

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
23 December 2010 (23.12.2010)

PCT

(10) International Publication Number
WO 2010/148104 A2

(51) International Patent Classification:

A61K 8/37 (2006.01) A61K 8/72 (2006.01)
A61K 8/36 (2006.01) A61Q 5/00 (2006.01)
A61K 8/30 (2006.01)

(21) International Application Number:

PCT/US2010/038846

(22) International Filing Date:

16 June 2010 (16.06.2010)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/187,465 16 June 2009 (16.06.2009) US
61/187,512 16 June 2009 (16.06.2009) US
61/239,903 4 September 2009 (04.09.2009) US

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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— without international search report and to be republished upon receipt of that report (Rule 48.2(g))



WO 2010/148104 A2

(54) Title: TOPICAL COMPOSITIONS CONTAINING A POLYMER FOR RELEASING AT LEAST ONE SALICYLIC ACID COMPOUND

(57) Abstract: The invention relates to compositions for topical application to hair comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound.

TITLE OF THE INVENTION

TOPICAL COMPOSITIONS CONTAINING A POLYMER FOR RELEASING
AT LEAST ONE SALICYLIC ACID COMPOUND

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of priority under 35 U.S.C. §119 (e) from U.S. Provisional Application Serial Nos. 61/239,903, filed September 4, 2009; 61/187,512, filed June 16, 2009; and 61/187,465, filed June 16, 2009, the entire contents of which are hereby incorporated by reference.

FIELD OF THE INVENTION

[0002] The present invention relates to compositions for topical application to hair such as cosmetic or dermatologic compositions comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound. Such topical compositions can be used in treating or preventing hair-related conditions and/or improving hair characteristics or properties.

DISCUSSION OF THE BACKGROUND

[0003] Salicylic acid compounds and other active agents are known to be useful in treating hair conditions such as, for example, seborrheic dermatitis, itchiness and flakiness and/or improving hair properties such as, for example, improving the quality of hair fiber before, during or after treatment (for example, relaxing, permanent, dying, bleaching, styling). However, formulating topical compositions containing

salicylic acid compound and/or other active agents can be problematic – it can be difficult to prepare a stable formulation containing salicylic acid compound and/or other active agents because, for example, salicylic acid compound and/or other active agents react with other ingredients commonly found in such formulations, thereby negatively affecting salicylic acid compound and/or other active agent activity or stability. Such lack of stability or activity can, in turn, affect the ability of the formulation to provide effective salicylic acid compound and/or other active agent over time, meaning that typical formulations containing salicylic acid compound and/or other active agents must be constantly reapplied to sustain salicylic acid compound and/or other active agent activity.

[0004] U.S. patent 7,122,615 and related patents disclose biocompatible aromatic polyanhydrides reportedly having improved degradation properties and processability, and “unique” therapeutic properties. However, these patents do not effectively disclose using such polyanhydrides in topical compositions, or that such polyanhydrides possess properties which could render them useful in topical compositions.

[0005] There is a need for topical compositions which can provide effective amounts of a salicylic acid compound and/or other active agent(s) to the hair of a mammal, particularly humans, which can treat or prevent hair-related conditions and/or improve hair characteristics or properties.

SUMMARY OF THE INVENTION

[0006] The present invention relates to compositions for topical application to hair comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound.

[0007] The present invention relates to compositions for topical application to hair comprising at least one polymer comprising at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound.

[0008] The present invention also relates to methods for treating or preventing hair-related conditions which can be treated or prevented using a salicylic acid compound comprising topically applying to the hair of a human a composition comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound in an amount sufficient to treat or prevent the condition.

[0009] The present invention also relates to methods for treating or preventing hair-related conditions which can be treated or prevented using a salicylic acid compound and at least one other active agent comprising topically applying to the hair of a human a composition comprising at least one polymer comprising at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound in an amount sufficient to treat or prevent the condition.

[0010] The present invention further relates to methods for improving hair properties or characteristics which can be improved using a salicylic acid compound comprising topically applying to the hair of a human a composition comprising at least one polymer comprising at least one

salicylic acid compound and at least one dicarboxylic acid compound in an amount sufficient to improve the property or characteristic.

[0011] The present invention further relates to methods for improving hair properties or characteristics which can be improved using a salicylic acid compound and at least one other active agent comprising topically applying to the hair of a human a composition comprising at least one polymer comprising at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound in an amount sufficient to improve the property or characteristic.

[0012] The present invention also relates to methods for providing extended treatment to hair comprising topically applying to hair a composition comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound in an amount sufficient to treat the hair with the salicylic acid compound over a period of time.

[0013] The present invention also relates to methods for providing extended treatment to hair comprising topically applying to hair a composition comprising at least one polymer comprising at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound in an amount sufficient to treat the hair with the salicylic acid compound and/or at least one other active agent over a period of time.

[0014] The present invention further relates to methods for stabilizing a salicylic acid compound in a topical composition comprising

incorporating the salicylic acid compound into a polymer comprising at least one dicarboxylic acid compound.

[0015] The present invention further relates to methods for stabilizing a salicylic acid compound and/or at least one other active agent in a topical composition comprising incorporating the salicylic acid compound and at least one other active agent into a polymer comprising at least one dicarboxylic acid compound.

[0016] It is to be understood that both the foregoing general description and the following detailed description are exemplary and explanatory only, and are not restrictive of the invention.

DETAILED DESCRIPTION OF THE INVENTION

[0017] As used herein, the expression "at least one" means one or more and thus includes individual components as well as mixtures/combinations.

[0018] Other than in the operating examples, or where otherwise indicated, all numbers expressing quantities of ingredients and/or reaction conditions are to be understood as being modified in all instances by the term "about," meaning within 10% to 15% of the indicated number.

[0019] "Hair" as used herein means hair and scalp.

[0020] "Substituted" as used herein, means comprising at least one substituent. Non-limiting examples of substituents include atoms, such as oxygen atoms and nitrogen atoms, as well as functional groups, such as hydroxyl groups, ether groups, alkoxy groups, acyloxyalkyl groups, oxyalkylene groups, polyoxyalkylene groups, carboxylic acid groups, amine

groups, acylamino groups, amide groups, halogen containing groups, ester groups, thiol groups, sulphonate groups, thiosulphate groups, siloxane groups, and polysiloxane groups. The substituent(s) may be further substituted.

[0021] The compositions and methods of the present invention can comprise, consist of, or consist essentially of the essential elements and limitations of the invention described herein, as well as any additional or optional ingredients, components, or limitations described herein or otherwise useful.

[0022] POLYMER

[0023] According to the present invention, compositions comprising at least one polymer including at least one salicylic acid compound and at least one dicarboxylic acid compound are provided.

[0024] According to the present invention, compositions comprising at least one polymer including at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound are provided.

[0025] The polymers of the present invention comprise at least one (ester-linker-ester) unit in which at least one ester portion is a salicylic acid compound, and the linker is a substituted or unsubstituted hydrocarbon chain containing two terminal carbonyl groups, and optionally containing one or more additional carbonyl groups and/or one or more atoms other than carbon such as oxygen, nitrogen or sulfur atoms. Preferably, the two terminal carbonyl groups of the linker correspond to the two carboxylic acid portions of the dicarboxylic acid compound, and the ester linkages are

formed between the hydroxyl functionality of the active agent(s) and the hydroxyl portion of the two carboxylic acid portions of the dicarboxylic acid compound. In the polymers of the present invention, the ester portions of the identified ester-linker-ester unit can either be the same active agents or different active agents among individual units. For example, both ester portions can be salicylic acid; both ester portions can be another salicylic acid compound such as 5-n-octylsalicylic acid (also referred to as 2-hydroxy-5-octanoylbenzoic acid); one ester portion can be salicylic acid and the other ester portion can be another salicylic acid compound such as 5-n-octylsalicylic acid; one ester portion can be salicylic acid and the other ester portion can be another active agent such as vitamin C; one ester portion can be another salicylic acid compound such as 5-n-octylsalicylic acid and the other ester portion can be another active agent such as vitamin C; etc.

[0026] According to preferred embodiments of the present invention, the polymer comprises a unit represented by the following formula:

[0027] $[X-Y-X]_z$

[0028] in which:

[0029] X is salicylic acid or a salt thereof;

[0030] Y is a hydrocarbon chain, substituted or unsubstituted, linear, branched or cyclic, containing two terminal carbonyl groups, and optionally containing one or more additional carbonyl groups and/or one or more atoms other than carbon such as oxygen, nitrogen or sulfur within the chain. Preferably, the hydrocarbon chain contains 1 to 20 carbon atoms, more preferably 1 to 10 carbon atoms, more preferably 2 to 6 carbon atoms,

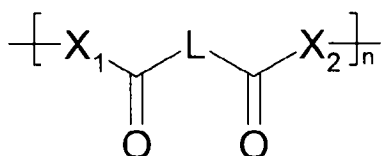
and more preferably 2 to 4 carbon atoms, including all ranges and subranges therebetween. Preferably, the hydrocarbon chain is hydrophobic. Most preferably, the hydrocarbon chain is an anhydride. Examples of suitable linkers include, but are not limited to, glutaric acid, adipic acid and diglycolic anhydride; and

[0031] z is preferably a number between 1 and 1,000, preferably between 10 and 750, and more preferably between 25 and 500, including all ranges and subranges therebetween.

[0032] Useful salts may be obtained by salification of a salicylic acid compound with a base. Useful bases include inorganic bases such as alkali and alkaline metal hydroxides (sodium hydroxide, potassium hydroxide, and the like) or ammonia hydroxides. Organic bases may also be used for salification. Also useful are amphoteric bases. Quaternium salts such as dimethylhydroxypropyl ammonium salts can also be useful.

[0033] According to preferred embodiments of the present invention, the polymer comprises a unit represented by the following formula:

[0034]

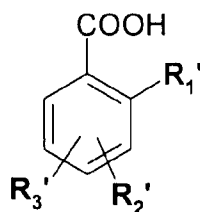


[0035] wherein X1 and X2 can be the same or different, and can be a salicylic acid compound and/or an active agent other than a salicylic acid compound; n is a number preferably ranging from 1 to 1000, more

preferably from 3 to 500, and most preferably from 5 to 100; and L is a linking structure.

[0036] According to the present invention, at least one of X1 and X2 is a salicylic acid compound. X1 and/or X2 can be salicylic acid or any salt thereof, or any derivative of salicylic acid, having any substitution at any location of salicylic acid. Preferably, the salicylic acid compound is salicylic acid, an alkylated derivative of formula (I) below, or a salt of either:

[0037]



[0038] in which R₁' represents a hydroxyl radical or an ester of formula:

[0039] --O--CO--R₄'

[0040] in which R₄' is a saturated or unsaturated aliphatic radical containing from 1 to 26 carbon atoms, preferably from 1 to 18 carbon atoms, or an amine or thiol function optionally substituted with an alkyl radical containing from 1 to 18 carbon atoms, preferably 1 to 12 carbon atoms,

[0041] R₂' and R₃', independently of one another, are in position 3, 4, 5 or 6 on the benzene ring and represent, independently of one another, a hydrogen atom or a radical:

[0042] --(O)_n--(CO)_m--R₅'

[0043] in which n and m , independently of one another, are each an integer equal to 0 or 1; on condition that R_2 and R_3 are not simultaneously hydrogen atoms,

[0044] R_5 represents a hydrogen atom, a linear, branched or cyclized saturated aliphatic radical containing from 1 to 18 carbon atoms or an unsaturated radical containing from 3 to 18 carbon atoms, bearing one to nine conjugated or non-conjugated double bonds, it being possible for the radicals to be substituted with at least one substituent chosen from halogen atoms (fluorine, chlorine, bromine or iodine), trifluoromethyl radicals, hydroxyl in free form or esterified with an acid containing from 1 to 6 carbon atoms, or carboxyl in free form or esterified with a lower alcohol containing from 1 to 6 carbon atoms. The salicylic acid derivative of formula (I) is preferably such that R_1 represents a hydroxyl radical, R_2 represents a hydrogen atom, R_3 is in position 5 of the benzene ring and represents a radical $—CO—R_5$ in which R_5 represents a saturated aliphatic radical containing from 3 to 15 carbon atoms.

[0045] Suitable salicylic acid compounds are disclosed, for example, in U.S. patent nos. 6,159,479, 5,558,871, 4,767,750, 5,267,407, 5,667,789, and 5,580,549, and U.S. patent application publication nos. 2009/0029928 and 2004/0162272, the disclosures of all of which are incorporated by reference in their entirety.

[0046] Particularly preferred salicylic acid compounds include 5- n -octanoylsalicylic acid, 5- n -decanoylsalicylic acid, 5- n -dodecanoylsalicylic acid, 5- n -octylsalicylic acid, 5- n -heptyloxysalicylic acid, 4- n -heptyloxysalicylic acid, 5-*tert*-octylsalicylic acid, 3-*tert*-butyl-5-methylsalicylic

acid, 3-tert-butyl-6-methylsalicylic acid, 3,5-diisopropylsalicylic acid, 5-butoxysalicylic acid, 5-octyloxysalicylic acid, 5-propanoylsalicylic acid, 5-n-hexadecanoylsalicylic acid, 5-n-oleoylsalicylic acid, 5-benzoylsalicylic acid, monovalent and divalent salts thereof, and mixtures thereof.

[0047] Useful salts may be obtained by salification of a salicylic acid compound with a base. Useful bases include inorganic bases such as alkali and alkaline metal hydroxides (sodium hydroxide, potassium hydroxide, and the like) or ammonia hydroxides. Organic bases may also be used for salification. Also useful are amphoteric bases. Quaternium salts such as dimethylhydroxypropyl ammonium salts can also be useful.

[0048] If present, the active agent other than salicylic acid compound (X1 or X2) can include, but are not limited to, active agents known for whitening skin, peeling skin, hydrating keratinous material, moisturizing keratinous material, coloring keratinous material, stimulating synthesis of dermal or epidermal macromolecules (and/or inhibiting degradation of such macromolecules), and improving capillary circulation, as well as antioxidants, antidandruff agents, antiglycation agents, antiseborrheic agents, and sunscreens. Also, any active agent having at least two reactive functions (acid, hydroxyl, NH_2 , mercapto, etc.) may be acceptable. Preferably, the other active has a sufficient number of functional groups to allow modification of polymer properties such as, for example, crosslinking, branching, attaching other molecules, solubility, or biodistribution of the polymer. Specific examples of acceptable other active agents include, but are not limited to, (3-hydroxy-2-pentylcyclopentyl)acetic acid, kojic acid, ferrulic acid, vanillic acid, syringic acid, glycolic acid, lactic or

any alpha hydroxyl acid, gentisic acid, hydroxyethyl urea, dihydroxyacetone, and vitamin C.

[0049] L is a divalent branched or unbranched, substituted or unsubstituted, saturated or unsaturated, hydrocarbon chain preferably having 1 to 100, preferably 1 to 50 carbon atoms, including all ranges and subranges therebetween. Preferably, the hydrocarbon chain contains 1 to 20 carbon atoms, more preferably 1 to 10 carbon atoms, more preferably 2 to 6 carbon atoms, and more preferably 2 to 4 carbon atoms, including all ranges and subranges therebetween. Preferably, the hydrocarbon chain is hydrophobic. According to preferred embodiments, if substituted, L is preferably substituted with one or more R groups, where R is preferably C1-C6 alkoxy, C3-C6 cycloalkyl, C1-C6 alkanoyl, C1-C6 alkanoyloxy, C1-C6 alkoxy carbonyl, C1-C6 allylthio, azido, cyano, nitro, halo, hydroxyl, oxo, carboxy, aryl, aryloxy, heteroaryl, or heteroaryloxy.

[0050] Preferably, the polymer has a Mw between 5,000 and 50,000, more preferably between 7,500 and 35,000, and most preferably between 9,000 and 25,000, including all ranges and subranges therebetween.

[0051] Preferably, the polymer has a Tg between 15 and 75°C, more preferably between 20 and 60°C, and more preferably between 25 and 55°C, including all ranges and subranges therebetween.

[0052] In accordance with the present invention, the polymer can be a homopolymer containing the same repeating unit, or it can be a copolymer containing one or more repeating units in addition to the above unit.

[0053] According to the present invention, the polymer must satisfy one or more of the following conditions, preferably all of the following conditions, to be suitable for use in a topical composition:

[0054] (1) it is soluble in isopropyl lauroyl sarcosinate, caprylic/capric triglyceride, dimethyl isosorbide, dicaprylyl carbonate, isononyl isononanoate and/or octyldodecanol at 5% concentration level (preferably at a 20% concentration level);

[0055] (2) it is stable for 1 month at 45°C in one or more of the above-mentioned solvents;

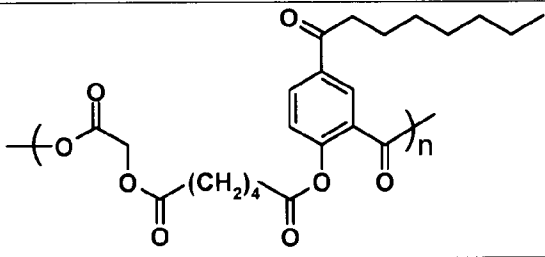
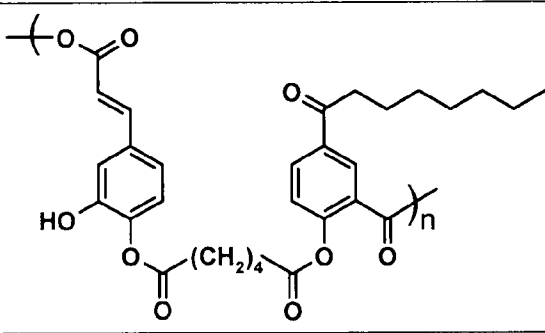
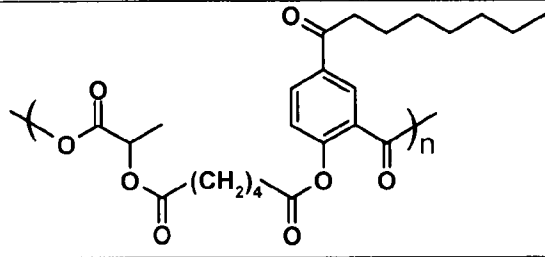
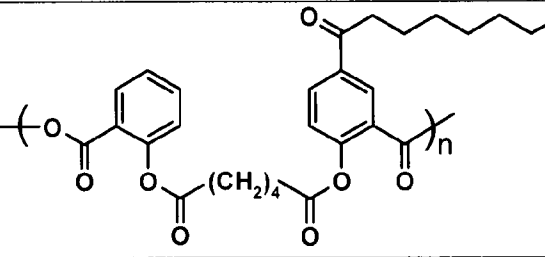
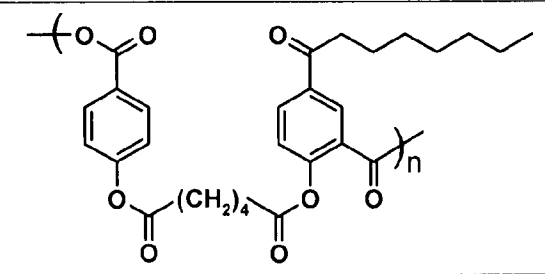
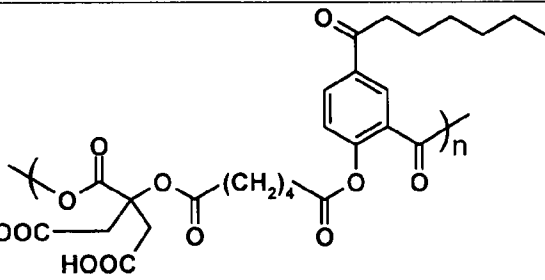
[0056] (3) it releases salicylic acid compound and/or other active agent at a rate of at least about 10% after about four hours; and

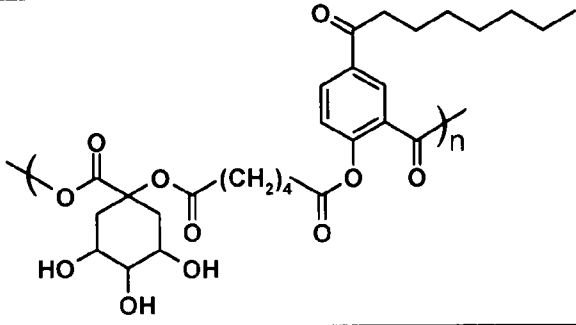
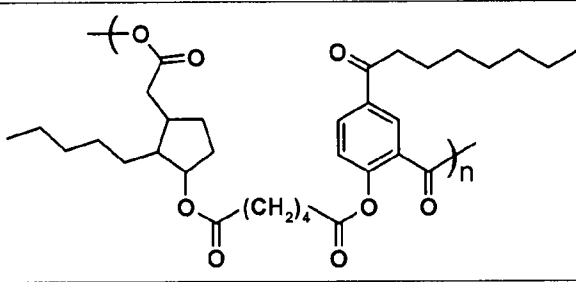
[0057] (4) it releases salicylic acid compound and/or other active agent at a rate of at least about 50% after about twelve hours.

[0058] Because of such properties, the polymer can be effectively used in topical formulations.

[0059] Specifically preferred polymers include, for example, Poly (2-hydroxy-5-octanoylbenzoic acid) with adipic acid, Poly (2-hydroxy-5-octanoylbenzoic acid /Salicylic acid – 50/50) with adipic acid, Poly (2-hydroxy-5-octanoylbenzoic acid /Lactic acid – 50/50) with adipic acid, Poly (2-hydroxy-5-octanoylbenzoic acid 5/Glycolic acid – 50/50) with adipic acid, Poly (2-hydroxy-5-octanoylbenzoic acid) with azelaic acid, Poly (Salicylic acid) with azelaic acid, and Poly (2-hydroxy-5-octanoylbenzoic acid /Salicylic acid - 50/50) with azelaic acid. Specifically preferred polymers are also disclosed, with corresponding structures, in the following table:

Example	X1	X2	L	Structure
1	5-n-octanoylsalicylic acid	ferulic acid	$(CH_2)_4$	
2	5-n-octanoylsalicylic acid	gentisic acid	$(CH_2)_4$	
3	5-n-octanoylsalicylic acid	gallic acid	$(CH_2)_4$	
4	5-n-octanoylsalicylic acid	Syringic acid	$(CH_2)_4$	
5	5-n-octanoylsalicylic acid	Vanillic acid	$(CH_2)_4$	

6	5-n-octanoylsalicylic acid	glycolic acid	$(CH_2)_4$	
7	5-n-octanoylsalicylic acid	Caffeic acid	$(CH_2)_4$	
8	5-n-octanoylsalicylic acid	Lactic acid	$(CH_2)_4$	
9	5-n-octanoylsalicylic acid	Salicylic acid	$(CH_2)_4$	
10	5-n-octanoylsalicylic acid	benzoic acid	$(CH_2)_4$	
11	5-n-octanoylsalicylic acid	Citric acid	$(CH_2)_4$	

<p>12</p>	<p>5-n-octanoylsalicylic acid</p>	<p>Quinic acid</p>	<p>(CH₂)₄</p>	
<p>13</p>	<p>5-n-octanoylsalicylic acid</p>	<p>3-hydroxy-2-pentylcyclopentanecarboxylic acid</p>	<p>(CH₂)₄</p>	

[0060] According to the present invention, the polymers of the present invention are capable of releasing salicylic acid compound and/or other active agent (for example, through degradation and/or ester cleavage), and the released salicylic acid compound and/or other active agent is topically active. In accordance with preferred embodiments, the polymer releases salicylic acid compound and/or other active agent in a topically effective amount: that is, in an amount sufficient to treat hair, for example in an amount sufficient to treat or prevent hair conditions such as, for example, seborrheic dermatitis, itchiness or flakiness and/or to improve hair properties such as, for example, improving the quality of hair fiber before, during or after treatment (for example, relaxing, permanent, dying, bleaching, styling). Of course, the effective amount of salicylic acid compound and/or other active agent may vary depending upon the hair condition or property being treated or prevented such that the amount of salicylic acid compound and/or other active agent released is in accordance with known treatment or

prevention methods using a salicylic acid compound and/or other active agent (or methods in which such treatment or prevention could be determined without undue experimentation). Generally speaking, the salicylic acid compound and/or other active agent are preferably present in the polymer in a combined amount ranging from about 1 to 95% by weight, more preferably from about 10 to about 85% by weight, and more preferably from about 45 to about 75% by weight, based on the total weight of the polymer, including all ranges and subranges within these ranges.

[0061] The composition of the invention can further optionally comprise any additive usually used in the field under consideration. For example, oils, water, pigments, solvents such as alcohols, polyols, film forming agents, dispersants, antioxidants, vitamins, sunscreens, preserving agents, fragrances, fillers, neutralizing agents, surfactants, antiperspirants, hydrophilic polymers, and mixtures thereof can be added. A non-exhaustive listing of such ingredients can be found in U.S. patent application publication nos. 2009/0029928 and 2004/0170586, the entire contents of which are hereby incorporated by reference. Further examples of suitable additional components can be found in the other references which have been incorporated by reference in this application. Still further examples of such additional ingredients may be found in the *International Cosmetic Ingredient Dictionary and Handbook* (9th ed. 2002).

[0062] The compositions according to the invention can be in any form, including all of the galenic forms normally used in the cosmetics and dermatological fields, in particular in the form of lotions, emulsions (W/O or O/W or multiple), aqueous gel or solutions, aqueous-alcoholic gel or

solution, aqueous-glycolic gel or solution, and can be prepared according to the usual methods.

[0063] When the composition according to the invention comprises an oily phase, in particular when it is in the form of an emulsion, the oily phase preferably contains at least one oil, in particular physiologically acceptable oil. It can also contain other fatty substances.

[0064] When the composition is in the form of an emulsion, it is preferably an oil-in-water (O/W) emulsion. The emulsions generally contain at least one emulsifier chosen in particular from amphoteric, anionic, cationic or nonionic emulsifiers, used alone or as a mixture. These emulsifiers are chosen from those conventionally used in the cosmetics field. The amount of surfactants (in terms of active material) can range, for example, from 0.1% to 70% by weight, preferably from 0.5% to 60% by weight, better still from 1% to 50% by weight, and even better still from 1% to 30% by weight, relative to the total weight of the composition.

[0065] It is also possible to prepare emulsions without emulsifying surfactants, or containing less than 0.5% thereof, with respect to the total weight of the composition, using appropriate compounds, for example polymers having emulsifying properties, such as the polymers sold under the names Carbopol 1342 and Pemulen by the company Noveon; or optionally crosslinked and/or neutralized polymers and copolymers of 2-acrylamido-2-methylpropanesulphonic acid, such as the poly-(2-acrylamido-2-methylpropanesulphonic acid) sold by the company Clariant under the name "Hostacerin AMPS" (INCI name: ammonium polyacryldimethyltauramide) or such as the emulsion polymer sold under the

name Sepigel 305 by the company Seppic (INCI name: polyacrylamide/C13-C14 isoparaffin/laureth-7); particles of ionic or nonionic polymers, more particularly particles of anionic polymer, such as in particular isophthalic acid or sulphoisophthalic acid polymers, and in particular phthalate/sulphoisophthalate/glycol copolymers (for example, diethylene glycol/phthalate/isophthalate/1,4-cyclohexanedimethanol copolymers (INCI name: diglycol/CHDM/isophthalates/SIP copolymer) sold under the names Eastman AQ polymer (AQ35S, AQ38S, AQ55S, AQ48 Ultra) by the company Eastman Chemical.

[0066] It is also possible to prepare emulsions without emulsifiers, stabilized with silicone particles or particles of metal oxide such as TiO₂ or the like, which may or may not be coated.

[0067] A person skilled in the art will take care to select the optional additional additives and/or the amount thereof such that the advantageous properties of the composition according to the invention are not, or are not substantially, adversely affected by the envisaged addition.

[0068] These substances may be selected variously by the person skilled in the art in order to prepare a composition which has the desired properties, for example, consistency or texture.

[0069] These additives may be present in the composition in a proportion from 0% to 99% (such as from 0.01% to 90%) relative to the total weight of the composition and further such as from 0.1% to 50% (if present), including all ranges and subranges therebetween.

[0070] Needless to say, the composition of the invention should be cosmetically or dermatologically acceptable, i.e., it should contain a non-

toxic physiologically acceptable medium and should be able to be applied to the eyelashes of human beings.

[0071] According to other preferred embodiments, a topical composition comprises micelles in which at least one polymer of the present invention is encapsulated. Encapsulating active agents in micelles is well-known in the art. Preferably, such micelles comprise at least one polymer of the present invention but do not contain any solvent. In accordance with these preferred embodiments, the polymer is released from the micelle upon application of the topical composition (for example, mechanical agitation associated with applying the composition and/or hydrolysis may cause disruption of the micelle and release of the polymer). Once the polymer has been released from the micelle, the salicylic acid compound(s) and/or other active agent(s) can be released from the polymer as discussed above.

[0072] In accordance with other preferred embodiments, topical compositions comprising at least one polymer of the present invention may be combined with other compositions or actions upon application to hair. In accordance with these preferred embodiments, kits comprising a topical composition comprising at least one polymer of the present invention and a second composition for combination with the topical composition can be provided. For example, a kit comprising a first composition comprising, consisting essentially of, or consisting of at least one polymer of the present invention and a second composition comprising at least one solvent in which the polymer(s) is (are) solubilized can be provided. At the time of application, the first composition can be combined with the second composition to solubilize the polymer(s), and such solubilization results in

release of salicylic acid compound(s) and/or other active agent(s) of the polymer(s). Alternatively, the first composition may further comprise a solvent such that the polymer(s) is (are) solubilized, but release of salicylic acid compound(s) and/or other active agent(s) does not occur. In such embodiments, the second composition comprises a compound which triggers release of the salicylic acid compound(s) and/or other active agent(s) from the polymer(s). For example, the second composition could comprise a pH adjusting agent which, upon combination of the two compositions, could subject the polymer to pH conditions which would cause release of the salicylic acid compound and/or other active agent. Of course, such a pH triggered release of the salicylic acid compound and/or other active agent could occur in the first embodiment (or any other embodiment) as well.

[0073] According to preferred embodiments, methods for treating or preventing hair-related conditions which can be treated or prevented using a salicylic acid compound comprising topically applying to the hair of a human a composition comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound in an amount sufficient to treat or prevent the condition are provided.

[0074] According to preferred embodiments, methods for treating or preventing hair-related conditions which can be treated or prevented using a salicylic acid compound and/or other active agent comprising topically applying to the hair of a human a composition comprising at least one polymer comprising at least one salicylic acid

compound, at least one other active agent, and at least one dicarboxylic acid compound in an amount sufficient to treat or prevent the condition are provided.

[0075] According to preferred embodiments, methods for improving hair properties or characteristics which can be improved using a salicylic acid compound comprising topically applying to the hair of a human a composition comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound in an amount sufficient to improve the property or characteristic are provided.

[0076] According to preferred embodiments, methods for improving hair properties or characteristics which can be improved using a salicylic acid compound and/or other active agent comprising topically applying to the hair of a human a composition comprising at least one polymer comprising at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound in an amount sufficient to improve the property or characteristic are provided.

[0077] According to preferred embodiments, methods for providing extended treatment to hair comprising topically applying to hair a composition comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound in an amount sufficient to treat the hair with the salicylic acid compound over a period of time are provided. Preferably, extended treatment occurs for a period between 4 hours and 5 days per application of the composition, more preferably 6 hours and 3 days, more preferably between 8 hours and 2 days.

[0078] According to preferred embodiments, methods for providing extended treatment to hair comprising topically applying to hair a composition comprising at least one polymer comprising at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound in an amount sufficient to treat the hair with the salicylic acid compound and/or other active agent over a period of time are provided. Preferably, extended treatment occurs for a period between 4 hours and 5 days per application of the composition, more preferably 6 hours and 3 days, more preferably between 8 hours and 2 days.

[0079] According to preferred embodiments, methods of treating or preventing seborrheic dermatitis comprising applying a composition to the hair comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound in an amount sufficient to prevent or treat seborrheic dermatitis are provided.

[0080] According to preferred embodiments, methods of treating or preventing seborrheic dermatitis comprising applying a composition to the hair comprising at least one polymer comprising at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound in an amount sufficient to prevent or treat seborrheic dermatitis are provided.

[0081] According to preferred embodiments, methods of preventing or treating scalp itchiness or flakiness/dandruff comprising applying to the hair a composition comprising at least one polymer comprising at least one salicylic acid compound and at least one

dicarboxylic acid compound in an amount sufficient to prevent or treat scalp itchiness or flakiness are provided.

[0082] According to preferred embodiments, methods of preventing or treating scalp itchiness or flakiness/dandruff comprising applying to the hair a composition comprising at least one polymer comprising at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound in an amount sufficient to prevent or treat scalp itchiness or flakiness are provided.

[0083] According to preferred embodiments, methods of improving hair properties such as, for example, strength, flexibility, resiliency, comprising applying to hair a composition comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound in an amount sufficient to improve the desired hair properties are provided.

[0084] According to preferred embodiments, methods of improving hair properties such as, for example, strength, flexibility, resiliency, comprising applying to hair a composition comprising at least one polymer comprising at least one salicylic acid compound, at least one other active agent, and at least one dicarboxylic acid compound in an amount sufficient to improve the desired hair properties are provided.

[0085] In accordance with these preceding preferred embodiments, the compositions of the present invention comprising at least one polymer comprising at least one salicylic acid compound and/or at least one other active agent, and at least one dicarboxylic acid compound are applied topically to the hair of a person in need of the desired treatment or

prevention in an amount sufficient to achieve the desired result. The compositions may be applied to the desired area as needed, preferably once or twice daily, more preferably once daily or even once every two days.

[0086] According to preferred embodiments, methods of stabilizing a salicylic acid compound and/or other active agent in a topical composition comprising incorporating the salicylic acid compound and/or other active agent into a polymer comprising at least one dicarboxylic acid compound are provided.

[0087] Unless otherwise indicated, all numbers expressing quantities of ingredients, reaction conditions, and so forth used in the specification and claims are to be understood as being modified in all instances by the term "about." Accordingly, unless indicated to the contrary, the numerical parameters set forth in the following specification and attached claims are approximations that may vary depending upon the desired properties sought to be obtained by the present invention.

[0088] Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the invention are approximations, the numerical values set forth in the specific examples are reported as precisely as possible. Any numerical value, however, inherently contain certain errors necessarily resulting from the standard deviation found in their respective measurements. The following examples are intended to illustrate the invention without limiting the scope as a result. The percentages are given on a weight basis.

[0089] Examples

[0090] Experimental Synthesis Protocol

[0091] 1. Synthesis of diacids

[0092] In a 2 liter reactor, add acids under nitrogen flow. Then, add 1 liter of THF. Stir until dissolution. Then, add pyridine. Dilute the acid chloride in 250 ml of THF and add the mixture in the reactor dropwise for 45 minutes. Leave at room temperature for 3 hours. Transfer the organic solution into 1 liter of water. Acidify to pH=2 by addition of hydrochloric acid 10N. Extract with the dichloromethane. Dry under MgSO₄. Concentrate in the rotary evaporator. Dry in 40°C during 24 hours to yield diacid.

[0093] 2. Synthesis of polyesters

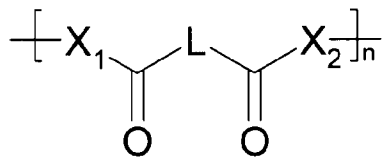
[0094] Put the diacid in a 2 liter reactor. Add 1.5 l of acetic anhydride. Solubilize at room temperature and leave under stirring during 1 hour. Put the reactor under vacuum ($6 \cdot 10^{-2}$ mbar) for 6 hours. React at 180°C for 1 hour and leave under vacuum. Stir until gaseous release stops. Return to room temperature and atmospheric pressure. Dissolve the polymer in dichloromethane. Precipitate the polymer in diethyl ether. Dry under vacuum in 50°C during 48 hours and recover the polyester.

[0095] The following compounds were prepared according to the above procedure.

	Compound A	Compound B	Compound C	Compound D	Compound E	Compound F	Compound G
Acid 1	2-hydroxy-5-octanoylbenzoic acid 75g 0.284 mole	2-hydroxy-5-octanoylbenzoic acid 50g 0.189 mole	2-hydroxy-5-octanoylbenzoic acid 50g 0.189 mole	2-hydroxy-5-octanoylbenzoic acid 50g 0.189 mole	2-hydroxy-5-octanoylbenzoic acid 58.64g 0.222 mole	Salicylic acid 31.3g 0.226 mole	2-hydroxy-5-octanoylbenzoic acid 40g 0.152 mole
Acid 2		Salicylic acid 26.16g 0.1879 mole	Lactic acid 17.06g 0.189 mole	Glycolic acid 14.37g 0.189 mole			Salicylic acid 20.92g 0.152 mole
Acid Chloride	Adipic chloride 26g 0.142 mole	Adipic chloride 34.59g 0.189 mole	Adipic chloride 34.59g 0.189 mole	Adipic chloride 34.59g 0.189 mole	Azelaic chloride 25g 0.111 mole	Azelaic chloride 26g 0.113 mole	Azelaic chloride 34.22g 0.152 mole
Pyridine	44.94g 0.568 mole 3600	59.80g 0.756 mole 2300	59.80g 0.756 mole 2300	59.80g 0.756 mole 1800	35.12g 0.444 mole 1900	35.75g 0.452 mole 1800	48.02g 0.608 mole 3600
Mn g/mol							
Mw g/mol	6000	3900	3400	2700	2400	3300	8400
Ip	1.7	1.7	1.5	1.5	1.3	1.8	2.4

WHAT IS CLAIMED IS:

1. A composition for topical application to hair comprising at least one polymer comprising at least one salicylic acid compound and at least one dicarboxylic acid compound.
2. The composition of claim 1, wherein the polymer comprises a unit represented by the following formula:



wherein X1 and X2 can be the same or different, and is selected from the group consisting of a salicylic acid compound and an active agent other than a salicylic acid compound, wherein at least one of X1 and X2 is a salicylic acid compound;

n is a number ranging from 1 to 1000; and

L is a divalent branched or unbranched, substituted or unsubstituted, saturated or unsaturated, hydrocarbon chain having 1 to 50 carbon atoms.

3. The composition of claim 1, wherein the at least one salicylic acid compound is salicylic acid or a salt thereof.
4. The composition of claim 1, wherein the at least one salicylic acid compound is 2-hydroxy-5-octanoylbenzoic acid or a salt thereof.
5. The composition of claim 2, wherein X1 and/or X2 is salicylic acid or a salt thereof.

6. The composition of claim 2, wherein X1 and/or X2 is 2-hydroxy-5-octanoylbenzoic acid or a salt thereof.
7. The composition of claim 1, wherein the dicarboxylic acid compound is azelaic acid or adipic acid.
8. The composition of claim 3, wherein the dicarboxylic acid compound is azelaic acid or adipic acid.
9. The composition of claim 4, wherein the dicarboxylic acid compound is azelaic acid or adipic acid.
10. The composition of claim 1, wherein the polymer has a Mw between 5,000 and 50,000.
11. The composition of claim 1, wherein the polymer has a Tg between 15 and 75°C.
12. The composition of claim 2, wherein the polymer has a Tg between 15 and 75°C.
13. A method of treating or preventing seborrheic dermatitis comprising applying the composition of claim 1 to hair in an amount sufficient to prevent or treat seborrheic dermatitis.
14. A method of treating or preventing seborrheic dermatitis comprising applying the composition of claim 2 to hair in an amount sufficient to prevent or treat seborrheic dermatitis.
15. A method of preventing or treating scalp itchiness, flakiness or dandruff comprising applying the composition of claim 1 to hair in an amount sufficient to prevent or treat scalp itchiness, flakiness or dandruff.

16. A method of preventing or treating scalp itchiness, flakiness or dandruff comprising applying the composition of claim 2 to hair in an amount sufficient to prevent or treat scalp itchiness, flakiness or dandruff.

17. A method of improving hair strength, flexibility or resiliency comprising applying the composition of claim 1 to hair in an amount sufficient to improve hair strength, flexibility or resiliency.

18. A method of improving hair strength, flexibility or resiliency comprising applying the composition of claim 2 to hair in an amount sufficient to improve hair strength, flexibility or resiliency.