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(54) Title: SKIN CARE COMPOSITIONS CONTAINING AN AMIDE AND A RETINOID

(57) Abstract

An amide of a hydroxy fatty acid in combination with retinol or retinyl ester resulted in a synergistic inhibition of keratinocyte differentiation. The effects of the retinol or retinyl esters in combination with hydroxy fatty acid amides were analogous to treatment with retinoic acid.

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SKIN CARE COMPOSITIONS CONTAINING AN AMIDE AND A RETINOID

Field of the Invention

The invention relates to skin care compositions containing an amide and retinol or retinyl ester and to cosmetic methods involving applying such compositions to the skin.

Background of the Invention

Retinol (vitamin A) is an endogenous compound which occurs naturally in the human body and is essential for normal epithelial cell differentiation. Natural and synthetic vitamin A derivatives have been used extensively in the treatment of a variety of skin disorders and have been used as skin repair or renewal agents. Retinoic acid has been employed to treat a variety of skin conditions, e.g., acne, wrinkles, psoriasis, age spots and discoloration. See e.g., Vahlquist, A. et al., *J. Invest. Dermatol.*, Vol. 94, Holland D.B. and Cunliffe, W.J. (1990), pp. 496-498; Ellis, C. N. et al., "Pharmacology of Retinols in Skin", Vasel, Karger, Vol. 3, (1989), pp. 249-252; Lowe, N.J. et al., "Pharmacology of Retinols in Skin", Vol. 3, (1989), pp. 240-248; PCT Patent Application No. WO 93/19743.

It is believed that the use of retinol or retinyl esters would be preferred over retinoic acid. Retinol is an endogenous compound. Esters of retinol hydrolyze in-vivo to produce retinol. Retinol and retinyl esters are considered safer than retinoic acid. Unfortunately, retinol and retinyl esters are less effective than retinoic acid at providing skin benefits.

The present invention is based, in part, on the discovery that a combination of retinol or retinyl esters with amides of hydroxy fatty acids results in a synergistic inhibition in keratinocyte differentiation. The effects of hydroxy fatty acid amides combined with retinol or a retinyl ester were analogous to the effects of retinoic acid. Thus, a mixture of a hydroxy fatty acid amide with retinol or retinyl esters mimics retinoic acid yet is easier and safer to use than retinoic acid.

Thornfeldt (U.S. Patent No. 5,057,501) discloses a method for treatment of papulosquamous and eczematous diseases with a composition containing a sesquiterpene compound and from about 0.025% to about 35% of a monocarboxylic fatty acid, ester, or amide. The compositions may also include a retinoid; Thornfeldt teaches that certain retinoids, namely isotretinoin, tretinoin, etretin (all of which are stereoforms of retinoic acid) and etretinate (an ester of trimethoxyphenyl retinoic acid) have proven efficacy against papulosquamous diseases. PCT Application WO/9325177 (Proctor and Gamble) discloses compositions for topical application to skin which contain a specific type of acyclic carboxamide coolant and may include retinoids such as retinoic acid and its derivatives (e.g., cis and trans). PCT application WO/9403156 (Rhone Poulenc) discloses a topical composition containing linoleic acid or a derivative as an active ingredient for treatment and prophylaxis of impure skin (e.g., skin affected by pimples, pustules, or comedones); the composition may also contain 0.025-0.1 wt. % of tretinoin. European Patent Application No. 0 388 275 (Pierre Fabre Cosmetique) discloses compositions for treating seborrhea containing alkyl carboxamide and a zinc salt which may be zinc retinoate.

Klaus et al., (U.S. Patent No. 5,216,148) disclose the use of specific complex carboxamides for treating and preventing

neoplasms, dermatoses, and aging of skin. Van Scott et al. (U.S. Patent No. 4,380,549) and Yu et al., (U.S. Patent No. 4,363,815) disclose treatment of acne, dry, flaky, scaly skin with a hydroxyacid or the amide thereof. EP 0 582 458 discloses use of N,N-(1,4C alkyl) lauramide. EP 0 559 304 discloses the use of an amide containing a hydrocarbyl chain of at least 25 carbon atoms as a skin smoothening agent. Beauquey et al. (U.S. Patent No. 5,308,551) disclose a skin washing and conditioning composition containing, among other ingredients, a 1-4C alkanolamide of a 8-16C fatty acid. Great Britain Patent Specification No. 1,126,289 (Hoffman-La Roche) discloses a stock vitamin preparation containing vitamin A alcohol or a vitamin A ester, an emulsifier and a solvent which is selected from an alcohol or a dialkyl amide of a monocarboxylic acid (e.g., N,N-diethyl-acetamide, N,N-dimethyl acetamide or N,N-dimethyl formamide). The vitamin preparation has a very high vitamin content, i.e., the minimum concentration is 250,000 I.U. vitamin A/ml. Further, the amides disclosed in the '289 application do not include or mention melinamide.

An earlier filed European Patent Application EP 0 742 005 (Unilever; priority date May 8, 1995), published November 13, 1996 (after the priority date of the present application), discloses combinations of fatty acid amides with retinol or retinyl esters. EP '005 however does not teach amides of hydroxy fatty acids.

The art cited above does not disclose skin conditioning compositions based on synergistic combinations of hydroxy fatty acid amides with retinol or a retinyl ester. None of the art cited above addresses the need for an effective alternative to retinoic acid.

Summary of the Invention

The present invention includes, in part, a skin conditioning composition containing:

(a) from 0.001% to 10% of a retinoid selected from the group consisting of retinol and retinyl ester;

(b) from 0.0001% to 50% of an amide of a hydroxy fatty acid; and

(c) a cosmetically acceptable vehicle.

The invention also provides a cosmetic method of conditioning skin comprising topically applying the present composition to the skin. It further provides a cosmetic method mimicking the effect of retinoic acid on skin, comprising topically applying the present composition to the skin.

The term "conditioning" as used herein means prevention and treatment of one or more of the following: dry skin, photodamaged skin, appearance of wrinkles, age spots, aged skin, acne, psoriasis, atopic dermatosis. The compositions are also useful for attaining skin lightening and/or controlling sebum excretion, and/or increasing stratum corneum flexibility, and generally increasing the quality of skin. The composition may be used to improve skin desquamation and cellular proliferation.

The presence of a hydroxy fatty acid amide in the inventive product substantially improves the performance of retinol or retinyl ester, i.e., a hydroxy fatty acid amide substantially increases the ability of retinol or retinyl ester to affect cellular proliferation. A hydroxy fatty acid amide has no or little effect on improving skin benefit when used alone; a

substantial increase in skin benefit is only realized when a hydroxy fatty acid amide is combined with retinol or a retinyl ester.

In short, the present invention is based, at least in part, on the discovery of synergistic interaction between retinol or retinyl ester and a hydroxy fatty acid amide.

According to the present invention, by virtue of including an effective amount of a hydroxy fatty acid amide into compositions containing retinol or a retinyl ester, the performance of the compositions is substantially improved. Alternatively, lower levels of retinol or retinyl ester may be included in the composition containing a hydroxy fatty acid amide to equal the performance of a similar formulation without the amide.

Description of the Preferred Embodiment

The inventive compositions contain, as a first essential ingredient, a compound selected from the group consisting of retinol, retinyl esters and mixtures thereof.

The term "retinol" includes amongst others the following isomers of retinol: all-trans-retinol, 13-cis-retinol, 11-cis-retinol, 9-cis-retinol, 3,4-didehydro-retinol. Preferred isomers are all-trans-retinol, 13-cis-retinol, 3,4-didehydro-retinol, 9-cis-retinol. Most preferred is all-trans-retinol, due to its wide commercial availability.

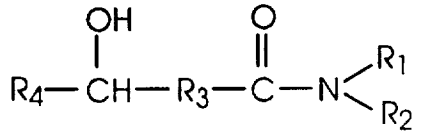
Retinyl ester is an ester of retinol. The term "retinol' has been defined above. Retinyl esters suitable for use in the present invention are C_1-C_{30} esters of retinol, preferably C_2-C_{20} esters, and most preferably C_2, C_3, and C_{16} esters because they

are more commonly available. Examples of retinyl esters include but are not limited to: retinyl palmitate, retinyl formate, retinyl acetate, retinyl propionate, retinyl butyrate, retinyl valerate, retinyl isovalerate, retinyl hexanoate, retinyl heptanoate, retinyl octanoate, retinyl nonanoate, retinyl decanoate, retinyl undecandate, retinyl laurate, retinyl tridecanoate, retinyl myristate, retinyl pentadecanoate, retinyl heptadeconoate, retinyl stearate, retinyl isostearate, retinyl nonadecanoate, retinyl arachidonate, retinyl behenate, retinyl linoleate, retinyl oleate, retinyl lactate, retinyl glycolate, retinyl hydroxy caprylate, retinyl hydroxy laurate, retinyl tartarate.

The preferred ester for use in the present invention is selected from retinyl palmitate, retinyl acetate and retinyl propionate, because these are the most commercially available and therefore the cheapest. Retinyl linoleate is also preferred due to its efficacy.

The retinoid is employed in the inventive composition in an amount of from 0.001% to 10%, preferably in an amount of from 0.01% to 1%, most preferably in an amount of from 0.01% to 0.5%.

The second essential ingredient of the inventive compositions is an amide of a hydroxy fatty acid. The structure of an amide of a hydroxy fatty acid is as follows:



wherein R_1, R_2 and R_4 each is independently selected from hydrogen and aliphatic saturated or unsaturated, straight or branched hydrocarbon chains which may be hydroxylated, containing from 1 to 20 carbon atoms;

R_3 is $-(CH_2)_n$ where n is an integer from 0 to 18;

Preferably, R_1, R_2, R_4 each independently contains from 2 to 20 carbon atoms, more preferably from 2 to 15 carbon atoms, most preferably from 3 to 13 carbon atoms.

Preferably the hydroxy acid amide is an amide of α- or β-hydroxy acid, i.e., n is 0 or 1.

The most preferred hydroxy fatty acid amides to be included in the inventive compositions are: lactamide-monoethanolamide, C_{13}-β-hydroxy acid amide (2-hydroxy-C_{13}-amide), N-hydroxyethyl-2-hydroxy-C_{16} amide, 12-hydroxy-N-(2-hydroxyethyl) octadecanamide, and monoethanolamide of castor oil.

The amide is included in the inventive compositions in an amount ranging from 0.0001% to 50%, preferably from 0.01% to 10%, most preferably from 0.1% to 5%.

Cosmetically Acceptable Vehicle

The composition according to the invention also comprises a cosmetically acceptable vehicle to act as a dilutant, dispersant or carrier for the retinol and/or retinyl ester and the hydroxy fatty acid amide in the composition, so as to facilitate its distribution when the composition is applied to the skin.

Vehicles other than or in addition to water can include liquid or solid emollients, solvents, humectants, thickeners and powders. An especially preferred nonaqueous carrier is a polydimethyl siloxane and/or a polydimethyl phenyl siloxane. Silicones of this invention may be those with viscosities ranging anywhere from 10 to 10,000,000mm^2/s(centistokes) at 25°C. Especially desirable are mixtures of low and high viscosity silicones. These silicones are available from the General Electric Company under trademarks Vicasil, SE and SF and from the Dow Corning Company under the 200 and 550 Series. Amounts of silicone which can be utilized in the compositions of this invention range anywhere from 5% to 95%, preferably from 25% to 90% by weight of the composition.

The cosmetically acceptable vehicle will usually form from 5% to 99.9%, preferably from 25% to 80% by weight of the composition, and can, in the absence of other cosmetic adjuncts, form the balance of the composition. Preferably, the vehicle is at least 50 wt.%, more preferably at least 80 wt.% water , by weight of the vehicle. Preferably, water comprises at least 50 wt.% of the inventive composition, most preferably from 60 to 80 wt.%, by weight of the composition.

Optional Skin Benefit Materials and Cosmetic Adjuncts

An oil or oily material may be present, together with an emulsifier to provide either a water-in-oil emulsion or an oil-in-water emulsion, depending largely on the average hydrophilic-lipophilic balance (HLB) of the emulsifier employed.

The inventive compositions preferably include sunscreens. Sunscreens include those materials commonly employed to block ultraviolet light. Illustrative compounds are the derivatives

of PABA, cinnamate and salicylate. For example, octyl methoxycinnamate and 2-hydroxy-4-methoxy benzophenone (also known as oxybenzone) can be used. Octyl methoxycinnamate and 2-hydroxy-4-methoxy benzophenone are commercially available under the trademarks, Parsol MCX and Benzophenone-3, respectively. The exact amount of sunscreen employed in the emulsions can vary depending upon the degree of protection desired from the sun's UV radiation.

Another preferred optional ingredient is selected from essential fatty acids (EFAs), i.e., those fatty acids which are essential for the plasma membrane formation of all cells, in keratinocytes EFA deficiency makes cells hyperproliferative. Supplementation of EFA corrects this. EFAs also enhance lipid biosynthesis of epidermis and provide lipids for the barrier formation of the epidermis. The essential fatty acids are preferably chosen from linoleic acid, γ-linolenic acid, homo-γ-linolenic acid, columbinic acid, eicosa-(n-6,9,13)-trienoic acid, arachidonic acid, timnodonic acid, hexaenoic acid and mixtures thereof.

Yet another preferred optional ingredient is selected from azoles, e.g., climbazole, bifonazole, clotrimazole, ketoconazole, miconazole, econazole, itraconazole, fluconazole, terconazole, butoconazole, sulconazole, lionazole and mixtures thereof. The azole may be included in the inventive compositions in an amount of from 0.001 to 50 wt. %, preferably from 0.001 to 10 wt.%, most preferably from 0.1 to 5%.

Emollients are often incorporated into cosmetic compositions of the present invention. Levels of such emollients may range from 0.5% to 50%, preferably between 5% and 30% by weight of the total composition. Emollients may be classified under

such general chemical categories as esters, fatty acids and alcohols, polyols and hydrocarbons.

Esters may be mono- or di-esters. Acceptable examples of fatty di-esters include dibutyl adipate, diethyl sebacate, diisopropyl dimerate, and dioctyl succinate. Acceptable branched chain fatty esters include 2-ethyl-hexyl myristate, isopropyl stearate and isostearyl palmitate. Acceptable tribasic acid esters include triisopropyl trilinoleate and trilauryl citrate. Acceptable straight chain fatty esters include lauryl palmitate, myristyl lactate, oleyl eurcate and stearyl oleate. Preferred esters include coco-caprylate/caprate (a blend of coco-caprylate and coco-caprate), propylene glycol myristyl ether acetate, diisopropyl adipate and cetyl octanoate.

Suitable fatty alcohols and acids include those compounds having from 10 to 20 carbon atoms. Especially preferred are such compounds such as cetyl, myristyl, palmitic and stearyl alcohols and acids.

Among the polyols which may serve as emollients are linear and branched chain alkyl polyhydroxyl compounds. For example, propylene glycol, sorbitol and glycerin are preferred. Also useful may be polymeric polyols such as poly-propylene glycol and polyethylene glycol. Butylene and propylene glycol are also especially preferred as penetration enhancers.

Exemplary hydrocarbons which may serve as emollients are those having hydrocarbon chains anywhere from 12 to 30 carbon atoms. Specific examples include mineral oil, petroleum jelly, squalene and isoparaffins.

Another category of functional ingredients within the cosmetic compositions of the present invention are thickeners. A

thickener will usually be present in amounts anywhere from 0.1 to 20% by weight, preferably from 0.5% to 10% by weight of the composition. Exemplary thickeners are cross-linked polyacrylate materials available under the trademark Carbopol from the B.F. Goodrich Company. Gums may be employed such as xanthan, carrageenan, gelatin, karaya, pectin and locust bean gum. Under certain circumstances the thickening function may be accomplished by a material also serving as a silicone or emollient. For instance, silicone gums with viscosity in excess of 10 centistokes and esters such as glycerol stearate have dual functionality.

Powders may be incorporated into the cosmetic composition of the invention. These powders include chalk, talc, kaolin, starch, smectite clays, chemically modified magnesium aluminum silicate, organically modified montmorillonite clay, hydrated aluminum silicate, fumed silica, aluminum starch octenyl succinate and mixtures thereof.

Other adjunct minor components may also be incorporated into the cosmetic compositions. These ingredients may include coloring agents, opacifiers and perfumes. Amounts of these other adjunct minor components may range anywhere from 0.001% up to 20% by weight of the composition.

<u>Use of the Composition</u>

The composition according to the invention is intended primarily as a product for topical application to human skin, especially as an agent for conditioning and smoothening the skin, and preventing or reducing the appearance of wrinkled or aged skin.

In use, a small quantity of the composition, for example from 1 to 100ml, is applied to exposed areas of the skin, from a suitable container or applicator and, if necessary, it is then spread over and/or rubbed into the skin using the hand or fingers or a suitable device.

Product Form and Packaging

The topical skin treatment composition of the invention can suitably be formulated as a lotion, a cream or a gel. The composition can be packaged in a suitable container to suit its viscosity and intended use by the consumer. For example, a lotion or cream can be packaged in a bottle or a roll-ball applicator, or a propellant-driven aerosol device or a container fitted with a pump suitable for finger operation. When the composition is a cream, it can simply be stored in a non-deformable bottle or squeeze container, such as a tube or a lidded jar. The composition may also be included in capsules such as those described in U.S. Patent 5,063,057.

The invention accordingly also provides a closed container containing a cosmetically acceptable composition as herein defined.

The following specific examples further illustrate the invention. Retinoids were obtained from Sigma.

MATERIALS AND METHODS

Cell Culture:

Human keratinocytes, isolated from neonatal foreskin by trypsin treatment were grown in Dulbecco Modification Eagle

(DME) Hams F12 (1:1) medium/10% fetal calf serum in the presence of irradiated 3T3 mouse fibroblasts for establishing dividing keratinocyte colonies. Cells were grown under the above condition until their second passage and kept frozen for future use. Frozen second passage keratinocytes were thawed and plated into the above medium and grown for five days before they were switched to a serum-free MCDB 153-based medium keratinocyte growth medium (KGM) from Clonetics Corporation, San Diego, CA, containing 0.15 mM Ca, or keratinocyte serum-free media (KSFM) from GIBCO containing 0.09 mM Ca). On day 7, when the cells were 80-90% confluent, they were trypsinized and plated in the serum-free medium for the various experiments.

TRANSGLUTAMINASE ASSAY

Transglutaminase Assay and Keratinocyte Differentiation

During the process of terminal differentiation in the epidermis, a 15nm thick layer of protein, known as the cornified envelope (CE) is formed on the inner surface of the cell periphery. The CE is composed of numerous distinct proteins which have been cross-linked together by the formation of N^{ε}-(γ-glutamyl) lysine isodipeptide bonds catalyzed by the action of at least two different transglutaminases expressed in the epidermis. Transglutaminase I (TGase I) is expressed in abundance in the differentiated layers of the epidermis, especially the granular layer, but is absent in the undifferentiated basal epidermis. Thus TGase I is a useful marker of epidermal keratinocyte differentiation with high TGase I levels indicating a more differentiated state. An ELISA based TGase I assay, using a TGase I antibody, was used to assess the

state of differentiation of the cultured keratinocytes in the examples that follow.

For Example 1, the following procedure was used:

Keratinocytes (cultured as described above) were plated in 96 well plates at a density of 3,000 cells per well in 200 µl media. After incubation for four days the media was changed to media containing test compounds (six replicates per test). The cells were cultured for a further 72 hours after which time the media was aspirated and the plates stored at -70°C. Plates were removed from the freezer, and the cells washed with PBS. 100 µl sterile water was added and the cells were freeze fractured by freezing at -70°C then thawing. The cells were incubated for one hour at room temperature (R/T) with PBS/3% BSA (wash buffer, bovine serum albumin), then rinsed with a fresh aliquot of wash buffer. Cells were incubated with 50 µl of primary antibodies monoclonal anti-human transglutaminase mouse antibody (IgG) obtained from Biomedical Industries diluted 1:2,000 in wash buffer for one hour, 37°C then rinsed two times with wash buffer. Cells were then incubated with 50 µl of secondary antibody (Fab fragment, peroxidase conjugated anti-mouse IgG obtaining from Amersham) diluted 1:4,000 in wash buffer for one hour at 37°C, then rinsed two times with wash buffer. Cells were incubated with substrate solution (4 mg o-phenylene diamine and 3.3 µl 30% H_2O_2 in 10ml 0.1M citrate buffer pH 5.0) for five minutes, R/T, in darkness (under aluminum foil). The reaction was stopped by the addition of 50 µl 4N H_2SO_4. The absorbance of samples was read at 492nm in the plate reader. Out of the six replicates, four were treated with both antibodies, two were treated only with the secondary antibody (i.e., to determine background binding of enzyme conjugated Ab). TGase I levels were determined by subtracting background from the readings

from each treatment and determining mean ± s.d. for the replicates exposed to both antibodies.

For Example 2, the following procedure was used:

Keratinocytes (cultured as described above) were plated in 96 well plates at a density of 3,000 cells per well in 200µl of cell culture media. After incubation for four days, the media was changed to media containing test compounds (six replicates per test). The cells were cultured for a further 72 hours after which time the media was aspirated and the plates stored at -70°C. After the plates were removed from the freezer, the cells were further freezed fractured by freezing and thawing and then washed 3x with PBS. The cells were incubated for one hour at room temperature (R/T) with TBS/5% BSA buffer. Cells were then incubated with 100µl of monoclonal anti-human transglutaminase (IgG) mouse antibody (primary antibody) obtained from Biomedical Technologies Inc. diluted 1:2000 in TBS/1% BSA buffer for two hours at 37°C, and then rinsed six times with wash buffer (TBS/1% BSA/0.05% Tween-20). Cells were next incubated with 100µl of Fab fragment, peroxidase conjugated anti-mouse IgG antibody (secondary antibody) from Amersham diluted 1:4,000 in wash buffer for two hours at 37°C and then rinsed three times with wash buffer and three times with PBS. Cells were incubated with substrate solution (4mg o-phenylene diamine and 3.3µl 30% H_2O_2 in 10mL 0.1M citrate buffer, pH 5.0) for five minutes at R/T and in darkness (under aluminum foil). The reaction was stopped by the addition of 50µl 4N H_2SO_4. The absorbance of samples was read at 492nm in the plate reader. Out of the six replicates, four were treated with both antibodies, two were treated only with the secondary antibody (i.e., to determine the background binding of the enzyme conjugated antibody). TGase I levels were determined by

subtracted background from the readings from each treatment and determining the mean ± s.d. for the replicates exposed to both antibodies.

DNA Assay

The level of TGase I detected after treatment of the cells could be influenced by cell number, i.e., the greater the number of cells the greater the level of TGase I detected. The level of TGase I was normalized to DNA content of the cells in the same well thus eliminating variation due to differences in cell number. DNA quantitation is a particularly useful indicator of cell number, including keratinocyte cell number, because each cell has to all intents and purposes an identical genome and therefore an identical quantity of DNA. The total DNA content of a well of cells therefore is directly proportional to the cell number in that well. Quantitation of DNA was used to normalize the TGase data to cell number.

Keratinocytes were plated in 96 well plates at a density of 3,000 cells per well in 200µl media. After incubation for four days the media was changed for media containing test compounds (6 replicates per test). The cells were cultured for a further 72 hours after which time the media was aspirated and the plates stored for at least 1.5 hours at -70°C. Plates were removed from the freezer and thawed for 30 minutes. 100µl/well of Hoechst dye (1µg/ml final concentration) was added and this was incubated for 15 minutes, covered and then read in a fluorimeter (ex. 360nm and em. 460nm). The dye solution was removed and the wells were rinsed with PBS in preparation for the TGase assay.

EXAMPLE 1

Retinoic acid is more effective than retinol at altering keratinocyte differentiation state

The effect on Transglutaminase levels normalized to DNA content of the cells after addition of retinoic acid (RA) and retinol (ROH) was examined and the results are shown in Table 1.

TABLE 1

Treatment	mean TGase/ DNA x 10^{-4} ± s.d (% control)	p value vs Control	p value vs $2.5x10^{-7}$M ROH	p value vs $2.5x10^{-8}$M ROH	p value vs $2.5x10^{-9}$M ROH
Control	2.44 ± 0.24 (100%)	-	0.001	0.001	0.001
$2.5x10^{-7}$M RA	0.16 ± 0.11 (7%)	0.001	0.001	0.001	0.001
$2.5x10^{-7}$M ROH	1.14 ± 0.22 (47%)	0.001	-	0.001	0.001
$2.5x10^{-8}$M RA	1.34 ± 0.40 (55%)	0.001	0.2	0.001	0.001
$2.5x10^{-8}$M ROH	1.89 ± 0.30 (77%)	0.001	0.001	-	0.001
$2.5x10^{-9}$M RA	1.87 ± 0.49 (77%)	0.001	0.001	0.784	0.001
$2.5x10^{-9}$M ROH	2.70 ± 0.59 (>100%)	0.001	0.001	0.001	-

n = 3

All concentrations of retinoic acid tested, i.e., 2.5×10^{-7}M, 2.5×10^{-8}M and 2.5×10^{-9}M decreased keratinocyte differentiation over the ethanol control and did so to a significantly greater extent than each of the corresponding 2.5×10^{-7}M, 2.5×10^{-8}M and 2.5×10^{-9}M retinol treatments. The decrease in transglutaminase level was dose dependent for both retinoic acid and retinol. This is consistent with retinoic acid having a greater inhibitory effect on epithelial differentiation than retinol.

EXAMPLE 2

Amides of hydroxy fatty acids and retinol act synergistically to inhibit keratinocyte differentiation

The effect on TGase I levels normalised to DNA content of the cells was examined in response to a 72 hour treatment with the test compounds. The amide was obtained from Quest International. C_{13} β-hydroxy acid amide has the following structure:

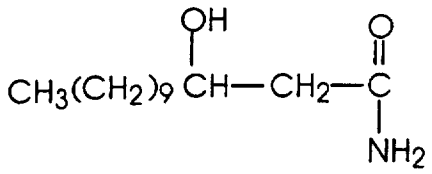


TABLE 2A

Effect of Retinol And C_{13} β-Hydroxy Acid Amide On Keratinocyte TGase/DNA

Treatment	mean TGase/ DNA $x10^5 \pm$ s.d (% control)	p value vs Control	p value vs 2.5x 10^{-8} M ROH	p value vs 2.5x 10^{-8} M RA	p value vs 10^{-8} C13-β-hydroxyacid amide
Control	18.42 ± 3.88 (100%)	-	0.001	0.001	0.875
2.5x10^{-8}M RA	1.05 ± 1.05 (6%)	0.001	0.001	-	0.001
2.5x10^{-8}M Retinol	14.62 ± 2.99 (79%)	0.001	-	0.001	0.001
10^{-8}M C13-β-hydroxy-acid amide	18.53 ± 4.58 (101%)	0.875	0.001	0.001	-
2.5x10^{-8}M ROH + 10^{-8}M C13-β-hydroxy-acid amide	11.36 ± 2.43 (62%)	0.001	0.001	0.001	0.001

n = 3

$2.5x10^{-8}$M retinoic acid was very effective at repressing keratinocyte TGase I levels (to 6% of control level). $2.5x10^{-8}$M retinol was less effective than retinoic acid (79%) and 10^{-8}M C13 β-hydroxy-acid amide had no inhibitory effect on the keratinocyte TGase I level when used alone. However $2.5x10^{-8}$M retinol + 10^{-8}M C13 β-hydroxy-acid amide repressed keratinocyte TGase I to 62% of control levels. C13 β-hydroxy-acid amide and retinol therefore act synergistically to repress keratinocyte differentiation in an analogous manner to the effect of retinoic acid.

The effect on TGase I levels normalised to DNA content of the cells was examined in response to a 72 hour treatment with the test compounds. "Lactamide MEA" is lactamide monoethanolamide. It was obtained from Croda Chemicals. Lactamide MEA has the following structure:

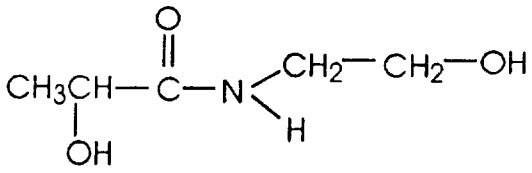


TABLE 2B

Effect Of Retinol And Lactamide MEA On Keratinocyte Differentiation

Treatment	mean TGase/ DNA $x10^5$ ± s.d (% control)	p value vs Control	p value vs $2.5x\ 10^{-7}$ M ROH	p value vs $2.5x\ 10^{-7}$ M RA	p value vs 10^{-6} lactamide-MEA
Control	64.11 ± 3.19 (100%)	-	0.110	0.002	0.001
$2.5x10^{-7}$M RA	46.71 ± 7.83 (73%)	0.002	0.030	-	0.049
$2.5x10^{-7}$M Retinol	58.47 ± 6.25 (91%)	0.110	-	0.030	0.311
10^{-6}M lactamide-MEA	55.22 ± 2.43 (86%)	0.001	0.311	0.049	-
$2.5x10^{-7}$M ROH + 10^{-6}M lactamide-MEA	46.29 ± 6.79 (72%)	0.001	0.018	0.930	0.024

n = 3

$2.5x10^{-7}M$ retinoic acid was effective at repressing keratinocyte TGase I levels (to 73%) of control level. $2.5x10^{-7}M$ retinol and $10^{-6}M$ lactamide-DEA were less effective at inhibiting keratinocyte TGase I level when used alone. However $2.5x10^{-7}M$ retinol + $10^{-6}M$ lactamide-DEA repressed keratinocyte TGase I to 72% of control levels. Lactamide-MEA and retinol therefore act synergistically to repress keratinocyte differentiation in an analogous manner to the effect of retinoic acid.

Examples 1 and 2 demonstrate that retinoic acid, in a dose dependent manner, decreased keratinocyte differentiation. In Examples 1 and 2, retinoic acid was used as positive control and reference compound against which the other compounds under analysis were compared. Retinol was ineffective at decreasing keratinocyte differentiation.

The unexpected results of Examples 1 and 2, however, were that the effect of retinol on cultured keratinocytes can be enhanced to levels approaching those of retinoic acid by combining retinol or retinyl ester with an amide of hydroxy fatty acid - a compound which exerts little or no benefit on its own. The results documented above demonstrate that an amide of hydroxy fatty acid acts synergistically with retinol or retinyl ester, to decrease keratinocyte differentiation, mimicking the effect of retinoic acid.

Examples 3-8 illustrate topical compositions according to the present invention. The compositions can be processed in conventional manner. They are suitable for cosmetic use. In particular the compositions are suitable for application to wrinkled, rough, dry, flaky, aged and/or UV-damaged skin to improve the appearance and the feel thereof as well as for application to healthy skin to prevent or retard deterioration thereof.

EXAMPLE 3

This example illustrates a high internal phase water-in-oil emulsion incorporating the inventive composition.

	% w/w
Retinol	0.5
Fully hydrogenated coconut oil	3.9
C_{13} β-hydroxy fatty acid amide	5
Brij 92*	5
Bentone 38	0.5
$MgSO_4 7H_2O$	0.3
Butylated hydroxy toluene	0.01
Perfume	qs
Water	to 100

* Brij 92 is polyoxyethylene (2) oleyl ether

EXAMPLE 4

This example illustrates an oil-in-water cream incorporating the inventive composition.

	% w/w
Retinyl palmitate	0.15
Mineral oil	4
Lactamide MEA	1
Brij 56*	4
Alfol 16RD*	4
Triethanolamine	0.75
Butane-1,3-diol	3
Xanthan gum	0.3
Perfume	qs
Butylated hydroxy toluene	0.01
Water	to 100

* Brij 56 is cetyl alcohol POE (10)
Alfol 16RD is cetyl alcohol

EXAMPLE 5

This example illustrates an alcoholic lotion incorporating the composition according to the invention.

	% w/w
Retinyl palmitate	0.15
N-hydroxyethyl-2-hydroxy-C_{12} amide	0.1
Ethanol	40
Perfume	qs
Butylated hydroxy toluene	0.01
Water	to 100

EXAMPLE 6

This example illustrates another alcoholic lotion containing the inventive composition.

	% w/w
Retinol	0.15
N-hydroxyethyl-2-hydroxy-C_{16} amide	0.1
Ethanol	40
Antioxidant	0.1
Perfume	qs
Water	to 100

EXAMPLE 7

This example illustrates a suncare cream incorporating the composition of the invention:

	% w/w
Retinol	0.01
12-hydroxy-N-(2-hydroxyethyl)octadecanamide	0.1
Silicone oil 200 cts	7.5
Glycerylmonostearate	3
Cetosteryl alcohol	1.6
Polyoxyethylene-(20)-cetyl alcohol	1.4
Xanthan gum	0.5
Parsol 1789	1.5
Octyl methoxycinnate (PARSOL MCX)	7
Perfume	qs
Color	qs
Water	to 100

EXAMPLE 8

This example illustrates a non-aqueous skin care composition incorporating the inventive combination.

	% w/w
Retinoic acid	0.15
Monoethanolamide of castor oil	1
Silicone gum SE-30[1]	10
Silicone fluid 345[2]	20
Silicone fluid 344[3]	55.79
Squalene	10
Linoleic acid	0.01
Cholesterol	0.03
2-hydroxy-n-octanoic acid	0.7
Vitamin E linoleate	0.5
Herbal oil	0.5
Ethanol	2

[1] A dimethyl silicone polymer having a molecular weight of at least 50,000 and a viscosity of at least 10,000 centistokes at 25°C, available from GEC

[2] Dimethyl siloxane cyclic pentamer, available from Dow Corning Corp.

[3] Dimethyl siloxane tetramer, available from Dow Corning Corp.

CLAIMS:

1. A skin conditioning composition comprising

   (a) from 0.001% to 10% of a compound selected from the group consisting of retinol, retinyl ester and mixtures thereof;

   (b) from 0.0001% to 50% of an amide of a hydroxy fatty acid; and

   (c) a cosmetically acceptable vehicle.

2. The composition of claim 1 wherein the retinyl ester is selected from the group consisting of retinyl palmitate, retinyl acetate, retinyl propionate, retinyl linoleate and mixtures thereof.

3. The composition of claim 1 wherein ingredient (a) is retinol.

4. A cosmetic method of conditioning skin the method comprising applying topically to skin a composition according to any one of claims 1 - 3.

5. A cosmetic method of mimicking the effect on skin of retinoic acid, the method comprising applying to the skin a composition according to any one of claims 1 - 3.

INTERNATIONAL SEARCH REPORT

Intern ıal Application No
PCT/EP 97/05135

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61K7/48

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)
IPC 6 A61K

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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	EP 0 742 005 A (UNILEVER PLC ;UNILEVER NV (NL)) 13 November 1996 cited in the application see claims	1-5
A	GB 1 126 289 A (HOFFMANN-LA ROCHE & CO.) 5 September 1968 cited in the application see the whole document	1,2
P,A	WO 97 09307 A (GIST BROCADES BV ;LAMBERS JOHANNES WILHELMUS JAC (NL); VERWEIJ JAN) 13 March 1997 see page 1, line 1 - page 3, line 31; example 1	1

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

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"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.

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INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/EP 97/05135

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	FR 2 358 138 A (HENKEL KGAA) 10 February 1978 see claims	1
E	EP 0 803 248 A (UNILEVER PLC ;UNILEVER NV (NL)) 29 October 1997 see page 3, line 1 - line 11 see page 4, line 5 - line 10; claims	1-5

2

INTERNATIONAL SEARCH REPORT

Information on patent family members

Inter. nal Application No
PCT/EP 97/05135

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 0742005 A	13-11-96	US 5599548 A	04-02-97
		CA 2175547 A	09-11-96
		JP 8301748 A	19-11-96
GB 1126289 A		NONE	
WO 9709307 A	13-03-97	AU 6986496 A	27-03-97
		EP 0789686 A	20-08-97
FR 2358138 A	10-02-78	DE 2631284 A	26-01-78
		AT 350731 B	11-06-79
		BE 856683 A	11-01-78
		GB 1525449 A	20-09-78
		JP 53038637 A	08-04-78
		NL 7706844 A	16-01-78
		US 4143159 A	06-03-79
EP 0803248 A	29-10-97	AU 1901897 A	30-10-97
		CA 2202338 A	25-10-97