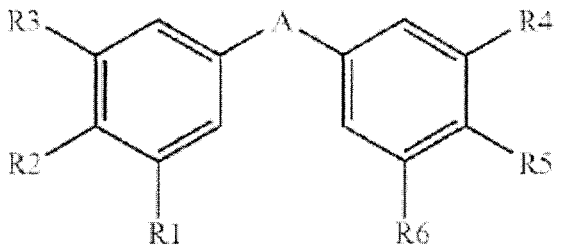
used in cosmetic formulas, it can only be used in very small amounts. If present in too large an amount, the resveratrol will hydrolyze and cause the cosmetic formulation into which it is incorporated to become discolored. The compound has stability issue-sensitive to light and heat, solubility problem- almost insoluble in water and in lipophilic components, and bioavailability issues- do not reach in vivo a sufficient effect because of their poor solubility, which may limit its use in foods and supplements, and cosmetic applications.

SUMMARY

Fine dry particulate resveratrol compositions suitable for use in topical formulations, as well as methods of making and using the same, are provided. In the dry particulate resveratrol composition, the resveratrol active agent is associated with the particles, e.g., via entrapment in the pores of the particles and/or ionic binding and/or non-covalent binding to the surface of the particles and/or loosely associated with the particles. Also provided are topical formulations which include the dry particulate resveratrol compositions of the invention, and methods of using the same.

In one aspect of the present disclosure, there is provided a topical formulation comprising a fine dry particulate resveratrol composition that includes a resveratrol active agent(s) present inside of the pores of nanoporous calcium particles and/or on the surface of the particles and/or loosely associated with the particles, and a topical delivery vehicle, wherein said topical delivery vehicle is an aqueous topical delivery vehicle;
wherein said topical formulation is storage stable; and
wherein said resveratrol active agent is according to formula (I):



I

wherein A denotes a carbon-carbon single or double bond; and
R1, R2, R3, R4, R5 and R6 are independently from each other hydrogen, hydroxy, etherified hydroxy or esterified hydroxy groups.

~~In another aspect of the present disclosure, there is provided a topical formulation comprising:~~
~~a fine dry particulate resveratrol composition as disclosed herein; and~~
~~a topical delivery vehicle.~~

In a further aspect of the present disclosure, there is provided a topical formulation as disclosed herein for use in ~~delivering an resveratrol active agent to~~ the

treatment of a skin condition in a subject~~, comprising:~~

~~(a) a fine dry particulate resveratrol composition as disclosed herein; and~~

~~(b) a topical delivery vehicle~~.

In another aspect of the present disclosure, there is provided a use of a topical formulation ~~comprising:~~

~~(a) a fine dry particulate resveratrol composition as disclosed herein; and~~

~~(b) a topical delivery vehicle;~~

as disclosed herein in the manufacture of a medicament for ~~delivering an resveratrol active agent to~~the treatment of a skin condition in a subject.

In a further aspect of the present disclosure, there is provided a method for producing a topical formulation as disclosed herein comprising:

(a) combining:

(i) nanoporous calcium particles comprising a porous structure that defines an internal space; and

(ii) an resveratrol active agent of formula (I) as defined herein;

in the presence of a solvent to produce a mixture; ~~and~~

(b) removing the solvent from the mixture to produce a fine dry particulate resveratrol composition; and

(c) combining the fine dry particulate resveratrol composition with a topical delivery vehicle.

BRIEF DESCRIPTION OF THE FIGURES

FIG. 1 provides graphical results of a study showing the improved delivery into skin.

DETAILED DESCRIPTION

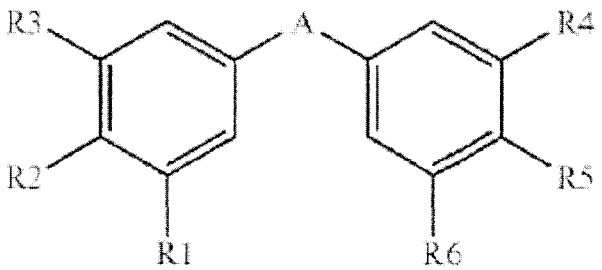
Fine dry particulate resveratrol compositions suitable for use in topical formulations, as well as methods of making the same, are provided. In the dry particulate resveratrol composition, the resveratrol active agent is associated with the particles, e.g., via entrapment in the pores of the particles and/or ionic binding and/or non-covalent binding to the surface of the particles and/or loosely associated with the particles. Also provided are topical formulations which include the dry particulate resveratrol compositions of the invention, and methods of using the same.

Before the present invention is further described, it is to be understood that this invention is not limited to particular embodiments described, as such may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting, since the scope of the present invention will be limited only by the appended claims.

Where a range of values is provided, it is understood that each intervening value, to the tenth of the unit of the lower limit unless the context clearly dictates

WHAT IS CLAIMED IS:

1. A topical formulation comprising a fine dry particulate resveratrol composition that includes a resveratrol active agent(s) present inside of the pores of nanoporous calcium particles and/or on the surface of the particles and/or loosely associated with the particles, and a topical delivery vehicle, wherein said topical delivery vehicle is an aqueous topical delivery vehicle;
wherein said topical formulation is storage stable; and
wherein said resveratrol active agent is according to formula (I):



I

wherein A denotes a carbon-carbon single or double bond; and
R1, R2, R3, R4, R5 and R6 are independently from each other hydrogen, hydroxy, etherified hydroxy or esterified hydroxy groups.

2. The topical formulation ~~fine dry particulate resveratrol composition~~ according to Claim 1, wherein the weight percentage of the resveratrol active agent in the composition ranges from 0.001 or more~~up to 100~~.

3. The topical formulation ~~fine dry particulate resveratrol composition~~ according to Claims 1 or 2, wherein the nanoporous calcium particles are nanoporous calcium phosphate particles.

4. The topical formulation ~~fine dry particulate resveratrol composition~~ according to Claim 3, wherein the nanoporous calcium phosphate particles are uniform, rigid, spherical, nanoporous calcium phosphate particles ~~are ceramic~~.

5. The topical formulation ~~fine dry particulate resveratrol composition~~ according to Claim 4, wherein the uniform, rigid, spherical, nanoporous calcium phosphate particles are ceramic.

6. The topical formulation ~~fine dry particulate resveratrol composition~~ according to any of the preceding claims, wherein the uniform, rigid, spherical, nanoporous calcium phosphate particles have a diameter ranging from 1 to 10 μm.

7. The topical formulation ~~fine dry particulate resveratrol composition~~ according to Claim 6, wherein the uniform, rigid, spherical, nanoporous calcium phosphate particles have a diameter of 2 μm or less.

8. The topical formulation ~~fine dry particulate resveratrol composition~~ according to any of the preceding claims, wherein the nanoporous calcium phosphate particles comprise pores ranging in size from 2 nm to 100 nm.

9. The topical formulation ~~fine dry particulate resveratrol composition~~ according to any of the preceding claims, wherein the resveratrol active agent is resveratrol.

~~10. A topical formulation comprising:~~

~~a fine dry particulate resveratrol composition according to any of Claims 1 to 9;~~

~~and~~

~~a topical delivery vehicle.~~

~~11. The topical formulation according to Claim 10, wherein the topical delivery vehicle is an aqueous topical delivery vehicle.~~

~~12~~10. A topical formulation according to any of claims 1 to 9 for use in the treatment of a skin condition in~~delivering an resveratrol active agent to~~ a subject~~, comprising:~~

~~(a) a fine dry particulate resveratrol composition according to any of Claims 1 to 9; and~~

~~(b) a topical delivery vehicle~~.

~~13~~11. Use of a topical formulation according to any of claims 1 to 9 ~~comprising:~~

~~(a) a fine dry particulate resveratrol composition according to any of Claims 1 to 9; and~~

~~(b) a topical delivery vehicle;~~

in the manufacture of a medicament for the treatment of a skin condition in~~delivering an resveratrol active agent to~~ a subject.

~~14~~12. A method for producing a topical formulation according to any one of claims 1 to 9, comprising:

(a) combining:

(i) nanoporous calcium particles comprising a porous structure that defines an internal space; and

(ii) an resveratrol active agent of formula (I) as defined in claim 1;

in the presence of a solvent to produce a mixture; ~~and~~

(b) removing the solvent from the mixture to produce a fine dry particulate resveratrol composition; and

(c) combining the fine dry particulate resveratrol composition with a topical delivery vehicle.

~~15. The method according to Claim 14, wherein the method is a method of making any of the compositions or formulations of Claims 1 to 12.~~

~~16~~13. The method according to Claim ~~15~~12, wherein the particles and resveratrol active agent of formula (I) are combined under negative pressure.