicine.

16. The method of Claim 13, wherein the first therapeutic agent is (-)-halofenate.

17. The method of Claim 13, wherein the first therapeutic agent is administered at from about 200 mg to about 800 mg per day and the second therapeutic agent is administered at from about 0.1 mg to about 2.0 mg per day.

18. The method of Claim 14, wherein the first therapeutic agent is (-)-halofenate.

19. The method of Claim 15, wherein the first therapeutic agent is (-)-halofenate.

20. The method of Claim 14, wherein the first therapeutic agent is administered at from about 200 mg to about 800 mg per day and the second therapeutic agent is administered at from about 0.1 mg to about 2.0 mg per day.

21. The method of Claim 15, wherein the first therapeutic agent is administered at from about 200 mg to about 800 mg per day and the second therapeutic agent is administered at from about 0.1 mg to about 2.0 mg per day.

22. A kit comprising a composition of any of Claims 1-12.

23. The kit of Claim 22, further comprising a package insert with instructions indicating that the two therapeutic agents can be used together.

INTERNATIONAL SEARCH REPORT

international application No.
PCT/US2013/036474

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(8) - A61K 31/221 (2013.01)
 USPC - 514/550
 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)
 IPC(8) - A61K 31/165, 31/221, 31/24 (2013.01)
 USPC - 514/534, 543, 550, 629

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
 CPC - A61K 31/165, 31/221 (2013.01)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 PatBase, Orbit, PubChem, Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2009/151695 A1 (O'NEIL et al) 17 December 2009 (17.12.2009) entire document	1, 7-9, 12, 22, 23
Y		2-6, 10, 11
Y	US 2003/0220399 A1 (LUSKEY et al) 27 November 2003 (27.11.2003) entire document	2-6, 11, 13-21
Y	US 2010/0137235 A1 (DAVIS) 03 June 2010 (03.06.2010) entire document	10, 11, 13-21

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 09 August 2013	Date of mailing of the international search report 20 AUG 2013
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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摘要

本文公開了用於降低受試者的血清尿酸水準以及用於治療與升高的血清尿酸水準相關病症的藥物組合物、方法和試劑盒，包括給予包含尿酸降低劑和抗炎劑的組合物。在一些方面，所述尿酸降低劑是(-)-鹵芬酯、(-)-鹵芬酸、或其藥用鹽。在一些方面，所述第二試劑是抗炎劑、或其藥用鹽。