

# Cleansers and moisturisers: the basics

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## ABSTRACT

Cleansers and moisturisers are used every day for maintaining our skin in good health, and while they may seem like simple products, our choice of product can have a major impact on the health and healing of our skin. A quality moisturiser should combine emollients, humectants and occlusives to simulate the skin's natural approach to maintaining good hydration, while a quality cleanser should use gentle surfactants and moisturisers to cleanse the skin and leave the natural oils intact. Product pH also plays a large role in the health of our skin, with high pH products having many adverse effects on the skin's ability to stay hydrated. When recommending a cleanser or moisturiser, it's important to keep the patient's preferences in mind, as compliance will increase if the patient is happy to use the product.

*Keywords: Cleanser, moisturiser, pH, formulation, skin.*

Whether our skin is intact or compromised, cleansers and moisturisers are part of our everyday life. On the surface of it, they seem like very straightforward products, but the choices that are made in regard to cleansers and moisturisers can have an effect on both skin health and healing. This review will look at the considerations that need to go into formulating and selecting a quality cleanser or moisturiser.

Cleansers and moisturisers are needed to help maintain our skin in good condition. The skin provides mechanical strength and resistance, it controls transport of substances from the outside of our bodies to the inside and vice versa, and it prevents ingress of foreign chemical substances, microbes and allergens, while also helping to prevent damage from free radicals and UV radiation<sup>1</sup>. When our skin is intact and functioning correctly we don't think about it, but when something goes wrong we can usually feel it, see it and often others can see it too, making us self-conscious.

## MOISTURISERS

A moisturiser is a topical product designed to help treat and prevent dry skin. It's common to think that a moisturiser adds water to the skin; however, this is a misunderstanding. Rather, a moisturiser works by preventing or reducing water evaporation from the skin. This action allows the skin to rehydrate from within.

The terminology surrounding moisturisers can be a little confusing, so we should define a few words for this review. The words 'moisturiser' and 'emollient' are often used interchangeably and can mean different things, or the same thing, depending on who is using the terms. For this article, a 'moisturiser' is a finished product used for topical application, while an 'emollient' is an ingredient that can be used in a moisturiser.

A moisturiser is needed to help keep the skin looking young and fresh. Hydrated skin is plump, luminescent and elastic. Dehydrated skin is tired looking, particularly around the eyes, dull and lacks spring and elasticity. We need to use moisturisers for the treatment and prevention of dry skin, flaky skin, itchy skin and inflamed skin. These symptoms can be caused by dry or sensitive dermatological conditions which can be the result of a genetic predisposition; pathological causes, such as eczema, contact dermatitis or xerosis; environmental causes such as sun, wind or air conditioning; medications such as statins, diuretics and retinoids; and other causes such as age.

## THE SKIN'S NATURAL MOISTURISING SYSTEM

The skin has a number of natural systems that it uses to maintain its integrity. All these systems are trying to keep water in or on the skin. The skin combines the humectant-based natural moisturising factor with lipophilic materials that sit either on top of the skin, or within the intercellular spaces of the stratum corneum (SC).

### Natural moisturising factor

The first system the skin uses is called natural moisturising factor (NMF), which is a cocktail of water-soluble components that largely acts through a humectant mechanism. This system helps retain moisture by drawing water to itself and binding to it, thus holding the water in the skin. NMF is a multi-component blend containing sodium PCA, amino acids and lactate. NMF is found inside the cells

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of the SC, but it can be readily leached from the skin when the skin is exposed to water.

Fillagrin is a precursor molecule that is cleaved to form NMF. For the cleaving mechanism to function, the skin needs to be hydrated<sup>2</sup>. This can lead to a viscous cycle forming: the skin gets dry which means the fillagrin cleavage rate is reduced which means the skin gets drier<sup>2</sup>. Additionally a lack of fillagrin leads to more porous skin allowing allergens to penetrate the skin, activate the immune system and lead to inflammation, itching and visible skin lesions<sup>3</sup>.

### Lamellar lipids

Lamellar lipids, also called intercellular lipids, are composed of a multi-component blend containing ceramides, free fatty acids and cholesterol. The lamellar lipids form the mortar between the corneocytes of the SC, where they are water-repellent and trap water beneath themselves. Lamellar lipids form the main barrier against water loss<sup>4</sup> and when the skin is fully hydrated, water loss through the lamellar lipids is slow.

### Sebum

Sebum is produced by the sebaceous glands in the skin and forms a film over the top of the skin. It's a multi-component blend containing squalene, triglycerides and wax esters, with a pH of 5.5 to 6.5 to help maintain the skin's natural acid protection against fungi and bacteria. Sebum also acts as an external lubricant and keeps the surface of the skin smooth.

When it comes to the mechanisms used by the skin to keep itself hydrated, the important message is that the skin does not rely on one system alone, nor does it rely on one material alone to protect itself. The skin uses three systems, all comprising a blend of materials, to achieve a synergistically effective natural moisturising system.

## DESIGNING AN EFFECTIVE MOISTURISER

When designing a moisturiser or looking for a quality moisturiser, there are two important issues. Firstly, it must work; a good moisturiser will contain an effective combination of moisturising agents. The second issue is that it must be cosmetically acceptable; a good moisturiser is one that the patient will use.

Moisturising agents can be divided into two types: lipophilic or hydrophilic. Hydrophilic moisturisers are also known as humectants, while lipophilic moisturisers can be subdivided into emollients and occludents.

### What is an humectant?

Humectants are hygroscopic substances. They absorb water from their environment, which is the product that they have been formulated into, and they promote water retention in the skin. Humectants penetrate the SC readily<sup>4</sup> and act like biological sponges, absorbing water from the product and delivering it to the skin. Some common humectants are sodium PCA, butylene glycol and glycerin. Humectants result in higher water levels in the SC

regions they are localised in<sup>4</sup>, with changes in the hydration of the skin shown to correlate with glycerin content<sup>5</sup>.

### What is an emollient?

Emollients provide an 'oily' film over the skin surface where they trap water, allowing the SC to swell and close the cracks in the dry skin. Emollients help prevent the penetration of irritants and allergens while also improving the appearance of the skin by smoothing flaky skin cells. Some common emollients are safflower oil, alcohols benzoate and liquid paraffin, which is also called paraffinum liquidum.

### What is an occludent?

Occludents form a film or barrier on the skin and restrict the escape of water vapour, trapping water in the skin's uppermost layers and protecting against moisture loss<sup>4</sup>. Some common occludents are lanolin, waxes and soft white paraffin, which is also called petrolatum. Some lipophilic moisturisers, such as petrolatum, can enter the intercellular space of the SC and become part of the lipid structure of the SC to provide an increased barrier to water loss<sup>4,6,7</sup>. Through this interaction with the SC lipids, they effect an internal occlusion of the SC<sup>4</sup>. Petrolatum is often considered one of the most effective moisturising ingredients for dry skin<sup>8</sup>.

Although presented here as discrete types of moisturisers, in reality there is some overlap between the properties of emollients and occludents.

## WHEN MOISTURISERS GO WRONG

While it may seem pretty straightforward to create a good moisturiser, we have an excellent example of a product currently available that can do a lot of damage to the skin: Aqueous Cream BP. Aqueous Cream was originally designed to be a soap-alternative skin cleanser. It's non-foaming, thick and has a cream-like appearance. Gradually it came to be used as a leave-on moisturiser. The problem with using Aqueous Cream as a leave-on moisturiser is that it contains sodium lauryl sulfate as the surfactant cleanser. When sodium lauryl sulfate is used as a cleanser and washed off the skin, it does not cause any issues, but when left on the skin, its surfactant action can be damaging to both normal and atopic skin.

When Aqueous Cream was applied to normal skin, twice daily for four weeks, it resulted in increased protease activity that led to inflammation and increased skin shedding, along with accelerated skin turnover with immature and small corneocytes emerging<sup>9</sup>. Ongoing use of Aqueous Cream has also been found to progressively thin the SC<sup>10</sup>.

When applied to skin with atopic dermatitis/eczema<sup>11</sup>, twice daily for four weeks, Aqueous Cream significantly decreases barrier function and increases skin permeability. It also leads to a worsening of the skin's condition and structure, while moving those with dermatitis/eczema towards the disease state<sup>11</sup>.

Table 1: Three moisturisers and their *humectants*, *emollients* and *occludents*

	QV Skin Lotion	QV Cream	QV Intensive Body Moisturiser
Ingredients	Aqua, <u>glycerin</u> , <u>petrolatum</u> , <b>C12-15 alkyl benzoate</b> , cetearyl alcohol, ceteth-20, steareth-2,	Aqua, <b>paraffinum liquidum</b> , <u>glycerin</u> , <u>petrolatum</u> , cetearyl alcohol, <b>squalane</b> , <b>dimethicone</b> , ceteth-20, glyceryl stearate SE, stearic acid, laureth-3, glyceryl stearate, methylparaben, dichlorobenzyl alcohol.	<b>Paraffinum liquidum</b> , <u>petrolatum</u> , <b>isopropyl myristate</b> , polyethylene, cetearyl alcohol, silica, <b>dimethicone</b> .
- <i>Humectants</i>			
- <b>Emollients</b>	<b>dimethicone</b> , glyceryl stearate, methylparaben, propylparaben, dichlorobenzyl alcohol, polyacrylic acid, triethanolamine.		
- <u>Occludents</u>			*Note this product is water-free.

Some moisturisers sold as 'sorbolene' can also have similar concerns; however, as 'sorbolene' is a generic name rather than a trade or brand name, the issues will not affect every cream sold as 'sorbolene'.

## THE BENEFITS OF QUALITY MOISTURISERS

Moisturisers have an indirect anti-inflammatory action and a direct anti-proliferative effect on skin. Moisturisers help to decrease the severity of atopic dermatitis and are important in preventing recurrence while also having a steroid-sparing effect<sup>12</sup>. Twice-daily application of pH-balanced, fragrance-free moisturiser on patient limbs has been found to reduce skin tears by up to 50%<sup>13,14</sup>.

A good moisturiser must have two central properties. Firstly, it must contain a synergistic blend of moisturising agents, just like our skin. This will lead to efficacy. A quality moisturiser will contain an effective combination of moisturising agents: occludent, emollient and humectant. Secondly, it must be a nice product to use. As a general rule, the heavier the moisturiser the better the effect, but we need to balance the heaviness of the moisturiser with what the patient is willing to use<sup>12</sup>. It does the patient no good if the best moisturiser for their condition is so cosmetically unacceptable they are reluctant to use it. This is particularly important for our littlest users. Table 1 shows three moisturisers and their ingredients, identifying which are the humectant, emollient and occlusive ingredients.

### Water-free moisturisers

Water-free moisturisers (WFM) are unique in that they don't usually contain humectants. For an humectant to perform properly it needs to be in a formulated moisturiser with water. Without water in the formulation the humectant cannot hydrate. Studies have shown that if glycerin is used in WFM it has no benefits<sup>15</sup>.

Moisturisers containing water are known to cause stinging when applied to inflamed or fissured skin<sup>16</sup>. WFM are advantageous for very dry, cracked or broken skin where the water in a moisturiser can cause stinging or irritation. WFM are also preservative-free so can be of benefit if patients have concerns about, or sensitivities to,

preservatives. WFM are also highly occlusive, which makes them ideal for keeping healing surgical wounds hydrated.

### Moisturisers are essential

While there is no one perfect moisturiser for every patient, moisturisers are an essential component of treating dry skin and maintaining hydration of normal skin — *not an optional extra*. Moisturisers are important in promoting skin health and preventing skin breakdown, are quick and easy to use and have few side effects while significantly improving dry skin and related conditions.

## CLEANSERS

Where do cleansers fit into basic skin care? The function of a cleanser is simply to clean the skin. But while cleaning the skin it must also leave the skin hydrated and biologically intact. A cleanser must not strip the sebum, lipids or NMF, and needs to leave the skin pH at a reasonable level. Cleansers are designed to remove dirt, sweat, sebum, and oils from the skin. This is achieved through the use of surfactants that aid in the uplifting of dirt and solubilisation of oils. The cleansing process also helps to promote normal exfoliation and rejuvenate the skin.

### The adverse effects of poor cleanser choice

The interaction of poorly designed cleanser surfactants with the SC proteins and lipids can be damaging to skin<sup>17</sup>. The changes that take place can be immediately felt through the feeling of after-wash tightness.

Surfactants in poorly designed cleansers can bind to the SC proteins, resulting in swelling and hyper-hydration of the skin while it's being washed<sup>17</sup>. This is usually followed by rapid de-swelling when the water evaporates from the skin, leading to drying stress or tightness. The dry, tight feeling that can occur after skin cleansing is associated with lipid removal and protein binding.

Skin swelling facilitates the penetration of other cleanser ingredients, such as fragrance and colour, which can lead to a biochemical response such as irritation and itch<sup>17</sup>. Continued use

of such cleansers can lead to dry skin, barrier damage, erythema and itch<sup>17</sup>.

## CLEANSER DESIGN CHALLENGES

Surfactants are efficient at dissolving unwanted oils and sebum from the skin, but they can also remove endogenous skin lipids<sup>17</sup>. This results in a challenge: while surfactants are essential for cleanser performance, the wrong cleanser design can reduce the ability of the skin to regulate water loss. An additional complication is that washing with water alone can adversely affect the skin, due to leaching of the water-soluble NMF from the skin<sup>17</sup>.

A quality cleanser must minimise the damage caused by surfactants while also compensating for any damage by providing moisturising benefits. Gentle surfactants are vital, and these can be anionic, non-ionic, amphoteric or cationic. The moisturisers that can be added are emollients, humectants or occlusives. Lastly, the pH of the cleanser must be balanced to that of the skin and be acidic.

A cleanser's performance is the sum of its parts. A single ingredient does not make a cleanser good or bad for the skin; rather it's the combination of ingredients that will allow a cleanser to be gentle or cause damage to the skin. For example, pure sodium lauryl sulfate would make a harsh skin cleanser with loose foam, but when combined with amphoteric surfactants the resulting product is gentle on the skin, pleasant to use and rinses off well. Reputable companies will always hold skin compatibility testing for their cleansers. If in doubt, ask to see it.

### A word about foam

Foam is just foam. The foaming nature of a cleanser does not make it good or bad. Foam is not a signal of cleansing power or harshness, while non-foaming cleansers are not intrinsically gentle. Both foaming and non-foaming cleansers can be designed to be gentle on the skin. The final choice should be up to the patient. As many people like foam, a foaming cleanser may increase compliance.

### Soap versus syndet

The first skin-cleansing agent we had was soap. Today soap is used as a generic term; however, it does have an important technical definition. Soap is manufactured through saponification where fats/oils are combined with a strong alkali. This process results in a cleansing product with a high pH, around 9–10. The nature of soap means that if we try to decrease its pH it will precipitate out and no longer function as a cleanser. Soap can come in many forms, but some common terms to look for on a cleanser ingredient list are the suffixes -stearate, -palmitate, -cocoate, -tallowate. Today soap can be found in bar and liquid form, on its own or blended with synthetic detergents.

Soap-free cleansers such as QV Gentle Wash use synthetic detergents, which are also known as 'syndets'. Syndet-based cleansers have become increasingly common in the last two decades, and can be

found in bar and liquid forms. Their significant advantage is that they can be manufactured or adjusted to any pH, so are highly skin-friendly.

## THE IMPORTANCE OF CLEANSER pH

The skin is naturally acidic, that is, it has a low pH. This is known as the 'acid mantle' and forms part of the skin's defence system against infection.

Using a high-pH cleanser can have many adverse effects on the skin, with high-pH cleansers able to increase the skin's natural pH. Skin that has a high pH is more prone to dehydrate; this is due to disruption of the lipid bilayers, allowing increased water loss<sup>18</sup>.

Cleansing with soap or high-pH syndets increases propionibacteria on the skin, while using low-pH syndets decreases it<sup>18</sup>. It has been found that it's the pH of the cleanser and not the cleanser ingredients that affect skin microbiology<sup>18</sup>.

The pH of a cleanser is significantly correlated with its ability to induce irritation<sup>19</sup>. The higher the pH, the greater the irritation potential. With the long-term use of such cleansers, the irritation can be great enough to cause hyperpigmentation<sup>19</sup>. Cumulative skin irritation will also prolong recovery time and can hinder skin repair<sup>19</sup>, a relevant aspect of cleanser choice for post procedure or wound care.

Using high-pH cleansers, such as soap, can activate epidermal proteases<sup>20</sup>. Inappropriate protease activity can lead to a loss of corneodesmosome integrity, a loss of corneocyte cohesion and increased epidermal permeability<sup>20</sup>. Overall, this results in dry, flaky, irritated skin.

It is important that any cleanser used on the skin has a slightly acidic pH to maintain the skin's natural environment.

## THE PROPERTIES OF A QUALITY CLEANSER

A quality cleanser needs to cleanse gently and maintain the skin's barrier function and flora. To accomplish this, the cleanser should use a combination of gentle surfactants with added moisturisers, be free from unnecessary ingredients such as fragrance, colours and essential oils, and have a pH that is slightly acidic to match the skin. Use of a pH-neutral, soap-free cleanser can be a powerful tool, with such a product considered important to reduce the risk of skin tears<sup>21,22</sup>.

### Moisturisers in cleansers

By adding moisturisers to cleansers, we can help to prevent and reverse any skin changes induced by the surfactants. Emollients, such as liquid paraffin or safflower oil, function as "sacrificial lipids" to minimise the surfactant-mediated depletion of skin lipids<sup>17</sup>. Occlusive moisturising agents, such as petrolatum, can deposit on the skin during cleansing to reduce dryness, as well as provide a barrier to water loss<sup>17</sup>. Humectants can deposit on the skin and help

Table 2: Three cleansers and their *surfactants* and *moisturisers*

	QV Face Gentle Cleanser	QV Gentle Wash	QV Wash
Intended for:	Dry, sensitive skin	Dry skin	Normal to dry skin
Acidic pH	Yes	Yes	Yes
Ingredients	Aqua, <i>petrolatum</i> , <i>sodium laureth sulfate</i> , <i>carthamus tinctorius</i> , <i>glycerin</i> , <i>lauryl betaine</i> , xanthan gum, guar hydroxypropyl trimonium chloride, tocopherol, methylparaben, propylparaben, sodium polyacrylate, citric acid.	Aqua, <i>glycerin 15%</i> , <i>sodium lauroyl sarcosinate</i> , <i>disodium cocoamphodiacetate</i> , <i>lauryl betaine</i> , <i>sodium cocoyl isethionate</i> , acrylates/C10-30 alkyl acrylate crosspolymer, styrene/acrylates copolymer, aminomethyl propanol, methylparaben, propylparaben.	Aqua, <i>sodium lauryl sulfate</i> , <i>glycerin 10%</i> , <i>lauryl betaine</i> , <i>disodium cocoamphodiacetate</i> , <i>sodium cocoyl isethionate</i> , PEG-120 methyl glucose dioleate, glycol stearate, methylparaben, citric acid, propylparaben.

ameliorate the effects of the NMF being removed via cleansing. Of all the humectants available, of particular interest is glycerin.

Glycerin is a natural component of the human skin and body. It's transported from the dermis through the keratinocytes by a transmembrane water/glycerol transport protein, Aquaporin 3<sup>23,24</sup>. Glycerin functions like NMF with its hygroscopic properties increasing the water holding capacity of an impaired SC<sup>24</sup>. When used topically, glycerin protects the skin from irritant dermatitis and accelerates recovery of irritated skin, while also improving skin hydration<sup>24</sup>. Topical glycerin aids barrier recovery through corneocyte desquamation regulation and is able to restore skin hydration at low usage levels<sup>24</sup>.

Table 2 shows three cleansers and their ingredient lists along with which ingredients are the surfactants and moisturising agents.

While it may seem very obvious how a cleanser should be used, in the western world we tend to overclean our skin. Cosmetic manufacturers will often recommend a cleanser be used morning and night, and patients like to see foam, so they use a lot more cleanser than they need to. For the best skin health, cleansers should be used when microbial contamination is a risk, such as after using the toilet, prior to eating, and so on, or when the skin is noticeably dirty or smelly. It's also important to remember that a little cleanser goes a long way and foam quantity does not equal cleansing power.

## CONCLUSIONS

The cleanser chosen can have a significant impact on the health and function of the skin. Good cleansers are not characterised by their fragrance, appearance, or cost, or where they are sold. The best cleanser will use gentle, soap-free surfactants, moisturisers (preferably glycerin), have an acidic pH, and will avoid unnecessary

ingredients. A quality moisturiser is essential for healthy skin maintenance. It's important to remember that there is no one perfect moisturiser for every person and that matching the correct moisturiser to the patient is essential for ongoing compliance and good skin health. A quality moisturiser should contain a blend of moisturising ingredients: emollients, occludents and humectants. Cleansers and moisturisers can appear deceptively simple; however, the choices made by patients and health care workers can have a major impact on skin health, healing and wellbeing.

## CONFLICT OF INTEREST

The author of this review is a full-time employee of Ego Pharmaceuticals.

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