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REVIEW

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The science behind skin care: Moisturizers

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Summary

Moisturizers provide functional skin benefits, such as making the skin smooth and soft, increasing skin hydration, and improving skin optical characteristics; however, moisturizers also function as vehicles to deliver ingredients to the skin. These ingredients may be vitamins, botanical antioxidants, peptides, skin-lightening agents, botanical anti-inflammatories, or exfoliants. This discussion covers the science of moisturizers.

KEYWORDS

active cosmetics, botanicals, moisturizer, serums, skin creams, transepidermal water loss

1 | INTRODUCTION

Skin cleansing and moisturization are two of the most basic aspects of human hygiene, affecting both skin health and disease. Cleansing is the process of removing materials from the skin surface, and in some respects, moisturization is the process of putting back what was mistakenly removed. It is unfortunate, but cleansers cannot distinguish between sebum and intercellular lipids, removing them all efficiently. Thus, moisturizers were developed to put lipids back on the skin surface after cleansing but have now evolved into vehicles to deliver cosmetically active ingredients.[1,2,3] The first part of this review addressed cleansing, while this second installment addresses moisturizers.

2 | MOISTURIZER GOALS

Moisturizers must fulfill 4 basic needs in order of consumer importance: make the skin smooth and soft, increase skin hydration, improve appearance, and possibly deliver ingredients to the skin surface. A moisturizer that does not deliver on these 4 attributes cannot be a success in the marketplace.

2.1 | Improved skin smoothness and softness

The most basic consumer need achieved by moisturizer application is smooth and soft skin. All moisturizers in the current marketplace make the skin smooth and soft; however, better formulations are longer lasting. Skin that is smooth and soft is an assessment of the organization of the corneocytes on the skin surface. As the intercellular lipids are removed, the edges of the corneocytes fold creating friction as the hand is rubbed across the skin surface. Creating smooth and soft skin utilizes emollients (Table 1), which are thin oily substances capable of depositing between the desquamating corneocytes temporarily until the next cleansing, at which time they must be reapplied.

2.2 | Increased skin hydration

Moisturizers that are medically relevant must increase skin hydration by retarding water loss from the skin surface, known as transepidermal water loss (TEWL).[5] This is accomplished by placing a water impermeable film over the skin to retard evaporation and by applying substances to the skin surface to attract water. Moisturizers do not moisturize the skin, which is a misnomer.[6] Only through skin, barrier repair can TEWL be permanently returned to normal levels.

Increased skin hydration is the mechanism by which most moisturizers decrease fine lines of dehydration, especially those around the eye where the skin is thinnest. Retarding TEWL will hydrate this skin temporarily until the moisturizer is removed with cleansing. While wrinkle reduction may appear to be a functional benefit, it is a result of increased skin hydration that will be temporary unless skin barrier repair occurs.

2.3 | Improved optical appearance

A lesser moisturizer is goal is to improve skin appearance, a characteristic known as radiance or luminosity. These attributes are the appreciation of the amount of light reflected by the skin surface

TABLE 1 Emollients for soft smooth skin[4]

1. Protective Emollients: diisopropyl dilinoleate and isopropyl isostearate. Create longer lasting protective smooth film on skin surface
2. Fatting Emollients: castor oil, propylene glycol, jojoba oil, isostearyl isostearate, and octyl stearate. Create a slightly greasy longer lasting film on skin surface
3. Dry Emollients: isopropyl palmitate, decyl oleate, and isostearyl alcohol. Create a thin nongreasy film on skin surface
4. Astringent Emollients: dimethicones, cyclomethicones, isopropyl myristate, and octyl octanoate. Create minimal greasy residue reducing the oily feel of other emollients

back into the eye of the observer, which is directly related to the smoothness of the skin surface. With advancing age, skin melanin, hemoglobin, and collagen distribution become more irregular. Moisturizers capable of delivering a lightly pigmented film to the skin surface or enhancing light reflection from the skin surface may improve the optical appearance of the skin. Pigments, such as iron oxide, and optically reflective materials, such as mica or fish scale, can be added to moisturizers to create anti-aging appearance benefits.

3 | SKIN BARRIER AND MOISTURIZATION

Moisturizers can improve skin cosmesis but can also improve xerosis and positively modify the skin barrier. Xerosis is a result of decreased water content of the stratum corneum, which leads to abnormal desquamation of corneocytes.[7] For the skin to appear and feel normal, the water content of this layer must be above 10% with a maximum of 30% or over hydration will result.[8] Water is lost through evaporation to the environment under low humidity conditions and must be replenished by water from the lower epidermal and dermal layers.[9] An intact skin barrier will maintain TEWL in a healthy range;[10] however, skin barrier damage will result in xerosis characterized by a stratum corneum that is thicker, fissured, and disorganized in electron micrographs.[11]

Three intercellular lipids are necessary to maintain the skin barrier: sphingolipids, free sterols, and free fatty acids.[12-14] Ceramides are the major lipid by weight in the stratum corneum, which become sphingolipids when glycosylated.[15] Ceramides possess the majority of the long-chain fatty acids and linoleic acid in the skin. When barrier damage occurs, rapid lamellar body secretion and a cascade of cytokine changes associated with adhesion molecule expression and growth factor production occur resulting in the production of ceramides.[16,17] The signal for this barrier repair, initiating the synthesis of lipids, is an increase in TEWL.[18-20] Thus, remoisturization of the skin must then occur in four steps: initiation of barrier repair, alteration of surface cutaneous moisture partition coefficient, onset of dermal-epidermal moisture diffusion, and synthesis of intercellular lipids.[21] It is generally thought in the cosmetics industry that a stratum corneum containing between 20% and 35% water will exhibit the softness and pliability of normal stratum corneum.[22]

4 | MECHANISMS OF MOISTURIZATION

All moisturizers work through 4 basic mechanisms of restoring skin water content: occlusion, humectancy, hydrophilic matrices, and photoprotection.[23]

4.1 | Occlusion

Occlusive moisturizers function by placing a water impermeable barrier over the skin surface creating an environment conducive to barrier repair. This is the most effective and most common mechanism employed. There are numerous substances used by the cosmetic chemist to achieve this goal with the combination of ingredients yielding the esthetics and efficacy of the final formulation. These substances are summarized in Table 2.[24]

The most occlusive and most physiologic moisturizer is said to be petrolatum; however, its esthetics are undesirable accounting for the myriad of moisturizers on the market.[25] It reduces TEWL by 99%, allowing enough water vapor to leave the skin for initiation of barrier repair.[26,27]

4.2 | Humectancy

Humectants are substances that attract water acting like sponges on and in the skin. All liquid and cream moisturizers contain humectants to prevent product desiccation, but the humectant may be present in insufficient concentration to have a physiologic function. The dermis possesses glycosaminoglycans, including hyaluronic acid, to function as humectants; however, other humectants include the following: glycerin, honey, sodium lactate, urea, propylene glycol, sorbitol, pyrrolidone carboxylic acid, gelatin, vitamins, and some proteins.[24,28] These topically applied ingredients can draw water from the air; however, the moisturizer becomes sticky and unesthetic when this occurs. Most humectants, of which glycerin is the most effective, draw water from the deeper epidermis and dermis allowing the skin to feel smoother by filling holes in the stratum corneum through swelling.[29] An unopposed humectant will draw water from the skin to the lower humidity atmosphere, thus a moisturizer must contain both occlusives and humectants for optimal efficacy.[30]

TABLE 2 Occlusive moisturizing ingredients

1. Hydrocarbons: petrolatum, mineral oil, paraffin, squalene
2. Silicones: dimethicone, cyclomethicone, amodimethicone
3. Animal and vegetable fats: lanolin, shea butter, grape seed oil, avocado oil, hemp oil, jojoba oil, sesame seed oil, nut oil
4. Fatty acids: lanolin acid, stearic acid
5. Fatty alcohols: lanolin alcohol, cetyl alcohol
6. Polyhydric alcohols: propylene glycol, butylene glycol
7. Wax esters: lanolin, beeswax, stearyl stearate
8. Vegetable waxes: carnauba, candelilla
9. Phospholipids: lecithin
10. Sterols: cholesterol

4.3 | Hydrophilic matrices

Hydrophilic matrices are a less popular form of moisturization characterized by the colloidal oatmeal bath where the oatmeal forms a physical protective coating over the skin preventing evaporation. Colloidal oatmeal is also used in moisturizers for much the same reason. Other high molecular weight substances that can provide a barrier to evaporation include proteins, such as growth factors and collagen fragments, that are not added for their ability to modify cellular behavior, but rather to reduce TEWL. Occlusion and humectancy are much more effective methods of moisturization than hydrophilic matrices.

4.4 | Photoprotection

Finally, photoprotection is also considered a form of moisturization by the cosmetic industry, and moisturization claims can be based on the inclusion of any sunscreen ingredient. Moisturizers claiming repair and replenishing qualities may have a sunscreen added to support the claim. The sunscreen, whether organic or inorganic, is thought to prevent cellular damage and thus prevent dehydration.

5 | MOISTURIZER FORMULATIONS

5.1 | Creams and lotions

Creams and lotions are emulsions containing hydrophilic and hydrophobic ingredients. Creams generally have a higher viscosity, while lotions are thinner with a lower viscosity, but there is no viscosity that defines a cream or a lotion(Table 3). Acrylic-based polymers, such as carbomers which are cross-linked polyacrylate polymers, are used to thicken the product and control viscosity. In either viscosity, the emulsion can be oil-in-water (O/W), where the oil is emulsified into the water, or water-in-oil (W/O), where the water is emulsified into the oil. O/W emulsions are the most popular for moisturizer use; however, emulsifiers are responsible for many of the problems associated with moisturizers as they can also solubilize intercellular lipids. Liquid crystal forming emulsifiers that do not damage the intercellular lipids include lecithin or hydrogenated lecithin. Other skin friendly emulsifiers include behentrimonium methosulfate and dicetyldimonium chloride.

5.2 | Ointments

Ointments are anhydrous semisolid preparations composed of fats, waxes, animal and plant oils, and hydrocarbons. Because they do not include water necessary for microbial growth, they can be formulated without preservatives or with a low preservative load. By definition, they are also waterproof; however, they possess poor esthetics because they are sticky and stain clothing. This moisturizer formulation may be preferred in patients with extremely dry skin or preservative allergies, but very few moisturizers and many therapeutic moisturizers fall into this category.

TABLE 3 Moisturizer selection based on skin type and location

Moisturizer category	Formulation characteristics	Skin type suitability	Unique attributes
Lotion	Thinner film, oil-in-water emulsion	Face and body; normal skin	Less greasy, spread more easily
Cream	Thicker film, oil-in-water emulsion	Face, body, hands, feet; dry skin	Higher viscosity than lotions, harder to spread
Ointment	Thickest film, contains no water	Hands and feet; barrier disrupted diseased skin	Greasy, sticky; based on petrolatum, lanolin, dimethicone
Paste	Ointment mixed with powder contains no water	Diaper area	Greasy, sticky, resists water removal; based on zinc oxide and petrolatum
Gel	Thick until rubbed into the skin, then flowable	Face, hair	Leave nongreasy film; based on acrylic polymers, gums, and cellulose thickeners
Serum	Thin liquid to deliver cosmetic ingredients to skin	Face	Minimal film, rapid evaporation, nongreasy
Powder	Blended small particle solid materials	Intertriginous areas; foot powder, diaper powder	Absorbs water; based on talc, silicates, and starch
Suspension	Clear liquid with visible particles	Oily skin, intertriginous areas	Liquid powder; based on carbomer, bentonite clay
Stick	Solid stroked over skin to leave film contains no water	Lips	Melts at body temperature to a film; based on paraffin, candelilla, and carnauba wax
Aerosol	Droplet film; requires can, propellant, and nozzle	Hair-bearing skin	Inefficient discontinuous film application

5.3 | Serums

A new formulation in moisturizers is the serum, a thin water or oil-based product applied to freshly washed skin. The serum provides minimal moisturization benefits but is used to apply an active agent to the skin beneath a moisturizer.[31] As the serum formulation is not necessarily an emulsion, it does not require emulsifiers which could damage the active ingredient. Usually, the serum has few ingredients designed to optimize the availability of the active agent, which may be a vitamin, growth factor, botanical extract, etc.

6 | SITE-SPECIFIC MOISTURIZER FORMULATIONS

Moisturizers have been formulated for everybody area to expand the market and generate more sales. Most moisturizers consist of water, lipids, emulsifiers, preservatives, fragrance, color, and specialty additives with water accounting for 60%-80% of any moisturizer; however, externally applied water does not remoisturize the skin. The water functions as a diluent and evaporates leaving the active agents behind.[21] The major moisturizer categories are face, body, and hand/feet (Table 3).

6.1 | Face

Facial moisturizers account for the majority of the moisturizing market with O/W formulations dominating. O/W emulsions can be identified by their cool feel and nonglossy appearance, while W/O emulsions can be identified by their warm feel and glossy appearance.[32] Facial moisturizers are generally composed of vegetable/mineral oil or dimethicone, propylene glycol, glycerin, and water in sufficient quantity to form a lotion or cream. Products can be developed for every complexion type with slight variation.

Oily complexion products are generally oil-free composed of water and dimethicone, which is noncomedogenic and hypoallergenic. Products designed for normal/combination skin contain predominantly water, vegetable/mineral oil or dimethicone, and propylene glycol with very small amounts of petrolatum. Dry skin moisturizers contain water, vegetable/mineral oil, propylene glycol, and petrolatum. By adjusting the occlusivity of the primary moisturizing ingredient, many different formulations can be developed for many different facial needs.

6.2 | Body

Body moisturizers come in a variety of preparations including lotion, cream, mousse, and ointment.[33] Lotions are the most popular formulation. Body lotions are generally O/W emulsions containing 10%-15% oil, 5%-10% humectant, and 75%-85% water. More specifically, they are composed of water, vegetable/mineral oil, propylene glycol, stearic acid, and petrolatum. Most also contain an emulsifier, such as triethanolamine stearate, which is also a surfactant. Humectants such as glycerin or sorbitol may be used. Other additives include vitamins, such as A, D, and E, and soothing agents, such as aloe or allantoin.

6.3 | Hand and feet

Hand creams are O/W emulsions with 15%-40% oil, 5%-15% humectant, and 45%-80% water.[34] The addition of silicone derivatives can render the hand cream water-resistant through 4-6 washings. Most hand creams are based on petrolatum, glycerin, waxes, and dimethicone.

7 | MOISTURIZING INGREDIENTS

There is tremendous diversity in moisturizer formulation; however, most moisturizers contain the same basic ingredients to which "hero" substances are added for market distinction. For example, petrolatum and dimethicone are the primary occlusive moisturizers, but seaweed extract may be added as a "hero" ingredient, as this particular line of moisturizers is based on the concept of "back to nature sea harvested products." Here, the most dermatologically relevant moisturizing ingredients are discussed.

7.1 | Petrolatum

Petrolatum has a rich dermatologic history. It was originally manufactured and patented by Robert A. Chesebrough in 1872 as a chemical to treat leather; however, its value was soon recognized as a remedy for chapped hands and as a hair pomade. Later, petrolatum was adapted to the pharmaceutical and skin care industry as a vehicle instead of lard, which frequently turned rancid.[35] Petrolatum offered the benefit of preservative-free stability, due to its anhydrous nature.

Petrolatum is a semisolid mixture of hydrocarbons obtained through the dewaxing of heavy mineral oils. Pure cosmetic-grade petrolatum is practically odorless and tasteless but has not been synthetically duplicated. Petrolatum is the most effective moisturizing ingredient on the market today, reducing transepidermal water loss by 99%. It functions as an occlusive to create an oily barrier through which water cannot pass. Thus, it maintains cutaneous water content until barrier repair can occur. Petrolatum is able to penetrate into the upper layers of the stratum corneum and aid in the restoration of the stratum corneum barrier. Petrolatum impacts all 4 phases of skin remoisturization: initiation of barrier repair, alteration of surface cutaneous moisture partition coefficient, onset of dermal-epidermal moisture diffusion, and synthesis of intercellular lipids.

Petrolatum is a remarkably inert substance as it does not bind proteins or undergo chemical alteration in the skin, thus allowing it to be hypoallergenic. Pure cosmetic-grade petrolatum, which is free of tar impurities, is also noncomedogenic. Petrolatum decreases the appearance of fine lines on the face and body due to dehydration. It functions to reduce itching and mild pain by creating a protective film overexposed lower epidermal and dermal nerve endings. It acts as an emollient by entering the space between the rough edges of desquamating corneocytes, restoring a smooth skin surface. It can also function as an exfoliant by loosening desquamating corneocytes, which are physically removed as the petrolatum is rubbed into the skin. Petrolatum is the basis for many moisturizer formulations.

7.2 | Silicone

After petrolatum, the most significant cosmetic ingredient to be discovered is silicone. Topical silicone is hypoallergenic, noncomedogenic, and nonacnegenic. It is a remarkable nongreasy moisturizer

and skin conditioning agent providing the basis for "oil-free" moisturizers.

Silicone was developed in the 1930s when Franklin, Hyde, and McGragor discovered a method of extracting pure silica from raw quartzite and converting it to dimethyl silicone.

Silicone originates from silica, which is found in sand, quartz, and granite. It derives its properties from the alternating silica and oxygen bonds, known as siloxane bonds, which are exceedingly strong.[36] The silicone used in topical preparations is odorless, colorless, nontoxic liquid insoluble in water, but permeable to water vapor. This characteristic is important in cosmetic manufacture, as perspiration must be allowed to evaporate under facial moisturizers. The insolubility of silicone in water also prevents perspiration from removing the product from the skin surface. Silicone also forms a cohesive film on the keratin surface, a characteristic known as substantivity, conveying water-resistant and rub-proof properties to moisturizers and sunscreens.[37]

Silicone acts as nongreasy occlusive agent that can have an astringent effect on other oily substances, such as petrolatum. Silicone can also function as an emollient, filling in spaces between desquamating corneocytes, to create a smooth skin surface patients desire until the product is removed with rubbing or washing creating a smooth surface. Dimethicone and cyclomethicone are the two most common derivatives utilized in moisturizer formulations.

7.3 | Ceramides

Endogenous ceramide synthesis is the first step in barrier repair. Nine different ceramides have been identified and synthetically duplicated for inclusion in moisturizer formulations distinguished by their polar head group architecture, as well as by their hydrocarbon chain properties.[38] A ceramide-dominant, triple-lipid barrier repair formulation containing capric acid, cholesterol, conjugated linolenic acid, candelilla wax, and petrolatum was designed to correct the lipid-biochemical abnormalities in atopic dermatitis.[39] It was compared to fluticasone cream in 121 patients with moderate-to-severe atopic dermatitis for 28 days. The researchers found that the ceramide device reduced SCORAD scores, decreased pruritus, and improved sleep habits; however, faster improvement was seen with the topical corticosteroid at day 14.[40] This 510K approved device possessed a triple-lipid combination ratio mimicking physiologic intercellular lipids paving the way for many ceramide-based moisturizers.

7.4 | Fatty acids and lipid trilayers

A different approach to skin moisturization is the use of free fatty acids, which are found in the intercellular lipids that reside between corneocytes to create a waterproof, moderately impermeable barrier. Scanning electron micrographs show the intercellular lipid bands as trilayer entities with a dimension of 3.3 nm. These bands usually occur in groups of 6 or 9 and are essential for human life. It is estimated that the lipid layer has a total thickness of 13 nm and accounts for the inability of particles larger than 13 nm to penetrate the skin.

It is theorized that supplementing the skin with free fatty acids can lead to barrier repair. One such 510K approved barrier cream contains palmitamide monoethanolamine (PEA), a fatty acid that is said to be deficient in atopic skin and it is theorized that replacing this fatty acid can hasten disease resolution. It is also thought that PEA, an analog of cannabis may affect the itch pathways. In an open-label study of 2456 patients, the intensity of erythema, pruritus, excoriation, scaling, lichenification, and dryness was significantly reduced with a combined score reduction of 58.6% when subjects applied the PEA-based barrier cream.[41] However, this was an uncontrolled prospective cohort study, yet this idea is used in cosmeceutical moisturizers.

7.5 | Natural moisturizing factor (NMF)

Natural moisturizing factor (NMF) is a commonly used scientific and cosmetic terms to delineate the combination of chemicals the body uses to regulate the moisture content of the stratum corneum. Natural moisturizing factor (NMF) has been synthetically formulated as a mixture of amino acids, derivatives of amino acids, and salts. Naturally occurring epidermal NMF contains amino acids, pyrrolidone carboxylic acid, lactate, urea, ammonia, uric acid, glucosamine, creatinine, citrate, sodium, potassium, calcium, magnesium, phosphate, chlorine, sugar, organic acids, and peptides.[42] About 10% of the dry weight of the stratum corneum cells is composed of NMF broken down from filaggrin; however, formulations attempt to

TABLE 4 Active skin care mechanisms of action

- Modify skin barrier
  - Smooth skin scale
  - Exfoliate skin scale
- Enhance intercellular lipids
  - Cholesterol
  - Triglycerides
  - Essential fatty acids
  - Ceramides
  - Natural moisturizing factor (NMF)
- Activate a receptor
  - Retinoids
- Function to protect DNA
  - Antioxidants
  - Sunscreens
- Modulate a pathway
  - Peptides
- Activate or inhibit an enzyme
  - Skin-lightening agents
- Reduce inflammation
  - Botanical antioxidants
  - Plant sterols
- Alter hormone balance
  - Soy phytoestrogens

remoisturize the skin through synthetic NMF composed of ingredients and ratios mimicking the naturally occurring substance.

7.6 | Sodium PCA

One ingredient of synthetic NMF is sodium PCA, which is a sodium salt of 2-pyrrolidone-5-carboxylic acid. Synthetic sodium PCA has been shown to be a better moisturizer than glycerol and is found in several moisturizer products functioning as a humectant when used in concentrations of 2% or higher.[43]

7.7 | Urea and lactic acid

Urea and lactic acid are also components of synthetic NMF and can diffuse into the outer stratum corneum disrupting hydrogen bonding exposing water binding sites on the corneocytes and facilitating increased hydration. This is especially important in calluses, which can be improved by foot products containing these ingredients to increase stratum corneum pliability in direct proportion to the amount of lactic acid or urea absorbed.[30]

8 | SUMMARY

Moisturizers are purported in the current marketplace to perform many functions as listed in Table 4; however, they can make no substantive claims and are considered cosmetics. For example, there are many ingredients included in moisturizers purported to lighten skin, mimic botulinum toxin chemodenervation, provide vitamin supplementation, function as antioxidants, and exfoliate the skin; however, documentation is sparse and unscientific (Table 5). Moisturizers can claim to improve the "appearance" of the skin, but no more. This in many ways

TABLE 5 Common cosmetic moisturizer additives

Cosmetic ingredient	Derivation	Purported cosmetic functionality (in vitro)
Skin lighteners		
1. Liquiritin	Licorice extract containing flavonoids	Disperses melanin
2. Aleosin	Aloe vera derived glycoprotein known as hydroxymethylchromone	Inhibits tyrosinase by competitive inhibition at the DOPA oxidation site
3. Arbutin	Derived from the leaves of the Vaccinium vitis-idaea plant containing glucopyranoside	Decreases tyrosinase activity and inhibits melanosome maturation
4. Vitamin C	L-ascorbic acid	Interrupts melanin production by interacting with copper ions to reduce dopaquinone and blocking dihydrochinindol-2-carboxyl acid oxidation
Peptides		
1. Carrier peptides	GHK-Cu (glycine, histidyl, lysine linked to copper)	Delivers copper to facilitate wound healing
2. Signal peptides	Pal-KTTKS (lysine, threonine, threonine, lysine, serine linked to palmitic acid)	Procollagen I fragment to stimulate collagen I, III, IV synthesis
3. Neurotransmitter peptides	Acetyl hexapeptide-3	Inhibits vesicle docking through prevention of SNARE complex formation
Vitamins		
1. Vitamin A (Retinoids)	Retinyl palmitate, retinol, retinyl esters	Cutaneously may convert to retinoic acid and bind to retinoid receptors
2. Vitamin E	Alpha-tocopherol	Oil-soluble antioxidant
3. Niacin	Vitamin B3	Anti-inflammatory, epidermal lipid increase
4. Panthenol	Vitamin B5	Humectant able to hold water
5. Essential fatty acids	Unsaturated linoleic, linolenic, and arachidonic acid	Component of the intercellular lipids
Botanicals		
1. Soy	Isoflavones genistein and daidzein	Phytoestrogens functioning as antioxidants
2. Curcumin	Tetrahydrocurcumin	Antioxidant
3. Silymarin	Flavonoids silybin, silydianin, and silychristine	Antioxidant
4. Pycnogenol	Marine pine bark Pinus pinaster containing taxifolin, catechin, and procyanidins	Antioxidant
5. Ginkgo	Maidenhair tree containing bilobalide, ginkgolides, and ginkgolic acid	Antioxidant
Exfoliants		
1. Alpha hydroxy acid (AHA)	Glycolic acid	Water-soluble keratolytic
2. Beta hydroxy acid (BHA)	Salicylic acid	Oil-soluble keratolytic

has hampered development of more sophisticated functional cosmetics, yet the ingenuity of the cosmetic chemist continues to develop better and more sophisticated products to optimize skin appearance on the face, body, and hands/feet. Examining the number of annual product introductions, the diversity of product offerings, and the amount of money spent on moisturizers reveals the sophistication of this category and the necessity of the dermatologist understanding basic moisturizer concepts. This article presented an overview of moisturizers, which hold great promise for future innovation and development.

DISCLOSURE

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