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3,767,786

INHIBITING PERSPIRATION WITH SCOPOLAMINE ESTERS

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No Drawing. Continuation-in-part of application Ser. No. 31,804, May 26, 1960, now abandoned. This application Apr. 20, 1961, Ser. No. 104,262

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4 Claims

ABSTRACT OF THE DISCLOSURE

Antiperspirant compositions and methods based on certain anticholinergic scopolamine esters as active ingredients.

CROSS-REFERENCE TO RELATED APPLICATION

This application is a continuation-in-part of copending application, Ser. No. 31,804, filed May 26, 1960, now abandoned.

This invention relates to antiperspirant formulations containing as an active ingredient certain esters of scopolamine acid salts.

Metal salts having astringent properties are used to inhibit perspiration or sweating. Aluminum salts are widely used; zinc salts have found some favor; and zirconium salts have recently become important. Salts of many other metals have antiperspirant activity; but, for the most part, they are not useful because of cost, availability, toxicity, color and other such considerations. Most commonly, the anions of the metal salts are chloride or chloride and hydroxide; but other anions as diverse as sulfate, sulfamate, phenolsulfonate, bromide, iodide, nitrate and lactate have been disclosed.

An early problem encountered in formulating antiperspirants based on astringent salts, which generally have an acidic reaction, was that fabrics with which they came into contact were weakened. Some persons with sensitive or broken skin experienced irritation supposedly caused by the low pH. These problems have been largely overcome by incorporation of buffers, such as urea and amino acids, to adjust and control the pH. Often basis metal salts are employed to give a somewhat higher pH. Special active ingredients or additives to decrease fabric damage or increase mildness to the skin have been disclosed. Problems of preparing a smooth cosmetically acceptable formulation increase with increasing amounts of astringent salts as do problems of mildness to the skin.

A further difficulty with antiperspirants of an astringent character is that considerable time often elapses between their application and their desired effect. The antiperspirant effect is not fully developed in most people for several hours with many commercial formulations; and maximum effectiveness is obtained only after regularly repeated usage over a period of days or weeks. A further difficulty with these antiperspirants is that they may be washed away from the axilla to a considerable extent by profuse sweating before they have an opportunity to inhibit perspiration. An additional difficulty with astringent-type antiperspirants is that some fraction of the population does not achieve control of sweating by their use. At best, astringent-based antiperspirant compositions containing relatively large amounts of metallic salts will provide about 40-50% reduction in sweating in the axillae.

Anticholinergic agents have been used by the medical profession for the systemic and topical treatment of certain pathological cases of excessive sweating. They have been suggested in the literature as possible ingredients of cosmetic antiperspirants. However, these suggestions

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teach the conclusion that satisfactory anticholinergic formulations for cosmetic and medical use have not been developed, the chief difficulty being to achieve adequate inhibition of perspiration at a level of usage which is physiologically safe. The subject has recently been summarized by Robert Brun in American Perfumer, 73, No. 5, p. 22 (1959). This conclusion has been supported by the absence of such formulas in the market place though many investigators must be aware of the potentialities of anticholinergic agents.

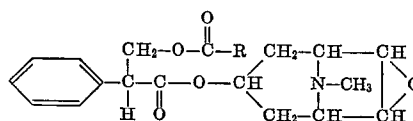
In order to define "anticholinergic" it is necessary to briefly describe certain aspects of human sweating. Eccrine sweat glands, which secrete most of the liquid sweat, are activated by a chemical mediator, usually considered to be acetylcholine, which is liberated at nerve endings when they are properly stimulated. An anticholinergic compound is one which destroys the action of the acetylcholine, probably by blocking the receptor sites of the secretory cells of the sweat glands, so that the cells are unable to respond. In addition to the eccrine glands, which are widely distributed over the surface of man's body, there are apocrine sweat glands which are fewer in number and are localized in particular areas, including the axilla. Examples of anticholinergic compounds used in classical studies of sweat inhibition include scopolamine and atropine.

An object of this invention is to provide an antiperspirant formulation with increased efficacy in reducing the amount of perspiration.

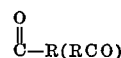
A further object of this invention is to provide an effective antiperspirant formulation which does not require astringent salts and which does not cause fabric damage, skin irritation or undue difficulties in formulation of a cosmetic product.

A still further object of this invention is to provide an antiperspirant composition which will safely and substantially completely inhibit perspiration.

It was found that these and other objects are accomplished with an antiperspirant composition containing, as an active ingredient uniformly dispersed in a dermatologically acceptable vehicle, an anticholinergic compound having the following formula:



wherein



is a straight chain acyl group, a branched chain acyl group, an aromatic group or a cyclic aliphatic group, containing from 4 to about 12 carbon atoms, preferably 4 to 7 carbon atoms. The compound can be in the form of the free base (as shown in the formula) or an acid salt wherein the acid substituent, HX (e.g., HBr or HCl) is attached to the terminal oxygen in the scopolamine portion of the ester.

There is no difference in antiperspirant activity between the two forms; however the acid salt can be obtained in crystalline form whereas the free base is usually isolated in the form of a liquid. Examples of acid forming anions, in the case of acid salts, are chloride, bromide, iodide, nitrate, citrate, acetate, methosulfate, sulfate, phosphate and tartrate. The particular anion chosen does not appear to affect the antiperspirant activity of the active ingredient of the compositions of this invention.

For convenience, the anticholinergic compounds will be referred to hereinafter as C₄-C₁₂ scopolamine esters.

Specific examples of the C₄-C₁₂ scopolamine esters that are useful in this invention are:

trimethylacetyl scopolamine hydrochloride (pivaloyl scopolamine hydrochloride)
 2-ethylbutyryl scopolamine hydrobromide
 2-ethyl-3-methylbutyryl scopolamine hydrobromide
 n-butyryl scopolamine hydrobromide
 n-valeryl-scopolamine hydrobromide
 isovaleryl scopolamine hydrobromide
 isopropylacetyl scopolamine hydrobromide
 4-methylpentanoyl scopolamine hydrobromide
 benzoyl scopolamine hydrobromide
 2,4-dichlorobenzoyl scopolamine hydrobromide
 cyclopentylpropionyl scopolamine hydrobromide
 cyclohexylpropionyl scopolamine hydrobromide
 naphtholyl scopolamine.

Also useful are:

n-hexanoyl scopolamine hydrobromide
 n-heptanoyl scopolamine hydrobromide
 n-octanoyl scopolamine hydrobromide
 n-nonanoyl scopolamine hydrobromide
 n-decanoyl scopolamine hydrobromide.

The free base form or the hydroiodide, hydronitrate, hydrocitrate or hydroacetate salts of the above compounds are also useful in the invention.

The preferred compounds are n-butyryl scopolamine hydrobromide, trimethyl acetyl scopolamine hydrochloride and benzoyl scopolamine hydrobromide.

Methods for making C₄-C₁₂ scopolamine esters are described in U.S. Pat. 2,814,623.

The C₄-C₁₂ scopolamine esters described above have very surprisingly high antiperspirant activity. Extremely small amounts provide a high degree of perspiration inhibition with no evidence of physiological side effects, e.g., dryness of mouth, toxicity or action on the central nervous system. The C₄-C₁₂ scopolamine esters surprisingly are much more active than their lower and higher homologues, e.g., respectively, acetyl scopolamine hydrobromide or n-propionyl scopolamine hydrobromide and stearyl scopolamine hydrobromide or oleyl scopolamine; they are much more active than their quaternized counterparts, e.g., scopolammonium N-methyl bromide; trimethyl acetyl scopolamine methyl bromide. Moreover, they are much more active than their atropine counterparts, e.g., trimethylacetyl atropine hydrobromide or benzoyl atropine hydrobromide.

The antiperspirant compositions of this invention should contain C₄-C₁₂ scopolamine esters in amounts not less than about 0.001% to provide antiperspirant efficacy and not more than about 0.1% as shown in the examples to provide a margin of safety to ensure that there are no side effects from repeated use as an antiperspirant. The preferred range is 0.005% to 0.1%. (All parts and percentages herein are by weight.) It was surprising to find that such a small amount of the C₄-C₁₂ scopolamine esters provides a high degree of antiperspirant effectiveness. Moreover, it was surprising to find that the maximum amount which can be safely used in an antiperspirant product is relatively low. Even at such low levels, the penetration of the skin by the C₄-C₁₂ scopolamine esters is so rapid that good antiperspirant efficacy is obtained when the skin is washed soon after application.

The compositions of this invention should be formulated so that they have a pH in aqueous solution of not less than about 3 nor more than about 6.5. At pH's outside of this range the C₄-C₁₂ scopolamine esters are relatively unstable after a period of time, either hydrolyzing or decomposing, particularly at elevated temperatures, and thereby losing their activity. Irritation may be encountered at pH's lower than 3. If elevated temperatures, e.g., 140° F., are to be encountered, the pH range should be from 3 to 5. The usual buffering materials can be used

to adjust the pH as necessary to obtain the desired pH. Examples of such buffers are: glycine,

citric acid+Na₂HPO₄,

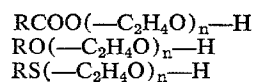
potassium hydrogen tartrate, potassium hydrogen phthalate and sodium hydrogen succinate.

The C₄-C₁₂ scopolamine esters are used in the compositions of this invention, in the above stated concentration ranges, uniformly dispersed in a water miscible, dermatologically acceptable vehicle. (Dispersion is intended to include solution.) Such a vehicle is non-toxic, is compatible with the human skin on which the composition will be used, and does not prevent absorption of the active antiperspirant ingredient by the skin. Such vehicles are well known in the cosmetic field and their choice is not critical to the efficacy of the C₄-C₁₂ scopolamine esters so long as they are water miscible and the above concentration range is observed, preferably within the above pH limits. Examples of water miscible, dermatologically acceptable vehicles are: water; water-soluble alcohols (monohydric and polyhydric alcohols—particularly lower alcohols, C₁-C₈—e.g., ethanol, propanol, glycerol, sorbitol, ethylene glycol, hexylene-glycol, mannitol, propylene glycol); polyethylene glycols and methoxypolyethylene glycols (Carbowaxes having molecular weights ranging from 200 to 20,000); glyceryl monolaurate, monopalmitate or monostearate; polyethylene glycols esterified with higher fatty acids; polyethylene glycerols; polyethylene sorbitols; glucose. When alcohols or their derivatives are used, some water is nearly always included since such materials are usually hygroscopic. Also suitable are oil-in-water emulsions such as cold cream bases. An example of a cold cream is: 13% stearic acid, 2% glyceryl monostearate, 5% olive oil, 0.5% KOH and 73.5% water.

The vehicle should be water miscible to fulfill the above requirements, particularly absorption by the skin. Petroleum based substances and other water immiscible substances, e.g., mineral oil, petroleum jelly, stearyl diacetin, lanolin, paraffin, and beeswax, and appear to slow the absorption of the active antiperspirant ingredient by the skin. However, such substances can be used in an antiperspirant formulation if there is sufficient water miscible vehicle present to provide a medium for absorption by the skin. Emulsification of such substances will also provide a means for their use.

Preferably, the vehicle contains about 0.1% to about 10% of a nonionic, cationic or amphoteric surface active agent; the preferred amount is in the range of about 0.1% to about 2%. The upper limit of such surface active agents (surfactant) is not critical although large amounts may be unsuitable in formulations where excessive foaming would be undesirable. The presence of a surface active agent appears to increase still further the already surprising efficacy of the C₄-C₁₂ scopolamine ester. It is believed that the surface active agent provides a more efficient absorption by the skin of the active antiperspirant ingredient of the compositions of this invention. Cationic, and particularly nonionic, surface active agents are desirable although anionic non-soap surfactants are also suitable. Anionic non-soap surfactants may tend to interact slightly with the scopolamine acid salts. Anionic non-soap surfactants are preferably used at concentrations of about 0.01% to about 0.5% and desirably below about 0.1%.

Water soluble nonionic surfactants are highly suitable for use in this invention; they include detergent compounds produced by the condensation of alkylene oxide groups (hydrophilic in nature) with an organic hydrophobic compound which may be aliphatic or alkyl aromatic in nature. Examples of such detergents are: the polyalkylene glycol esters, ethers, and thioethers of the types,

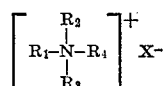


wherein R represents long chain alkyl radicals having from about 8 to about 18 carbon atoms and n is an integer from about 4 to about 30; the polyethylene oxide condensates of alkyl phenols, e.g., the condensation products of alkyl phenols having about 6 to 12 carbon atoms in the alkyl group, in either straight chain or branched chain configuration, with ethylene oxide in amounts equal to 10 to 25 moles of ethylene oxide per mole of alkyl phenol; compounds formed by condensing ethylene oxide with a hydrophobic base formed by the condensation of propylene oxide with propylene glycol; the condensation product of ethylene oxide with the product resulting from the reaction of propylene oxide and ethylene diamine. More specific examples of some suitable non-ionic detergents are: the reaction products of *o*-octylphenol with an average of from 9 to 30 moles of ethylene oxide per mole, and the water-soluble waxy reaction products of lauryl alcohol and ethylene oxide having a titer of about 35° C. or higher and of oleyl alcohol and ethyleneoxide having a titer of about 29° C. or higher.

Other examples of nonionic surfactants are: tertiary trialkyl amine oxides wherein one alkyl group contains 10–18 carbon atoms and the other alkyl groups are short chain groups (a specific example is dodecyl dimethyl amine oxide); hexadecyl dimethyl ammonio propionate; 3-(hexadecyl dimethyl ammonio)-propane-1-sulfonate.

The preferred nonionic surfactant is available on the market under the trade name of "Pluronic." These compounds are formed by condensing ethylene oxide with a hydrophobic base formed by the condensation of propylene oxide with propylene glycol. The hydrophobic portion of the molecule exhibits water insolubility. Its molecular weight is of the order of 1500 to 1800. The addition of polyoxyethylene radicals to this hydrophobic portion tends to increase the water solubility of the molecule as a whole. Liquid products are obtained up to the point where the polyethylene content is about 50% of the total weight of the condensation product. Further increase in the relative content of polyoxyethylene to hydrophobic portion renders the final product wax-like or solid in consistency. The molecular weight of Pluronic L-61, L-64 and F-68 which find particular utility in the practice of the present invention are about 2000, 3000 and 8000 respectively.

Examples of cationic surfactants suitable for practice of this invention are the detergent quaternary ammonium salts. Such salts have the general formula:



wherein R_1 is a hydrophobic radical and R_2 , R_3 and R_4 are each hydrocarbon radicals. R_1 can be aliphatic, unsaturated aliphatic, cycloaliphatic, acyl, aliphaticaryl and arylaliphatic radicals containing 8 to 25 carbon atoms, e.g., branched or normal chain alkyl phenoxy alkoxy alkyl, branched or long chain alkyl cresoxy alkoxy alkyl, long chain alkoxyaryl, branched or long chain alkyl phenoxy alkyl, long chain alkyl aryl, halogen substituted long chain alkylaryl, aryl alkyl, long chain alkyl, long chain alkenyl and cycloalkyl. R_2 , R_3 and R_4 can contain each 1 to 10 carbon atoms, with the total carbon atoms in the three radicals being from 3 to 12. Examples of R_2 , R_3 and R_4 are low molecular weight alkyl, preferably methyl or ethyl, or aryl, preferably phenyl, or arylalkyl, preferably benzyl.

X is a salt forming radical which is an anionic radical capable of forming a water soluble salt. Chloride and bromide are preferred but halides generally, sulfates, phosphates, methosulfate, and other salt forming ions are also satisfactory.

Specific examples of suitable cationic detergents are: cetyl trimethyl ammonium bromide; dodecyl dimethyl benzyl ammonium chloride; N-(lauroyl colomino formylmethyl) pyridinium chloride; N-cetyl pyridinium bromide; chlorinated dodecylbenzyl trimethyl ammonium chloride; benzethonium chloride.

Examples of amphoteric detergent surfactants are alkyl beta imino dipropionates and alkyl beta amino propionates, wherein the alkyl group contains 10 to 20 carbon atoms, and imidazoline derivatives of the Miranol class. Other examples of amphoteric surfactants may be found in "Surface Active Agents," Schwartz and Perry, pp. 218–228 and "Surface Active Agents and Detergents, vol. II," Schwartz, Perry and Berch, pp. 138–143.

Examples of anionic non-soap surfactants suitable for the practice of this invention are the detergents of the sulfonated and sulfated types such as the alkyl (C_8 – C_{18}) sulfates, the alkyl (C_8 – C_{18}) polyethenoxy (1–10 units of $-C_2H_4O-$) ether sulfates, the alkyl (C_8 – C_{18}) aromatic sulfonates, the mono- or di-alkyl (C_8 – C_{18}) esters of sulfosuccinic acid, sulfonated or sulfated amides of higher fatty acids, sulfuric acid esters of polyhydric alcohols incompletely esterified with higher fatty acids, higher fatty acids esters of low molecular weight alkylol sulfonic acids, etc., usually in the form of their sodium, potassium, ammonium, or alkanolammonium salts. Some of the particular detergents of this category are: sodium octyl sulfate, sodium nonyl sulfate, sodium decyl sulfate, monoethanolammonium dodecyl sulfate, ammonium tetradecyl sulfate, monoethanolammonium pentadecyl sulfate, monoethanolammonium hexadecyl sulfate, monoethanolammonium octadecyl sulfate, monoethanolammonium oleyl sulfate, sodium salts of dioctyl sulfosuccinate, sodium octyl benzene sulfonate, sodium nonyl benzene sulfonate, sodium dodecyl benzene sulfonate, sodium tetradecyl benzene sulfonate, ammonium pentadecyl benzene sulfonate, ammonium triisopropyl benzene sulfonate, sodium salts of the oleic acid ester of isethionic acid, sodium salt of the lauric acid amide of taurine, triethanolammonium coconut oil monoglyceride monosulfate, monoethanolammonium tallow diglyceride monosulfate. N lauroyl sarcosinates are also suitable.

Fatty acid soaps, e.g., sodium coconut or tallow soap, are not desirable because of hydrolysis at the preferred pH of the compositions of the invention.

Two methods were used to test the effectiveness of the antiperspirant compositions of this invention and other compositions with which they were compared. The two methods were the "axilla" method and the "forearm" method, both on human subjects.

The axilla method involves direct measurement of the weight of perspiration in the axilla. This is very significant since the axilla is the area of the most practical importance in the inhibition of perspiration. The axilla method uses a gravimetric measure of the amount of perspiration produced in the axilla to determine antiperspirant effect. One hour after application of the composition to be tested, the subjects were placed in a room at 100° F. After a "warm-up" period of ½ hour, the axillae were washed and dried. Then tared Webrill pads for the collection of perspiration were placed in the axillae of each arm for 10 minutes after which another set of pads were placed in the axillae for 10 minutes. After a 20 minute rest, two more sets of pads were placed in the axillae for two 10 minute periods each. The procedure was repeated after another 20 minute rest, after which additional rests and collections may be made by the same procedure for as long as desired. Each time the pads were removed from the axillae, they were weighed to determine the amount of perspiration produced. In the course of the test, the perspiration collection 3 hours after application is a convenient and significant time for comparison purposes.

While the amounts of perspiration produced in the left and right axilla of a subject are usually not the same,

a given subject will have a reasonably constant ratio of output between the two sides. A normal ratio for a subject was established by making four or five control runs before any treatment was applied. When the antiperspirant composition to be tested was applied to one axilla (the other one being the control), the normal ratio was significantly altered. The reduction in sweating produced by the antiperspirant being tested was obtained by fitting the results from the axilla method into the following formula:

Percent reduction in sweating = 100

$$-\left(\frac{\text{antiperspirant test ratio}}{\text{average untreated ratio}}\right) \times 100$$

The forearm test is primarily a qualitative test to determine whether a given composition has antiperspirant activity. However, with practice, grades can be readily given for visual results, as described below, to evaluate effectiveness. Grades are assigned from 0 (no antiperspirant effect) to 4 (complete perspiration inhibition), and 4+ (complete perspiration inhibition spreading beyond the treated area) with 3 being about 90% inhibition, 2 about 60% and 1 about 30%. In the forearm test, a given area of the forearm is treated three times with the composition to be tested over a period of 10 minutes, permitting the composition to dry each time. After 4 or 5 hours, the arm is washed and dried. A 1½% solution of iodine in ethanol is then painted over the area and allowed to dry. A slurry of starch and castor oil is then placed over the area and the subject sits in a room at 100° F. for 5 to 15 minutes, depending on the subject. Any perspiration emitted releases iodine, which then reacts with the starch to give a visual indication (a blue-black color) of perspiration. To determine the length of effectiveness the test can be repeated, with no re-application of the antiperspirant composition, after 48, 72 or 96 hours or more.

The antiperspirant compositions of this invention are illustrated by the following examples.

EXAMPLE I

Aqueous solutions of trimethylacetyl scopolamine hydrochloride at various concentrations were compared for antiperspirant efficacy using the axilla method on human subjects. The average number of subjects for the tests for the various concentrations was 5. The solutions also contained 1% Pluronic F-68 which is a condensation product of ethylene oxide with a hydrophobic base formed by the condensation of propylene oxide with propylene glycol. Pluronic F-68 has a molecular weight of about 8000. The pH of the solutions was approximately 4. The grading measurements were made 3 hours after application.

Concentration, percent:	Percent reduction in sweating
0.0025 -----	35
0.005 -----	60
0.02 -----	90
0.05 -----	95

In each case there was no evidence of skin irritation, fabric damage or side effects.

Trimethylacetyl scopolamine (free base) can be used instead of the hydrochloride salt with substantially equal results.

EXAMPLE II

0.05% aqueous solutions of the following compounds were compared for antiperspirant efficacy using the axilla method on human subjects. The average number of subjects for the tests for the various concentrations was 5. The solutions also contained 1% Pluronic F-68 and had a pH of approximately 4. Grading measurements were made 3 hours after application.

Compound:	Percent reduction in sweating
Control -----	0
Scopolamine hydrobromide -----	5
Acetyl scopolamine hydrobromide -----	10
Propionyl scopolamine hydrobromide -----	5
n-Butyryl scopolamine hydrobromide -----	95
n-Valeryl scopolamine hydrobromide -----	70
Trimethylacetyl scopolamine hydrochloride -----	95
2 - ethyl - 3-methylbutyryl scopolamine hydrobromide -----	80
2-ethylbutyryl scopolamine hydrobromide -----	90
Isovaleryl scopolamine hydrobromide -----	85
Scopolammonium N-methyl bromide -----	0

The above comparisons illustrate the importance of having at least 4 carbon atoms in the acyl ester of scopolamine acid salts. Also illustrated is the high antiperspirant efficacy of such compounds at a relatively low level. In all cases, there was no indication of skin irritation, fabric damage or side effects. The free base forms of the acid salts of Example II show substantially the same results.

EXAMPLE III

The following compounds were compared using the forearm method. The compounds were in a 0.1% aqueous solution having a pH of approximately 4. The compounds were tested on four male subjects, each, at the end of 5, 24 and 48 hours. In each case, the grade on each subject at the end of each period was substantially the same.

Compound:	Grade
Trimethylacetyl scopolamine hydrochloride ---	4+
Trimethylacetyl scopolammonium N-methylbromide -----	0
2-ethylbutyryl scopolamine hydrobromide -----	4+
2 - ethylbutyryl scopolammonium N - methylbromide -----	0
2 - ethyl - 3 - methylbutyryl scopolamine hydrobromide -----	4+
2 - ethyl - 3 - methylbutyryl scopolammonium N-methyl bromide -----	0

This comparison between representatives of the C₄-C₁₂ scopolamine esters used in the compositions of this invention with their quaternized counterparts illustrates that the latter compounds do not have the surprisingly high antiperspirant efficacy of the former compounds. The free base forms of the acid salts of Example III show substantially the same results.

EXAMPLE IV

To illustrate the importance of pH in the compositions of this invention on aging at high temperatures, the following solutions of trimethylacetyl scopolamine hydrochloride were compared by the forearm method. The solutions also contained 1% Pluronic F-68. The grades were taken 24 hours after application. The tabulated grades are the averages of the readings on 5 different subjects.

Aged at 70° F. for 6 days		
Concentration, percent	pH	Grade
0.10 -----	6	4
0.10 -----	5	4
0.05 -----	6	4
0.05 -----	5	4
0.05 -----	3	4
Aged at 140° F. for 6 days		
0.10 -----	6	0.8
0.10 -----	5	3.8
0.10 -----	3	3.4
0.05 -----	7	0.8
0.05 -----	6	0.6
0.05 -----	5	3.8

The pH was adjusted with buffer solutions prepared by combining varying proportions of 0.1 M citric acid and

0.2 M Na_2HPO_4 . Trimethylacetyl scopolamine can be used instead of the hydrochloride salt in Example IV with substantially equal results.

EXAMPLE V

Antiperspirant compositions having a pH of approximately 4 were formulated by combining the following ingredients.

	Percent
(A) Trimethylacetyl scopolamine hydrochloride	0.05
Pluronic F-68	1.0
Water	98.95
(B) Trimethylacetyl scopolamine hydrochloride	0.05
Cetyl trimethylammonium bromide	1.0
Water	98.95
(C) Trimethylacetyl scopolamine hydrochloride	0.05
Uniformly dispersed in a mixture of polyethylene glycols (Carbowaxes) 62½/ of of which have a molecular weight of 1500 and 37½% of which have a molecular weight of 4000	99.95
(D) Trimethylacetyl scopolamine hydrochloride	0.05
Water	99.95
(E) Trimethylacetyl scopolamine hydrochloride	0.05
Sodium dodecylbenzene sulfonate	0.10
Water	99.85
(F) Trimethylacetyl scopolamine hydrochloride	0.05
Absolute ethanol	99.95

Trimethyl acetyl scopolamine can be used instead of the hydrochloride salt in each of the compositions of Example V with substantially equal results. The compositions were tested for antiperspirant efficacy by the axilla method with the grading readings on several subjects being taken 3 hours after application. Compositions A and B, containing nonionic and cationic surface active agents respectively, ranged from 85% to 95% in percent reduction in sweating. Compositions C, D, E and F ranged from 50% to 80% in percent reduction in sweating. There was no evidence of skin irritation, fabric damage or side effects.

In composition A in Example V, 1% sodium lauryl beta imino dipropionate can be substituted for the Pluronic F-68 with substantially equal results.

EXAMPLE VI

The following compounds were tested using the forearm methods. The compounds were dissolved in a matrix consisting of a 1% aqueous solution of Pluronic F-68 having a pH of approximately 4.

Compounds	Conc.	Grade after—			
		5 hrs.	24 hrs.	48 hrs.	72 hrs.
A. Benzoyl scopolamine hydrobromide.	0.05	4	4+	4+	4
B. 2,4-dichlorobenzoyl scopolamine hydrobromide.	0.05	4	4	4	4
C. Cyclopentylpropionyl scopolamine hydrobromide.	0.1	3	4	4	4
D. Cyclohexylpropionyl scopolamine hydrobromide.	0.1	4	4	4	4
E. Naphthoyl scopolamine (free base).	0.05	2	4+	4+	4

Compound A gave excellent antiperspirant results when tested using the axilla method at a concentration of 0.5%. Compound B at the 0.1% level, compound C at the 0.1% level and compound D at the 0.05% level, gave very good antiperspirant results when tested by the axilla method.

Compounds A, B, C and D can be used in their free base form with substantially equal results.

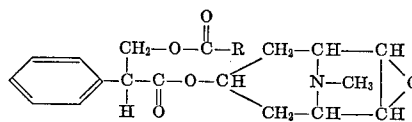
In the above examples, ingredients other than those recited can be added to achieve a cosmetically desirable product. The physical form of the product can be any of those known to the cosmetic art. For example, the composition can be a clear solution, a lotion or a cream or stick. Aerosols and sprays can be used but are much less desirable than the other forms. Examples of cosmetically desirable ingredients which can be included, but which

are not necessary, in the compositions of this invention, are perfumes; dyes; buffers; emulsifiers; thickening agents such as hydroxyethyl cellulose; humectants; deodorants such as hexachlorophene; antibiotics such as neomycin; aluminum and zirconium astringent salts such as those described in U.S. Pats. 2,814,584; 2,814,585; 2,854,382; 2,906,668.

While the compositions of the present invention find their greatest utility as antiperspirants topically applied to the auxiliary areas of the body, it was found that they also have surprising utility for use on other parts of the body. For example, the compositions, topically applied, substantially completely inhibited sweating of the palms of hands and soles of the feet. This aspect of the invention is useful for those people who are troubled with "clammy" hands or whose feet are cold because of dampness caused by sweating. Moreover, inhibition of sweating on the palms of the hands and the soles of the feet will provide relief for dermatitis which is aggravated by perspiration. Forehead sweating can also be successfully inhibited, as for example, in the case of surgeons or technicians who are under stress and who must use both hands. Amounts of $\text{C}_4\text{--C}_{12}$ scopolamine esters greater than at the 0.25% level can be used to control extreme sweating if done with care, as for example by a physician.

What is claimed is:

1. The method of inhibiting perspiration which comprises the step of topically applying to the human skin an effective amount of a composition containing, in a water-miscible, dermatologically acceptable vehicle, having a pH of about 3 to about 5, not less than about .0025% nor more than about 0.1% of an anticholinergic material selected from the group consisting of the free base and acid salt forms of a compound having the formula

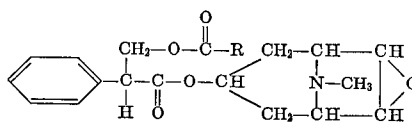


wherein



is dichlorobenzoyl.

2. The method of inhibiting perspiration which comprises the step of topically applying to the human skin an effective amount of a composition containing, in a water-miscible, dermatologically acceptable vehicle, having a pH of about 3 to about 5, not less than about .0025% nor more than about 0.1% of an anticholinergic material selected from the group consisting of the free base and acid salt forms of a compound having the formula



wherein

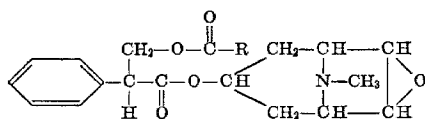


is naphthoyl.

3. The method of inhibiting perspiration which comprises the step of topically applying to the human skin an effective amount of a composition containing, in a water-miscible, dermatologically acceptable vehicle, having a pH of about 3 to about 5, not less than about .0025% nor more than about 0.1% of an anticholinergic material

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selected from the group consisting of the free base and acid salt forms of a compound having the formula

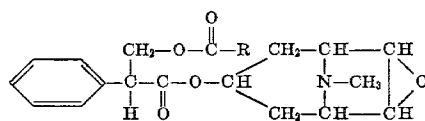


wherein



is benzoyl.

4. The method of inhibiting perspiration which comprises the step of topically applying to the human skin an effective amount of composition containing, in a water-miscible, dermatologically acceptable vehicle, having a pH of about 3 to about 5, not less than about .0025% nor more than 0.1% of an anticholinergic material selected from the group consisting of the free base and acid salt forms of a compound having the formula



wherein



is cycloalkyl-propionyl having 4 to 12 carbon atoms.

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U.S. Cl. X.R.

424—66, 69, 78, 365

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