

# How to choose a suitable emollient

Is E45 cream better than Epaderm? In this article, **Christine Clark** investigates emollients and how pharmacists can answer such questions

It is believed that defective epidermal barrier function, resulting from genetic differences, plays a central role in atopic eczema, contact dermatitis, psoriasis and ichthyoses. However, people who do not suffer from these conditions can also experience dry skin as a result of extreme conditions, living and working in a dry environment or using drying bath products. Dry, itchy skin is also often a problem for the elderly because reduced sebum and ceramide production are associated with ageing.

Emollients work by rehydrating the outermost layer of skin and by reducing water loss. They restore suppleness and pliability and improve the cosmetic appearance of the skin, particularly if it is dry and scaling.

With such a wide range of branded and generic emollient products available, it can be difficult to know which to recommend. Both inappropriate product selection and incorrect use can result in emollient therapy being dismissed as being ineffective. An understanding of the properties of emollients together with knowledge of skin structure and function, can

help the pharmacist to recommend the most suitable products and regimens. Effective treatment depends on careful selection of products to match patients' needs and preferences.

## Emollient products

Emollient products include ointments, creams, lotions, bath oils and soap substitutes.

**Ointments** Ointments are greasy or fatty semisolids. Ointment bases can be categorised into four types: fatty, absorption, emulsifying and water-soluble.

Fatty bases include anhydrous hydrocarbons such as soft paraffin. These are not absorbed but form an occlusive layer on the skin surface. They have a low water-absorbing capacity and, although they are effective emollients, their greasiness can make them cosmetically unattractive.

Absorption bases (eg, wool fat, wool alcohols) contain emulsifying agents (water-in-oil) and can absorb water or aqueous secretions. They can absorb up to 15 per cent of their own weight in water and remain semisolid. Absorption bases spread easily but are less occlusive than fatty bases.

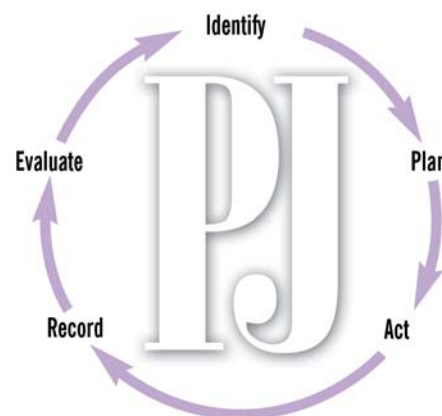
Emulsifying bases can form oil-in-water emulsions. They contain surfactants that can be non-ionic, cationic or anionic. Examples include (respectively) Cetomagrogol Emulsifying Ointment BP, Cetrimide Emulsifying Ointment BP and Emulsifying Ointment BP.

Water-soluble bases are usually mixtures of high and low molecular weight polyethylene glycols (macrogols). These spread well and can be washed off the skin easily.

**Creams and lotions** Creams are semisolid emulsions. They can be of the oil-in-water ("vanishing creams") type or water-in-oil (described as "oily creams") type. Typically, they feel less greasy than ointments, spread well and can be washed off easily. They are less occlusive than ointments and, therefore, less effective at hydrating the stratum corneum. Oil-in-water creams often have a pleasant cooling effect as the aqueous phase evaporates.

Emollient lotions are dilute oil-in-water emulsions (creams) or emulsions formulated with more "spreadable" emollient ingredients (see below).

**Emollient wash products and bath additives** Conventional soaps and wash products can have a drying effect. Emollient wash products (such as aqueous cream, emulsifying ointment) do cleanse the skin effectively, although they do not lather like soap. Emollient bath additives are another means of applying emollients — they leave a fine film of emollient on the skin after bathing.



## Identify knowledge gaps

1. Creams are more hydrating than ointments. True or false?
2. Why are vitamins commonly included in emollient products?
3. How can people be encouraged to use emollients effectively?

Before reading on, think about how this article may help you to do your job better. The Royal Pharmaceutical Society's areas of competence for pharmacists are listed in "Plan and record", (available at: [www.rpsgb.org/education](http://www.rpsgb.org/education)). This article relates to "appropriate management of common symptoms by the pharmacist" (see appendix 4 of "Plan and record").

**Formulation considerations** Greasier emollients are harder to spread and more occlusive. Lighter emollients are easier to spread and less occlusive. By selecting an appropriate blend of emollients, the feel and function of a moisturiser can be tailored to its intended use. The best formulations combine three to four different emollients with various spreading properties (see Panel 1<sup>1</sup>). Day creams and lotions can be formulated with the medium-spreading emollient ingredients, whereas body lotions may use the easy-spreading emollients.

## Panel 1: Spreadability of emollients and examples

**Poor spreadability (greasy)**  
Eg, castor oil, almond oil and oleylolate

**Medium spreadability (creamy)**  
Eg, caprylic or capric triglyceride, ocril dodecanol, cetearyl isononanoate and oleyl alcohol

**Easy spreadability (non greasy)**  
Eg, dioctyl cyclohexane, isopropyl stearate and isopropyl myristate

## Case study

Gail, a 28-year old office worker, suffers from sporadic bouts of eczema affecting mainly her hands and forearms. Sometimes the skin on her legs also becomes dry and itchy. She uses Eumovate Eczema and Dermatitis Cream when she experiences a bad flare-up but finds that regular use of emollients keeps the condition under control most of the time. In the past she has been prescribed Unguentum M and has bought E45 Cream over the counter. Friends have recommended Neutrogena Dermatological cream and Gammaderm and warned her to avoid lanolin-containing products. Another friend has told her that it does not matter what she uses because they are all the same and so she should buy the cheapest. How would you advise her?

All emollients are not the same so Gail should consider what she wants the emollient to do. Unguentum M, E45 Cream and Gammaderm are all pleasant to use and suitable for daytime use. If her skin becomes extremely dry and itchy, then a humectant-containing product such as Neutrogena Dermatological or Calmurid would be useful along with a rich emollient for night-time use. E45 cream, with which she has had no problems, contains highly purified lanolin. Finally, Gail should also be advised to use an emollient wash product and could be given details of the National Eczema Society for information and support.

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## Structure of the skin

Skin comprises the dermis, a layer 3mm to 5mm thick, and the epidermis, which varies in thickness from about 0.06mm on the eyelids to 0.8mm on the palms and soles. The dermis contains blood vessels, hair follicles and sweat glands, whereas the epidermis is composed of four layers of densely packed keratinocytes (skin cells) in various stages of development (see Figure 1).

Keratinocytes are formed in the stratum basale (basal layer) and gradually migrate (through the stratum spinosum and the stratum granulosum) to the surface layer (the stratum corneum or horny layer). In the lower two layers cells are linked by protein bridges called desmosomes. In the stratum granulosum cells acquire granular structures, degradation of cell nuclei and organelles occurs and the cells begin to flatten. It takes about 14 days for cells to move from the stratum basale to the stratum corneum and a further 14 days for the cells to be shed from the surface.

In normal, healthy skin, the epidermis prevents excessive water loss. At the interface between the stratum granulosum and the stratum corneum, lipids are extruded from cells into the intercellular space. These "barrier lipids" form highly organised, multi-lamellar bilayers. The lipid substance is a complex mixture that contains ceramides, fatty acids, cholesterol, cholesterol sulphate and sterol or wax esters, and the stratum corneum can visualised as a brick wall where the cells (now known as corneocytes) are the bricks and the lipids are the mortar.

Although cells are continuously shed from the stratum corneum, the deeper layers are firmly bonded together by the intercellular lipids. The integrity of this layer is important for preventing water loss. The corneocytes themselves contain a water-retaining substance called natural moisturising factor (NMF). This is a complex mixture of free amino acids, amino acid derivatives and salts, which ensures that water is held in the cells. Cells with a high water content swell and press tightly against one another, with no gaps. A healthy stratum corneum has a relatively high water content (15 to 20 per cent) and is elastic and pliable. When the water content of the stratum corneum falls below

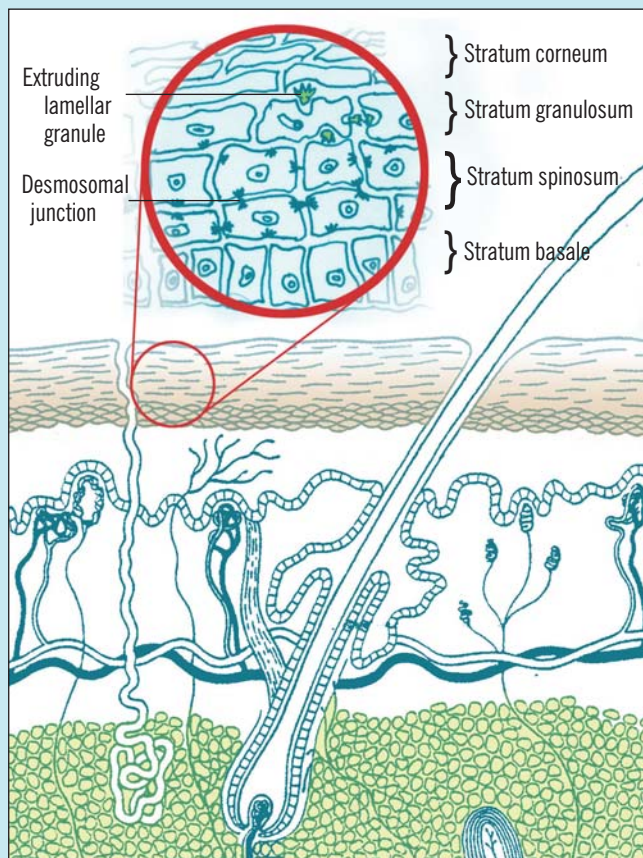


Figure 1: Structure of the skin

10 per cent, fine scaling is visible and the skin feels rough and dry.

Dry skin is the result of abnormal water loss. For example, in atopic eczema, barrier lipids in the lower part of the stratum corneum are not formed normally.<sup>7</sup> The absence of effective cellular "cement" results in increased water loss. As water is lost, the cells of the stratum corneum shrink and cracks form between them. The result is dry skin, which can neither retain water effectively nor prevent the ingress of irritants or allergens. Such changes can also be seen in normal skin when epidermal lipids are removed by repeated use of surfactants or solvents. The use of soap on eczematous skin removes more lipid and reduces barrier function

further, resulting in the appearance of lesions. People with atopic eczema are more sensitive to the effects of soap and surfactants than is usual, and even their apparently normal skin has a lower threshold for irritation than that of non-sufferers.

### Actions of emollients

Emollients are believed to restore the integrity of the epidermal barrier in two ways. First, they form an oily (occlusive) layer over the skin that prevents the evaporation of water. Water trapped in the stratum corneum passes into the corneocytes, which swell, and fissures reduce. Second, emollients can penetrate deep into the stratum corneum and mimic the effects of barrier lipids. This, in turn, prevents penetration of irritants and allergens that can provoke local inflammatory reactions, particularly in eczema.

There is also some evidence that emollients have indirect anti-inflammatory actions. When the epidermal barrier is disrupted experimentally, a pro-inflammatory cytokine, interleukin-1alpha (IL-1 $\alpha$ ), is released. It is thought that IL-1 $\alpha$  is released in response to trauma to promote repair of the epidermis but that excessive or inappropriate release might be involved in the pathogenesis of eczema. In skin diseases in which the epidermal barrier is impaired, it is possible that even minor trauma, such as that caused by scratching, could release IL-1 $\alpha$ . The apparent anti-pruritic and anti-inflammatory effects of emollients might be the result of reduced production and release of IL-1 $\alpha$ .

An emollient that spreads easily gives the sensation of early smoothness, which dissipates quickly. Some formulation scientists believe the ideal moisturiser should mimic sebum, which represents a mixture of emollients with different spreading abilities and tactile properties. Sebum is 28 per cent free fatty acids, 32 per cent triglycerides, 14 per cent waxes, and 5 per cent squalene, in addition to other lesser components. Other moisturisers aim to mimic natural moisturising factor (see Panel above), but the ideal product has not been created.

### Special ingredients

A number of ingredients deserve to be mentioned.

**Humectants** Humectants are agents that attract water. They are widely used in cosmet-

ics and pharmaceutical products. Humectants draw water from the dermis into the epidermis, rather than from the atmosphere. Common examples include urea, glycerine, polyethylene glycol and lactic acid. For example, application of a 10 per cent urea cream can double the amount of water in the stratum corneum. However, products containing only humectants increase transepidermal water loss when applied to skin that has a defective epidermal barrier. Therefore, formulations containing a humectant should also contain an occlusive ingredient to prevent this water loss.

A detailed consideration of penetration enhancing agents is beyond the scope of this article but it is worth noting that penetration enhancement is another property of urea. The delivery of hydrocortisone from a urea-

containing cream is higher than from the corresponding urea-free vehicle. A study comparing 1 per cent hydrocortisone and 10 per cent urea (Calmurid HC) with the more potent steroid betamethasone 17-valerate 0.1 per cent concluded that the two products were equally effective.<sup>2</sup>

**Vitamins** Vitamins are often added to emollient products for their chemical rather than biological effects. For example, retinol and pantothenol are used as humectants and vitamin E (tocopheryl acetate) as an antioxidant, to preserve the product.

**Essential fatty acids** Studies have shown that many people with eczema have a deficiency of delta-6-desaturase. This enzyme converts the essential fatty acid (EFA) linoleic acid to

## Panel 2: Complete emollient therapy

### Emollient cream or ointment

Use liberally (500g per week is not unusual). Apply with clean hands after a bath. Apply gently, in the direction of hair growth to prevent folliculitis. Leave at least half an hour between emollient application and any topical steroid application to avoid dilution of the steroid or its spread to unaffected areas.

Warm the emollient (eg, by standing it in the airing cupboard) so that it can be applied easily. Or if itching is a major problem, cool the emollient by storing it in the fridge). In extreme weather apply more, as frequently as possible (ideally three to four times a day, but at least twice a day).

### Emollient bath oil

The bath should be warm but not too hot because this exacerbates itching. Use a bath mat to prevent slipping. Use 15ml of oil for an adult bath and 5ml for a baby bath. Pat skin dry. Do not rub because this can also exacerbate itching.

### Emollient soap substitute

Use the soap substitute whenever washing hands and before getting into a bath or shower. Apply to dry skin then rinse off with water. Never use ordinary soap or bubble bath, even if it claims to be "moisturising". Average prescription for one week: 250ml for an adult and 150ml for a child.

linolenic acid, a key step in prostaglandin synthesis. This, combined with the observation that EFA deficiency causes dry, flaky skin, provides the rationale for the use of gamma-linolenic acid (gamma linolenic acid) in people with eczema. Although the marketing authorisation for oral EFA supplements was withdrawn, a topical preparation (Gammaderm) is available for dry skin conditions.

**Lanolin** Lanolin is a good emollient. Despite its reputation as an allergen, the true incidence of lanolin sensitivity among the general population is "vanishing small".<sup>3</sup> A review of nearly 25,000 dermatology patients who had undergone patch tests using 30 per cent lanolin alcohols in white soft paraffin showed that only 1.7 per cent were sensitive to lanolin.<sup>4</sup> Hypoallergenic lanolin (Medilan) is now commonly-used and studies have shown that less than 1 per cent of patients with documented allergy to lanolin are sensitive to this emollient.<sup>5</sup> Unfortunately, lanolin's reputation as a sensitiser has gained currency through frequent repetition in textbooks and cosmetic marketing that has emphasised "lanolin-free" as a selling point.

**Colloidal oatmeal** Colloidal oatmeal is finely ground oatmeal that is reputed to form a hydrophilic matrix, making a cooling application that appears to have some anti-pruritic effects.

**Macrogols** Macrogols are water-soluble ethylene glycol polymers that range from hard

waxes to mobile liquids. They are widely used in dermatological formulations. Lauro-macrogols are said to have a mild local anaesthetic effect and can be useful in relieving itching. Mixed lauro-macrogols are included in Baume bath oils and Baume Plus cream for this reason.

### Effective use of emollients

Although there is a lack of good quality clinical trials concerning the use of emollients, longstanding experience attests to their efficacy. However, there appears to be wide variation in response between patients, probably due a combination of factors including product selection and appropriate use. It is essential to ensure that the emollient is used frequently and, therefore, the aim is to find the cheapest emollient that is cosmetically acceptable — an emollient that is unacceptable will not be used.

Finding the most suitable emollient for an individual can be a matter of trial and error. There is often a trade-off between efficacy and cosmetic acceptability (smell, consistency, etc). In general, greasier, oil-based products are more efficacious but they are less acceptable. Different emollients might be required for different areas of the body; for example, a heavy emollient for dry skin on the limbs and a lighter product for the face. Similarly, a richer (greasier) emollient might be more acceptable for use at night rather than during the day. Richer products might also be more acceptable in the winter to combat the drying effects of cold weather and central heating.

People should be encouraged to try different emollients to help them to decide what they like best. Some hospitals have trial kits of emollients for this purpose. Studies have shown that assiduous use of emollients can result in lower doses of steroids being needed and it can be useful to point this out to people who are apprehensive about using steroids. Patients should be reminded not to use a steroid cream as an emollient.

Many dermatologists recommend "complete emollient therapy" in order to get the most benefit from emollients. This is based on the premise that the patient's skin should be protected from soap and detergents as far as possible, and treated with emollients as frequently as possible. The treatment regimen involves the use of an emollient cream or ointment, bath oil and soap substitute. Education on how to use these products is important (see Panel 2).

### Allergens and irritants

Some emollients contain potential allergens that can exacerbate eczema. For example, creams and lotions usually contain preservatives, such as benzyl alcohol and hydroxybenzoates (parabens). Patients should, therefore, always perform a patch test before using a new product on large or sensitive areas of skin.

Recent findings suggest that aqueous cream may be unsuitable as a leave-on emollient, although satisfactory as a wash-off prod-

## Action: practice points

Reading is only one way to undertake CPD and the Society will expect to see various approaches in a pharmacist's CPD portfolio.

1. The effectiveness of emollient therapy can be improved by appropriate product selection and patient education. Look at the list of ingredients of some of the emollient products stocked in your pharmacy and work out what they do.
2. Pharmacists can help patients to make appropriate choices and to manage their treatment successfully. Make testers of emollients available in your pharmacy.
3. Consider what might be involved in setting up a primary care eczema clinic. Visit [www.eczema.org](http://www.eczema.org) for ideas.

## Evaluate

For your work to be presented as CPD, you need to evaluate your reading and any other activities. Answer the following questions: What have you learnt? How has it added value to your practice? (Have you applied this learning or had any feedback?) What will you do now and how will this be achieved?

uct.<sup>6</sup> This has been attributed to the well-documented irritant effects of the anionic surfactant sodium lauryl sulphate. Aqueous cream also contains chlorocresol or phenoxethanol, which can increase irritation.

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## Resources

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