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(54) Title: PRODRUGS OF CANNABIDIOL, COMPOSITIONS COMPRISING PRODRUGS OF CANNABIDIOL AND METHODS OF USING THE SAME

(57) Abstract: Described herein are cannabidiol prodrugs, methods of making cannabidiol prodrugs, formulations comprising cannabidiol prodrugs and methods of using cannabidiols. One embodiment described herein relates to the transdermal or topical administration of a cannabidiol prodrug for treating and preventing diseases and/or disorders.

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AMENDED CLAIMS
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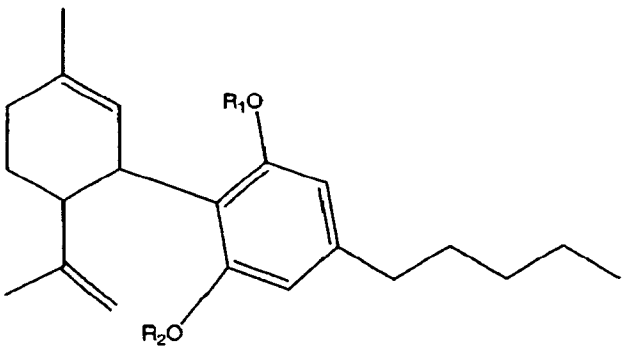
1. A compound having the formula:



wherein R_1 and R_2 are independently selected from hydrogen, substituted alkanoic acid esters having a straight, branched or cyclic acyl chain of between 3 and 16 carbons, unsubstituted alkanoic acid ester having a straight, branched or cyclic acyl chain of between 3 and 16 carbons, formic acid ester, straight, branched or cyclic carbonate, straight, branched or cyclic substituted alkyl carbamate and straight, branched or cyclic unsubstituted alkyl carbamate;

wherein R_1 and R_2 can not both be hydrogen; and

wherein substituents of the acyl chain of the substituted alkanoic acid esters contain nitrogen or oxygen.

2. (Cancelled)

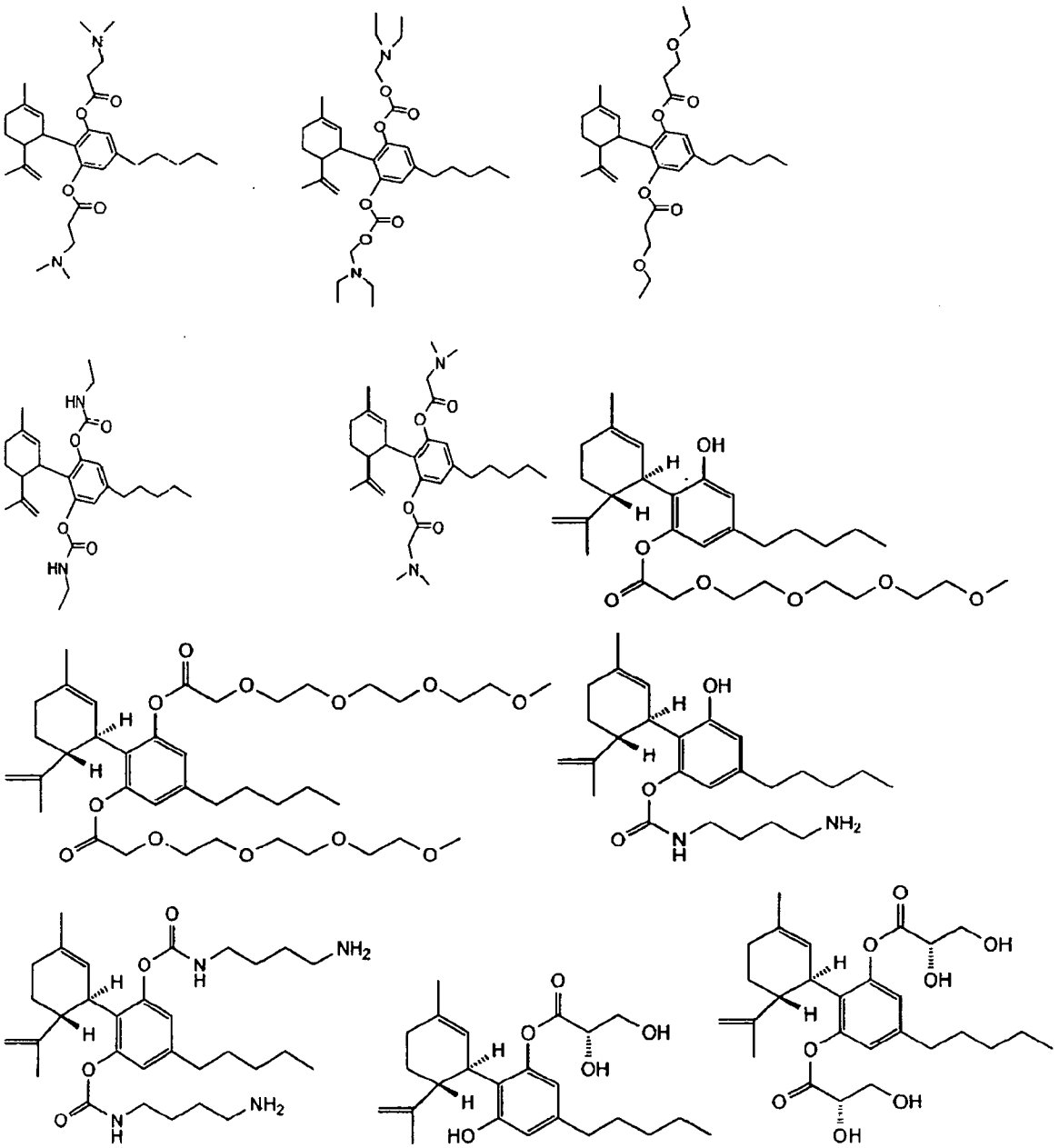
3. (Cancelled)

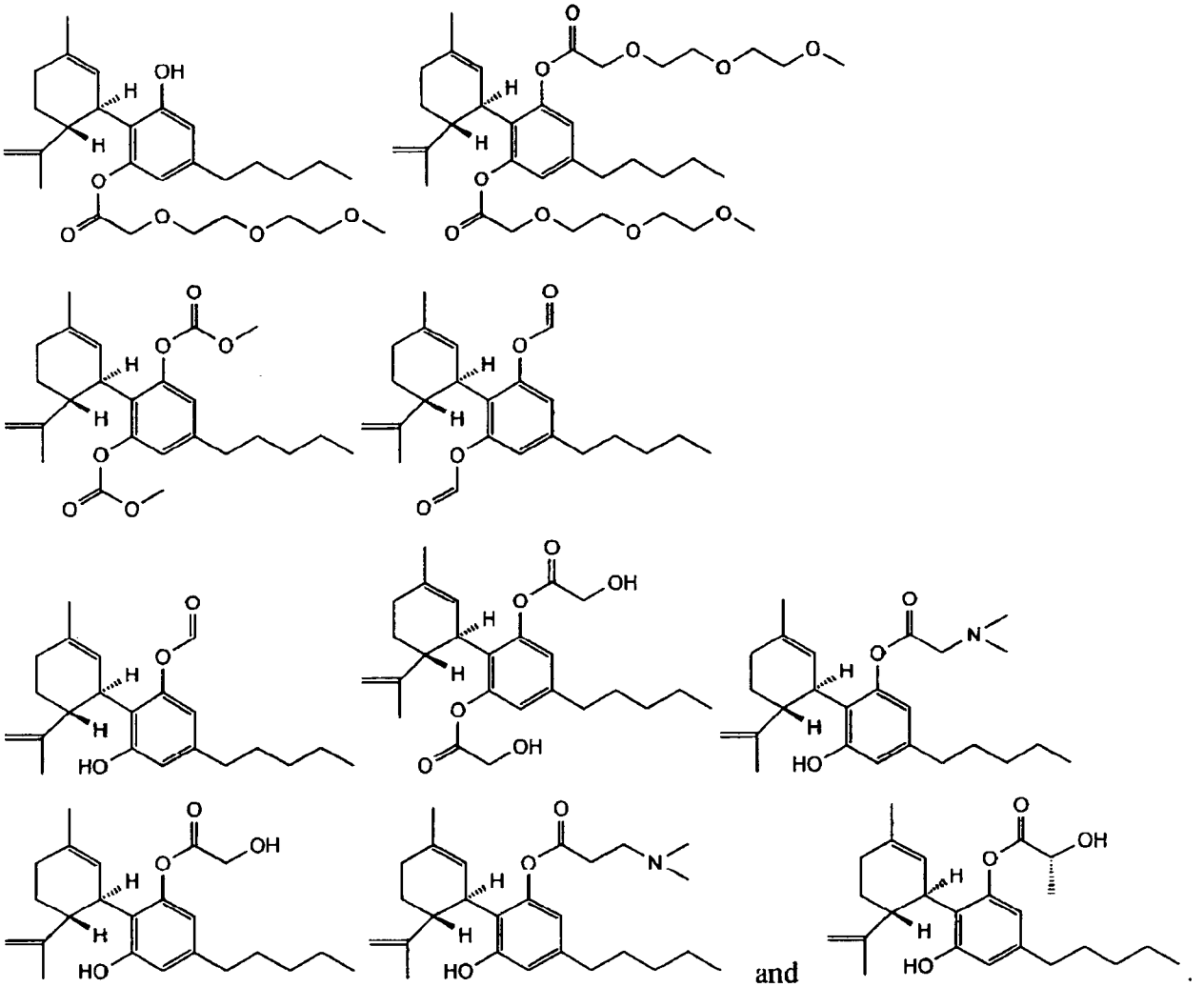
4. The compound of claim 1 wherein the substituted alkanoic acid ester is selected from the group consisting of: an amino ester, an alkylamino acid ester, dialkylamino acid ester and oxygenated alkanoic acid ester.

5. The compound of claim 4 wherein the oxygenated alkanoic acid ester is selected from the group consisting of: oxaester, oxoester and combinations of oxaester and oxoester.

6. The compound of claim 4 wherein the oxaester is selected from the group consisting of: hydroxylated alkanoic acid ester, pegylated alkanoic acid ester, glycolic acid ester, lactic acid ester and hyaluronic acid ester.

7. The compound of claim 1 selected from the group consisting of:





and

8. A pharmaceutical composition comprising:

(a) a compound as described in claim 1; and

(b) a pharmaceutically acceptable excipient.

9. A pharmaceutical composition comprising:

(a) a compound as described in claim 7; and

(b) a pharmaceutically acceptable excipient.

10. The use of a compound as described in claim 1 for the preparation of a medicament for the treatment of a medical condition in a mammal, wherein the medical condition is selected from the group consisting of: nausea, vomiting, emesis, pain, wasting syndrome,

HIV-wasting, chemotherapy induced nausea and vomiting, alcohol use disorders, dystonia, multiple sclerosis, inflammatory bowel disorders, arthritis, dermatitis, Rheumatoid arthritis, systemic lupus erythematosus, anti-inflammatory, anti-convulsant, anti-psychotic, anti-oxidant, neuroprotective, anti-cancer, immunomodulatory effects, peripheral neuropathic pain, neuropathic pain associated with post-herpetic neuralgia, diabetic neuropathy, shingles, burns, actinic keratosis, oral cavity sores and ulcers, post-episiotomy pain, psoriasis, pruritis, contact dermatitis, eczema, bullous dermatitis herpetiformis, exfoliative dermatitis, mycosis fungoides, pemphigus, severe erythema multiforme (*e.g.*, Stevens-Johnson syndrome), seborrheic dermatitis, ankylosing spondylitis, psoriatic arthritis, Reiter's syndrome, gout, chondrocalcinosis, joint pain secondary to dysmenorrhea, fibromyalgia, musculoskeletal pain, neuropathic-postoperative complications, polymyositis, acute nonspecific tenosynovitis, bursitis, epicondylitis, post-traumatic osteoarthritis, synovitis, juvenile rheumatoid arthritis and inhibition of hair growth.

11. The use of a compound as described in claim 7 for the preparation of a medicament for the treatment of a medical condition in a mammal, wherein the medical condition is selected from the group consisting of: nausea, vomiting, emesis, pain, wasting syndrome, HIV-wasting, chemotherapy induced nausea and vomiting, alcohol use disorders, dystonia, multiple sclerosis, inflammatory bowel disorders, arthritis, dermatitis, Rheumatoid arthritis, systemic lupus erythematosus, anti-inflammatory, anti-convulsant, anti-psychotic, anti-oxidant, neuroprotective, anti-cancer, immunomodulatory effects, peripheral neuropathic pain, neuropathic pain associated with post-herpetic neuralgia, diabetic neuropathy, shingles, burns, actinic keratosis, oral cavity sores and ulcers, post-episiotomy pain, psoriasis, pruritis, contact dermatitis, eczema, bullous dermatitis herpetiformis, exfoliative dermatitis, mycosis fungoides, pemphigus, severe erythema multiforme (*e.g.*, Stevens-Johnson syndrome), seborrheic dermatitis, ankylosing spondylitis, psoriatic arthritis, Reiter's syndrome, gout, chondrocalcinosis, joint pain secondary to dysmenorrhea, fibromyalgia, musculoskeletal pain, neuropathic-postoperative complications, polymyositis, acute nonspecific tenosynovitis, bursitis, epicondylitis, post-traumatic osteoarthritis, synovitis, juvenile rheumatoid arthritis and inhibition of hair growth.

12. The use of a compound as described in claim 10 wherein the cannabidiol prodrug is administered transdermally.

13. The use of a compound as described in claim 10 wherein the cannabidiol prodrug is administered topically.

14. The use of a compound as described in claim 1 for the preparation of a medicament comprising the steps of:

(a) combining a compound of claim 1 with a pharmaceutical excipient to form a pharmaceutical composition;

(b) creating a dosage form suitable for administration to a mammal from the pharmaceutical composition; and

(c) administering the dosage form to a mammal.

15. The use of a compound as described in claim 7 for the preparation of a medicament comprising the steps of:

(a) combining a compound of claim 7 with a pharmaceutical excipient to form a pharmaceutical composition;

(b) creating a dosage form suitable for administration to a mammal from the pharmaceutical composition; and

(c) administering the dosage form to a mammal.

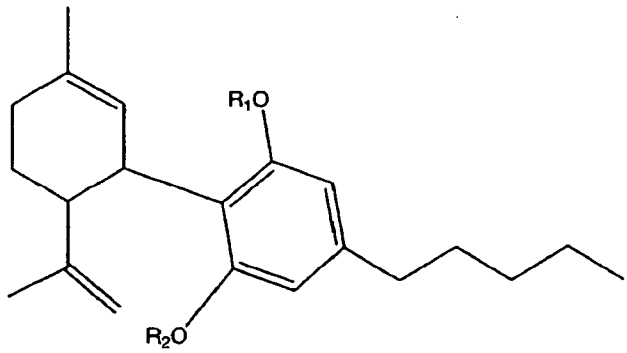
16. The use of claim 15 wherein the compound is administered by a route selected from the group consisting of: transdermal, topical, oral, buccal, sublingual, intra venous, intra muscular, vaginal, rectal, ocular, nasal and follicular.

17. A cosmetic composition for application to the skin of a person comprising:

(a) a cannabidiol prodrug; and

(b) a dermatologically acceptable vehicle.

18. The composition of claim 17 wherein the cannabidiol prodrug is selected from the group consisting of:



wherein R_1 and R_2 are independently selected from the group consisting of: hydrogen, glycolic acid ester, lactic acid ester, hyaluronic acid ester, formic acid ester, glycolic acid carbamate, hyaluronic acid carbamate and lactic acid carbamate, glycolic acid carbonate, hyaluronic acid carbonate and lactic acid carbonate; and

wherein R_1 and R_2 cannot both be hydrogen.

19. A cannabidiol prodrug having a log P value less than cannabidiol.

20. The compound of claim 4 wherein the oxoester is selected from the group consisting of: ketoesters and aldehyde-esters.

21. The compound of claim 4 wherein the combination of oxaester and oxoester is selected from the group consisting of: dicarboxylic acid mono esters, carboxylic acid mixed esters, hydroxyketoesters, hydroxyaldehyde-esters and ketoether-esters.

22. The compound of claim 1 wherein the straight, branched or cyclic substituted alkyl carbamate is selected from the group consisting of: oxygenated carbamate, oxacarbamate, pegylated carbamate, hydroxylated carbamate, amino carbamate, alkylamino carbamate, dialkylamino carbamate, glycolic acid carbamate, hyaluronic acid carbamate and lactic acid carbamate.

23. The compound of claim 1 wherein the straight, branched or cyclic carbonate is selected from the group consisting of: oxygenated carbonate, oxacarbonate, pegylated carbonate, hydroxylated carbonate, alkyl carbonate, amino carbonate, alkylamino carbonate, dialkylamino carbonate, glycolic acid carbonate, hyaluronic acid carbonate and lactic acid carbonate.