TITLE

PHARMACEUTICAL COMPOSITIONS COMPRISING DGLA AND/OR 15-HETRE AND METHODS OF USE THEREOF

FIELD

[0001] The disclosure generally relates to compositions comprising fatty acids including, for example, DGLA, 15-OHEPA, and/or 15-HETrE and their use for preventing and/or treating the effects associated with UV radiation such as erythema.

BACKGROUND

[0002] Ultraviolet (UV) radiation is the most prominent and ubiquitous carcinogen in our environment and the skin is its major target. Epidemiological, clinical and biological studies have implicated repeated exposures of human skin to solar UV radiation as a cause of both melanoma and non-melanoma skin cancers. UV radiation also induces inflammatory responses including erythema, edema, dermal infiltration of leukocytes and production of cytokines and growth factors. Further, there is mounting evidence that such inflammation plays a pivotal role in tumor initiation and promotion. Accordingly, there exists a need in the art for methods for protecting the skin against UV-induced damage and its effects.

SUMMARY

[0003] The present disclosure provides compositions comprising fatty acids agents including, for example, DGLA, 15-OHEPA, and/or 15-HETrE, used singly or in combination, for the prevention and/or treatment of effects associated with UV radiation such as erythema. Optionally, such compositions may further comprise one or more sunscreen active agents.

[0003a] In a first aspect the present invention refers to the use of a composition comprising a therapeutically effective amount of DGLA and/or 15-HETrE in the manufacture of a medical composition for preventing or reducing the occurrence of erythema.

[0004] ~~The present disclosure provides~~Also disclosed are compositions, for preventing or reducing the occurrence of erythema, that comprise a therapeutically effective amount of DGLA and/or 15-HETrE.

[0005] In some ~~embodiments~~examples, the composition comprises about 0.1 wt.% DGLA to about 20 wt.% DGLA.

[0006] In some ~~embodiments~~examples, the composition comprises about 10 wt.% DGLA, about 1.0 wt.% DGLA, or about 0.1 wt.% DGLA.

[0007] In some ~~embodiments~~examples, the composition comprises about 0.01 wt.% to about 50 wt.% 15-HETrE.

[0008] In some ~~embodiments~~examples, the composition comprises about 10 wt.% 15-HETrE, about 1.0 wt.% 15-HETrE, about 0.1 wt.% 15-HETrE, or about 0.01 wt.% 15-HETrE.

[0009] In some ~~embodiments~~examples, the composition comprise about 0.1 wt.% DGLA to about 20 wt.% DGLA and about 0.01 wt.% to about 50 wt.% 15-HETrE.

[0009a] In another aspect, the present invention refers to the use of a photoprotective composition comprising i.) a therapeutically effective amount of DGLA and/or 15- HETrE; and ii.) a sunscreen active agent in the manufacture of a medical composition for preventing or reducing the occurrence of erythema.

[0010] ~~The present disclosure also provides~~Also disclosed is a photoprotective composition, for preventing or reducing the occurrence of erythema, that comprises i.) a therapeutically effective amount of DGLA and/or 15-HETrE; and ii.) a sunscreen active agent.

[0011] In some ~~embodiments~~examples, the composition comprises about 0.1 wt.% DGLA to about 20 wt.% DGLA.

[0012] In some ~~embodiments~~examples, the composition comprises about 10 wt.% DGLA, about 1.0 wt.% DGLA, or about 0.1 wt.% DGLA.

[0013] In some ~~embodiments~~examples, the composition comprises about 0.1 wt.% to about 50 wt.% 15-HETrE.

[0014] In some ~~embodiments~~examples, the composition comprises about 10 wt.% 15-HETrE, about 1.0 wt.% 15-HETrE, about 0.1 wt.% 15-HETrE, or about 0.01 wt.% 15-HETrE.

[0015] In some ~~embodiments~~examples, the composition comprise about 0.1 wt.% DGLA to about 20 wt.% DGLA and about 0.01 wt.% to about 50 wt.% 15-HETrE.

[0016] In some ~~embodiments~~examples, the sunscreen active agent is a UV blocker, UV absorber, or UV scattering agent.

[0017] In some ~~embodiments~~examples, the UV blocker is a UVA, UVB, or a UVA/UVB blocker.

[0018] In some ~~embodiments~~examples, the UV blocker is selected from the group consisting of: para aminobenzoic acid, avobenzone, cinoxate, dioxybenzone, homosalate, menthyl anthranilate, octocrylene, octyl methoxycinnamate, octyl salicylate, oxybenzone, padimate O, phenylbenzimidazole sulfonic acid, sulisobenzone, trolamine salicylate, titanium dioxide, zinc oxide, diethanolamine methoxycinnamate, digalloy trioleate, ethyl dihydroxypropyl PABA, glyceryl aminobenzoate, lawsone with dihydroxyacetone, red petrolatum, ethylhexyl triazone, dioctyl butamido triazone, benzylidene malonate polysiloxane, terephthalylidene dicamphor sulfonic acid, disodium phenyl dibenzimidazole tetrasulfonate, diethylamino hydroxybenzoyl hexyl benzoate, bis diethylamino hydroxybenzoyl benzoate, bis benzoxazoylphenyl ethylhexylimino triazine, drometrizole trisiloxane, methylene bis-benzotriazolyl tetra methylbutyl phenol, and bis-ethylhexyloxyphenol methoxyphenyltriazine, 4-methylbenzylidenecamphor, and isopentyl 4-methoxycinnamate.

[0019] In some ~~embodiments~~examples, the composition further comprises a waterproofing polymer.

[0019a] In another aspect the present invention refers to the use of a topical composition comprising a therapeutically effective amount of DGLA or 15-HETrE in the manufacture of a medical composition for preventing or reducing the occurrence of erythema on at least one area of the skin of a subject.

[0020] ~~The present disclosure also provides~~Also disclosed are methods for preventing

or reducing the occurrence of erythema on at least one area of the skin of a subject, comprising: topically applying a therapeutically effective amount of a composition comprising DGLA or 15- HETrE to the at least one area of skin of the subject.

[0021] In some ~~embodiments~~examples, the composition comprises about 1.0 wt.% DGLA to about 20 wt.% DGLA.

[0022] In some ~~embodiments~~examples, the composition comprises about 10 wt.% DGLA, about 1.0 wt.% DGLA, or about 0.1 wt.% DGLA.

[0023] In some ~~embodiments~~examples, the composition comprises about 0.1 wt.% to about 50 wt.% 15-HETrE.

[0024] In some ~~embodiments~~examples, the composition comprises about 10 wt.% 15-HETrE, about 1.0 wt.% 15-HETrE, about 0.1 wt.% 15-HETrE, or about 0.01 wt.% 15-HETrE.

[0025] In some ~~embodiments~~examples, the erythema is caused by exposure to UV radiation.

[0026] In some ~~embodiments~~examples, the compositions is topically applied to at least one area of the skin prior to exposure of the subject to UV radiation.

[0027] In some ~~embodiments~~examples, the composition is applied the skin on a face, arms, torso, or legs.

[0028] In some ~~embodiments~~examples, the composition further comprises a sunscreen active agent.

[0029] In some ~~embodiments~~examples, the sunscreen active agent is a UV blocker, UV absorber, or UV scattering agent.

[0029a] In a further aspect, the present disclosure refers to the use of a topical composition comprising DGLA or 15-HETrE in the manufacture of a medical composition for preventing or reducing sun-induced damage on at least one area of the skin of a subject.

[0030] ~~The present disclosure also provides~~Also disclosed are methods for preventing or reducing sun- induced damage of the skin of a subject, comprising: topically applying the composition comprising DGLA or 15-HETrE to the at least one area of skin of the subject.

[0031] In some ~~embodiments~~examples, the composition comprises about 1.0 wt.% DGLA to about 20 wt.% DGLA.

[0032] In some ~~embodiments~~examples, the composition comprises about 10 wt.% DGLA, about 1.0 wt.% DGLA, or about 0.1 wt.% DGLA.

[0033] In some ~~embodiments~~examples, the composition comprises about 0.1 wt.% to about 50 wt.% 15-HETrE.

[0034] In some ~~embodiments~~examples, the composition comprises about 10 wt.% 15-HETrE, about 1.0 wt.% 15-HETrE, about 0.1 wt.% 15-HETrE, or about 0.01 wt.% 15-HETrE.

[0035] In some ~~embodiments~~examples, the compositions is topically applied to at least one area of the skin prior to exposure of the subject to sun light.

[0036] In some ~~embodiments~~examples, the composition is applied the skin on a face, arms, torso, or legs.

[0037] In some ~~embodiments~~examples, the composition further comprises a sunscreen active agent.

[0038] In some ~~embodiments~~examples, the sunscreen active agent is a UV blocker, UV absorber, or UV scattering agent.

[0039] In some ~~embodiments~~examples, the sun-induced damage is photoaging of the skin.

[0039a] In a still further aspect, the present invention refers to the use of a composition comprising DGLA and/or 15-HETrE in the manufacture of a medical composition for increasing the Sun Protection Factor (SPF) of a sunscreen, wherein the use comprises addition of the composition to the sunscreen.

[0040] ~~The present disclosure also provides~~Also disclosed herein are methods for increasing the Sun Protection Factor (SPF) of a sunscreen, comprising: adding a composition comprising DGLA and/or 15-HETrE to the sunscreen.

[0041] In some ~~embodiments~~examples, the composition comprises about 1.0 wt.% DGLA to about 20 wt.% DGLA.

[0042] In some ~~embodiments~~examples, the composition comprises about 10 wt.% DGLA, about 1.0 wt.% DGLA, or about 0.1 wt.% DGLA.

[0043] In some ~~embodiments~~examples, the composition comprises about 0.1 wt.% to about 50 wt.% 15-HETrE.

[0044] In some ~~embodiments~~examples, the composition comprises about 10 wt.% 15-HETrE, about 1.0 wt.% 15-HETrE, about 0.1 wt.% 15-HETrE, or about 0.01 wt.% 15-HETrE.

[0045] In some ~~embodiments~~examples, the SPF of the sunscreen is increased to 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, or about 75.

[0045a] In another aspect, the present invention refers to the use of a composition comprising DGLA and/or 15-HETrE in the manufacture of a medical composition for preventing or reducing the deleterious effects of UV radiation that contacts a surface, wherein the use comprises application of the composition to the surface.

[0046] ~~The present disclosure also provides~~Also disclosed herein are methods for preventing or reducing the deleterious effects of UV radiation that contacts a surface, comprising: applying to the surface a composition comprising DGLA and/or 15-HETrE.

[0047] In some ~~embodiments~~examples, the surface is skin.

[0048] These and other embodiments ~~of the invention~~/ examples are described in further detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0049] The foregoing summary, as well as the following detailed description of the disclosure, will be better understood when read in conjunction with the appended figures. For the purpose of illustrating the disclosure, shown in the figures are embodiments which are presently preferred. It should be understood, however, that the disclosure is not limited to the precise arrangements, examples and instrumentalities shown.

[0050] Figure 1 shows a graphical representation of the average daily Draize score for selected areas of the skin of miniature swine #1 exposed to UV and then topically administered a composition comprising ethanol (vehicle), 1 mg/mL DGLA, 10 mg/mL DGLA, or 100 mg/mL DGLA twice daily for each of seven days.

[0051] Figure 2 shows a graphical representation of the average daily Draize score for selected areas of the skin of miniature swine #2 exposed to UV and then topically administered a composition comprising ethanol (vehicle), 1 mg/mL DGLA, 10 mg/mL DGLA, or 100 mg/mL DGLA twice daily for each of seven days.

[0052] Figure 3 shows a graphical representation of the average daily Draize score for

selected areas of the skin of miniature swine #3 exposed to UV and then topically administered a composition comprising ethanol (vehicle), 1 mg/mL DGLA, 10 mg/mL DGLA, or 100 mg/mL DGLA twice daily for each of seven days.

What is claimed is:

1. A composition for preventing or reducing the occurrence of erythema, the composition comprising a therapeutically effective amount of DGLA and/or 15-HETrE.

2. A photoprotective composition for preventing or reducing the occurrence of erythema, the composition comprising i.) a therapeutically effective amount of DGLA and/or 15-HETrE; and ii.) a sunscreen active agent.

3. The composition of any one of claims 1 or 2, wherein the composition comprise about 0.1 wt.% DGLA to about 20 wt.% DGLA and about 0.01 wt.% to about 50 wt.% 15-HETrE.

4. The composition of claim 2, wherein the sunscreen active agent is a UV blocker selected from the group of UVA blockers, UVB blockers, and UVA/UVB blockers.

5. The composition of claim 4, wherein the UV blocker is selected from the group consisting of: para aminobenzoic acid, avobenzone, cinoxate, dioxybenzone, homosalate, menthyl anthranilate, octocrylene, octyl methoxycinnamate, octyl salicylate, oxybenzone, padimate O, phenylbenzimidazole sulfonic acid, sulisobenzone, trolamine salicylate, titanium dioxide, zinc oxide, diethanolamine methoxycinnamate, digalloy trioleate, ethyl dihydroxypropyl PABA, glyceryl aminobenzoate, lawsone with dihydroxyacetone, red petrolatum, ethylhexyl triazone, dioctyl butamido triazone, benzylidene malonate polysiloxane, terephthalylidene dicamphor sulfonic acid, disodium phenyl dibenzimidazole tetrasulfonate, diethylamino hydroxybenzoyl hexyl benzoate, bis diethylamino hydroxybenzoyl benzoate, bis benzoxazoylphenyl ethylhexylimino triazine, drometrizole trisiloxane, methylene bis-benzotriazolyl tetra methylbutyl phenol, and bis-ethylhexyloxyphenol methoxyphenyltriazine, 4-methylbenzylidenecamphor, and isopentyl 4-methoxycinnamate.

6. The composition of claim 2 further comprising a waterproofing polymer.

7. A topical composition for preventing or reducing the occurrence of erythema on at least one area of the skin of a subject, the topical composition comprising a therapeutically effective amount of DGLA or 15-HETrE.

8. The topical composition of claim 7, wherein the erythema is caused by exposure to UV radiation.

9. The topical composition of claim 7, wherein the composition is for topical application to at least one area of the skin prior to exposure of the subject to UV radiation.

10. The topical composition of claim 7, wherein the composition is for topical application to the skin on a face, arms, torso, or legs.

11. A topical composition for preventing or reducing sun-induced damage on at least one area of the skin of a subject, the topical composition comprising DGLA or 15-HETrE.

12. The topical composition of claim 11, wherein the composition is for topical application to at least one area of the skin prior to exposure of the subject to sun light.

13. The topical composition of claim 11, wherein the composition is topically applied the skin on a face, arms, torso, or legs.

14. The topical composition of any one of claims 7 or 11, wherein the composition further comprises a sunscreen active agent.

15. The topical composition of claim 14, wherein the sunscreen active agent is a UV blocker, UV absorber, or UV scattering agent.

16. The topical composition of claim 11, wherein the sun-induced damage is photoaging of the skin.

17. A method for increasing the Sun Protection Factor (SPF) of a sunscreen, the method comprising: adding a composition comprising DGLA and/or 15-HETrE to the sunscreen.

18. The composition of any one of claims 1, 2, 7, 11 or 17, wherein the composition comprises about 1.0 wt.% DGLA to about 20 wt.% DGLA.

19. The composition of claim 18, wherein the composition comprises about 10 wt.% DGLA, about 1.0 wt.% DGLA, or about 0.1 wt.% DGLA.

20. The composition of any one of claims 1, 2, 7, 11 or 17, wherein the composition comprises about 0.1 wt.% to about 50 wt.% 15-HETrE.

21. The composition of claim 20, wherein the composition comprises about 10 wt.% 15-HETrE, about 1.0 wt.% 15-HETrE, about 0.1 wt.% 15-HETrE, or about 0.01 wt.% 15-HETrE.

22. The method of claim 17, wherein the SPF of the sunscreen is increased to 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, or about 75.

23. A method for preventing or reducing the deleterious effects of UV radiation that contacts a surface, the method comprising: applying to the surface a composition comprising DGLA and/or 15-HETrE.

24. The method of claim 23, wherein the surface is skin.

What is claimed is:

1. Use of a composition comprising a therapeutically effective amount of DGLA and/or 15-HETrE in the manufacture of a medical composition for preventing or reducing the occurrence of erythema.

2. Use of a photoprotective composition comprising i.) a therapeutically effective amount of DGLA and/or 15- HETrE; and ii.) a sunscreen active agent in the manufacture of a medical composition for preventing or reducing the occurrence of erythema.

3. The use of any one of claims 1 or 2, wherein the composition comprise about 0.1 wt.% DGLA to about 20 wt.% DGLA and about 0.01 wt.% to about 50 wt.% 15-HETrE.

4. The use of claim 2, wherein the sunscreen active agent is a UV blocker selected from the group of UVA blockers, UVB blockers, and UVA/UVB blockers.

5. The use of claim 4, wherein the UV blocker is selected from the group consisting of: para aminobenzoic acid, avobenzone, cinoxate, dioxybenzone, homosalate, menthyl anthranilate, octocrylene, octyl methoxycinnamate, octyl salicylate, oxybenzone, padimate O, phenylbenzimidazole sulfonic acid, sulisobenzone, trolamine salicylate, titanium dioxide, zinc oxide, diethanolamine methoxycinnamate, digalloy trioleate, ethyl dihydroxypropyl PABA, glyceryl aminobenzoate, lawsone with dihydroxyacetone, red petrolatum, ethylhexyl triazone, dioctyl butamido triazone, benzylidene malonate polysiloxane, terephthalylidene dicamphor sulfonic acid, disodium phenyl dibenzimidazole tetrasulfonate, diethylamino hydroxybenzoyl hexyl benzoate, bis diethylamino hydroxybenzoyl benzoate, bis benzoxazoylphenyl ethylhexylimino triazine, drometrizole trisiloxane, methylene bis-benzotriazolyl tetra methylbutyl phenol, and bis-ethylhexyloxyphenol methoxyphenyltriazine, 4-methylbenzylidenecamphor, and isopentyl 4- methoxycinnamate.

6. The use of claim 2 further comprising a waterproofing polymer.

7. Use of a topical composition comprising a therapeutically effective amount of DGLA or 15-HETrE in the manufacture of a medical composition for preventing or reducing the occurrence of erythema on at least one area of the skin of a subject.

8. The use of claim 7, wherein the erythema is caused by exposure to UV radiation.

9. The use of claim 7, wherein the composition is for topical application to at least one area of the skin prior to exposure of the subject to UV radiation.

10. The use of claim 7, wherein the composition is for topical application to the skin on a face, arms, torso, or legs.

11. Use of a topical composition comprising DGLA or 15-HETrE in the manufacture of a medical composition for preventing or reducing sun-induced damage on at least one area of the skin of a subject.

12. The use of claim 11, wherein the composition is for topical application to at least one area of the skin prior to exposure of the subject to sun light.

13. The use of claim 11, wherein the composition is topically applied the skin on a face, arms, torso, or legs.

14. The use of any one of claims 7 or 11, wherein the composition further comprises a sunscreen active agent.

15. The use of claim 14, wherein the sunscreen active agent is a UV blocker, UV absorber, or UV scattering agent.

16. The use of claim 11, wherein the sun-induced damage is photoaging of the skin.

17. Use of a composition comprising DGLA and/or 15-HETrE in the manufacture of a medical composition for increasing the Sun Protection Factor (SPF) of a sunscreen, wherein the use comprises addition of the composition to the sunscreen.

18. The use of any one of claims 1, 2, 7, 11 or 17, wherein the composition comprises about 1.0 wt.% DGLA to about 20 wt.% DGLA.

19. The use of claim 18, wherein the composition comprises about 10 wt.% DGLA, about 1.0 wt.% DGLA, or about 0.1 wt.% DGLA.

20. The use of any one of claims 1, 2, 7, 11 or 17, wherein the composition comprises about 0.1 wt.% to about 50 wt.% 15-HETrE.

21. The use of claim 20, wherein the composition comprises about 10 wt.% 15-HETrE, about 1.0 wt.% 15-HETrE, about 0.1 wt.% 15-HETrE, or about 0.01 wt.% 15- HETrE.

22. The use of claim 17, wherein the SPF of the sunscreen is increased to 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, or about 75.

23. Use of a composition comprising DGLA and/or 15-HETrE in the manufacture of a medical composition for preventing or reducing the deleterious effects of UV radiation that contacts a surface, wherein the use comprises application of the composition to the surface.

24. The use of claim 23, wherein the surface is skin.