

DESCRIPTION

Title of Invention: HAIR-GROWING AGENT

Technical Field

[0001]

The present invention relates to a hair-growing agent comprising, as an active ingredient, cyclic phosphatidic acid or carbacyclic phosphatidic acid.

Background Art

[0002]

There are two categories of baldness; congenital baldness and acquired baldness. Many studies have been conducted concerning the pathogenesis and the occurrence mechanism of baldness. While numerous types of hair-growing and nourishing agents are available on the market in recent years, in fact, many factors concerning baldness remain unknown.

[0003]

Up to the present, vasodilators, such as an extract of *Swertia japonica Makino* and vitamin E acetate, stimulants, such as capsicum tincture, vitamins, such as pantothenic acid and biotin, hormones, anti-inflammatory agents, microbicides, and the like have been used as beneficial ingredients of many hair-growing and hair-nourishing agents for the prevention and treatment of baldness. Also, a lysophosphatidic acid or phosphatidic acid derivative has been known to have hair-growing and nourishing effects (Patent Documents 1 and 2). In addition, hair-growing and nourishing agents comprising ingredients that promote hyaluronic acid synthesis have been known (Patent Document 3).

[0004]

However, effects of such hair-growing and nourishing agents were not always sufficient, and such agents were not always able to provide satisfactory results to users. With the advancement of technology of recent years, accordingly, development of hair-growing and nourishing agents that can yield stronger hair-growing and nourishing effects is desired.

Prior Art Documents

Patent Documents

[0005]

Patent Document 1: JP Patent Publication (Kokoku) S63-41363 (B) (1988)

Patent Document 2: International Patent Publication WO 2001/012141

Patent Document 3: JP Patent Publication (Kokai) 2003-81778 (A)

Summary of the Invention

Objects to Be Attained by the Invention

[0006]

The present invention is intended to solve the problems of the conventional techniques described above and to provide a hair-growing agent exerting excellent hair-growing and nourishing effects.

Means for Attaining the Objects

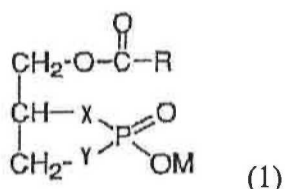
[0007]

The present inventors discovered that cyclic phosphatidic acid and a derivative thereof would exert excellent hair-growing and nourishing effects. This has led to the completion of the present invention.

[0008]

Specifically, the present invention provides a hair-growing agent comprising, as an active ingredient, a compound represented by Formula (1):

[Formula 1]



wherein R represents a linear or branched alkyl group having 1 to 30 carbon atoms, a linear or branched alkenyl group having 2 to 30 carbon atoms, or a linear or branched alkynyl group having 2 to 30 carbon atoms, which may comprise a cycloalkane ring or an aromatic ring; X

and Y each independently represent an oxygen atom or a methylene group, provided that X and Y do not simultaneously represent a methylene group; and M represents a hydrogen atom or an alkali metal atom.

[0009]

In Formula (1), preferably, X and Y represent an oxygen atom.

In Formula (1), preferably, one of X and Y represents an oxygen atom and the other represents a methylene group.

Preferably, the compound represented by Formula (1) has an acyl group comprising fatty acid derived from soybean lecithin.

[0010]

Also, the present invention provides a method for hair growth comprising administering the compound represented by Formula (1) to a subject.

[0011]

Further, the present invention provides use of the compound represented by Formula (1) for production of a hair-growing agent.

Effects of the Invention

[0012]

The present invention can provide a hair-growing agent exerting excellent hair-growing and nourishing effects.

Brief Description of the Drawings

[0013]

[Fig.1] Fig. 1 shows changes in hair growth scores for the control group and the group subjected to NcPA administration.

[Fig.2] Fig. 2 shows hair growth conditions for the control group on Day 25 of administration.

[Fig.3] Fig. 3 shows hair growth conditions for the group subjected to NcPA administration on Day 25 of administration.

Embodiments for Carrying out the Invention

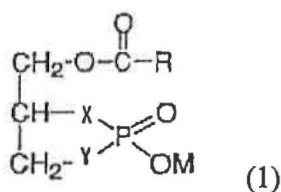
[0014]

Hereafter, the present invention is described in greater detail.

The hair-growing agent of the present invention can be used for treatment of male-pattern baldness and other purposes, and it comprises, as an active ingredient, cyclic phosphatidic acid, carbacyclic phosphatidic acid, or a salt thereof. Cyclic phosphatidic acid, carbacyclic phosphatidic acid, or a salt thereof is not particularly limited, provided that it exerts the effects of the present invention. Preferably, a compound represented by Formula (1) can be used:

[0015]

[Formula 2]



[0016]

wherein R represents a linear or branched alkyl group having 1 to 30 carbon atoms, a linear or branched alkenyl group having 2 to 30 carbon atoms, or a linear or branched alkynyl group having 2 to 30 carbon atoms, which may comprise a cycloalkane ring or an aromatic ring; X and Y each independently represent an oxygen atom or a methylene group, provided that X and Y do not simultaneously represent a methylene group; and M represents a hydrogen atom or an alkali metal atom.

[0017]

Specific examples of a linear or branched alkyl group having 1 to 30 carbon atoms represented by a substituent R in Formula (1) include methyl, ethyl, propyl, butyl, pentyl, hexyl, heptyl, octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, octadecyl, nonadecyl, and eicosyl.

[0018]

Specific examples of a linear or branched alkenyl group having 2 to 30 carbon atoms represented by a substituent R include allyl, butenyl, octenyl, decenyl, dodecadienyl, and hexadecatrienyl. More specific examples include 8-decenyl, 8-undecenyl, 8-dodecenyl,

8-tridecenyl, 8-tetradecenyl, 8-pentadecenyl, 8-hexadecenyl, 8-heptadecenyl, 8-octadecenyl, 8-icosenyl, 8-docosenyl, heptadeca-8,11-dienyl, heptadeca-8,11,14-trienyl, nonadeca-4,7,10,13-tetraenyl, nonadeca-4,7,10,13,16-pentaenyl, and henicosa-3,6,9,12,15,18-hexaenyl.

[0019]

Specific examples of a linear or branched alkynyl group having 2 to 30 carbon atoms represented by a substituent R include 8-decynyl, 8-undecynyl, 8-dodecynyl, 8-tridecynyl, 8-tetradecynyl, 8-pentadecynyl, 8-hexadecynyl, 8-heptadecynyl, 8-octadecynyl, 8-icocynyl, 8-dococynyl, and heptadeca-8,11-diynyl.

[0020]

Specific examples of a cycloalkane ring that can be contained in the alkyl, alkenyl, or alkynyl group described above include a cyclopropane ring, a cyclobutane ring, a cyclopentane ring, a cyclohexane ring, and a cyclooctane ring. A cycloalkane ring may contain one or more hetero atoms, and examples thereof include an oxirane ring, an oxetane ring, a tetrahydrofuran ring, and an N-methylprolidine ring.

[0021]

Specific examples of an aromatic ring that can be contained in the alkyl, alkenyl, or alkynyl group described above include a benzene ring, a naphthalene ring, a pyridine ring, a furan ring, and a thiophene ring.

[0022]

When a substituent R represents an alkyl group substituted with a cycloalkane ring, accordingly, specific examples thereof include cyclopropylmethyl, cyclohexylethyl, and 8,9-methanopentadecyl.

[0023]

When a substituent R represents an alkyl group substituted with an aromatic ring, specific examples thereof include benzyl, phenethyl, and p-pentylphenyloctyl.

[0024]

R preferably represents a linear or branched alkyl group having 9 to 17 carbon atoms, a linear or branched alkenyl group having 9 to 17 carbon atoms, or a linear or branched alkynyl group having 9 to 17 carbon atoms. More preferably, R represents a linear or

branched alkyl group having 9, 11, 13, 15, or 17 carbon atoms or a linear or branched alkenyl group having 9, 11, 13, 15, or 17 carbon atoms. Particularly preferably, R represents a linear or branched alkenyl group having 9, 11, 13, 15, or 17 carbon atoms.

[0025]

X and Y in a compound represented by Formula (1) each independently represent an oxygen atom (-O-) or a methylene group (-CH₂-), although X and Y do not simultaneously represent a methylene group. Accordingly, the three combinations of X and Y are as follows.

- (1) X represents an oxygen atom and Y represents an oxygen atom.
- (2) X represents an oxygen atom and Y represents a methylene group.
- (3) X represents a methylene group and Y represents an oxygen atom.

[0026]

M in a cyclic phosphatidic acid derivative represented by Formula (1) represents a hydrogen atom or an alkali metal atom. Examples of an alkaline metal atom include lithium, sodium, and potassium, with sodium being particularly preferable.

[0027]

Specific examples of a compound represented by Formula (1) used in the present invention are preferably cyclic phosphatidic acid derivative of Formula (1) wherein R represents, as acyl at position 1, stearoyl, oleoyl, linoleoyl, or linolenoyl having 17 carbon atoms, palmitoyl or palmitoleoyl having 15 carbon atoms, or a fatty acid mixture comprising 2 or more such fatty acids. A cyclic phosphatidic acid derivative comprising acyl composed of fatty acid derived from soybean lecithin is particularly preferable.

[0028]

A compound represented by Formula (1) occasionally comprises an isomer, such as a position isomer, geometric isomer, tautomer, or optical isomer, in accordance with substituent type. A mixture comprising all types of available isomers and a mixture comprising two or more types of such isomers at any proportion are within the scope of the present invention.

[0029]

A compound represented by Formula (1) is occasionally in the form of a water adduct or solvent adduct (a hydrate or solvate). Such adduct is also within the scope of the

present invention. In addition, any crystalline form of the compound represented by Formula (1) or a salt thereof is within the scope of the present invention.

[0030]

A compound among compounds represented by Formula (1), in which X and Y each independently represent an oxygen atom, can be chemically synthesized according to the method disclosed in JP Patent Publication (Kokai) No. H5-230088 A (1993), JP Patent Publication (Kokai) No. H7-149772 A (1995), JP Patent Publication (Kokai) No. H7-258278 A (1995), or JP Patent Publication (Kokai) No. H9-25235 A (1997), for example.

[0031]

Furthermore, a compound among compounds represented by Formula (1), in which X and Y each independently represent an oxygen atom, can be synthesized by allowing phospholipase D to react with lysophospholipid according to the method disclosed in JP Patent Publication (Kokai) No. 2001-178489 A. Lysophospholipid to be used herein is not particularly limited, as long as it can react with phospholipase D. Many types of lysophospholipids are known, including those differing in fatty acid type and molecular species having an ether or vinyl ether bond. They are commercially available. As for phospholipase D, those derived from higher plants, such as cabbage and peanut, and those derived from microorganisms, such as *Streptomyces chromofuscus* and *Actinomadura sp.*, are available as commercial reagents. Cyclic phosphatidic acid can be synthesized with high selectivity with the aid of an enzyme derived from *Actinomadura sp.* No. 362 (JP Patent Publication (Kokai) No. H11-367032 A (1999)). Conditions for reaction between lysophospholipid and phospholipase D are not particularly limited, as long as an enzyme can exert its activity. For example, the reaction is carried out in an acetate buffer (pH around 5 to 6) containing calcium chloride at a temperature ranging from room temperature to a warmed temperature (preferably approximately 37°C) for approximately 1 to 5 hours. The resulting cyclic phosphatidic acid derivative can be purified by extraction, column chromatography, thin-layer chromatography (TLC), or other means in accordance with a conventional method.

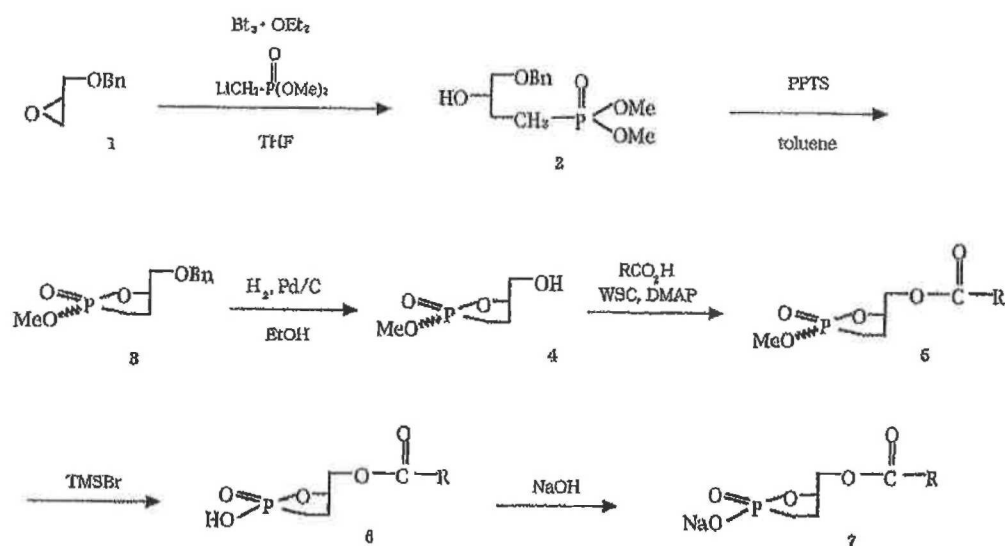
[0032]

Furthermore, among the compounds represented by Formula (1), a compound in

which X represents an oxygen atom and Y represents a methylene group, can be synthesized according to the method described in the document (Kobayashi, S., et al., Tetrahedron Letters 34, 4047-4050, 1993) or the method described in International Patent Publication WO 2002/094286. A specific example of the synthetic pathway is as follows.

[0033]

[Formula 3]



[0034]

In the above synthetic pathway, commercially available (R)-benzylglycidyl ether (1) is first activated with $\text{BF}_3 \cdot \text{Et}_2\text{O}$, n-BuLi is allowed to react with methyl phosphonic acid dimethyl ester, and the resulting lithio derivative is subjected to a reaction. Thus, alcohol (2) is obtained.

The thus obtained alcohol is allowed to react with an excess of a pyridinium salt of p-toluenesulfonic acid in toluene at 80°C to obtain a cyclized product (3). The cyclized product is decomposed with hydrogenation under a hydrogen atmosphere using 20% $\text{Pd}(\text{OH})_2\text{-C}$, so that debenzylation is carried out (4). As a condensation agent, 1-ethyl-3-(3-dimethyl aminopropyl)carbodiimide hydrochloride is allowed to react with fatty acid to obtain a coupling product (5). Subsequently, bromotrimethylsilane is used as a nucleophile to remove a methyl group alone in a position-selective manner. Thus, cyclic phosphonic acid (6) is obtained. The cyclic phosphonic acid (6) is transferred into a

separatory funnel using ether, a small amount of a 0.02N sodium hydroxide aqueous solution is added dropwise thereto, and separation is then carried out, so that a target compound is extracted and purified as a sodium salt (7).

[0035]

Also, a compound among compounds represented by Formula (1), in which X represents a methylene group and Y represents an oxygen atom, can be synthesized according to the method described in JP Patent Publication (Kokai) No. 2004-010582 (A) or International Patent Publication WO 2003/104246.

[0036]

A preparation form of the hair-growing agent of the present invention is not particularly limited, as long as it can contain a compound represented by Formula (1) and it can be applied to the epidermis. For example, the hair-growing agent can be used in the form of a liquid, emulsion, semisolid, or solid agent by comprising adequate cosmetic or pharmaceutical vehicles. In order to further enhance absorption of the agent, it may be included in a microcapsule or liposome.

[0037]

The hair-growing agent of the present invention may be in any preparation form. For example, it can be in the form of hair liquid, hair tonic, hair lotion, ointment, hair cream, mousse, gel, shampoo, or hair conditioner. Such agent can be produced by adding a cyclic phosphatidic acid derivative used in the present invention to a suitable vehicle in accordance with a conventional technique.

[0038]

Content of the cyclic phosphatidic acid derivative in the hair-growing agent of the present invention varies depending on the kind of cyclic phosphatidic acid derivative. It is usually 0.01% to 5.0% by weight, preferably 0.01% to 3.0% by weight, and more preferably 0.1% to 1.0% by weight.

[0039]

Preferred vehicles for liquid preparations are those that are generally used in hair-growing agents, such as purified water, ethyl alcohol, or polyhydric alcohol. If necessary, additives may be added thereto.

Examples of polyhydric alcohol include glycerol, 1,3-butylene glycol, and propylene glycol.

Examples of additives include surfactants, vitamins, anti-inflammatory agents, microbicides, hormones, crude drug extracts, tinctures, refrigerants, moisturizers, keratolytics, antioxidants, sequestering agents, and perfumes.

[0040]

Surfactants are not particularly limited. Nonionic, anionic, cationic, or amphoteric surfactants can be used, according to need.

[0041]

Examples of vitamins include benzyl nicotinate, nicotinamide, D-pantothenyl alcohol, pantothenyl ethyl ether, biotin, pyridoxine hydrochloride, and riboflavin.

[0042]

Examples of anti-inflammatory agents include dipotassium glycyrrhizinate, β -glycyrrhetic acid, allantoin, diphenhydramine hydrochloride, guaiazulene, and 1-menthol.

Examples of microbicides include trichlorohydroxydiphenyl ether, hinokitiol, triclosan, chlorohexidine gluconate, phenoxyethanol, resorcin, isopropylmethylphenol, azulene, salicylic acid, zinc pyrithione, benzalkonium chloride, photosensitizing dye No. 301, and sodium mononitroguayacol.

[0043]

Examples of hormones include ethynylestradiol, estrone, and estradiol.

Examples of crude drug extracts include extract of *Swertia japonica Makino*, garlic extract, ginseng extract, aloe extract, and cinchona extract.

Examples of tinctures include capsicum tincture, ginger tincture, and cantharis tincture.

Examples of refrigerants include capsicum tincture, 1-menthol, and camphor.

[0044]

Examples of moisturizers include L-pyrrolidonecarboxylic acid, sodium hyaluronate, chondroitin sulfate, plant worm extract, and saffron extract.

Examples of antioxidants include butylhydroxyanisole, isopropyl gallate, propyl gallate, and erythorbic acid.

Examples of sequestering agents include ethylenediamine tetraacetate and a salt thereof.

[0045]

Examples of perfumes include natural perfumes, such as orange oil, lemon oil, bergamot oil, lime oil, lemongrass oil, and lavender oil, and synthetic perfumes, such as menthol, rose oxide, linalool, citral, and linalyl acetate.

[0046]

When the above liquid preparations are used in the form of spray, they can be used in combination with combustible gas, incombustible gas, or the like. Examples of combustible gas include LPG (a liquefied petroleum gas) and dimethyl ether, and examples of incombustible gas include a nitrogen gas and a carbon dioxide gas.

Vehicles for semisolid or solid preparations include Vaseline, solid paraffin, vegetable oils, mineral oils, lanolin, wax, and macrogol. Further, the above additives, emulsifiers such as lecithin, and lower alcohols such as ethyl alcohol and isopropyl alcohol may be added thereto, if necessary.

[0047]

The dose of the hair-growing agent of the present invention varies depending upon the symptom of the subject, the mode of administration, or other conditions. The agent is percutaneously administered in an amount of 0.1 to 250 mg, and preferably 1 to 100 mg in terms of a compound represented by Formula (1) per adult once or several times per day.

[0048]

The present invention is described in greater detail with reference to the following examples, although the present invention is not limited to these examples.

Examples

[0049]

Production Example 1

Native cPA used in the examples (hereafter also referred to as "NcPA") was prepared in the manner described below (see Examples 1, 3, and 5 of JP Patent Application No. 2011-126901).

Soybean phospholipids (10 g; lecithine content: 70%) were dissolved in 100 ml of 1 M acetate buffer (pH 6.5) containing 0.3 M calcium chloride, 6,000 units of *Streptomyces*-derived phospholipase A2 were added thereto, and the reaction was allowed to proceed with agitation at 40°C for 18 hours. The pH level of the reaction solution was adjusted to 2.5 so as to inactivate the enzyme, 100 ml of chloroform and 50 ml of methanol were added, the mixture was thoroughly agitated, and lipid components were then extracted. The chloroform layer was collected and solidified to dryness under reduced pressure with the use of a rotary evaporator. Acetone (100 ml) was added to the solid component, phospholipids were precipitated, and free fatty acids were removed. The precipitate (5 g) was dissolved in 40 ml of chloroform, 10 ml of 1 M acetate buffer (pH 5.5) was added, 1,500 units of *Actinomadura*-derived phospholipase D were added thereto, and the reaction was allowed to proceed with agitation at 40°C for 18 hours. To the reaction solution were added 20 ml of 3 M sodium chloride and 20 ml of a 0.1 M EDTA solution, and the mixture was agitated at 40°C for 1 hour. Further, 20 ml of methanol was added thereto, the mixture was thoroughly agitated, and the resultant was centrifuged at 3,000 rpm for 5 minutes to collect the chloroform layer. The solution was solidified to dryness under reduced pressure with the use of a rotary evaporator, and 3.8 g of cyclic phosphatidic acid sodium salt was obtained. Cyclic phosphatidic acid sodium salt (3.8 g) was obtained from soybean phospholipid with lecithine content of 70% (i.e., 7 g of lecithin in 10 g of soybean phospholipid), and the yield was 54.3%. The purity of the cyclic phosphatidic acid sodium salt was analyzed using a silica gel plate, the cyclic phosphatidic acid sodium salt on the plate was developed with chloroform/methanol/acetic acid/5% sodium disulfite (100:40:12:5, V/V), and the resultant was soaked in a 5% copper acetate/8% phosphoric acid/2% sulfuric acid solution for a short period of time, followed by air drying and heating at 180°C for about 10 minutes. Thereafter, the resulting spots were analyzed using a scanner (Atto Corporation). Specifically, spots on a thin-layer chromatograph were examined using a densitometer by using a standard product (97% purified product) as a control and quantified in terms of area ratio. The purity of the cyclic phosphatidic acid sodium salt in the product obtained as a result of the above process was 54%.

[0050]

The cyclic phosphatidic acid sodium salt (500 mg) was dissolved in 5 ml of chloroform containing 10% methanol, the solution was applied to a silica gel column, the solution was developed with the same medium, and the resultant was further developed with chloroform containing 20% methanol to separate it into 10-ml fractions. A fraction containing cyclic phosphatidic acid sodium salt was collected by the TLC method described above and solidified to dryness under reduced pressure with the use of a rotary evaporator. Thus, 320 g of cyclic phosphatidic acid sodium salt powder was obtained. The purity of the cyclic phosphatidic acid sodium salt in the sample was 95%.

[0051]

A fatty acid composition of the high-purity cyclic phosphatidic acid sodium obtained above was analyzed by the gas chromatogram technique. Cyclic phosphatidic acid sodium was dissolved to a concentration of 20 mg/ml in methanol hydrochloride, and the solution was heated at 65°C for 30 minutes. After the temperature had been reduced to room temperature, water was added in an amount equivalent to that of the solution, and an equivalent amount of hexane was then added, followed by thorough mixing. The mixture was centrifuged at 3,000 rpm for 5 minutes, 2 µl of the hexane layer was injected into a capillary column, and the fatty acid component was analyzed. The results of analysis are shown below.

Fatty acids	Content (%)
Palmitin acid	23.9
Stearic acid	5.4
Oleic acid	8.6
Linoleic acid	53.4
Linolenic acid	4.9
Other fatty acids	3.8

[0052]

Test Example 1

With the use of NcPA produced in Production Example 1, hair-growing effects were tested using mice.

[0053]

(1) Specimens to be administered

Control sample: 50% ethanol (a solution of equivalent amounts of ethanol and physiological saline)

Test material: A 1% NcPA aqueous solution was prepared with the addition of physiological saline, the 1% NcPA aqueous solution was diluted with ethanol to adjust the NcPA concentration to 0.5%, and the resultant was used as a test material.

[0054]

(2) Test animals and breeding conditions

Male C3H/HeNCrI CrIj mice (hereafter abbreviated as C3H, SPF; 18.8 g to 23.6 g; Charles River Japan, Inc.) were subjected to the test. The posterior regions from the cervical regions to the caudal regions (excluding the lateral regions) of mice were shaved with razors with the use of shaving foams 3 days before grouping (47- to 48-week-old). The animals were bred in animal rooms, in which the temperature was maintained at 23°C and the humidity was maintained at 55%, for a light period and a dark period of 12 hours, respectively, with a ventilation frequency of 12 times per hour. Mice were allowed to freely ingest solid feeds (MF, Lot No. 111206, Oriental Yeast Co., Ltd.) and allowed to freely drink tap water.

[0055]

(3) Administration

The route of percutaneous administration was employed. Specimens to be administered (the control sample and the test material) were administered to the dorsal skin of mice using micropipettes and softly applied with fingers (the control group: 10 mice; the group subjected to NcPA administration: 10 mice). The amount of the solution administered was 100 µl/site. Administration was carried out once a day. The first day of administration was designated Day 1, and administration was continued for 24 days.

[0056]

(4) Evaluation

The shaved areas were visually inspected on the day of grouping (Day 1) and Days 5, 7, 10, 13, 16, 19, 22, and 25 on the basis of the evaluation criteria shown in Table 1, and "the mean ± the standard deviation" for each group was determined. Each group was photographed on the days of score observation. Photographing and score observation were

carried out prior to administration.

[0057]

[Table 1]

Table 1: Evaluation criteria

Symptoms	Scores
Skin color turns pink	1
Skin color turns gray (less than 30% of the shaved area)	2
Skin color turns gray (less than 60% of the shaved area) or hair growth is observed (less than 30% of the shaved area)	3
Skin color turns gray (60% or more of the shaved area) or hair growth is observed (less than 60% of the shaved area)	4
Hair growth is observed (60% or more of the shaved area)	5

[0058]

(5) Results

The results of observation of hair growth scores are shown in Table 2 and Fig. 1, and photographs of mice are shown in Fig. 2 and Fig. 3.

[0059]

[Table 2]

Table 2: Effects of NcPA on hair growth scores

	Control group	Group subjected to NcPA administration
Day 1	1.0 ± 0.0	1.0 ± 0.0
Day 5	1.0 ± 0.0	1.0 ± 0.0
Day 7	1.0 ± 0.0	1.1 ± 0.1
Day 10	1.3 ± 0.2	1.4 ± 0.2
Day 13	1.7 ± 0.2	2.0 ± 0.2
Day 16	2.3 ± 0.4	2.8 ± 0.3
Day 19	2.9 ± 0.4	4.0 ± 0.3(*)
Day 22	3.6 ± 0.4	4.5 ± 0.2
Day 25	3.9 ± 0.3	4.8 ± 0.1(*)

Numerical values in the table indicate "mean ± standard deviation."

*: P < 0.1

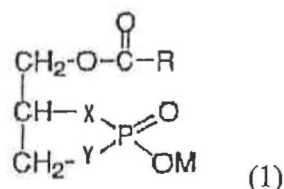
[0060]

As shown in Table 2 and in Fig. 1, higher scores were observed ($P < 0.1$) on Day 19 and Day 25 in the group subjected to NcPA administration to which NcPA had been percutaneously administered at 1,100 $\mu\text{l}/\text{site}/\text{day}$ for 24 days, compared with the control group. Thus, effects of NcPA for promoting hair growth were confirmed.

CLAIMS

[Claim 1] A hair-growing agent comprising, as an active ingredient, a compound represented by Formula (1):

[Formula 1]



wherein R represents a linear or branched alkyl group having 1 to 30 carbon atoms, a linear or branched alkenyl group having 2 to 30 carbon atoms, or a linear or branched alkynyl group having 2 to 30 carbon atoms, which may comprise a cycloalkane ring or an aromatic ring; X and Y each independently represent an oxygen atom or a methylene group, provided that X and Y do not simultaneously represent a methylene group; and M represents a hydrogen atom or an alkali metal atom.

[Claim 2] The hair-growing agent according to claim 1, wherein, in Formula (1), X and Y represent an oxygen atom.

[Claim 3] The hair-growing agent according to claim 1, wherein, in Formula (1), one of X and Y represents an oxygen atom and the other represents a methylene group.

[Claim 4] The hair-growing agent according to any one of claims 1 to 3, wherein the compound represented by Formula (1) has an acyl group comprising fatty acid derived from soybean lecithin.