(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
31 October 2019 (31.10.2019)

WIPO | PCT

(10) International Publication Number
WO 2019/206764 A1

(51) International Patent Classification:
*A61K 8/27* (2006.01) *A61Q 15/00* (2006.01)
*A61K 8/63* (2006.01) *A61K 8/19* (2006.01)

(21) International Application Number:
PCT/EP2019/059933

(22) International Filing Date:
17 April 2019 (17.04.2019)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PCT/CN2018/084073 23 April 2018 (23.04.2018) CN
18172332.1 15 May 2018 (15.05.2018) EP

(71) Applicant *(for all designated States except AE, AG, AU, BB, BH, BN, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, JO, KE, KN, KW, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, QA, RW, SA, SC, SD, SG, SL, SZ, TT, TZ, UG, US, VC, ZA, ZM, ZW)*: **UNILEVER N.V.** [NL/NL]; Weena 455, 3013 AL Rotterdam (NL).

(71) Applicant *(for AE, AG, AU, BB, BH, BN, BW, BZ, CA, CY, EG, GB, GD, GH, GM, IE, IL, IN, JO, KE, KN, KW, LC, LK, LS, MT, MW, MY, NA, NG, NZ, OM, PG, QA, RW, SA, SC, SD, SG, SL, SZ, TT, TZ, UG, VC, ZA, ZM, ZW only)*: **UNILEVER PLC** [GB/GB]; Unilever House, 100 Victoria Embankment, London Greater London EC4Y 0DY (GB).

(71) Applicant *(for US only)*: **CONOPCO, INC., D/B/A UNILEVER** [US/US]; 700 Sylvan Avenue (A4), Englewood Cliffs, New Jersey 07632 (US).

(72) Inventors: **CAO, Han**; Unilever (China) Investing Company 66 Linxin Road, Linkong Economic Development Zone, Changning District, Shanghai, 200335 (CN). **LI, Xiaoke**; Unilever (China) Investing Company 66 Linxin Road, Linkong Economic Development Zone, Changning District, Shanghai, 20335 (CN). **PRAMANIK, Amitava**; 045 Richfields Outer Ring Road, Marathahalli, Bangalore 560 010 Karnataka (IN). **ZHOU, Huanjun**; Unilever (China) Investing Company 66 Linxin Road, Linkong Economic Development Zone, Changning District, Shanghai, 200335 (CN). **ZHOU, Weizheng**; Unilever (China) Investing Company 66 Linxin Road, Linkong Economic Development Zone, Changning District, Shanghai, 200335 (CN).

(74) Agent: **WHALEY, Christopher**; Unilever Patent Group Olivier van Noortlaan 120, 3133 AT Vlaardingen (NL).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**
— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

**Published:**
— *with international search report (Art. 21(3))*

(54) Title: AN ANTIPERSPIRANT COMPOSITION

(57) Abstract: The present invention is in the field of personal care compositions especially relating to anti-perspirant compositions. They involve effective use of cholic acid derivatives to achieve this purpose. The efficacy of the composition is delivered through effective use of this compound by formulating with multivalent metal salts in a topically acceptable carrier.

WO 2019/206764 A1

# AN ANTIPERSPIRANT COMPOSITION

## Field of the invention

The present invention is in the field of personal care especially relating to anti-perspirant compositions. They involve effective use of cholic acid derivatives to achieve this purpose.

## Background of the invention

The present invention relates to compositions, such as those that contain antiperspirant actives. These actives are added to compositions to reduce perspiration on application to the surface of the body, particularly to the underarm regions of the human body viz. the axilia. Antiperspirant actives used so far are typically astringent metal salts such as aluminium or zirconium salts. Antiperspirant actives are usually incorporated in compositions at low pH, in the range of 2 to 7. The present inventors have found that certain cholic acid derivatives like hydroxycholic acid or salts thereof when combined with certain multivalent metal ions are found to provide long lasting antiperspirant activity.

US4664910 (Lever Bros., 1987) discloses a cosmetic composition which is suitable for application on the skin or hair as a powdered product to remove sebum and/or perspiration which comprises a cholanic acid derivative and a powder absorbent. The present inventors find that the teaching of this publication does not provide the necessary antiperspirant efficacy to be equal to or better than known aluminium or zirconium based actives. Thus, the present inventors embarked on a program to improve the efficacy of such actives.

After extensive experimentation, the present inventors found that when certain hydroxycholic acids or their salts are combined with multivalent metal salts, especially divalent metal salts, the antiperspirancy efficacy is enhanced. This efficacy is significantly perceivable when it is formulated in an anhydrous medium.

It is thus an object of the present invention to provide for antiperspirant compositions that have enhanced efficacy and are free of conventional metal based actives like those of aluminium or zirconium.

**Summary of the invention**

According to the first aspect of the present invention there is provided an antiperspirant composition comprising

(i) 0.5 to 50 wt% of a cholic acid derivative selected from a hydroxycholic acid, or a salt thereof;

(ii) A multivalent metal salt; and

(iii) a topically acceptable carrier.

wherein said multivalent metal salt is soluble in said topically acceptable carrier.

According to another aspect of the present invention there is provided a non-therapeutic method of reducing perspiration comprising the step of applying the composition of the invention on to the desired skin surface.

Yet another aspect of the present invention relates to non-therapeutic use of a cholic acid derivative selected from hydroxycholic acid or a salt thereof, in combination with a multivalent metal salt in a topically acceptable carrier for reducing perspiration.

**Detailed description of the invention**

These and other aspects, features and advantages will become apparent to those of ordinary skill in the art from a reading of the following detailed description and the appended claims. For the avoidance of doubt, any feature of one aspect of the present invention may be utilized in any other aspect of the invention. The word “comprising” is intended to mean “including” but not necessarily “consisting of” or “composed of.” In other words, the listed steps or options need not be exhaustive. It is noted that the examples given in the description below are intended to clarify the invention and are not intended to limit the invention to those examples per se. Similarly, all percentages are weight/weight percentages unless otherwise indicated. Except in the operating and comparative examples, or where otherwise explicitly indicated, all numbers in this description and claims indicating amounts of material or conditions of reaction, physical properties of materials and/or use are to be understood as modified by the word “about”. Numerical ranges expressed in the format "from x to y" are understood to include x and y. When for a specific feature multiple preferred ranges are described in the format "from

x to y", it is understood that all ranges combining the different endpoints are also contemplated.

The compositions of the invention are typically “personal care compositions”, suitable for cosmetic use as detailed below. Further, use of the compositions of the invention is typically cosmetic or non-therapeutic use.

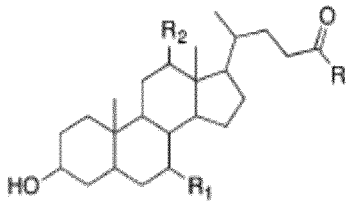
In some embodiments of the present invention, the compositions may be used for the therapeutic treatment of hyperhidrosis (extreme sweating). In one aspect the compositions of the invention are used for therapeutic treatment. Alternatively, the compositions are used for non-therapeutic applications, more particularly for cosmetic purposes.

By “An Antiperspirant Composition” as used herein, is meant to include a composition for topical application to the skin of mammals, especially humans. Such a composition is preferably of the leave-on type. By a leave-on composition is meant a composition that is applied to the desired skin surface and left on for a period of time (say from one minute to 24 hours) after which it may be wiped or rinsed off with water, usually during the regular course of personal washing. The composition may also be formulated into a product which is applied to a human body for improving the appearance, cleansing, odor control or general aesthetics. The composition of the present invention can be in the form of a liquid, lotion, cream, foam, scrub, gel or stick form and may be delivered through a roll-on device or using a propellant containing aerosol can. It is especially useful for delivering low pH compositions to the axilla of an individual for anti-precipitancy benefits. “Skin” as used herein is meant to include skin on any part of the body (e.g., neck, chest, back, arms, underarms, hands, legs, buttocks and scalp) especially the underarms.

“Soluble” for the purpose of the present invention means the solubility of a salt (multivalent metal salt) in a solvent at 25°C and atmospheric pressure. “Soluble” means that a salt is able to be dissolved in a solvent to form a solution with a concentration of at least 10g/L, preferably at least 100g/L.

According to the first aspect of the present invention there is provided an antiperspirant composition comprising a cholic acid derivative selected from a hydroxycholic acid, or a salt thereof; multivalent metal salt and a topically acceptable carrier.

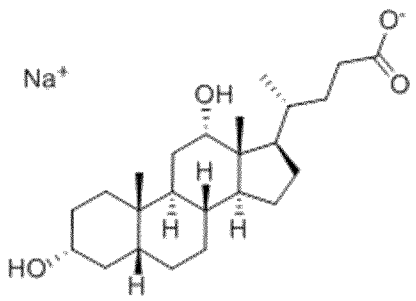
Hydroxycholic acid has the general structure as given below:



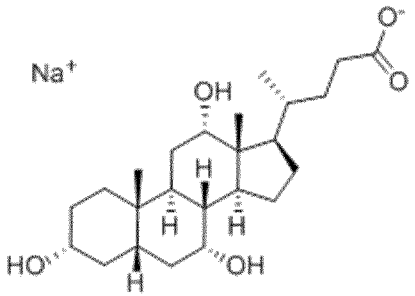

| | R | $R_1$ | $R_2$ |
|---|---|---|---|
| Cholic acid (CA) | OH | OH | OH |
| Deoxycholic acid (DCA) | OH | H | OH |
| Chenodeoxycholic acid (CDCA) | OH | OH | H |
| Lithocholic acid (LCA) | OH | H | H |
| Ursodeoxycholic acid (UDCA) | OH | β-OH | H |

The preferred hydroxycholic acids which may be included in the composition are chosen from one of more of cholic acid, deoxycholic acid, lithocholic acid, chenodeoxycholic acid, glycocholic acid, glycodeoxycholic acid, ursodeoxycholic acid or taurocholic acid. The salts of these deoxycholic acids may also be included and are preferred as compared to the acid forms. The preferred salts are sodium or potassium salts. It is preferred that the salt of hydroxycholic acid is soluble in the topically acceptable carrier. The structure of the salt forms of these preferred compounds are given below:

Sodium deoxycholate (deoxycholic acid sodium salt) $C_{24}H_{39}O_4Na$

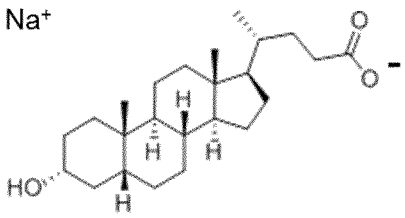



Sodium cholate (cholic acid sodium salt) $C_{24}H_{39}O_5Na$

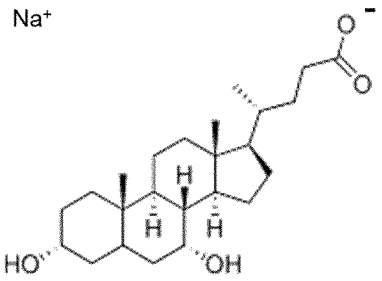




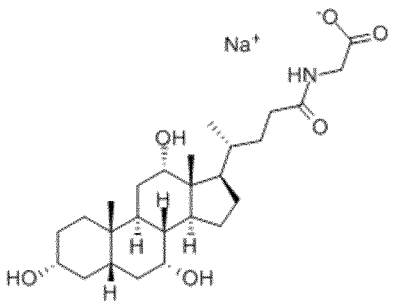

Sodium lithocholate (lithocholic acid sodium salt) $C_{24}H_{39}O_3Na$



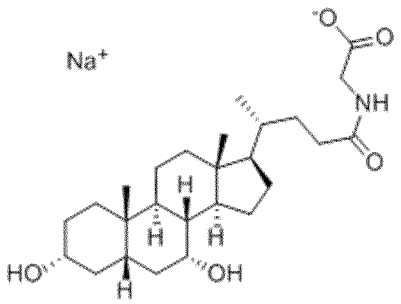

Sodium chenodeoxycholate (chenodeoxycholic acid sodium salt) $C_{24}H_{39}O_4Na$



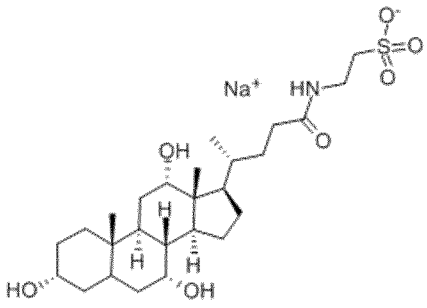

 Sodium glycocholate (glycocholic acid sodium salt) $C_{26}H_{42}NO_6Na$



Sodium glycodeoxycholate (glycochenodeoxycholic acid sodium salt) $C_{26}H_{42}NO_5Na$



Sodium taurocholate $C_{26}H_{44}NSO_7Na$



In accordance with this invention, the cholic acid derivative is included in 0.5 to 50%, preferably 0.5 to 15%, more preferably 2 to 8% by weight of the composition.

The composition of the invention includes a salt of a multivalent metal which may be selected from calcium, strontium, zinc, magnesium, titanium, zirconium or aluminium. The multivalent metal is preferably divalent. In accordance with this invention, the multivalent metal salt is soluble in the topically acceptable carrier. The preferred multivalent metal is magnesium, calcium, strontium or zinc, most preferred being calcium or zinc. The multivalent metal salt is preferably water soluble. The salt may be chloride,

sulphate, phosphate, acetate or alcoholamine. Of these chloride, phosphate or acetate are most preferred. The most preferred multivalent salt for inclusion in the antiperspirant composition of the invention are calcium chloride, zinc acetate, strontium acetate and strontium chloride. The multivalent metal salt is preferably included in 0.01 to 30%, preferably 0.1 to 5%, more preferably 0.1 to 1% by weight of the composition.

Without wishing to be bound by theory, the inventors believe that the combination of the cholic acid derivative and the multivalent salt cause the metal ions to increase the charge screen effect and the coordination effect thus facilitating the self-assembly/gelation of cholic acid derivatives in the presence of sweat.

The composition of the invention comprises a topically acceptable carrier. The composition is seen to be effective especially when the topically acceptable carrier is anhydrous. By an anhydrous carrier is meant that water content in the composition is less than 5wt%, preferably less than 2 wt%, more preferably less than 1 wt% and optimally absent from the composition. To enable this, the anhydrous carrier preferably comprises a silicone compound, an alcohol or a wax. The alcohol, when used, could be a low boiling (C2-C4) alcohol or a polyhydric alcohol, preferably a polyhydric alcohol.

The pH of the composition is preferably higher than 3.5 more preferably in the range of 4 to 7. The pH of the composition of the invention is measured using the following procedure:
Equal volumes of the composition and model ionic sweat (pH 6.1) are mixed, and the pH value is measured using an accurate range pH test paper.

The composition of the invention preferably comprises a polyhydric alcohol. Polyhydric alcohol is also referred to in short as polyol. A polyhydric alcohol as per the present invention is a compound having two or more hydroxyl groups. Suitable class of polyhydric alcohols that may be included in the composition of the invention are monomeric polyols, polyalkylene glycols or sugars. Preferred monomeric polyols are glycol; alkylene glycol e.g. propylene glycol; glycerol; or xylitol, more preferably propylene glycol.

Suitable polyalkylene glycols are polyethylene glycol or polypropylene glycol.

Sugars for inclusion in the invention could be monomeric, dimeric, trimeric or of the polymeric form. Preferred sugars include glucose, fructose, mannose, sucrose, threitol, erythritol, sorbitol, mannitol, galactitol, adonitol, dextran, or cyclodextrin. Of these the more preferred sugars are glucose, fructose, sucrose, sorbitol, mannitol, adonitol, dextran, or cyclodextrin.

Other components commonly included in conventional antiperspirant compositions may also be incorporated in the composition of the present invention. Such components include skin care agents such as emollients, humectants and skin barrier promoters; skin appearance modifiers such as skin lightening agents and skin smoothing agents; anti-microbial agents, in particular organic anti-microbial agents, and preservatives.

The anti-perspirant composition can be applied cosmetically and topically to the skin, broadly speaking, by one of two methods. Some consumers prefer one method and some others, the other method. In one method, sometimes called a contact method, a composition is wiped across the surface of the skin, depositing a fraction of the composition as it passes. In the second method, sometimes called the non-contact method, the composition is sprayed from a dispenser held proximate to the skin, often in an area of about 10 to 20 $cm^2$. The spray can be developed by mechanical means of generating pressure on the contents of the dispenser, such as a pump or a squeezable sidewall or by internally generated pressure arising from a fraction of a liquefied propellant volatilising, the dispenser commonly being called an aerosol.

There are broadly speaking two classes of contact compositions, one of which is liquid and usually applied using a roll-on dispenser or possibly absorbed into or onto a wipe, and in the second of which the antiperspirant active is distributed within a carrier liquid that forms a continuous phase that has been gelled. In one variation, the carrier fluid comprises a solvent for the antiperspirant and in a second variation, the antiperspirant remains a particulate solid that is suspended in an oil, usually a blend of oils.

Stick or soft solid compositions

Many different materials have been proposed as gellant for a continuous oil phase, including waxes, small molecule gelling agents and polymers. They each have their

advantages and of them, one of the most popular class of gellant has comprised waxes, partly at least due to their ready availability and ease of processing, including in particular linear fatty alcohol wax gellants. A gelled antiperspirant composition is applied topically to skin by wiping it across and in contact with the skin, thereby depositing on the skin a thin film.

The nature of the film depends to a significant extent on the gellant that is employed. Although wax fatty alcohols have been employed as gellant for many years, and are effective for the purpose of gelling, the resultant product is rather ineffective at improving the visual appearance of skin, and in particular underarm skin, to which the composition has been applied. This problem has been solved by including ameliorating materials for example, di or polyhydric humectants and/or a triglyceride oil.

Roll-on

Liquid compositions that are applicable from a roll-on broadly speaking can be divided into two classes, namely those in which an antiperspirant active is suspended in a hydrophobic carrier, such as a volatile silicone and those in which the antiperspirant active is dissolved in a carrier liquid. The latter has proven to be more popular. There are mainly two sorts of dissolving carrier liquid, namely carriers that are predominantly alcoholic, which is to say the greater part of the dissolving carrier fluid comprises ethanol and the second class in which the carrier liquid is mainly water. The former was very popular because ethanol is a mild bactericide in its own right, but its popularity waned because it stings, especially if the surface onto which the composition has been applied has been damaged or cut, such as can easily arise during shaving or other de-hairing operations.

The second class of formulations that is an alternative to alcoholic formulations comprise a dispersion of water-insoluble or very poorly water soluble ingredients in an aqueous solution of the antiperspirant. Herein, such compositions will be called emulsions. Antiperspirant roll-on emulsions commonly comprise one or more emulsifiers to maintain a distribution of the water-soluble ingredients.

Aerosol compositions

The antiperspirant composition may be delivered through an aerosol composition which comprises a propellant in addition to the other ingredients described hereinabove. Commonly, the propellant is employed in a weight ratio to the base formulation of from 95:5 to 5:95. Depending on the propellant, in such aerosol compositions the ratio of propellant to base formulation is normally at least 20:80, generally at least 30:70, particularly at least 40:60, and in many formulations, the weight ratio is from 90:10 to 50:50. A ratio range of from 70:30 to 90:10 is sometimes preferred.

Propellants herein generally are one of three classes; i) low boiling point gasses liquifided by compression, ii) volatile ethers and iii) compressed non-oxidising gases.

Class i) is conveniently a low boiling point material, typically boiling below –5°C, and often below –15°C, and in particular, alkanes and/or halogenated hydrocarbons. This class of propellant is usually liquefied at the pressure in the aerosol canister and evaporates to generate the pressure to expel the composition out of the canister. Examples of suitable alkanes include particularly propane, butane or isobutane. The second class of propellant comprises a very volatile ether of which the most widely employed ether hitherto is dimethyl ether. This propellant can advantageously be employed at relatively low weight ratio of propellant to base formulation, for example to as low as 5:95. It can also be employed in admixture with, for example, compressible/liquefiable alkane gasses. The third class of propellant comprises compressed non-oxidising gasses, and in particular carbon dioxide or nitrogen. Inert gases like neon are a theoretical alternative.

When the composition of the invention is delivered in a roll-on, a firm solid or a stick format, the topically acceptable carrier comprises a hydrophobic carrier or an aqueous carrier. The hydrophobic carrier in such cases may comprise a silicone compound, low boiling alcohol or a wax. When the composition comprises a propellant, it is delivered as an aerosol.

The composition of the present invention can comprise a wide range of other optional components. The CTFA Personal care Ingredient Handbook, Second Edition, 1992,

which is incorporated by reference herein in its entirety, describes a wide variety of non-limiting personal care and pharmaceutical ingredients commonly used in the skin care industry, which are suitable for use in the compositions of the present invention. Examples include: antioxidants, binders, biological additives, buffering agents, colorants, thickeners, polymers, astringents, fragrance, conditioners, exfoliating agents, pH adjusters, preservatives, natural extracts, essential oils, skin sensates, skin soothing agents, and skin healing agents.

A preservative is a preferred additional component in compositions of the invention. A preservative serves to reduce or eliminate microbial contamination of compositions of the invention. Preservatives are typically employed at a total level of from 0.05 to 3%, preferably at from 0.1 to 2% and most preferably at from 0.4 to 1%.

Suitable preservatives for use with the present invention include 2-phenoxyethanol, iodopropynyl butylcarbamate, $C_1$-$C_3$ alkyl parabens, sodium benzoate, caprylyl glycol and EDTA. Particularly preferred preservatives are 2-phenoxyethanol, iodopropynyl butylcarbamate, sodium benzoate, caprylyl glycol and EDTA and especially preferred are 2-phenoxyethanol and iodopropynyl butylcarbamate.

A preferred additional component of compositions of the invention is a fragrance. Suitable materials include conventional perfumes, such as perfume oils and also include so-called deo-perfumes, as described in EP 545,556 and other publications. Levels of incorporation are preferably up to 4% by weight, particularly from 0.1% to 2% by weight, and especially from 0.7% to 1.7% by weight.

An antimicrobial deodorant active is a preferred an additional component in compositions of the invention. Such components serve to reduce or eliminate body odour by reducing or otherwise impeding the function of microbes on the skin of the body responsible for malodour generation.

The antimicrobial deodorant active may also be a preservative for the composition.

When employed, the anti-microbial deodorant agent is typically incorporated into the composition at from 0.01% to 3% and particularly at from 0.03% to 0.5%.

Preferred anti-microbial deodorant agents have a minimum inhibitory concentration (MIC) of 1 $mg.ml^{-1}$ or less, particularly 200 $\mu g.ml^{-1}$ or less, and especially 100 $\mu g.ml^{-1}$ or less. The MIC of an anti-microbial agent is the minimum concentration of the agent required to significantly inhibit microbial growth. Inhibition is considered "significant" if an 80% or greater reduction in the growth of an inoculum of *Staphylococcus epidermidis* is observed, relative to a control medium without an anti-microbial agent, over a period of 16 to 24 hours at 37°C. Details of suitable methods for determining MICs can be found in "Antimicrobial Agents and Susceptibility Testing", C.Thornsberry, (in "Manual of Clinical Microbiology", 5th Edition, Ed. A. Balows *et al*, American Society for Microbiology, Washington D.C., 1991). A particularly suitable method is the Macrobroth Dilution Method as described in Chapter 110 of above publication (pp. 1101-1111) by D. F. Sahm and J. A. Washington II. MICs of anti-microbials suitable for inclusion in the compositions of the invention are triclosan: 0.01-10 $\mu g.ml^{-1}$ (J.Regos *et al.*, Dermatologica (1979), 158: 72-79) and farnesol: ca. 25 $\mu g.ml^{-1}$ (K. Sawano, T. Sato, and R. Hattori, Proceedings of the 17th IFSCC International Conference, Yokahama (1992) p.210-232). By contrast ethanol and similar alkanols have MICs of greater than 1 $mg.ml^{-1}$.

Suitable organic anti-microbials are bactericides, for example quaternary ammonium compounds, like cetyltrimethylammonium salts; chlorhexidine and salts thereof; and diglycerol monocaprate, diglycerol monolaurate, glycerol monolaurate, and similar materials, as described in "Deodorant Ingredients", S.A.Makin and M.R.Lowry, in "Antiperspirants and Deodorants", Ed. K. Laden (1999, Marcel Dekker, New York). More preferred anti-microbials for use in the compositions of the invention are polyhexamethylene biguanide salts (also known as polyaminopropyl biguanide salts), an example being Cosmocil CQ™ available from Zeneca PLC, preferably used at up to 1% and more preferably at 0.03% to 0.3% by weight; 2',4,4'-trichloro,2-hydroxy-diphenyl ether (triclosan), preferably used at up to 1% by weight of the composition and more preferably at 0.05-0.3%; and 3,7,11-trimethyldodeca-2,6,10-trienol (farnesol), preferably used at up to 1% by weight of the composition and more preferably at up to 0.5%.

Other suitable organic antimicrobial agents are transition metal chelators, as described in WO01/52805, for example. Transitional metal chelators having a binding coefficient for iron(III) of greater than $10^{26}$, for example diethylenetriaminepentaacetic acid and salts thereof are preferred.

According to another aspect of the present invention there is provided a method of reducing perspiration comprising the step of applying a composition of the invention on to the desired skin surface. The composition is preferably applied on the axilla. The method is also preferably non-therapeutic or for cosmetic application.

Yet another aspect of the present invention relates to use of a cholic acid derivative selected from hydroxycholic acid or a salt thereof, in combination with a multivalent metal salt in a topically acceptable carrier for reducing perspiration. The use is for therapeutic treatment. Alternatively, the use is for non-therapeutic purposes, particularly for cosmetic purposes.

The invention will now be illustrated with the help of the following non-limiting examples.

**Examples**

Examples 1-3: Stability of the compositions as per the invention

The following compositions were prepared as given in Table – 1 below

Table -1

| Example | Cholic acid derivative (wt%) | Metal salt (wt%) | Ethanol (wt%) | Propylene Glycol (wt%) |
|---|---|---|---|---|
| 1 | sodium deoxycholate 5.0 | Calcium chloride 0.5 | - | 94.5 |
| 2 | sodium deoxycholate 4.0 | Zinc acetate 0.4 | 95.6 | - |
| 3 | Sodium Cholate 5.0 | Calcium chloride 2.5 | - | 92.5 |

The above compositions were tested for stability by using the following procedure:

The samples were transferred into transparent plastic jars which were then stored at 50 °C for 4 weeks. The appearance of each of the samples was checked visually and recorded at various time points. The samples were graded as either Transparent (T), Cloudy (C) or Precipitate (P). The data on the appearance of the samples is summarized in Table – 2 below:

Table -2.

| Example | 0 week | 1 week | 2 weeks | 3 weeks | 4 weeks |
|---|---|---|---|---|---|
| 1 | T | T | T | T | T |
| 2 | T | T | T | T | T |
| 3 | T | T | T | T | T |

The data in Table – 2 above indicates that compositions as per the invention (Examples 1 -3) were stable on storage for at least up to 4 weeks. It also indicates that the metal salt (calcium chloride/zinc acetate) is soluble in the carrier.

## Examples A-B, 4-6: Gelation of compositions with model sweat

Compositions as in Table 3 below were prepared

Table – 3

| Example | Cholic acid derivative (wt%) | Metal salt (wt%) | Ethanol (wt%) | Propylene Glycol (wt%) |
|---|---|---|---|---|
| A | Sodium deoxycholate 5.0 | - | - | 95 |
| B | Sodium deoxycholate 4.0 | - | 96.0 | - |
| 4 | Sodium deoxycholate 5.0 | Calcium chloride 0.5 | - | 94.5 |
| 5 | Sodium deoxycholate 4.0 | Zinc acetate 0.4 | 95.6 | - |
| C | Sodium Cholate 5.0 | - | - | 95.0 |
| 6 | Sodium Cholate 5.0 | Calcium chloride 2.5 | - | 92.5 |

The compositions were tested for gelation ability by using the following procedure:

The samples were mixed with equal volume of model ionic sweat (pH 6.1).

The composition of model ionic sweat (pH 6.1) is as given below:

| Ingredient | wt% of total |
|---|---|
| Potassium Chloride | 0.0373 |
| Sodium Bicarbonate | 0.0840 |
| Sodium Chloride | 0.5085 |
| Ammonium Chloride | 0.0107 |
| Calcium Chloride | 0.0222 |
| Lactic Acid | 0.0901 |
| Urea | 0.0018 |
| Water | 99.2454 |

The gelation time was determined by a vial inversion method: When the sample showed no flow on inversion and holding for 5 seconds, it was regarded as a gel. The data on gelation is shown in Table 4 below.

Table – 4

| Example | Gelation | Gelation time (minutes) |
|---|---|---|
| A | no | - |
| B | no | - |
| 4 | yes | 30 |
| 5 | yes | 60 |
| C | No | - |
| 6 | yes | 90 |

The data in Table – 4 above indicates that compositions as per the invention (Example 4 to 6) show gelation in reasonable time scales indicating its ability to block sweat pores thereby having anti-perspirant potential. Compositions outside the invention (Examples A to C) do not exhibit this property.

**Claims**

1. An antiperspirant composition comprising
   (i) 0.5 to 50 wt% of a cholic acid derivative selected from a hydroxycholic acid, or a salt thereof;
   (ii) A multivalent metal salt; and
   (iii) a topically acceptable carrier;
   wherein said multivalent metal salt is soluble in said topically acceptable carrier.

2. A composition as claimed in claim 1 wherein the salt of hydroxycholic acid is a sodium salt.

3. A composition as claimed in claim 1 or claim 2 wherein the hydroxycholic acid is selected from cholic acid, deoxycholic acid, lithocholic acid, chenodeoxycholic acid, glycocholic acid, glycodeoxycholic acid, ursodeoxycholic acid or taurocholic acid or a mixture thereof.

4. A composition as claimed in any one of the preceding claims wherein the multivalent metal is selected from calcium, strontium, zinc, magnesium, titanium, zirconium or aluminium.

5. A composition as claimed in claim 4 wherein the multivalent metal is calcium or zinc.

6. A composition as claimed in any one of the preceding claims wherein the metal salt is a chloride, sulphate, phosphate, acetate or alcoholamine.

7. A composition as claimed in any one of the preceding claims wherein the topically acceptable carrier is anhydrous.

8. A composition as claimed in claim 7 wherein the topically acceptable carrier comprises an alcohol which may be a low boiling (C2-C4) alcohol or a polyhydric alcohol.

9. A composition as claimed in claim 8 wherein the polyhydric alcohol is an alkylene glycol preferably propylene glycol.

10. A composition as claimed in 7 wherein the topically acceptable carrier comprises a propellant and the composition is delivered as an aerosol.

11. A composition as claimed in any one of the preceding claims comprising 0.5 to 15wt%, preferably 2 to 8 wt% of the cholic acid derivative.

12. A composition as claimed in any one of the preceding claims comprising 0.01 to 30 wt%, preferably 0.1 to 5 wt%, more preferably 0.1 to 1 wt% of metal salt.

13. A composition as claimed in any one of the preceding claims comprising an antimicrobial deodorant.

14. A non-therapeutic method of reducing perspiration comprising the step of applying a composition as claimed in any one of claims 1 to 13 on to the desired skin surface.

15. Non-therapeutic use of a cholic acid derivative selected from hydroxycholic acid or a salt thereof, in combination with a multivalent metal salt in a topically acceptable carrier for reducing perspiration.

# INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2019/059933

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61K8/27 A61K8/63 A61Q15/00 A61K8/19
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61K A61Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | RU 2 648 160 C2 (FEDERALNOE GOSUDARSTVENNOE BYUDZHETNOE NAUCHNOE UCHREZHDENIE VSEROSSIJ) 22 March 2018 (2018-03-22) claim 1 | 1-4,6,11 |
| X | US 4 664 910 A (CASERIO DOMENICO [IT] ET AL) 12 May 1987 (1987-05-12) cited in the application column 1, line 55 - column 2, line 10 pages 3,6 | 15 |

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 17 July 2019 | 31/07/2019 |

| Name and mailing address of the ISA/ | Authorized officer |
|---|---|
| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+31-70) 340-2040,<br>Fax: (+31-70) 340-3016 | Simon, Frédéric |

1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/EP2019/059933

| Patent document cited in search report | Publication date | Patent family member(s) | Publication date |
|---|---|---|---|
| RU 2648160 C2 | 22-03-2018 | --- | |
| US 4664910 A | 12-05-1987 | CA 1187802 A | 28-05-1985 |
| | | DE 3268202 D1 | 13-02-1986 |
| | | EP 0058000 A2 | 18-08-1982 |
| | | US 4664910 A | 12-05-1987 |