CLAIMS

1. A sprayable, storage stable, substantially anhydrous topical composition comprising a therapeutically effective amount of a vitamin D derivative or analogue and a therapeutically effective amount of a corticosteroid, the vitamin D derivative or analogue and the corticosteroid being dissolved in a pharmaceutically acceptable propellant selected from the group consisting of dimethyl ether, diethyl ether and methylethyl ether or a propellant mixture comprising a first propellant selected from the group consisting of dimethyl ether, diethyl ether and methylethyl ether and a second propellant selected from the group consisting of C_{3-5} alkanes, hydrofluoroalkanes, hydrochloroalkanes, fluoroalkanes and chlorofluoroalkanes the composition further comprising a pharmaceutically acceptable lipid carrier solubilized or suspended in said propellant or propellant mixture, the lipid carrier comprising one or more lipids which on application on skin and evaporation of the propellant form a semi-solid and occlusive layer at the site of application.

2. A composition according to claim 1, wherein the vitamin D derivative or analogue is selected from the group consisting of calcipotriol, calcitriol, tacalcitol, maxacalcitol, paricalcitol and alfacalcidol.

3. A composition according to claim 2, wherein the vitamin D analogue is calcipotriol or calcipotriol monohydrate.

4. A composition according to any one of claims 1-3, wherein the corticosteroid is selected from the group consisting of betamethasone, budenoside, clobetasol, clobetasone, desoximethasone, diflucortolon, diflorasone, fluocinonide, fluocinolon, halcinonide, halobetasol, hydrocortisone, mometasone and triamcinolone or a pharmaceutically acceptable ester thereof.

5. A composition according to claim 4, wherein the corticosteroid ester is betamethasone dipropionate, betamethasone valerate, clobetasol propionate or hydrocortisone acetate or hydrocortisone butyrate.

6. A composition according to any one of claims 1-5 further comprising a non-evaporating oily co-solvent selected from at least one of the following solvent classes (a) a compound of general formula I

$H(OCH_2C(CH_3)H)OR^1$

wherein R^1 is straight or branched chain C_{1-20} alkyl, and x is an integer of 2-60;
(b) an isopropyl ester of a straight or branched chain C_{10-18} alkanoic or alkenoic acid;
(c) a propylene glycol diester of a C_{8-14} alkanoic or alkenoic acid;
(d) a straight or branched C_{8-24} alkanol or alkenol;
(e) highly purified vegetable oils such as medium chain triglycerides or long chain triglycerides; and
(f) N-alkylpyrrolidone or N-alkylpiperidone.

7. A composition according to claim 6, wherein the compound of general formula I is polyoxypropylene-15-stearyl ether, polyoxypropylene-11-stearyl ether, polyoxypropylene-14-butyl ether, polyoxypropylene-10-cetyl ether or polyoxypropylene-3-myristyl ether.

8. A composition according to claim 6, wherein the isopropyl ester of a straight or branched chain C_{10-18} alkanoic or alkenoic acid is isopropyl myristate, isopropyl palmitate, isopropyl isostearate, isopropyl linolate or isopropyl monooleate.

9. A composition according to claim 6, wherein the propylene glycol diester of a C_{8-14} alkanoic acid is propylene glycol dipelargonate.

10. A composition according to claim 6, wherein the straight C_{8-24} alkanol is capryl, lauryl, cetyl, stearyl, oleyl, linoelyl or myristyl alcohol, or wherein the branched C_{8-24} alkanol is a branched C_{18-24} alkanol such as 2-octyldodecanol.

11. A composition according to claim 6, wherein the N-alkylpyrrolidone is N-methylpyrrolidone.

12. A composition according to any one of claims 1-11, wherein the propellant is dimethyl ether.

13. A composition according to any one of claims 1-11, wherein the first propellant of the propellant mixture is dimethyl ether.

14. A composition according to any one of claims 1-13, wherein the second propellant of the propellant mixture is a C_{3-5}alkane, preferably selected from the group consisting of n-propane, isopropane, n-butane or isobutane.

15. A composition according to claim 14, wherein the C_{3-5}alkane is n-butane and/or isobutane.

16. A composition according to claim 15, wherein the ratio of n-butane and/or isobutane to dimethyl ether is in the range of 6:1-0:1 v/v, such as 5:1-1:2, 4:1-1:1, 4:2-1:1, 4:2-4:3 or 4:2-1:1.

17. A composition according to claim 1, comprising
(a) about 0.00001-0.05% w/w of the vitamin D derivative or analogue,
(b) about 0.0005-1% w/w of the corticosteroid,
(c) about 5-55% w/w of the lipid carrier, and
(d) about 45-95% w/w of the propellant or propellant mixture. .

18. A composition according to claim 17 comprising about 10-50% w/w, about 15-45% w/w, or about 20-40% w/w of the lipid carrier.

19. A composition according to claim 17-18 comprising about 50-90% w/w or about 55-70% w/w of the propellant or propellant mixture.

20. A composition according to any one of claims 17-19, further comprising about 0.1-10% w/w of the oily solvent of claim 6, such as about 0.5-3% w/w, about 1-2.5% w/w or about 1.5-2% w/w of the oily solvent .

21. A composition according to any one of claims 1-20, wherein the lipid carrier comprises at least one paraffin selected from paraffins consisting of hydrocarbons with chain lengths from C_5 to C_{60}, the chain lengths peaking at C_{14-16}, C_{18-22}, C_{20-22}, C_{20-26}, C_{28-40}, and C_{40-44} (as determined by gas chromatography), or a lipophilic viscosity-increasing agent capable of imparting to the lipid carrier the property of forming a semi-solid and occlusive layer on skin on application and evaporation of the propellant, said viscosity-increasing agent being selected from the group consisting of microcrystalline wax, silicone wax and hydrogenated castor oil, or mixtures thereof, or an isoparaffin such as isohexadecane.

22. A pressurized container adapted to dispensing a topical composition on an affected skin area, the container including a container body comprising a composition according to any one of claims 1-21 and a valve assembly including an actuator for releasing the composition as a spray.

23. A container according to claim 22, wherein the valve assembly contains at least one aperture with a diameter of 0.05-1 mm.

24. A container according to claim 22, wherein the actuator is provided with an orifice with a diameter of 0.3-1.5 mm.

25. A composition according to any of claims 1-21 for use in the treatment of dermatological diseases or conditions.

26. A composition according to claim 25, wherein the dermatological disease or condition is selected from the group consisting of psoriasis, pustulosis palmoplantaris, ichtyosis, dermatitis, rosacea and acne.

Claims

1. A sprayable, storage stable, substantially anhydrous topical composition comprising a therapeutically effective amount of a vitamin D derivative or analogue and a therapeutically effective amount of a corticosteroid, the vitamin D derivative or analogue and the corticosteroid being dissolved in a pharmaceutically acceptable propellant selected from the group consisting of dimethyl ether, diethyl ether and methylethyl ether or a propellant mixture comprising a first propellant selected from the group consisting of dimethyl ether, diethyl ether and methylethyl ether and a second propellant selected from the group consisting of C_{3-5} alkanes, hydrofluoroalkanes, hydrochloroalkanes, fluoroalkanes and chlorofluoroalkanes the composition further comprising a pharmaceutically acceptable lipid carrier solubilized or suspended in said propellant or propellant mixture, the lipid carrier comprising one or more lipids which on application on skin and evaporation of the propellant form a semi-solid and occlusive layer at the site of application.

2. A composition according to claim 1, wherein the vitamin D derivative or analogue is selected from the group consisting of calcipotriol, calcitriol, tacalcitol, maxacalcitol, paricalcitol and alfacalcidol.

3. A composition according to claim 2, wherein the vitamin D analogue is calcipotriol or calcipotriol monohydrate.

4. A composition according to any one of claims 1-3, wherein the corticosteroid is selected from the group consisting of betamethasone, budesonide, clobetasol, clobetasone, desoximethasone, diflucortolon, diflorasone, fluocinonide, fluocinolon, halcinonide, halobetasol, hydrocortisone, mometasone and triamcinolone or a pharmaceutically acceptable ester thereof.

5. A composition according to claim 4, wherein the corticosteroid ester is betamethasone dipropionate, betamethasone valerate, clobetasol propionate or hydrocortisone acetate or hydrocortisone butyrate.

6. A composition according to any one of claims 1-5 further comprising a non-evaporating oily co-solvent selected from at least one of the following solvent classes

   (a) a compound of general formula I

   $$H(OCH_2C(CH_3)H)_xOR^1$$

   wherein R^1 is straight or branched chain C_{1-20} alkyl, and x is an integer of 2-60;
   (b) an isopropyl ester of a straight or branched chain C_{10-18} alkanoic or alkenoic acid;
   (c) a propylene glycol diester of a C_{8-14} alkanoic or alkenoic acid;
   (d) a straight or branched C_{8-24} alkanol or alkenol;
   (e) highly purified vegetable oils such as medium chain triglycerides or long chain triglycerides; and
   (f) N-alkylpyrrolidone or N-alkylpiperidone.

7. A composition according to claim 6, wherein the compound of general formula I is polyoxypropylene-15-stearyl ether, polyoxypropylene-11-stearyl ether, polyoxypropylene-14-butyl ether, polyoxypropylene-10-cetyl ether or polyoxypropylene-3-myristyl ether.

8. A composition according to claim 6, wherein the isopropyl ester of a straight or branched chain C_{10-18} alkanoic or alkenoic acid is isopropyl myristate, isopropyl palmitate, isopropyl isostearate, isopropyl linoleate or isopropyl monooleate.

9. A composition according to claim 6, wherein the propylene glycol diester of a C_{8-14} alkanoic acid is propylene glycol dipelargonate.

10. A composition according to claim 6, wherein the straight C_{8-24} alkanol is capryl, lauryl, cetyl, stearyl, oleyl, linoleyl or myristyl alcohol, or wherein the branched C_{8-24} alkanol is a branched C_{18-24} alkanol such as 2-octyldodecanol.

11. A composition according to claim 6, wherein the N-alkylpyrrolidone is N-methylpyrrolidone.

12. A composition according to any one of claims 1-11, wherein the propellant is dimethyl ether.

13. A composition according to any one of claims 1-11, wherein the first propellant of the propellant mixture is dimethyl ether.

14. A composition according to any one of claims 1-13, wherein the second propellant of the propellant mixture is a C_{3-5}alkane, preferably selected from the group consisting of n-propane, isopropane, n-butane and isobutane.

15. A composition according to claim 14, wherein the C_{3-5}alkane is n-butane and/or isobutane.

16. A composition according to claim 15, wherein the ratio of n-butane and/or isobutane to dimethyl ether is in the range of 6:1-0:1 v/v, such as 5:1-1:2, 4:1-1:1, 4:2-1:1, 4:2-4:3 or 4:2-1:1.

17. A composition according to claim 1, comprising

    (a) 0.00001-0.05% w/w of the vitamin D derivative or analogue,
    (b) 0.0005-1% w/w of the corticosteroid,
    (c) 5-55% w/w of the lipid carrier, and
    (d) 45-95% w/w of the propellant or propellant mixture.

18. A composition according to claim 17 comprising 10-50% w/w, 15-45% w/w, or 20-40% w/w of the lipid carrier.

19. A composition according to claims 17-18 comprising 50-90% w/w or 55-70% w/w of the propellant or propellant mixture.

20. A composition according to any one of claims 17-19, further comprising 0.1-10% w/w of the oily co-solvent of claim 6, such as 0.5-3% w/w, 1-2.5% w/w or 1.5-2% w/w of the oily solvent.

21. A composition according to any one of claims 1-20, wherein the lipid carrier comprises at least one paraffin selected from paraffins consisting of hydrocarbons with chain lengths from C_5 to C_{60}, the chain lengths peaking at C_{14-16}, C_{18-22}, C_{20-22}, C_{20-26}, C_{28-40}, and C_{40-44} (as determined by gas chromatography), or a lipophilic viscosity-increasing agent capable of imparting to the lipid carrier the property of forming a semi-solid and occlusive layer on skin on application and evaporation of the propellant, said viscosity-increasing agent being selected from the group consisting of microcrystalline wax, silicone wax and hydrogenated castor oil, or mixtures thereof, or an isoparaffin such as isohexadecane.

22. A pressurized container adapted to dispensing a topical composition on an affected skin area, the container including a container body comprising a composition according to any one of claims 1-21 and a valve assembly including an actuator for releasing the composition as a spray.

23. A container according to claim 22, wherein the valve assembly contains at least one aperture with a diameter of 0.05-1 mm.

24. A container according to claim 22, wherein the actuator is provided with an orifice with a diameter of 0.3-1.5 mm.

25. A composition according to any of claims 1-21 for use in the treatment of dermatological diseases or conditions selected from the group consisting of psoriasis, pustulosis palmoplantaris, ichtyosis, dermatitis, rosacea and acne.