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 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.

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 for use in delivering an resveratrol active agent to 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;

in the manufacture of a medicament for delivering an resveratrol active agent to a subject.

In a further aspect of the present disclosure, there is provided a method comprising:

(a) combining:

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

(ii) an resveratrol active agent;

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.

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

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

12. A ~~method of delivering an resveratrol active agent to a subject, the method comprising:~~

~~applying a~~ topical formulation for use 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~~;~~

~~to a topical region of the subject to deliver the resveratrol active agent to the subject~~.

13. Use of a topical formulation 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 delivering an resveratrol active agent to a subject.

~~13~~14. A method comprising:

(a) combining:

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

(ii) an resveratrol active agent;

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.

~~14~~15. The method according to Claim ~~13~~14, wherein the method is a method of making any of the compositions or formulations of Claims 1 to 12.

~~15~~16. The method according to Claim ~~14~~15, wherein the particles and resveratrol active agent are combined under negative pressure.