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Skin Care Creams: Formulation and Use

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Abstract

Skin reflects origin, lifestyle, age and state of health. Skin color, tone and evenness, pigmentation, as well as skin surface characteristics are signs of skin's health. The cosmetic and pharmaceutical industry offers a vast armamentarium of skin care products and procedures to clean, soothe, restore, reinforce, protect and to treat our skin and hence to keep it in "good condition". Skin care products are readily available in daily life and they play a major role in health and nursing care. The promotion of skin care products including their claims are often based on an effect (e.g., moisturizing, antioxidant), evoked by an active (e.g., urea, tocopherol) that is delivered through a vehicle (e.g., lotion) that relies on a specific technology (e.g., nanotechnology). In addition, "without" claims (e.g., without parabens) often accompany nowadays promotions. Today, modern skin care includes cleansing, soothing, restoring, reinforcing and protecting. With increasing age, the emphasis on skin care is changing. The importance of soothing, restoring, reinforcing increases and cleansing should be executed with particular care. The character of skin care shifts from more cosmetic objectives e smooth, healthy looking skin e to more therapeutic and preventive objectives e soothing, restoring, reinforcing and protecting stressed skin. Even though skin care and skin protection play an important role throughout lifetime the skin areas in primary need of care and protection also change. In younger years, environmental factors (e.g., UV radiation) are of primary importance whereas in advanced years, age-related factors (e.g., prolonged exposure to various sources of moisture, including urine or feces, perspiration, wound exudate, and their contents) become more important. Subsequently the skin areas in need of care and protection also change e initially skin areas (e.g., face, arms, legs) exposed to the external environment and later enclosed skin areas (e.g., skin folds, perianal, perigenital skin, groin, feet) become the vulnerable zones (hot spots). Ageing per se changes the skin structure and function across the life course increasing its susceptibility to numerous clinically relevant skin problems (e.g. xerosis cutis). Skin diseases (e.g., bacterial/fungal infections), accumulating effects of systemic diseases (e.g., diabetes mellitus, renal insufficiency) or pharmacotherapies (e.g., cancer therapies) also necessitate special skin care.

Keywords: Skin Care; Creams; Emollients; Moisturizers; Emulsions

Abbreviations: IPM: Isopropyl Myristate; AD: Atopic Dermatitis; SLS: Sodium Lauryl Sulfate; Environmental Protection Agency; TEA: Triethanolamine; CIR: Cosmetic Ingredient Review; LA: Linoleic Acid; SCI: Sodium Cocoyl Isethionate; SDS: Sodium Dodecyl Sulfate; PEGs: Polyethylene glycols; SSO: Sorbitan Sesquioleate; GA: Glycolic Acid; RAL: Retinaldehyde; SSR: Solar Simulated Radiation; AHA: Alpha-Hydroxy Acids; BHA: Beta Hydroxy Acid; ROS: Reactive Oxygen Species; ROM: Range of Motion; INCI: International Nomenclature of Cosmetic Ingredients; SPF: Sun Protection Factor; HMPs: Hydrophobically Modified Polymers; NLRs: Nucleotide

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Binding Domain and Leucine Rich Repeat Containing Proteins; NLRC4: NLR Family CARD Domain Containing 4; AIM2: Absent in Melanoma 2; NHEK: Normal Human Epidermal Keratinocytes; SkBF: Skin Blood Flow; TEWL: Transepidermal Water Loss; NMF: Natural Moisturizing Factors.

Background

Until the beginning of the 1900s, no clear difference existed between active and inactive components in dermatological and cosmetic preparations. Later, it became possible to assign specific therapeutic effects to certain chemical substances, and the concept of vehicle, i.e., a rather inactive carrier substance, started to be developed. Nowadays, formulations are mixtures of components that basically include one or more vehicles and one or more active principles. The efficacy of dermatological and cosmetic products is influenced by the type of vehicle and active principles. In general, formulations will work if the active ingredients penetrate into the epidermis. Hence, the correct selection of a suitable vehicle plays an important role during the development of a product. Pharmaceutical preparations are aimed at obtaining a curative effect. In these cases, the role of the vehicle is primarily to allow the delivery of the active principles to the site of application. Cosmetic formulations do not contain strictly curative drugs, but their purpose is rather to help skin homeostasis and prevent degenerative processes. As we have seen, a clear boundary between the medical and cosmetic fields cannot be easily traced, while the marked tendency of cosmetic industries to develop products containing pharmaceutically active principles has led to the introduction of the concept of cosmeceuticals. This term indicates cosmetic-pharmaceutical hybrids aimed at enhancing the beauty of the skin by means of ingredients that modify skin functionality or provide additional health-related function or benefit.

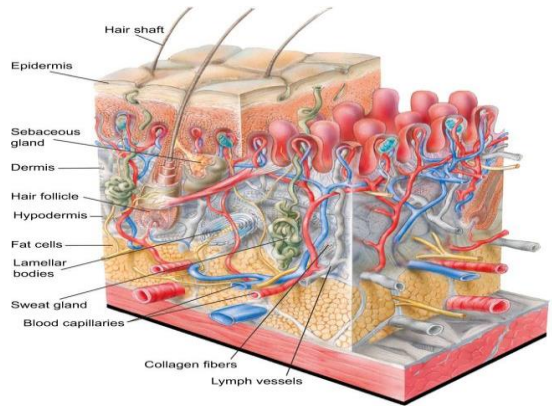

Figure 1: Structure of human skin.

The outer layer of the epidermis, the external layer of human skin, is made up primarily of corneocytes which provide a barrier function. Underlying the corneocytes are viable keratinocytes, which migrate outward and terminally differentiate to become corneocytes. The epidermis is organized into extensions called rete ridges that project between dermal papille (pink) into the underlying connective tissue. Underlying the epidermis is the dermis, which is primarily made up of collagen, elastin fibers, and other extracellular matrix components. Collagen and elastin fibers are synthesized by fibroblasts to provide tensile strength, firmness, and elasticity to the skin. The innermost layer of the skin, the hypodermis, is composed largely of fat cells, which helps provide structure to the skin. Blood capillaries, lymph vessels, sweat glands, sebaceous glands, hair follicles, and lamellar bodies lie within the dermis and hypodermis.

Introduction

Now, a variety of skincare products are available for almost any beauty concern one can have, including body washes, gels, lotions, exfoliants, moisturizers, toners, and sun protection. There is mainly a focus on helping skin from the inside out. The existence of the FDA keeps known toxic ingredients from being used, though many skincare products still do unfortunately have side effects. From time immemorial creams as, topical preparations are considered an important part of cosmetic products. Creams may be considered pharmaceutical products as even cosmetic creams are based on techniques developed by pharmacy and un-medicated creams are highly used in a variety of skin conditions in ancient times, creams were simply prepared by mixing of two or more ingredients using water as the solvent. With the advancement in technology, newer methods are used for formulation of creams. These semisolid preparations are elegant to use by the public and society. They show versatility in their functions. Creams can be applied to any part of the body with ease. It is convenient to use cream by all the age group of people. Although it may be equally well applied to non-aqueous products such as wax-solvent based mascaras, liquid eye shadows and ointments. If an emulsion is sufficiently low viscosity to be pourable (flow under influence of gravity alone) is referred to as lotion. Creams are emulsions of oil and water. In coming future, more advanced technologies and methods will be used for preparation, formulation and evaluation of creams. Also, the demand of herbal constituents-based creams is increasing day by day.

Skin care procedures and skin care products

The information on skin care procedures is plentiful but little scientifically documented and the number of

products available for cleansing, soothing, restoring, reinforcing and protecting is of an almost infinite variety. Nonetheless their functionalities may be described as

I. Removal of dirt, sebum, microorganisms, exfoliated corneocytes and other non-wanted substances from the skin.
II. Reduction of unpleasant skin symptoms (e.g., pruritus, burning, odor).
III. Restoration of (sub-clinically) damaged skin (e.g., dry and inflamed skin).
IV. Reinforcement of undamaged but vulnerable skin (e.g., skin surface pH balance, germ reduction).
V. Protection of damaged, undamaged and vulnerable skin from various noxious factors.
VI. Providing a pleasant skin feel (well-being) [1].

Maintaining the Functional Integrity of the Stratum Corneum

It has been recognized for approximately 7 decades that the stratum corneum exhibits biological properties that contribute directly to maintaining and sustaining healthy skin. Continued basic science and clinical research coupled with keen clinical observation has led to more recent recognition and general acceptance that the stratum corneum completes many vital "barrier" tasks, including but not limited to regulating epidermal water content and the magnitude of water loss; mitigating exogenous oxidants that can damage components of skin via an innate antioxidant system; preventing or limiting cutaneous infection via multiple antimicrobial peptides; responding via innate immune mechanisms to "cutaneous invaders" of many origins, including microbes, true allergens, and other antigens; and protecting its neighboring cutaneous cells and structures that lie beneath from damaging effects of ultraviolet radiation. Additionally, specific abnormalities of the stratum corneum (Figure 2) are associated with the clinical expression of certain disease states [2].

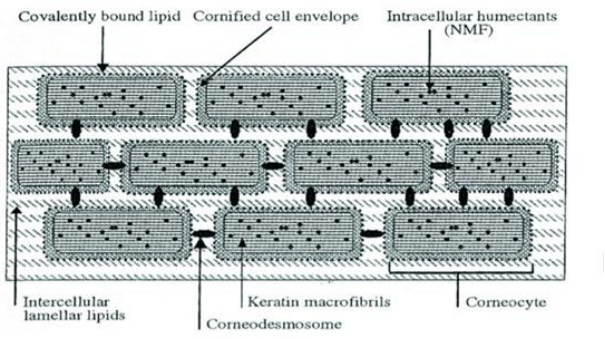

Figure 2: This figure depicts the "bricks and mortar" structure of the stratum corneum [2].

The corneocytes represent the bricks and the intercellular lamellar lipid membrane represents the mortar. Corneocytes comprise primarily keratin macrofibrils, are protected externally by a cornified cell envelope, and are held together by corneodesmosomes. The intercellular lamellar lipid membrane is primarily composed of ceramides, cholesterol, and fatty acids. A mixture of multiple small hygroscopic compounds presents within corneocytes, referred to collectively as natural moisturizing factor (NMF), plays a vital role in the physiological maintenance of stratum corneum hydration.

The functionality of the skin care products ranges from mono-functional, e.g., protecting barrier creams to poly-functional, e.g., soothing and restoring cleansers. They unfold their functionality as leave-on products (e.g., moisturizing or skin barrier products), or as rinse-off products (e.g., cleansers). Skin care procedures like washing/drying and the application of leave-on products-should be as benign as possible. The unduly removal of natural skin component (e.g., lipids), prolonged exposure to water (e.g., long-term immersion in full-baths), a (repeated) disruption of the physiological skin surface pH, and excessive and/or prolonged occlusion of the skin should be avoided. However, the epidermal acidification is known to be fragile and it is commonly accepted that cosmetic products, especially soaps and skin cleansing products, can induce significant changes in skin surface pH. The skin pH recovery needs time up to several hours before it can reach the physiological level. Skin care delivered to improve, e.g., the outcome of an eczema therapy or to reduce, e.g., the adverse effects of a cancer therapy are often termed as adjuvant skin care. Nonetheless, adjuvant or the above described classic preventive skin care pursues the similar goals. Moisturizing prevents and alleviates skin irritation, soothing the skin by slowing the evaporation of water. Many liquid face cleansers also moisturize, which may be all that is needed for a patient with oily skin. Protection from sun and environmental damage is important for all patients. While sunscreens are often irritants, the best options for young, oily, acne-prone skin tend to have a water or light liquid base. Moisturizing sunscreens are appropriate for patients with dry, sun-damaged skin, as well as those who wear makeup, have other skin diseases, or are easily irritated by products [3-6].

Types of Skin Creams

They are divided into two types: oil-in-water (O/W) creams which are composed of small droplets of oil dispersed in a continuous phase, and water-in-oil (W/O) creams which are composed of small droplets of water dispersed in a continuous oily phase. Whether the

aqueous or the oil phase becomes the dispersed phase depends primarily on the emulsifying agent used and the relative amounts of the two liquid phases. Hence, an emulsion in which the oil is dispersed as droplets throughout the aqueous phase is termed an oil-in-water (O/W) emulsion. When water is the dispersed phase and an oil the dispersion medium, the emulsion is of the water-in-oil (W/O) type. Oil-in-water creams are more comfortable and cosmetically acceptable as they are less greasy and more easily washed off using water. Water-in-oil creams are more difficult to handle but many drugs which are incorporated into creams are hydrophobic and will be released more readily from a water-in-oil cream than an oil-in-water cream. Water-in-oil creams are also more moisturizing as they provide an oily barrier which reduces water loss from the stratum corneum, the outermost layer of the skin. It is important for pharmacists to know the type of emulsion they have prepared or are dealing with, because this can affect its properties and performance (Table 1). Unfortunately, the several methods available can give incorrect results, so the type of emulsion determined by one method should always be confirmed by means of a second method [7,8].

Functional	Physicochemical	Subjective
Cleansing Creams Cold Creams Massage Creams Night Creams	Medium to High oil content O/W or W/O Low Slip Point oil phase Neutral pH May contain surfactant that improve penetration	Oily Difficult to 'Rub in' May be stiff and rich Also popular as lotions
Moisturizing Creams Foundation Creams Vanishing Creams	Low oil content Usually O/W Low slip-point oil phase Neutral to slightly acidic pH May contain emollients & special moisturizing ingredients	Easily spreadable and 'Rub in' quality Available as creams and lotions
Functional	**Physicochemical**	**Subjective**
Hand & Body Protective	Low to medium oil content Usually O/W Medium slip point oil phase Slightly alkaline or acidic pH May containing protective factors, especially silicon and lanolin	Easily spreadable but do not 'Rub in' with the ease of vanishing creams Very popular in lotion form
All Purpose Creams	Medium oil content O/W or W/O	Very often slightly oily but should be easy to spread

Table 1: Characteristics of Skin Creams [9].

Cleansing creams

In earliest times, cleansing was done by using a piece of bone or stone to scrape the skin. Later civilizations used materials of plant origin along with water for cleansing. Many different civilizations can be given credit for discovering soap. The earliest mention of the soap making process can be found in Sumerian clay tablets dating to ca. 2000 BC. By 600 BC, tree ash and animal fat had been used by the Phoenicians to prepare soap. The first cosmetic cleansing cream to be manufactured on an industrial scale was cold cream, an emulsion made with mineral or almond oil along with beeswax, borax and water. A second type of cleanser was introduced around 1920. It was made solely from oils and waxes, so was water-free (anhydrous) and was not an emulsion. Cleansers of this type were designed to melt or liquefy when applied to the skin – they were thixotropic – which is why they were referred to as liquefying cleansing creams. Skin permeability was found to depend very strongly on temperature and less strongly on the duration of heating. The pores of the skin are like little thermostats; they expand with heat and contract with cold. Now when a cream containing a high percentage of water is applied to the skin it is obvious that the pores will at once contract and prevent the deep penetration which is essential if the skin is to be thoroughly cleansed. Some chemists who favor cold cream type cleansers argue that such a reaction is momentary and that with continued rubbing the skin warms up and the pores open again. But they overlook the simple fact that water begins to evaporate immediately upon exposure and in evaporating it abstracts heat from the skin, which causes the pores to contract again. Many of the environmental impurities and cosmetic products are not water soluble and so washing the skin with simple water would not be sufficient to

remove them. Substances capable of emulsifying them into finer particles are to be used for making these fat-soluble impurities water soluble. Herein, cleansers fit into the picture. Skin cleansers are surface active substances (i.e. emulsifiers/detergents/surfactants/soaps) that lower the surface tension on the skin and remove dirt, sebum, oil from cosmetic products, microorganisms, and exfoliated corneum cells in an emulsified form. Careful face washing helps to improve and prevent acne; however, intensive washing has a risk of inducing skin barrier impairment and dry skin, especially in sensitive skin. An ideal cleanser should do all these without damaging or irritating the skin, on the contrary it should try to keep the skin surface moist. With the advent of advanced technologies, newer cleansers are now being manufactured which are mild, provide moisturizing benefits and can be easily washed off. The combined use of a facial skin cleanser and moisturizers is safe and effective for the care of acne in post-adolescent women with sensitive skin. The key ingredients in cleansing creams, which are also known as cold creams, are usually petrolatum, mineral oil, waxes and water (Table 2). Many cleansing creams also contain emulsifiers, which prevent the ingredients of the cream from separating into layers. It can moisturize skin and remove dirt, sweat, make-up at the same time. The layers of make-up, dust and sweat remain as a layer on the face and prevent the skin from breathing this may eventually lead to wrinkles and dullness. With their mild and effective action, cleansing creams now days have become a beneficial approach to healthy skin care [10-16].

Ingredient	Formulation 1 (%)	Formulation 2 (%)	Justification of Use
Stearic Acid	10	12.5	A key component of corneum lipids, an antioxidant and also potent anti-inflammatory lipid, non-toxic and non-irritant [17,18].
Mineral Oil	5	-	Mineral oil has been shown to improve skin softness and barrier function better than some other emollients. Benefits skin through hydration and occlusion [19].
Petrolatum	2	-	Emollient- base; it is poorly absorbed by the skin [20].
Cetostearyl Alcohol	1.5	2	It is used as an emulsion stabilizer, opacifying agent, and foam boosting surfactant, as well as an aqueous and nonaqueous viscosity-increasing agent [21].
Isopropyl Myristate	3	5	Emollient; oleaginous vehicle; skin penetrant; solvent, thickening agent, or lubricant [18], [22].
Sorbitan Monolaureate	2	-	Lubricants, processing aids, specific to petroleum production. Solvents (for cleaning and degreasing), surface active agents [23].
Glycerin	6.5	-	Humectant/Emollient
Na-Lauryl SO4	5	-	Anionic surfactant; detergent; emulsifying agent; skin penetrant; wetting agent [24].
Triethanolamine	1.5	-	A surfactant or pH adjuster [25], alkalizing agent; emulsifying agent
Polyoxyethylene Sorbitan Mono Laurate	2	-	Preventing surface adsorption and as stabilizers [26].
Water	61.5	68.5	
Lanolin	-	0.4	Emulsifying agent
Coco-Na Isothionate	-	12	Surface active agents; Cleansing Agent
Perfume, Preservative	q.s.	q.s.	

Table 2**:** Typical Formulation: Cleansing Creams.

There is strong evidence that mineral oil hydrocarbons are the greatest contaminant of the human body, amounting to approximately 1 g per person. Possible routes of contamination include air inhalation, food intake, and dermal absorption. The present study aims to identify the most relevant sources of mineral oil contamination [27]. Petrolatum is thought to be occlusive, thereby blocking transcutaneous water loss and trapping water under the skin's surface [28]. Petrolatum is a common moisturizer (Discussed in detail in often used in the prevention of skin infections after ambulatory surgeries and as a maintenance therapy of atopic

dermatitis (AD) [29]. Common ingredients in emollients include petroleum products, glycerin, fatty acids and plant oils. An ideal emollient should contain a combination of occlusive agents to slow down water loss, humectants to increase capacity to withhold moisture and lubricants to reduce friction against skin [30]. The exotic fats used in skin care are known to exhibit their effects through restoration of a sufficient layer of skin lipids and skin elasticity, boost natural skin regeneration and increased skin hydration by forming an inert, epicutaneous occlusive membrane. Besides these facts, mango butter which is one of several exotic fats is viewed as an ingenious replacement for cocoa butter, mineral and petroleum-based emollients because of its appreciable contents which are very important as source of skin active ingredients [31]. Isopropyl myristate is a non-greasy emollient that is absorbed readily by the skin. It is used as a component of semisolid bases and as a solvent for many substances applied topically [18]. IPM, the isopropyl ester of myristic acid, is used in cosmetics as a substitute for natural oils because it has excellent spreading properties and is absorbed easily into the skin. In many topical and transdermal preparations, IPM is also used as a co-solvent with skin penetration enhancement properties of active ingredients [22]. Polysorbate20 is a nonionic surfactant and emulsifier derived from sorbitan monolaurate, and is distinguished from the other members in the polysorbate range by the length of the polyoxyethylene chain and the fatty acid ester moiety. Due to non-toxic nature, it is used as a wetting agent in flavored mouth drops such as Ice Drops, helping to provide a spreading feeling to other ingredients like SD alcohol and mint flavor [32,33]. Glycerin is widely used in cosmetics and well as in pharmaceutical formulations, mainly as humectant. In vitro studies have shown glycerin to prevent crystallization of stratum corneum model lipid mixture at low room humidity (Figure 3). Ten days treatment of normal skin with 20% glycerin significantly increased skin corneometer values, indicating an increased hydration [34].

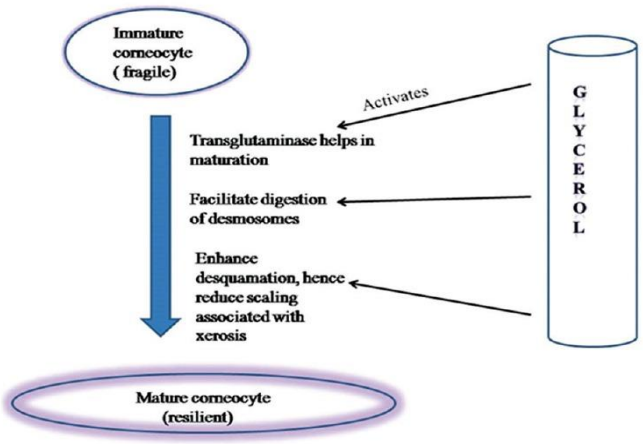

Figure 3: The mechanism of action of glycerol [35,36].

A humectant attracts and retains the moisture in the air nearby via absorption, drawing the water vapor into or beneath the organism's or object's surface. Much more is now known about the epidermis, and in particular, the stratum corneum. The “bricks and mortar” model suggests that its role is as an active membrane. Loss of intercellular lipids, i.e., the ceramides, cholesterol and fatty acids that form the bilayers, damages the water-barrier function. The stratum corneum then calls into action repair mechanisms. Scientifically, the moisturizing treatment involves a 4-step process: (a) repairing the skin barrier (b) Increasing water content (c) Reducing TEWL (d) Restoring the lipid barriers’ ability to attract, hold and redistribute water.

The intended application of detergents and cleaners should not result in direct contact with product ingredients; however, misuse of the product could potentially cause dermal (skin and ocular) or inhalation exposure. Sodium Lauryl Sulfate (SLS) enters and maintains residual levels in the heart, the liver, the lungs and the brain from skin contact. SLS is cited as causing severe eye damage and blindness. A second erroneous ocular health claim made about SLS is its link to cataract formation [35,37]. For cleaning and industrial uses, it is monitored by the Environmental Protection Agency (EPA). Sodium cocosulfate, made from coconut oil, can be used as a replacement for SLS in your beauty product recipes [25]. Recent studies suggest that coconut oil can

be a useful surfactant when combined with Yucca schidigera extract [38]. The polysorbates are amphipathic, nonionic surfactants composed of fatty acid esters of polyoxyethylene sorbitan being polyoxyethylene sorbitan monolaurate for polysorbate 20 and polyoxyethylene sorbitan monooleate for polysorbate 80. The polysorbates used in the formulation of biopharmaceuticals are mixtures of different fatty acid esters with the monolaurate fraction of polysorbate 20 making up only 40-60% of the mixture and the monooleate fraction of polysorbate 80 making up >58% of the mixture [26]. The Cosmetic Ingredient Review (CIR) Expert Panel assessed the safety of 39 polyether lanolin ingredients as used in cosmetics. The Panel concluded that these polyether lanolin ingredients are safe in the practices of use and concentration as given in this safety assessment [39]. Nasrollahi et.al 2018 revealed that Linoleic acid (LA) containing w/o emulsion exhibited erythema-reducing effects [40]. Sodium cocoyl isethionate (SCI) is an important surfactant ingredient in mild, syndet (synthetic detergent) cleansing bars. In vitro and in vivo studies have demonstrated that SCI is mild and less damaging to the skin barrier than soaps and surfactants such as sodium dodecyl sulfate (SDS) [41]. The Cosmetic Ingredient Review Expert Panel assessed the safety of triethanolamine (TEA) and 31 related TEA-containing ingredients as used in cosmetics. The TEA is reported to function as a surfactant or pH adjuster; the related TEA-containing ingredients included in this safety assessment are reported to function as surfactants and hair- or skin-conditioning agents. The exception is TEA-sorbate, which is reported to function as a preservative. The panel concluded that TEA and related TEA-containing ingredients named in this report are safe as used when formulated to be nonirritating. These ingredients should not be used in cosmetic products in which N-nitroso compounds can be formed [42]. A cleansing cream or lotion is spread onto the skin, using the fingertips, and massaged onto the surface. This action serves to loosen and suspend the grime and soil in the emulsion. A subsequent wipe with a tissue or cotton wool pad removes the majority of the applied cleansing emulsion, and with it the skin soil, grime or makeup. The cream should have a medium-to-high percentage oil phase and be easily spreadable, should not “rub in” and should not irritate the skin. In addition, if it can leave a residual emollient film on the skin, so much the better [43]. Surfactants in skin cleansers interact with the skin in several manners. In addition to the desired benefit of providing skin hygiene, surfactants also extract skin components during cleansing and remain in the SC after rinsing (Figure 4). These side effects disrupt SC structure and degrade its barrier properties. Hydrophobically modified polymers (HMPs) have been introduced to create skin compatible cleansing systems. At the presence of HMP, surfactants assemble into larger, more stable structures. These structures are less likely to penetrate the skin, thereby resulting in less aggressive cleansers and the integrity of the skin barrier is maintained. By creating these large polymer/surfactant complexes, the cleanser becomes less aggressive. In these HMP/surfactant systems, because less surfactant enters the SC, there is less inflammation, and therefore the skin barrier is less disturbed [44].

Figure 4**:** Audrey Hepburn [45-47].

The legendary Roman Holiday actress once famously said, “I owe 50% of my beauty to my mother and the other 50% to Erno Laszlo." Erno Laszlo, a pioneer in 20th Century skin care, believed beautiful skin was no miracle. He analyzed women's (and men's) skin giving them precise techniques for their personal cleansing and prescribed the exact products for their particular skin type and concern. The backbone of any cosmeceutical skin care regimen is facial cleansing and moisturizing. Moisturizers create the illusion of smooth, soft skin by placing a temporary film over the skin surface or by imparting a transient hydration benefit that does not clinically improve the quality or appearance of skin. Cleansing, aggressive exfoliation, and sebum reduction in the absence of a traditional moisturizer safely and effectively improved multiple clinical endpoints of photoaged skin.

Cold Cream

The invention of cold cream is credited to Galen, a physician in the second century from Greece. This cold cream is thick and softens when it touches the skin. It is perfect for dry skin on elbow, feet, and knees and also perfect for natural ways of removing makeup and to avoid eczema in dry parts of your body. The combination of fats and water in this product help moisturize – the cream gets its name because it's cold to the touch – with people using it to soften their skin, soothe sunburns, and protect faces from wintry weather, too. The emulsion is of a

"water in oil" type unlike the "oil in water" type emulsion of vanishing cream, so-called because it seems to disappear when applied on skin. Lubricating creams, night creams, or massage creams are a type of cold cream with the addition of lanolin (wool fat) and its derivatives. The name "cold cream" derives from the cooling feeling that the cream leaves on the skin. Cold creams were usually made as water-in-oil (W/O) emulsions. After the creams are applied to the skin much of the water evaporates leaving the remaining oil to act as a solvent which cleanses the skin of cosmetics and other grime. There may also be some surfactant activity. Some chemists suggested that as the water evaporated it cooled the skin which is why the creams are called 'cold cream'. An alternative explanation is that in the days before mineral oil or petrolatum were used, the creams needed to be stored in a cool place to stop them going rancid. This made them cold to the touch and so gave them their name. The first cold cream has been attributed to the Roman physician Galen (C.E. 150) who reputedly made a primitive emulsion by mixing water with molten beeswax and olive oil. It was laborious to make – requiring a great deal of mixing – and tended to separate on standing. However, the formulation persisted – generally using rose-water and/or oil of roses as a perfume – and was included in the first edition of the 'Pharmacopœa Londinensis' in 1618. Vegetable oils like almond oil are liable to deteriorate when they are mixed with water, so early forms were not long-lasting. Their short shelf life meant that cold creams were usually made up at home or purchased in small quantities, freshly made up by a local pharmacist, chemist or druggist. Borax-beeswax cold creams were white, opaque, had a high luster and spread easily on the skin, but the use of almond oil still limited the shelf life of the cream. When borax-beeswax cold creams were made with petrolatum and mineral oil rather than almond oil, cold creams were produced that were stable, cheap to produce and had a long shelf life. This made borax-beeswax cold creams ideal preparations for industrial manufacture and distribution. Cold creams that contained a high percentage of mineral oil (liquid paraffin) or petrolatum were regarded primarily as cleansers, to be spread on thickly, then removed with a cloth or tissues. However, depending on the formulation, they could be used for a variety of purposes and were often advertised as beauty creams or night creams. City air in most large western cities was a good deal grimier than it is today. Dust, soot and other particulate matter collected on the face, making it an enduring problem. Early advertisements for cold cream stressed the need to "cleanse your skin of all the dirt which lodges in the pores through the day, and which, more than anything else, injures the skin". It was also suggested that the cream be used at night to give it additional time to act. Cold creams were widely used in the theatrical trades to remove greasepaint with a number of suppliers producing products labelled as Theatrical Cold Cream. As the use of street make-up increased, cold creams were also promoted as a way to remove face powder, lipstick, rouge, foundation and other forms of personal make-up. Cold creams formed the basis of early beauty regimes developed by Pond's, Elizabeth Arden, Helena Rubinstein and others (Figure 5). By establishing a daily regime, cosmetic companies hoped they would increase the usage of their creams and widen consumer consumption to entire product lines. Guidance from beauty authorities saw many women adopt the practice of applying cold cream before sleep to remove the dirt, grime and cosmetics of the day. It cleansed the skin and, if not removed with soap and water, left a thin film with moisturizing properties. If it was doing something else while you slept, so much the better. One wonders, for example, how many women discovered that leaving it liberally on their face when they retired, helped them avoid the 'ministrations' of their husbands, enabling them to get a night of uninterrupted sleep. The all-purpose nature of cold cream, which had been its strength, proved to be its weakness. The recognition of different skin types and skin conditions along with the proliferation of skin creams containing 'beneficial additives' saw the need for an all-purpose skin cream decline. This fracturing of the commercial skin-care market which began with the introduction of stearate (vanishing) creams in 1892, picked up pace in the 1920s and 1930s and eroded the prestige of cold creams and pushed them increasingly into the low-end of the skin-care market. Although the use of cold creams has declined, they are still available. However, when more recent products are compared to original formulations marked differences are evident, primarily in the replacement of borax with modern surfactants [48-56].

Figure 5: 1961 POND'S SKIN CREAM vintage magazine advertisement "Special Formula Care" [57] **...** Put your skin on Pond's Special Formula Care ... and look lovelier overnight ... Pond's Cold Cream ... Pond's Dry Skin Cream ... Pond's Moisture Base ....

Cold cream is an emulsion of water and certain fats, usually including beeswax and various scent agents, designed to smooth skin and remove makeup. Beeswax itself suffers from 2 disadvantages as an ingredient in skin creams. The first of this is that it has a distinctive smell which usually has to be masked in the final product; the odor is not unpleasant but not found that compatible with the products of modern days' sophisticated image. And the quality and price also vary with season. The original cold cream recipe or the basic cold cream formula contains Borax. Borax was added to the basic combination of ingredients at the end of the nineteenth century. It reacts with fatty acids in the beeswax to form an emulsion and makes the cream stable. Borax plays many different roles in cold creams in that; it promotes emulsification and reduces surface tension of water. Borax is used in various household laundry and cleaning products but to its highly alkaline nature, it might cause skin irritation (Figure 6).

Figure 6: A borax-free cold cream [64,65]. Since borax is a naturally occurring mineral and is so useful in producing skincare and cleaning products, it is somewhat puzzling why there is so much fuss about its use. It's important to remember that "natural" doesn't always equal safe, nor does it guarantee we are protected from adverse effects.

Ingredient	Formula (Wt. %)			
	G	E	F	H
Mineral Oil	35.2	46.0	48.2	49.0
Sodium Behenoyl Lactylate	6.0	6.0	4.0	5.0
Beeswax	3.5	2.0	1.0	2.0
Ceresin Wax	2.0	1.5	0.9	2.0
Carbopol 934 (2% Aqueous)	5.0	5.0	5.0	5.0
Butylene glycol	3.0	4.0	4.0	4.5
Peg-100 Stearate	1.5	1.5	1.8	1.8
Petrolatum (2.5 soft)	1.0	1.0	1.0	1.0
Glycerin	0.9	1.3	1.0	1.0
Sorbitan Sesquioleate	0.9	0.8	1.0	0.9
Glyceral Stearate	0.5	0.7	1.0	0.5
Cetyl Alchohol	0.3	0.3	0.3	0.3
Stearic Acid	0.3	0.3	0.3	0.3
Fragrance	0.2	0.2	0.2	0.2
Dimethicone	0.1	0.1	0.1	0.1
Triethanolamine	0.1	0.1	0.1	0.1
Glydant PusR	0.1	0.1	0.1	0.1
Glycolic Acid	0.02	0.02	0.02	0.02
Vitamin E Acetate	0.01	0.01	0.01	0.01
Ascorbyl Palmitate	0.01	0.01	0.01	0.01
Hydrosycaprylic Acid	0.01	0.01	0.01	0.01
Water	to 100	to 100	to 100	to 100

There are also reports of adverse reproductive and developmental impact on the fetus. Its use in the long term is not recommended as there is a possibility of causing renal dysfunction as the borax accumulates in the body. It can also cause fatigue or vomiting due to toxicity. Some research suggests it could also cause genetic damage and be toxic to lymphocytes, the building block of the body's immune system [58-63].

Sodium Behenoyl Lactylate can be used as an emulsifying agent, humectant and conditioner in skin and hair care. Sodium Behenoyl Lactylate is vegetable derived and can be used in creams, lotions, facial cleansers, and bath products such as bath butters and scrubs [66,67]. White beeswax is a chemically bleached form of yellow wax and is used in similar applications: for example, to increase the consistency of creams and ointments, and to stabilize

water-in-oil emulsions. White wax is used to polish sugar-coated tablets and to adjust the melting point of suppositories. Beeswax has been used since ancient times for its antimicrobial properties in European and Asian traditional medicines. Preservative effects are possibly at the basis of its use in embalming and mummification practices by old Egyptians and Persian, or to model death masks by ancient Romans. A total of about 50 aroma components has also been reported. The ester/acid ratio is important for beeswax characterization by different Pharmacopeias, being generally lower (3–4) in European, and higher (8–9) in Asian beeswax [68,69]. Ceresin is often used as a substitute for ozokerite wax due to its similar properties, and also as a substitute for beeswax and paraffin wax. It acts as a rheological modifier at low concentrations (2–3%) and has the ability to create very small crystallites, which crosslink and establish a network structure that does not allow flow in practical conditions. Ceresin produces stable mixtures with oils and prevents bleeding or sweating of oil, and it produces a lighter cream that is less greasy [18,70]. Carbopol® 934 polymer is a white powder, cross-linked polyacrylic acid polymer. It exhibits short flow properties and a creamy sensory profile, and is therefore well suited for use as a rheology modifier in lotions and creams [71]. Butylene glycol is an antimicrobial preservative; humectant; solvent; water-miscible cosolvent. It is used in topical ointments, creams, and lotions, and it is also used as a vehicle in transdermal patches. Cottage cheese whey was unsatisfactory, but B. polymyxa produced large amounts of the glycol in sweet whey, about 60 mmol of glycol per 100 mmol of lactose utilized [18,72]. It is widely used in cosmetics, including low-irritant skin care products and topical medicaments, as an excellent and low-irritation humectant [73]. Polyethylene glycols (PEGs) are products of condensed ethylene oxide and water that can have various derivatives and functions. PEG-100 STEARATE (a polyethylene glycol ester of stearic acid, commercially available as HallStar® PEG 4400 MS; Jeemate 4400 DPS; Sabowax SE 100) is a non-ionic emulsifier (o/w) from petrochemical and vegetal sources. PEG-100 stearate is off-white, solid ester of polyethylene glycol (a binder and a softener) and stearic acid. The surfactant qualities of glyceryl stearate and PEG-100 stearate allow oil and water to mix. Used in after sun skin care, antiperspirants, beach wear sun care, cleansing wipes. When it comes to evaluating skin care chemicals to find the best ingredients for skin care, PEG 100 Stearate can be one of those cases where it's difficult to make a clear-cut assessment. On the one hand, this ingredient has many positive properties, such as the ability to moisturize and cleanse the skin. However, some studies point to a potential link between PEG 100 Stearate and development of toxicity within the body. Some skin care experts even suggest that this ingredient has been linked to problems with reproductive health and even cancer. When looking at PEG 100 Stearate as an emollient, there are other ingredients, like shea and cocoa butter that can also do the job very well. Glycerin is another well-known emollient that can increase skin hydration and softness. When it comes to emulsification properties of PEG 100 Stearate, alternative chemicals that are sometimes used include ceteareth 20, glycol stearate, or laureth 3 [74-77]. Sorbitol-based emulsifiers such as sorbitan sesquioleate (SSO) is used in a variety of products including skin care products, skin cleansing products, moisturizers, eye makeup and other makeup, primarily as an emollient. It is added to formulas as a skin soother and moisturizer and is derived from sorbitol, a humectant. They are commonly used in topical corticosteroids, topical antibiotics, topical antifungals, moisturizing creams and lotions, and topical retinoids. Contact dermatitis from sorbitol derivatives appears to be increasingly prevalent. Patch-testing with SSO can be useful in the work-up of patients with presumptive cosmetic allergic contact dermatitis. Those sensitized to SSO can be counseled to avoid sorbitol-containing products, especially topical corticosteroids [78-80]. Glyceryl Stearate acts as emollient; emulsifying agent; solubilizing agent; stabilizing agent; sustained-release agent; tablet and capsule lubricant. As a lubricant on the skin's surface, it gives the skin a soft and smooth appearance. It also slows the loss of water from the skin by forming a barrier on the skin's surface. Glyceryl Stearate, and Glyceryl Stearate SE help to form emulsions by reducing the surface tension of the substances to be emulsified. In cosmetics and personal care products, Glyceryl Stearate is widely used and can be found in lotions, creams, powders, skin cleansing products, makeup bases and foundations, mascara, eye shadow, eyeliner, hair conditioners and rinses, and suntan and sunscreen products [18,81,82]. Cetyl Alcohol is a synthetic, solid, fatty alcohol and nonionic surfactant. Cetyl alcohol is used as an emulsifying agent in pharmaceutical preparations. Often confused with the bad alcohols, such as denatured alcohol, the fatty alcohols include, among others, cetyl alcohol and stearyl alcohol. Typically, fatty alcohols are used as emollients and thickeners in skin-care products. Fatty alcohols are not irritating and, in fact, can be beneficial for dry skin [83-87]. Dimethicone is an antifoaming agent; emollient; water-repelling agent. Dimethicones of various viscosities are widely used in cosmetic and pharmaceutical formulations. In topical oil-in-water emulsions dimethicone is added to the oil phase as an antifoaming agent. It is hydrophobic and is also widely used in topical barrier preparations. Also called polydimethylsiloxane, is a type of silicone oil with distinctive properties that make it a useful ingredient in many skin care products. The combination of silicone with methyl groups tends to make it extremely resistant to water yet it keeps them flexible

and moving free, ideal properties for a lubricant. Dimethicone is viscoelastic meaning that, at high temperature, acts like a viscous liquid and, at low temperature, acts like elastic solid, similar to rubber. According to USFDA, dimethicone at concentrations between 1 and 30% is considered as a safe skin protectant. Besides being water and UV resistant, dimethicone is not greasy and is not expensive [88]. Glydant Plus™ is a unique and cost-effective preservative featuring a high level of antimicrobial activity in a wide variety of cosmetic and personal care formulations. Glydant Plus is also highly effective in inhibiting the growth of gram positive and gram-negative bacteria, yeasts and molds without the need of additional auxiliary preservatives. This water-soluble preservative has a low odor and is stable for extended periods of time over wide pH and temperature ranges [89]. Alpha-hydroxy acids (AHA) such as glycolic acid has been used extensively in cosmetic and dermatological formulas. In low concentration (2-5%) glycolic acid is believed to facilitate progressive weakening of cohesion of the intercellular material of the stratum corneum (SC), resulting in uniform exfoliation of its outermost layers (the stratum disjunctum) [90]. Exposure to UVB radiation induces inflammation and free radical-mediated oxidative stress through reactive oxygen species (ROS) that play a crucial role in the induction of skin cancer. Clinically chronic photoaging may result in fine wrinkles, texture abnormalities, pigment dyschromias, and actinic keratoses [91]. Glycolic acid (GA) chemical peels are a popular treatment for photoaged skin rejuvenation although retinaldehyde (RAL)-based cosmetic creams are potentially better tolerated than chemical peels [92]. Short-term topical application of glycolic acid in a cosmetic formulation increased the sensitivity of human skin to solar simulated radiation (SSR), while a comparable treatment with salicylic acid did not [93]. Glycolic acid also stimulates the growth of new skin. Although the exact mechanism of action of glycolic acid is still unknown, alpha-hydroxy acids decrease corneocyte cohesion and it has been suggested that this occurs by interference with the formation of ionic bonds. They dissolve adhesions between cells in the upper layers of the skin, inducing shedding of dry scales from the skin's surface, commonly referred to as exfoliation [94]. AHAs have been used as superficial peeling agents as well as to ameliorate the appearance of keratoses and acne in dermatology. However, caution should be exercised in relation to certain adverse reactions among patients using products with AHAs, including swelling, burning, and pruritus [95]. GA suppressed the mRNA expression levels of NLRC4 and AIM2 among the inflammasome complexes. GA also blocked interleukin (IL)-1β by reducing the activity of caspase-1 in the NHEKs. Treatment with GA (2%) inhibited UVB-induced inflammation marker NLRC4 protein levels in mouse dorsal skin. The photoprotective activity of GA was ascribed to the inhibition of ROS formation and DNA damage, as well as a reduction in the activities of inflammasome complexes and IL-1β. GA has anti-inflammatory and photoprotective effects against UVB irradiation (Figure 7). GA is potentially beneficial to the protection of human skin from UV damage [96].

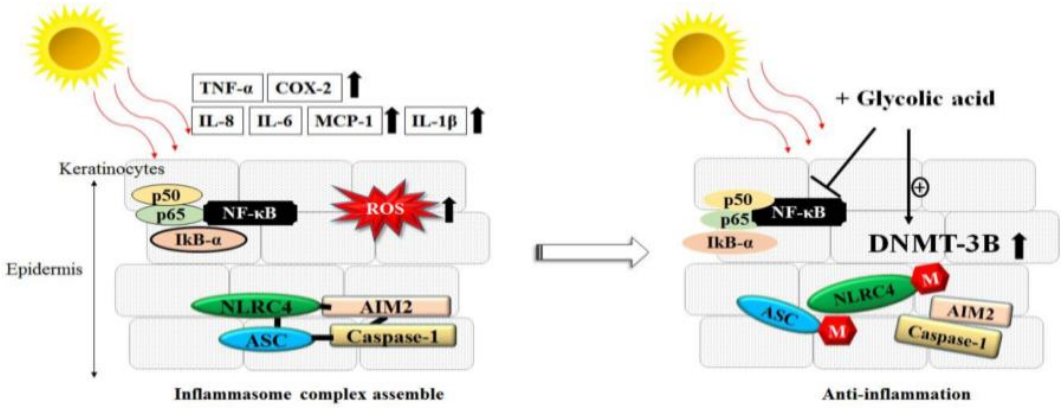

Figure 7: Glycolic acid (GA) had anti-inflammatory and photoprotective effects against UVB-irradiation in keratinocytes [97]. (Left) UVB-irradiation activated the nuclear factor-kappa B (NF-kB) pathway and promoted the inflammasome complex assembly, which in ROS accumulation and the release of several proinflammatory cytokines (e.g., interleukin (IL)-6, IL-8, monocyte chemoattractant protein (MCP)-1, IL-Iβ, COX-2, and IL-1β; (Right) Pretreatment with GA could activate DNMT-3B activity and induce the hypermethylation of promoters of NLRC4 and ASC genes, which subsequently hinder of the assembly of the inflammasome complex. GA also inhibited the UVB-induced promoter activity of NF-kB in keratinocyte cells.

A natural tocopherol and one of the most potent antioxidant tocopherols. It exhibits antioxidant activity by virtue of the phenolic hydrogen on the 2H-1-benzopyran-6-ol nucleus [98]. Stability of vitamin E depends on its form, dl-α-Toc acetate being the most stable. It protects the skin from various deleterious effects due to solar radiation by acting as a free-radical scavenger. Experimental studies suggest that vitamin E has antitumorigenic and photoprotective properties [99]. Although many cosmeceuticals contain vitamins C and E, very few are actually effective in topical application because the stability is compromised as soon as the product is opened and exposed to air and light. However, when a stable formulation delivers a high concentration of non-esterified, optimal isomer of the antioxidant, vitamins C and E inhibit the acute UV damage as well as chronic UV photoaging and skin cancer [100]. The solubility of ascorbyl palmitate in alcohol permits it to be used in nonaqueous and aqueous systems and emulsions. It is an antimutagenic agent; antioxidant [101]. Ascorbic acid-6-palmitate reduced cellular levels of reactive oxygen species following ultraviolet B irradiation. Ascorbic acid-6-palmitate strongly promoted ultraviolet-B-induced lipid peroxidation, c-Jun N-terminal kinase activation, and cytotoxicity, however. Despite its antioxidant properties, ascorbic acid-6-palmitate may intensify skin damage following physiologic doses of ultraviolet radiation [102]. Vitamin C also improves the elasticity of the skin and reduces wrinkles by stimulating collagen synthesis. Since it suppresses pigmentation and decomposes melanin, it is used as a skin-whitening agent. However, applied ascorbic acid is extremely reactive and therefore unstable in dispersions due to the fast oxidation and further irreversible chemical transformation. Therefore, the use of less reactive derivatives like ascorbyl phosphate salts (pro-antioxidant) or lipophilic ascorbyl esters is an attempt to prolong their stability [103]. Ascorbyl palmitate widely used in cosmetic and pharmaceutical preparations. Light accelerated the degradation of ascorbyl palmitate. In contrast, sodium ascorbyl phosphate was stable in both types of microemulsions. Sodium ascorbyl phosphate is shown to be convenient as an active ingredient in topical preparations [104]. The most common AHAs in cosmetic products are glycolic acid and lactic acid. Among others are citric acid, hydroxycaprylic acid, and hydroxycapric acid [105].

Night Creams

Night and massage creams are designed to be left on the skin for several hours or to remain mobile on the skin even after vigorous rubbing [106]. Therefore, they are composed with a substantial oil phase which will spread easily without disappearing but also without rubbing off on to clothing or bed linen in use (Table 3). Such creams tend to be high-oil-content, water-in-oil, soft solid or viscous liquid creams. A moisturizing effect is resulted due to the formation of the occlusive layer on the skin surface thereby reducing the rate of trans-epidermal water loss. Hence, the skin surface feels smooth by lubricating action and allowing any “saw tooth” cells in the outer layer of the stratum corneum to be smoothed down. The occlusive layer prevents epidermal moisture loss and also gives lubrication. Massage has a valuable part to play in skin care since it is well known that vigorous rubbing of the skin prevents dead surface cells and keeps epidermal blood supply in good condition. The term “moisturizing” has also been applied to water-in-oil creams of this type. The recent research has broadened the concept of moisturizing from the simple occlusive skin barrier principle. Many night moisturizing creams are comparatively light and easy to rub in compared with those of the overnight and massage types, although there still remains a market for the heavier moisturizing creams [107]. Recently, day and night creams containing Melatonin, vehiculated in lipospheres (Melatosphere™), have been developed (Nutriage day cream and Nutriage night cream (Exhibit 1); Cantabria Labs, Difa Cooper, Caronno Pertusella, VA, Italy). Melatonin is considered as a strong antioxidant molecule, and it is one of the most potent ·OH radical scavenger in nature. The liposphere carrier system could further improve the penetration of the Mel molecules through the skin layers. In women with skin aging, Melatonin-based creams improved significantly skin tonicity and skin hydration with a significant reduction in skin roughness, supporting the skin antiaging effect of this molecule applied topically [108].

Phase				
	Product	**INCI**	**Supplier**	**%**
A	Deionized Water	Water	- - - - -	62.10
	Glycerin	Glycerin	Interchimie	4.00
	Dermosoft® GMCY	Glyceryl Caprylate	Dr Straetmans*	0.50
	Satiaxane™ CX 911	Xanthan Gum	Cargill	0.50
	Biophilic™ H	Hydrogenated Lecithin (and) C12-16 Alcohols (and) Palmitic Acid	Lucas Meyer Cosmetics	4.00

	Product	INCI	Supplier	%
B	Sunflower Oil	Helianthus Annuus (Sunflower) Seed Oil	Emile Noel	5.00
	Hazelnut Oil	Corylus Avellana (Hazel) Seed Oil	Emile Noel	5.00
	erabeil Blanche Selectio	Beeswax	Baerlocher	4.00
	Vitapherole® E1000	Tocopherol (and) Helianthus Annuus (Sunflower) Seed Oil	VitaeNaturals	0.20
	Lipex® 102	Butyrospermum Parkii (Shea) Butter	AAK	3.00
	Product	**INCI**	**Supplier**	**%**
C	Deionized Water	Water	- - - - -	5.00
	Whitessence™	Artocarpus Heterophyllus Seed Extract (and) Maltodextrin (and) Disodium Phosphate (and) Sodium Phosphate	Lucas Meyer Cosmetics	2.00
	Mamaku Vital Essence Nature PF	Water (and) Glycerin (and) Cyathea Medullaris Leaf Extract	Lucas Meyer Cosmetics	2.00
	Exo-T™	Butylene Glycol (and) Vibrio Alginolyticus Ferment Filtrate	Lucas Meyer Cosmetics	1.00
	Tyrostat™ 09	Water (and) Glycerin (and) Rumex Occidentalis Extract	Lucas Meyer Cosmetics	1.00
	Product	**INCI**	**Supplier**	**%**
D	Potassium Sorbate	Potassium Sorbate	- - - - -	0.30
	Product	**INCI**	**Supplier**	**%**
E	Relax 2020/2	Fragrance	Vanessence	0.40

Table 3: Lightening Night Cream Formulation [109].
* International Nomenclature of Cosmetic Ingredients (INCI)

Deionized (DI) water is water that has been treated to remove all ions – typically, that means all of the dissolved mineral salts [110]. Glycerin is used as humectant/emollient. Dermosoft® GMCY (Glyceryl Caprylate) is a skin-conditioning agent - emollient; surfactant - emulsifying agent [111,112]. synergistic effects of isopropyl myristate and glyceryl monocaprylate (GEFA-C8) enhanced transdermal permeation of PTZ by disrupting SC lipids [113]. There is a considerable interest in the development of preservative-free or self-preserving cosmetics. Lonicera caprifoleum and Lonicera japonica in combination with glyceryl caprylate and/or levulinic acid, p-anisic acid, and ethanol (5%) gave an important assistance in order to boost the self-preserving system and to produce stable and safe cosmetic products [114]. Glyceryl Caprylate is a preferred ingredient in many natural care products (claimed safe for baby products). It is derived from plants, and a valuable resource because of its many properties. Glyceryl Caprylate moisturizes and balances the pH of the skin. Its antimicrobial and antifungal properties keep bacteria-causing germs at bay. It also contains a natural preservative that prevents mold from forming. It is very compatible with known organic ingredients but can also interact with extra iron [115]. It's moisturizing and re-fatting properties assist with improving and maintaining the moisture and balanced environment of the skin. It can also help to combat impurities due to its strong activity against Propionibacterium acnes [116]. Xanthan gum (XG) is a complex exopolysaccharide produced by the plant-pathogenic bacterium Xanthomonas campestris pv. (Xanthomonas bacteria, a Gram-negative bacteria genus that exhibits several different species) and is widely used as a thickener (gelling agent) or viscosity modifier [117]. It is also used as stabilizing agent; suspending agent; sustained-release agent [18]. The use of bioadhesive hydrogels for skin care presents important advantages such as long residence times on the application site and reduced product administration frequency. Hydrogel formulations showed a prevalently elastic rheological behaviour. Complex viscosity of carbomer homopolymer type C hydrogels was higher than that of the kappa carrageenan hydrogels. Formulations which combined carbomer homopolymer type C with xanthan gum or with carbomer copolymer type B were the most promising for bioadhesive skin products [118]. It has widely been used as an additive in various industrial and biomedical applications such as food and food packaging, cosmetics, water-based paints, toiletries, petroleum, oil-recovery, construction and building materials, and drug delivery. Recently, it has shown great potential in issue engineering applications and a variety of modification methods have

been employed to modify xanthan gum as polysaccharide for this purpose [119]. Biophilic™ H is a patented phospholipid-based O/W lamellar emulsifier designed to create elegant and very comfortable formulas. Its lamellar structure has a particular affinity to the skin, resulting in a second skin effect for maximum biocompatibility and tolerance [120]. Hydrogenated Lecithin is the product of controlled hydrogenation of Lecithin. Bilayers of these phospholipids in water may form liposomes, a spherical structure in which the acyl chains are inside and not exposed to the aqueous phase. Lecithin and Hydrogenated Lecithin are used in a large number of cosmetic formulations as skin conditioning agents-miscellaneous and as surfactant-emulsifying agents. Hydrogenated Lecithin is also used as a suspending agent-non-surfactant. Based on the available data, Lecithin and Hydrogenated Lecithin are safe as used in rinse-off cosmetic products; they may be safely used in leave-on products at concentrations up to 15%, the highest concentration tested in clinical irritation and sensitization studies; but the safety of use could not be substantiated in cosmetic products likely to be inhaled. Because of the possibility of formation of nitrosamines, these ingredients should not be used in cosmetic products in which N-nitroso compounds may be formed [121]. Functionally sunflower oil is a diluent; emollient; emulsifying agent; solvent; tablet binder. Skin care influences skin barrier function during the first postnatal weeks. Sunflower oil did not harm skin barrier function adaptation in healthy term neonates during the first five weeks of life [122]. Natural oils are applied topically as part of a traditional oil massage to neonates in many developing countries. Topical application of linoleate-enriched oil such as sunflower seed oil might enhance skin barrier function and improve outcome in neonates with compromised barrier function. Mustard oil, used routinely in newborn care throughout South Asia, has toxic effects on the epidermal barrier that warrant further investigation [123,124]. Topical application of olive oil for 4 weeks caused a significant reduction in stratum corneum integrity and induced mild erythema in volunteers with and without a history of atopic dermatitis. Sunflower seed oil preserved stratum corneum integrity, did not cause erythema, and improved hydration in the same volunteers. In contrast to sunflower seed oil, topical treatment with olive oil significantly damages the skin barrier, and therefore has the potential to promote the development of, and exacerbate existing, atopic dermatitis [125]. Several studies have shown significant differences between the moisturizing effects and skin tolerances of virgin and refined vegetable oils when incorporated in cosmetic emulsions. The phospholipid content of Hazelnut oil decreased from 286 ppm in virgin oil to traces in refined oil. Still, moisturizing effect obtained with the emulsion containing the enriched refined oil was shown to be the same as that obtained with the virgin oil emulsion [126]. Hazelnut oil contains 66-85% oleic acid, 7-25% linoleic acid, 4-9% palmitic acid and 1-6% stearic acid. When used in cosmetics and personal care products, hazelnut oil and Hydrogenated Hazelnut Oil function as skin-conditioning agents - emollient and skin-conditioning agents – occlusive. It's loaded with skin-nourishing vitamins and essential fatty acids that help protect skin against sun damage, boost collagen production, and more. Hazelnut is non-greasy and is best used for those who have oily skin but still want to enjoy the many benefits of carrier oils [127]. Vitapherole E1000 (Tocopherol and Helianthus Annuus Seed Oil combination); Vitapherole® is a line of IP natural-source vitamin E or tocopherols including α-tocopherols, mixed tocopherols, and acetates. They protect the skin from environmental stressors like pollution and UV. Tocopherols also help tighten and firm the look of skin which makes vitamin E the perfect addition to any anti-aging formula [128]. Shea butter is a vegetable fat obtained from the fruit of a tree native to Africa, Butyrospermum parkii. Shea butter is primarily composed of fatty acids such as stearic and oleic acids. This product can be used in formulations from 1% to 100%. It is a natural emollient that will add moisture back into the skin while also reducing swelling. Shea tree is abundantly found in the wide belt of savannah including West African countries like Nigeria, and further east in Uganda. Nowadays, shea butter, mainly the traditional one (called BIO-shea butter) interests cosmetic and pharmaceutical firms, contained nutritional elements like essential fatty acids (oleic and linoleic acids), minerals (calcium, iron, copper, magnesium, sodium, potassium and zinc), vitamins (A and E) and carotene, which would present them as available, cheap and accessible nutritive edible fats [129,130]. Whitessence ™ is a strong natural lightening agent extracted from Asian nangka seeds. The specific proteins of Whitessence ™ inhibit the transfer of melanin from melanocytes to keratinocytes. The decrease in the melanin quantity at the surface of the skin results in a clear and unified complexion [131,132]. Exo-T™, exopolysaccharide from Kopara (microorganisms mat) living in unique ecosystem in the rims of French Polynesian atolls, acts as an anti-wrinkle agent, anti-aging agent and regenerating / revitalizing (manufacturer's claim) [133]. Also, Tyrostat™ 9 is claimed as a potent strong inhibitor of tyrosinase enzymatic activity, one of the main enzymes involved in the pigmentation process [134]. Potassium sorbate is a potassium salt having sorbate as the counterion. Potassium Sorbate is a mild preservative being used in cosmetic and skin care formulas as a paraben alternative to prevent or retard the growth of microorganisms and protect products from spoiling. Phenoxyethanol, citric acid, sodium benzoate, and potassium sorbate were very common in all the

cosmetic product categories, found in a study where 2300 products commercially available in Spain was collected and examined to identify the frequency of a wide variety of preservatives in different product categories [135].

Exhibit 1. Benefits of day and night creams [136,137]	
Why Day Cream?	A day cream is designed to primarily protect and support skin during the day against damaging UV rays, pollution and environmental stress. They contain SPF to prevent burning and photoaging, antioxidants to fight free radicals, and ingredients like caffeine to make skin look energized and firm. Day creams are usually designed to be worn under cosmetics, so they have light, non-greasy formulas that are absorbed quickly and allow pores to breathe.
Why Night Cream?	Night cream works differently as it basically repairs and moisturize your skin to make it look supple and wrinkle-free. Good night creams contain antioxidants and anti-wrinkle ingredients which helps to slow down our natural process of ageing. For night cream, there's also the whitening night cream available. Most common ingredient to be found in a night cream are AHA, BHA*, Retinol, Vitamin A and so forth. A topical cream containing retinol 0.5% in combination with niacinamide, resveratrol, and hexylresorcinol is efficacious and tolerable for skin brightening/anti-aging when used with a complementary skin care regimen including SPF 30 sun protection (Figure 8).

* Unlike AHAs, BHAs can get deeper into the pores to remove dead skin cells and excess sebum.

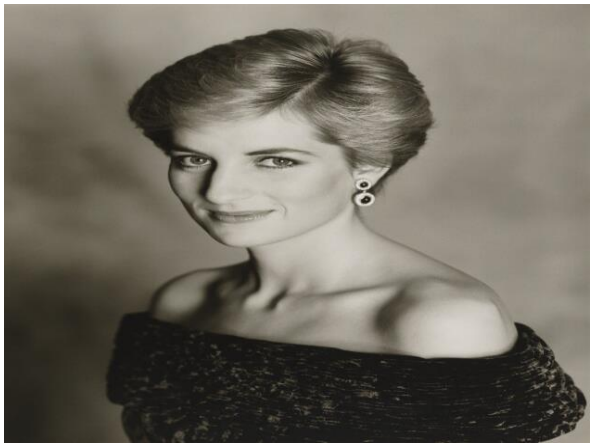

Figure 8: Diana, Princess of Wales, 1986 [138-140]**.** According to the magazine Longevity, Princess Diana was "scrupulous about using an SPF-8 sunblock." While the American Academy of Dermatology recommends applying at least SPF 30, protection against UV rays can prevent both sunburn and dangerous skin cancers.

Massage Creams

A beauty massages cream that promotes resilience and firmness while helping prevent sagging and other signs of aging. The great interest in eternal youth has developed a large market for skin care products claiming anti-wrinkle effects. Facial massage is an extremely popular form of beauty treatment and is thought to rejuvenate the skin. It may refresh the subjects by reducing their psychological distress and activating the sympathetic nervous system [141]. Performing short-term facial massage with a roller increases SkBF, and long-term use improves the vascular dilatation response [142]. Facial beauty treatment generally consists of three steps: vigorous massaging of the face with creams, steaming (using a hot towel or a steaming gadget), and application of a face mask containing adsorbents and astringents. Combining massage with moisturizer application is a popular technique in beauty spa sessions. The subjective positive psychological effects of massage with moisturizer application in hand and face beauty treatment are documented by many people attending spa sessions. Interestingly, daily performance of massage after moisturizer application was not an effective external intervention for enhancing moisturizer efficacy [143]. The action of rubbing a cream or emollient into the skin is a form of massage, and this simple action will go a very long way towards the recovery of skin integrity and in the prevention of harm and infection [144]. Anecdotally, the addition of aromatherapy oils to massage cream may have a positive effect on symptom relief in people with cancer, although evidence is again lacking [145]. Although there are several subjective benefits with facial beauty treatment, there may be immediate side-effects, such as erythema and edema, as well as delayed problems, such as dermatitis and acneiform eruption (follicular eruptions characterized by papules and pustules resembling acne), in about one-third of patients [146]. Gentle massage is often facilitated using a cream to reduce friction on the skin. However, there is also the possibility of massage causing harm - massage or rubbing of vulnerable skin may exert shear stresses which may themselves potentially cause damage. In addition, it is also possible that the use of a cream or emollient as part of the massage regimen may increase epidermal hydration and prevent dermal

stripping and the subsequent exposure of fragile dermal tissue [147]. Cellulite has been treated with massage which decreases tissue edema but it is also likely to have its effects at the cellular level by stimulating fibroblast (and keratinocyte) activity while decreasing adipocyte activity. In addition to massage, effective topical creams with a variety of agents were used to ameliorate the condition [148]. Slimming Cream Containing 3.5% Water-Soluble Caffeine and Xanthenes appears to be effective for the treatment of cellulitis without serious adverse effects. Moreover, massage is also used to remove interstitial fluid and accelerate lymphatic drainage, which leads to the reduction of cellulite [149]. Client-preferred massage creams are ideal for all modalities and offer a unique combination of medium glide, friction, and typically absorb completely into the skin (Table 4). Massage Warehouse carries a wide range of organic massage cream brands including TheraPro, Massage FX, Lotus Touch, Soothing Touch, Bon Vital and much more! [150]. Massage therapy has been shown to have beneficial effects on varying conditions including prenatal depression, preterm infants, full-term infants, autism, skin conditions, pain syndromes including arthritis and fibromyalgia, hypertension, autoimmune conditions including asthma and multiple sclerosis, immune conditions including HIV and breast cancer and aging problems including Parkinson's and dementia [151]. Thai foot massage may be one of the alternative therapies to improve balance performance for diabetic patients as a result of increasing range of motion (ROM) and sensation of the foot [152]. Massage in infancy improves growth and post-massage sleep. However, only sesame oil showed significant benefit [153]. Swedish Massage Therapy (SMT) is a complementary treatment that is believed to provide relaxation and therefore able to reduce blood pressure caused by stress [154]. Massage creams and lotions are well-suited to deep tissue and other high-friction massages. They tend to provide medium glide, and while they can be nourishing to the skin, are typically absorbed fairly slowly. Lotion and cream are often similar products, but tend to have a different consistency. Creams are generally quite a bit thicker, while lotions are more liquid. Lotions tend to give more bang for buck, as they are more spreadable. Creams do better for topical treatments on tough areas of skin. Some creams and lotions, particularly water-based ones, can leave the skin feeling dried out. Creams generally come in jars or tubs which don't fit into holsters, which can be a hassle during treatments. Creams and lotions are often cold when first applied to the skin and can be difficult to heat. Many are also scented, which will bother some clients [155].

Ingredient	% of total	500 g	2 cups	Function
Part A				
Distilled Water	38.10	190.50	3/4 cup + 1 TBS	Diluent
Glycerin	2.00	10.00	2 tsp	Humectant
Part B				
Cetyl Alcohol	4.25	21.25	4 1/4 tsp	Thickener
Ethylhexyl Palmitate	23.00	115.00	1/2 cup	Occlusive oil for slip
Grapeseed Oil	8.50	42.50	3 TBS	Vegetable oil for moisturizing
Cetearyl Alcohol (and) Ceteareth-20	3.55	17.75	3 1/2 tsp	Emulsifier blend
Caprylic/ Capric Triglycerides	10.00	50.00	1/4 cup	Occlusive oil for slip
Sweet Almond Oil	3.50	17.50	3 1/2 tsp	Vegetable oil for moisturizing
Glyceryl Stearate (and) PEG-100 Stearate	6.10	30.5	2 TBS	Emulsifier blend
Part C				
Germaben II	1.00	5.00	1 tsp	Preservative
Total	**100 %**	**500g**	**2 cups**	

Table 4: Massage Cream Formulation [156].

Ethylhexyl palmitate is an ingredient that functions as an emollient, solvent, pigment wetting agent, and fragrance fixative in cosmetics and personal care products. As an emollient, ethylhexyl palmitate helps to keep the skin moist and supple by reducing water loss from the epidermis (the outer layer of skin). Emollients also act as lubricants by reducing friction when anything rubs against the skin (Exhibit 3). Ethylhexyl palmitate is considered to be a non-occlusive emollient, which means it does not form a film on the surface of skin. It is often used as an organic replacement to silicones in a cosmetic formulation because it provides a dry-slip, silky feel that is very similar to how a silicone would feel. While all skin types can benefit from emollients like ethylhexyl palmitate, emollients are very beneficial for those who have dry, rough and/or flaky skin. Emollients can treat

these symptoms, leaving the skin looking and feeling soft and smooth. In addition, emollients can benefit those that suffer from conditions such as eczema, psoriasis, or other inflammatory skin condition [157]. Instruments that have been used for assessing epidermal hydration are based on measurements of conductance, capacitance and impedance of the skin. Most of the commercial moisturizer contains Aloe barbadensis (Aloe vera) as a moisturizing agent. Ingestion of Aloe preparations is associated with diarrhea, hypokalemia, pseudomelanosis coli (a disorder of pigmentation of the wall of the colon), kidney failure, as well as phototoxicity and hypersensitive reactions [158]. However, there so many other herb's extract/juices/oils like grape seed, cucumber, basil, jojoba oil, almond oil, olive oil, etc. present in the commercial moisturizer section claiming for restoring skin hydration and viscoelasticity [159]. Many of grapeseed oil's beauty benefits may be due to its omega-6 fatty acid content and vitamin E, an antioxidant that helps to build tissue, and lineolic acid, a fatty acid which promotes hair and skin growth. Nonionic emulsifiers depend chiefly upon hydroxyl groups and ether linkages (from polyhydric alcohol anhydrides and polyoxyethylene chains) for their hydrophobic effects [160]. Nonionic emulsifiers are usually less irritating than their ionic counterparts. Examples of nonionic emulsifiers include cholesterol, a natural component of the lipid bilayer, polyethylene glycol, cetearyl alcohol, ceteareth-20, and stearyl alcohol [161]. This non-ionic emulsifier blend, INCI Cetearyl Alcohol and Ceteareth 20, is a waxy pastille and creates a thicker, waxier end product. It is derived from coconut fatty acid. It is excellent for foot and elbow creams, which are slightly heavier. Provides good emollience and feel. It forms highly stable emulsions with excellent appearance and feel, compatible with a wide range of ingredients and pH [162]. Chemically, caprylic /capric triglyceride contains a high concentration of fatty acids, which allows it to provide an occlusive layer to help increase moisture-retention at the skin's surface. As a result, caprylic /capric triglyceride can have emollient properties that may boost skin-hydration levels [163]. Application of the o/w emulsion formulation containing either HP or capric/caprylic triglyceride significantly elevated skin moisture content and thus reduced transepidermal water loss (TEWL) by a maximal approximately 33% against the control formulation within 3 h and maintained this up to 6h [164]. Germaben II-E can be used in problem formulations, without the need for additional co-preservatives. It is compatible with almost all cosmetic ingredients, including surfactants and proteins. Germaben II-E is a clear viscous liquid preservative system with a characteristic mild odor. It is readily soluble at a level of 1.0% in both water/oil and oil/water emulsions, but not in water alone. Germaben II contains propylene glycol, propylparaben, methylparaben, and diazolidinyl urea. Some studies have raised concerns that paraben substances may be carcinogenic owing to their effect of mimicking the body's hormone estrogen" [165-167].

Vitamins used in skin Creams

The number of cosmetic products which include vitamins as a constituent has increased three-fold since 1991. Vitamins are commonly used as ingredients of products designed to improve the appearance and health of the skin; for this reason, the cutaneous benefits of such products are actively researched by dermatologists and chemists. It has been claimed that fat-soluble as well as water-soluble vitamins are capable of being taken up through the skin. The use of stabilized vitamins in cosmetic preparations for external application is justified [168]. Pantothenic acid, is a part of the water-soluble vitamin B complex. Its precursor and the related materials – panthenol, pantethine and pangamic acid have all been quoted as having a beneficial action on the skin and being useful in skin and/or hair preparations. Skin softening ability of pantothenic acid-based topical products have also been demonstrated in a few recent clinical trials [169]. Although there is no certain proof that they penetrate the skin and reach the location where they might exert an influence, vitamin B complex, panthenol and vitamin B6 (pyridoxine) are used in some cosmetics. Vitamin D, like vitamin A, is oil-soluble and is essential for skin health, but deficiencies are best corrected by oral administration to achieve a systemic effect. However, vitamins D2 and D3 (calciferol) are used, sometimes in conjunction with vitamin A. A mixture of vitamins A, E and D3 has been claimed to be synergistic. Vitamin E is said to enhance percutaneous resorption, and vitamin H is claimed to help fat and cholesterol synthesis. Other vitamins having some using topical preparations include the so-called vitamin F, now known as essential (unsaturated) fatty acids (EFA) [170].

Moisturizer

This term was developed by marketers, promoting its function to moisten the skin. Moisturizer and emollient are often regarded as synonymous, even when occlusives and humectants are also part of it. Emollients are mostly made up of lipids and their components, which fill intercorneocyte cluster gaps to enhance skin hydration, smoothness, softness, flexibility. Occlusives are other type of moisturizer which is mostly oil based and serve the function of maintaining skin water content by creating a hydrophobic barrier over the skin and blocking trans-epidermal water loss. The last type of moisturizers are humectants, that consist of hygroscopic substances which help the stratum corneum to absorb water by attracting water from dermis and a humid environment into the

epidermis. The efficacy of moisturizers depends largely on proper selection and compliance to continuously use it (Exhibit 2) [171]. Moisturizers, among all other skin creams, most widely used. If water is lost more rapidly from stratum corneum than it is received from the lower layer of the epidermis. The skin becomes dehydrated and loses its flexibility. Water alone will not restore the flexibility [172,173]. There are two basic types of dry skin. The first is due to prolonged exposure to low humidity and air movement. The second is due to ageing related physicochemical changes. Again, Dry skin or xeroderma is an extremely common problem which can be induced by complex interactions between environmental and individual factors including, but not limited to: low environmental temperature, low humidity, exposure to chemicals, microorganisms, aging, psychological stress, atopic dermatitis and eczema. Eczema common among young children. Other conditions, such as psoriasis and type 2 diabetes, can also cause skin to dry out [35,174]. Xerosis is abnormal dryness of the skin (Figure 9), mucous membranes, or conjunctiva (xerophthalmia). There are many causes of xerosis, and treatment depends on the particular cause [175]. Dry skin conditions are often not considered important by health professionals, and as a consequence treatment are frequently under-prescribed. As a result of this, problems with untreated dry skin can lead to a variety of issues. Conditions such as pruritus and ichthyosis vulgaris can be distressing, while ezcema and psoriasis can lead to more serious consequences such as fissures and infections and can result in a reduced quality of life and social isolation [176]. Moisturizers are topical products designed to improve and maintain the skin barrier function and to help prevent dry skin. It is common to think that a moisturizer adds water to the skin; however, this is a misunderstanding. Rather, a moisturizer works by preventing or reducing water evaporation from the skin.8 this action allows the skin to rehydrate from within. There are three classes of chemical ingredients that regularly serve as moisturizers: occlusives, humectants and emollients. Often these chemicals are either the same as or similar to natural components in the SC. They are often used in combination, with some ingredients providing overlap of characteristics [177,178].

Occlusion (by lanolin, petroleum, silicones, mineral and vegetable oil) prevent water loss from healthy normal skin causing the stratum corneum to be more hydrated, making it softer and supple. Examples of occlusive are: mineral and vegetable oils, lanolin and silicones. Their effect is increased by the use of mixtures of lipids and other fatty chemicals which have been designed to imitate the composition of the skin's natural oily secretions. More recently, skin substantive barrier materials (mainly based on quaternary ammonium complexes) have become available which seem to be able to influence the rate of trans-epidermal water loss without putting an inclusive or greasy barrier on the skin surface. These materials can be shown to be substantive to skin (and hair) and act not only as moisturizers, but as emollients and skin conditioning agents. Examples are quaternium, a hydroxyethyl-cellulose derivative [180].

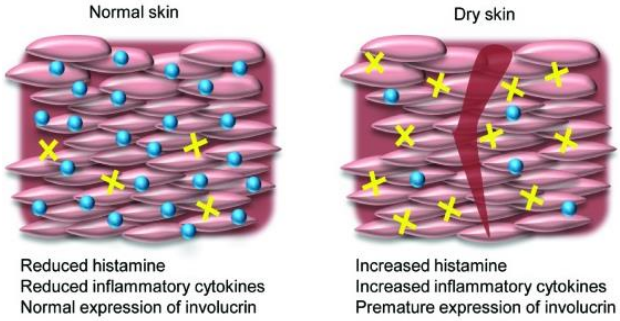

Figure 9: Mechanisms of xerosis [179]. Normal skin contains lower levels of histamine and inflammatory cytokines compared to dry skin. Premature expression of involucrin, a protein that forms a protective envelope around corneocytes, has been implicated in the pathophysiology of dry skin. In addition, xerotic skin has been shown to contain higher levels of keratin 5 and 14 and lower levels of keratin 1 and 10 compared to normal skin. The schematic on the right shows the cracked stratum corneum that is characteristic of dry skin and associated with decreased water content (blue spheres) and increased involucrin cross-linking (yellow crosses).

Humectants (Glycerol, Ethylene Glycol, PG, sorbitol alone or in admixture at various levels) attract water from atmosphere, so supplementing the skin water content. They can be used alone or in a mixture at various levels. Whether or not they penetrate the skin surface is a moot point, but at least they will attract moisture to the skin (Figure 10). [181,182]. The third and most valuable approach to miniaturization to supplementing Natural Moisturizing Factors (NMF) from the skin those are removed by polar solvents and detergent solutions. The NMF contains a combination of several naturally occurring free amino acids, urocanic acid, inorganic salts, sugars, lactic acid, and urea. Many of these are highly efficient at attracting and binding water from the atmosphere, allowing adequate hydration of corneocytes even in low humidity environment. Once applied to the skin, the ingredients can stay on the surface, be absorbed into the skin, be metabolized, or disappear from the surface by evaporation, sloughing off, or by contact with

other materials. In addition to substances considered as actives, e.g. fats and humectants, moisturizers contain substances conventionally considered as excipients (e.g. emulsifiers, antioxidants, preservatives). Partitioning of antioxidants, hydrogen bonding, interphase transport, surface accessibility, and interaction of emulsifier with antioxidants are considered to be important parameters that determine antioxidant activity in lipid-containing systems. Some formulations may deteriorate the skin condition, whereas others improve the clinical appearance and skin barrier function. For example, emulsifiers may weaken the barrier. On the other hand, petrolatum has an immediate barrier-repairing effect in delipidized stratum corneum. Moreover, one ceramide-dominant lipid mixture improved atopic dermatitis and decreased TEWL in an open-label study in children [183-185]. A typical moisturizing formulation is detailed in Table 5.

No.	Ingredient	%	Justification
1	Isopropyl Linoleate	2	Lubricant
2	Glyceryl Stearate	3	Emollient; emulsifying agent
3	Diisopropyl adipate	2	Plasticizer, moisturizer, cleaning agent
4	Myristyle myristate	1	Emollient
5	PEG 40 Stearate	1	Surfactant; cleansing agent
6	Cetyl alcohol	1.5	Emollient; emulsifying agent; stiffening agent
7	Ceteareath-20	0.5	Emulsifying agent
8	Quaternium-22	2	Antistatic
9	Hydroxyethyl cellulose (2% aq)	25	Emulsifying, bubble-forming agent, viscosity-increasing agent.
10	PG	3	Preservative; disinfectant; humectant
11	Water	59	
12	Prfume, preservative	q.s.	

Table 5: Moisturizer Formulation [186-196].

Isopropyl Linoleate the ester of isopropyl alcohol, it is a pale yellow, oily liquid. In cosmetics and personal care products, Isopropyl Linoleate may be used in the formulation of face and skin care products, hair care products, and eye and facial makeup. It acts as a lubricant on the skin's surface, which gives the skin a soft and smooth appearance [186]. The structure of a stable O/W cream is characterized by a more or less pronounced mixed crystal bilayer. The addition of co-emulsifiers in order to achieve a soft formulation often leads to a mixed crystal bilayer network of high viscosity and even phase separation. In order to avoid this component of different chemical identities are used which often are not inert or harmless if they are absorbed. The amount of co-emulsifier used should not be too high, as it would crystallize increasingly during storage which gives the preparation an optical inhomogenity and a lack in softness which is needed for a suitable cosmetic acceptance. A slightly higher concentration than is necessary for the mixed emulsifier system can be advantageous, as the formation of a separate crystalline lipophilic network in the preparation increases its viscosity which will lead to a higher physico-chemical stability of the formulation. These results were obtained with the co-emulsifiers glyceryl monostearate (Imwitor 900), cetylstearyl alcohol (Lanette O), and PEG-20-glycerolstearate (Tagat S2) as O/W emulsifier [187]. Glyceryl Monostearate Emollient; emulsifying agent; solubilizing agent; stabilizing agent [18]. Diisopropyl adipate (DIPA) is a fatty acid ester and an isopropyl ester; clear, colorless to light yellow viscous liquids. It is used for a variety of applications, such as the production of moisturizers, shaving lotions and cleaning agents. DIPA acts as a lubricant on the skin surface which gives the skin a soft and smooth appearance. Its solvent properties allow its use as a carrier for other cosmetic ingredients and also to soften synthetic compounds by reducing brittleness and cracking [188]. Myristyl Myristate is a 100% natural vegetable derived ester utilizing only the Myristic fatty acids. Non-greasy solid emollient, enhances esthetic properties of skin care products, gives more body & spreadability, results in superior whitening to the product and improved benefits to the skin [189]. About PEG-40 STEARATE: PEG-40 stearate is a synthetic polymer composed of PEG (polyethylene glycol) and stearic acid, a naturally occurring fatty acid. Products and formulas containing PEG 40 Stearate should not be used on broken or irritated skin. Although PEGs are considered safe for use topically on healthy skin, studies showed that patients suffering from severe burns were treated with PEG-based antimicrobial cream; this treatment resulted in kidney toxicity. Due to the presence of PEG, this ingredient may contain potentially toxic manufacturing impurities such as 1,4-dioxane [190]. Cetyl alcohol is a common choice of emollient. It forms a layer on the skin, which traps the water on the skin and prevents it from

escaping, thereby inhibiting skin dehydration [191]. Ceteareth-20 functions as an emollient and emulsifier. It's usually used in conjunction with other alcohols and fatty acids, working to thicken a solution and help other ingredients dissolve in a solvent. It also functions as a nonionic stabilizer in oil in water emulsions. Ceteareth-20 is the polyethylene glycol ether of cetearyl alcohol; may contain potentially toxic impurities such as 1,4-dioxane [192]. Quaternium-22 is a light amber-colored liquid, a quaternary ammonium salt. The unreacted monomer content of these ingredients was considered low and of no toxicological concern. Limited data showed no skin irritation/sensitization. Although these ingredients were nongenotoxic in bacterial assays, mammalian genotoxicity, carcinogenicity, and reproductive and developmental toxicity data were not available [193]. However, its toxicity is due to its ability to act as a nitrosating agent, releasing potentially carcinogenic nitrosamines [194]. Hydroxyethyl cellulose is a polysaccharide derivative with gel thickening, emulsifying, bubble-forming, water-retaining and stabilizing properties. It is used as a key ingredient in many household cleaning products, lubricants and cosmetics due to its non-ionic and water-soluble nature [195]. Propylene glycol is a synthetic liquid substance that absorbs water. It is a clear, colorless, viscous, practically odorless liquid, with a sweet, slightly acrid taste resembling that of glycerin. It is a propanediol that exists as a clear, colorless and hygroscopic liquid and consists of propane where the hydrogens at positions 1 and 2 are substituted by hydroxyl groups. It acts as Antimicrobial preservative; disinfectant; humectant; plasticizer; solvent; stabilizing agent; water-miscible cosolvent. Propylene glycol is used as an organic solvent and diluent in pharmaceuticals and many other industrial applications [196].

Figure 10: Winter treatments [197-199].

In the winter season when the air is crisp and chilly, a special skin care is necessary. Dry skin in the winter has been reported to involve scaling, defects in water holding and barrier functions, and decreased ceramide levels in the stratum corneum (SC). Indicators of dry skin conditions (conductance, dryness, roughness, and scaliness) strongly correlated with the level of ceramide. Daily application of a moisturizing cream is effective in improving mild subclinical inflammation that is induced on the facial skin by the winter environment.

	Emollients	Humectants	Occlusives	Protein Rejuvenators
Mechanism of action	Saturated & unsaturated hydrocarbons with variable length which improves skin barrier function, membrane fluidity and cell signaling, resulting in overall improvement of skin texture and appearance. Often combined with emulsifier	Low molecular substances in majority, with capability to attract water into stratum corneum. Frequently used with other compounds which may retain the water content	Consist of oils and waxes, forming an inactive layer on the skin surface to physically block water evaporation from the skin (transepidermal water loss)	Small molecular weight proteins, believed to aid skin rejuvenation by replenishing skin's essential proteins
Indication	Routine skin care, dry and rough skin, papulosquamous skin disease	Xerosis, ichthyosis	Prevention of contact dermatitis, xerosis, atopic dermatitis	Photodamaged skin, skin rejuvenation
Adverse effect	Contact irritation (seldom)	Irritation (lactic acid, urea)	Oily application, cosmetically disagreeable, folliculitis (mineral oil), contact dermatitis (lanolin), acneiform eruption	Contact dermatitis
Substance	Fatty acids, fatty alcohols, cholesterol, squalene, pseudoceramides	Urea, sorbitol, panthenol, glycerol, propylene glycol hyaluronic acid, alpha hydroxy acids	Mineral oil, petroleum jelly, beeswax, silicones, zinc oxide	Collagen, elastin, keratin

Exhibit 2: Types of Moisturizers [200,171].

Exhibit 3. Emollients used in skin creams [200-207]

"Emollience" is another ill-defined term often used in connection with skin creams. Emollient means imparting of a smoothness and general sense of well-being to the skin, as determined by touch. In a sense, therefore, water is an emollient. Emollients may also cause flattening of the skin surface, pluming of each corneocyte, and general smoothing and diminishing of facial lines. Every liquid, semi-solid or low-melting-point solid of a bland nature and cosmetic quality has been used as an emollient. Among the most popular water-soluble emollients are glycerine, sorbitol, propylene glycol, and various ethoxylated derivatives of lipids. Oil-soluble emollients include hydrocarbon oils and waxes, silicone gels, vegetable oils and fats, alkyl esters, fatty acids and alcohols, together with ethers of fatty alcohols (including polyhydric alcohols). The choice is determined by personal preference, data on potential skin irritation, the degree of "greasiness" and apparent residual film on the skin, cost and availability. Mineral oils and silicone oils do not "disappear" from the skin very readily when used in any quantity and are therefore useful in cleansing and night creams. Properlene glycol is an efficient preservative against certain micro-organisms at concentrations of more than 8%, but it is a potential sensitizer. The alkyl esters represent a range of interesting emollients ranging, as they do, through lactates, oleates, myristates, adipates, linoleates with the possibility of straight-chained, branch-chained, unsaturated, or saturated precursors. Some are almost water-thin liquids which rub quickly into the skin (decal and isodecyl oleates, isopropyl myristate), and others are waxy solids which melt near body temperature and give "body" to creams. Lanolin was once considered to be an extremely desirable emollient and the claim "contains lanolin" was felt to be a product "plus". Caution: Some emollients, particular those containing white soft paraffin or petroleum jelly can catch fire if used near a naked flame. One should keep children away from candlelight if applied emollients to them, near an open fire or while smoking a cigarette. Once the emollients have been applied to child's skin, he or she should also avoid naked flames, such as candles or open fires. Emollients should be stored in a cool, dry place away from any naked flames or heat sources such as radiators. The moisturizing effect of emollients can make the bath or shower tray very slippery. One should use a nonslip bath mat and clean it and the bath thoroughly after each use.

	Moisturizer	**Cold Cream**
General description	Moisturizer is a complex mixture of chemical agents specially designed to make the external layers of the skin (epidermis) softer and more pliable.	Cold cream is an emulsion of fats and water that can be used to clean and soften the skin.
Nature	It is thinner	It is thicker
Time of usage	Used in the day and in all seasons.	Used at night and generally in winter.
Functions	Moisturizers are strictly for moisturizing.	Cold creams are typically a cleanser or a very rich moisturizer
Common Examples	Olay Moisturizing Lotion, Himalaya Intensive Moisturizing Body Lotion, Lakme Peach Milk Moisturizers, etc.	Ponds Moisturising Cold Cream, Garnier Nourishing Cold Cream, Aromamagic Aloe Vera Cold Cream, etc.

Exhibit 4: Comparison between moisturizers and cold creams [208-212].

Vanishing and Foundation Cream

The majority of the products are moisturizers with added ingredients to support marketing claims. Whether the product is a facial foundation, an antiaging night cream, a sunscreen, a topical antioxidant, or a skin-lightening serum, the formulation is basically a moisturizer. Skin care products are numerous and perplexing, yet there is certain commonality among 80% of the formulations [213]. In order to achieve rapid 'Rub in' effect, vanishing creams are composed of emollient esters in oil phase which leave little apparent film over skin. For this reason, a low percentage oil phase usually chosen. The presence of the humectant glycerin was also used to claim that they helped reduce moisture loss from dry skin. Vanishing Cream is made especially for the outer skin. It is greaseless. It contains a marvelous substance that prevents loss of skin moisture – actually replaces lost moisture [208]. Major difference with cold cream is that cold cream is an emulsion of water and certain fats, usually including beeswax and various scent agents, designed to smooth skin and remove makeup. The emulsion is of a "water in oil" type unlike the "oil in water" type emulsion of vanishing cream, so-called because it seems to disappear when applied on skin [209]. The history of foundation use can be traced back as far as 200 B.C. It was considered fashionable to have a pale complexion, so Greek women applied white lead powder and chalk to lighten their skin. Roman women and men also lightened their skins using white lead, chalk, and tin

oxide-based creams. This fashion continued during the middle ages up to the early 19th century when consumers used numerous toxic concoctions to lighten their skin [214]. Foundation creams possess many of the same properties of vanishing creams. Foundation creams process many of the same properties. These creams are for daytime use to protect and "condition" the cleansed skin. It is important to know whether a foundation provides sun protection and whether it meets the standards set for other sunscreen products. Sunscreen agents help to protect the consumer's skin from the harmful, aging effects of shortwave solar radiation. Foundation cream comes in several forms: the original cream, a lighter mousse version, a heavier stick version, and a "pancake" version, a powder that turns creamy after spraying it with water. There's also a relatively new hybrid called cream to powder foundation (also called dual-finish foundation), which looks like a powder and applies like a cream if it is wet, and then dries to a powder finish. Protection which is imbalanced for either UV-B or UV-A radiation is potentially harmful for users believing themselves adequately protected. Foundations proved to be much more interesting because they possess a non-negligible SPF as well as good photostability making these products safe in terms of their mode of application (applied once daily in a study) [215]. They must therefore leave the skin non-greasy and preferably matte so that other makeup can easily be applied over it. Modern foundation creams are of excellent appearance and stability. They contain emollients and moisturizers. In terms of spread ability, coverage, and adhesion, the results of group who used the 'oscillation applicator' were significantly twice as high as the other group who applied by hand [216].

Figure 11: Jessica Alba [217,218].

The Dark Angel (TV series by James Cameron, premiered in Y2K) super star uses an all-natural, organic foundation, according to Glamour magazine, UK. "Vapour's foundation makes my complexion flawless without having to use powder," she told In Style.

The right foundation helps creating illusion of flawless skin. Foundation is arguably the most important part of our makeup routine. It covers blemishes, evens out skin tone and mattifes or illuminates depending on needs (Figure 11) [217]. Clients with pigmented skin are often coerced into purchasing a foundation that has too much white pigment [219]. Pigmented foundation creams can contain from 3–25% of pigments. Those with between 3 and 10% form a suitable substrate for the use for the subsequent use of powder, whereas those with higher pigment concentrations can be used as complete makeup and are often termed powder creams. They can be water-continuous or oil-continuous systems in liquid or solid form. The difficulties encountered in the preparations are: (a). The preferential absorption of emulsifier in the high surface of the pigment may sometimes cause inversion of the emulsion; (b). The inadequate dispersion of the pigment for reproducible colors. Pigments can be suspended by the use of cellulose derivatives or inorganic silicates such as bentonite or hydrated magnesium silicate [99]. According to dermatologists, it has been researched that the foundation cream covers the skin pores to produce a radiant look causing pore congestion and disrupt the skin from breathing. Not only that, after a long time it has been observed that the cream becomes oily which might result into blemishes and peeling especially dry skin. It is therefore advisable that after using foundation cream the layer should be thoroughly wash in the evening or else face the consequences of inflammation, acnes, rashes and pimples as the skin might be stuck with this. Women with status cosmeticus cannot tolerate makeup and complain of a continuous burning sensation after any application [220].

Stearic Acid Based Vanishing Cream		**Palm Oil Based Vanishing Cream**	
Ingredients	**(%)**	**Ingredients**	**(%)**
Stearic Acid	12.5	Natural palm oil base	12.5
Cetyl alcohol	1	Triethanolamine	1
Glycerol	6	Glycerol	6
Potassium hydroxide	1	Citric acid	0.2
Propyl Paraben	0.025	Propyl Paraben	0.025
Methyl Paraben	0.05	Methyl Paraben	0.05
Rose oil	Qs	Rose oil	Qs
Purified water	29.34	Purified water	30.1

Table 6: Typical Vanishing Cream Formulation [221].

Hand and Body Creams (All Purpose Creams)

True to its name, all-purpose cream is a flexible and versatile type of cream that can be used for both your savory and sweet creations [222]. They act nourishing or night cream when applied excessively, they function as hand creams when applied sparingly, and thus they are called all-purpose cream [223]. All-purpose creams are typified by a W/O emulsion or by high oil content O/W emulsions. These products are for general face and body usage and generally have a heavy consistency and significant drag on rub-out [48]. The cream is pourable at room temperature but is also able to be easily whipped when chilled. Preparations should comply following requirements: (a) As a foundation cream for general use it must provide a satisfactory foundation base for make-up without being too greasy (b) As a cleansing cream it should be liquefy quickly, be of an oily nature but should be free from 'Drag'. It should not be readily absorbed by the skin (c) As a hand cream it should be emollient yet not leave a greasy or sticky film on the skin (d) As a protective and emollient cream, it should leave a continuous but non-occlusive oil film on the skin. There appears to be a market for all purpose cream because: (i) Unsophisticated user who are unwilling to pay money therefore buys one cream to do as much as possible (ii) Slightly more sophisticated user who buys a specialty cream for one particular function and uses it as a specialty cream (iii) User who finds the cream ideally suited to their particular skin (iv) The user who particularly fragments their skin creams but resorts to an all-purpose cream when travelling or on holiday (v) For general family use and protection against the elements [54].

Cautions with Sensitive Skin in Using Regular Skin Care Creams/Lotions

Sensitive skin is generally defined as skin that is reactive to external aggressors both in the environment and skincare. When this barrier is weakened due to exposure to environmental aggressors, harsh products or because the body is worn down through stress for example, it is unable to function properly and the sensitive nerve endings just under the skin become irritated and subsequently react [224]. Therefore, sensitive skin can be a result of either nerve ending becoming more prone to irritation, or the skin barrier function breaking down. Sensitive skin presents as smarting, burning, stinging, itching, and/or tight sensation in their skin. These symptoms may occur minutes to hours after contact with a cosmetic product/ environmental stimulant or even after several episodes of use of a topic product, triggering the conduction by cumulative effect [225]. Sensitive skin: often feels tight and uncomfortable; is sometimes sore or sensitive to touch; needs extra hydration in winter; dries out during flights; can be oily in summer; flushes easily after a spicy meal or drinking alcohol; has patches of redness that may or may not fade; has areas of uneven texture, with dryness and flakiness; reacts to skincare; becomes itchy or develops a rash after contact with irritants; can feel itchy after wearing coarse, synthetic fabrics; turns red and dries out after a hot shower or bath; becomes irritable after continued washing with hard water. common causes of sensitive skin can include: (i) sun exposure (ii) exposure to air pollution (iii) frequent changes in temperature (iv) cold, harsh weather (v) hard water (water with higher mineral content) (v) very hot water (vi) lack of sleep (vii) hormonal changes during your menstrual cycle or pregnancy (viii) stress and late nights (ix) chlorine in swimming pools (x) dry skin (xi) dehydration [226]. Sensitive skin is less tolerant to frequent and prolonged use of cosmetics and toiletries. With the change in lifestyle and also with increased opportunity to use many new brands of cosmetics and toiletries, there has been an increase in females complaining of unique sensation in their facial skin. The condition is found in more than 50% of women and 40% of men, creating a sizable demand for products designed to minimize skin sensitivity. Good numbers of invasive and non-invasive tests are designed to evaluate and predict the sensitive skin. Management includes guidelines for selecting suitable cosmetics and toiletries in sensitive skin individuals [226].

Epilogue

The skin plays many roles ranging from barrier function to highly complex biochemical and photo biochemical processes. If we follow the definition above then skin care products are inherently not simply cosmetics to beautify the appearance of the skin. Many cosmetic formulations have complex mixtures of actives the interactions of which are not all well-defined. They then affect either the structure or the function (or both) of the skin. Unlike drugs, cosmetics typically are very safe and have few significant serious adverse events. However, like drugs, these active agents can impact many diverse functions of the skin and we do not fully comprehend the implications of these actions in many cases. Skin care products are readily available and their promotions with fanciful claims are omnipresent. The promotions are based on effects, evoked by actives that are delivered through vehicles that rely on specific technologies. Due to the fact, that these products are in direct contact to the target tissue, their vehicle and ingredients are able to profoundly modulate the characteristics of the skin and some of its functions. This makes products for the skin absolute unique and versatile delivery systems. Currently the majority of skin care products are cosmetics. In cosmetic products claims often describe their

functionalities and may be as simple as "soothe signs of dry skin" but may also be more fanciful like "Multi-ingredient anti-aging moisturizer designed to improve the appearance of facial skin". Skin care products are characterized by effects, evoked by actives that are delivered through vehicles that rely on specific technologies. The regulatory situation is unknown to most of the consumers and healthcare professionals. They have to trust the current regulations on cosmetic products and quality standards used by the manufacturer. This means that professional healthcare practitioners have a substantial responsibility for skin health while delivering skin care.

Article Summary

Skin care provide almost any possible kind of vehicles, including emulsifiers, surfactants, oils and butters, waxes, and hydrophilic solutions. These substances combine the properties of drug delivery to the skin, typical of vehicles, with the ability to produce specific actions on the skin, such as occlusive, moisturizing, smoothing, firming, soothing, and conditioning effects. This term "Cosmetics" indicates cosmetic-pharmaceutical hybrids aimed at enhancing the beauty of the skin by means of ingredients that modify skin functionality or provide additional health-related function or benefit. As well as giving beauty to a person via the skin, the cosmetic industry has now strongly linked its products medicinally to the subject of anti-ageing of the skin. The industry has also coined such terms as actives, cosmeceuticals, nutricosmetics, etc., and the legislation associated with cosmetology and dermatology has become similar.

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