

As people age skin cells divide more slowly and the inner layer of skin starts to thin. Fat cells beneath the dermis begin to atrophy and the underlying network of elastin and collagen fibres degrades so skin loses its elasticity, sags and forms wrinkles and furrows. Also dead skin cells, which are normally sloughed off from the stratum corneum, tend to accumulate, inhibiting cell renewal from the epidermis and giving the complexion a sad, grey appearance.

For many there comes a stage where the normal skin care regime of cleanse, tone and moisturise is not enough and they believe only a new skin surface will restore its former radiance. What options are available? Chemical peeling is not a new idea; it is claimed that Ancient Egyptians used a mix of alabaster, milk and honey and a cosmetic formulary from 1937 describes one based on salicylic acid, mercuric chloride and acetone in an aqueous alcoholic lotion and more recently phenol and trichloroacetic acid have been used.

Mechanical peeling is also possible. Dermatologists may use dermabrasion techniques in which a high-speed rotary instrument with an abrasive wheel or brush is used to remove the outer layers of the skin and improve any irregularities in the skin surface. A local anaesthetic is applied and the procedure is used to reduce acne scarring, tattoo scars, wrinkles, age spots, and other skin lesions but it is a surgical procedure only performed by trained medical practitioners.

Another technique used by dermatologists and cosmetic surgeons is laser resurfacing whereby the outer layers of skin are removed by laser. It is said to remove skin more precisely, layer by layer, using very short pulsed light energy or continuous light beams that are delivered in a scanning pattern to remove thin layers of skin with minimal heat damage to the surrounding structures.

Beauty therapists offer microdermabrasion treatments. Tiny crystals are sprayed onto the skin in a gentle abrasion technique that removes the dead outer layer of skin. The most popular crystals are aluminium oxide, usually in the form of a natural mineral called corundum. Age spots and fine lines can be erased, creating softer, smoother skin that has a younger feel to the touch. It is basically an exfoliation and skin rejuvenation procedure that can result in significant improvements to the complexion. Although many different applicators are available most apply the abrasive under vacuum, which is used to keep the crystals in motion and to remove dead skin cells and other debris resulting from the treatment. An alternative applicator uses a rotating head with an abrasive surface, which gives similar results.

Corundum is a wide-spread mineral that comes in many forms including rubies and sapphires. **Garnet Exfoliator** from **Lessonia** is a fine powder manufactured from garnet gems. Garnet contains 25% aluminium oxide, 35% silica and 30% iron oxides and is processed and accurately screened in three different sizes suitable for cosmetic exfoliation.

Microdermabrasion kits are available for home use but appear to be very expensive. A cheaper option is to use a good exfoliating product, which is where cosmetic formulation is important. These may incorporate scrubbing agents such as aluminium oxide, vegetable husks, ground nut shell, polymer beads and many other materials. **A&E Connock** has an exhaustive lists on its website [Ref 1] with details of how and when to use and very useful information about formulating with these materials.

An alternative to mechanical scrubbing is a return to chemical peeling but for home and salon use these are now based on alpha-hydroxy acids (AHAs) of which glycolic acid or lactic acid

are the most effective but those derived from natural sources have a marketing advantage. AHAs work by reducing cohesion between the outer layers of skin cells so dead skin cells are lost and a fresher complexion is revealed. Salicylic acid is a beta-hydroxy acid (BHA) and is equally effective but the use of this and AHAs in cosmetics is subject to controls.

The Cosmetic Ingredient Review (CIR) Expert Panel for reviewing the safety of cosmetic ingredients concluded that products containing glycolic and lactic acid are safe for use by consumers if the acid concentration is 10% or less and the final product has a $\text{pH} \geq 3.5$. The final product should be formulated in such a way that it protects the skin from increased sun sensitivity or its package directions tell consumers to use daily protection from the sun. In the USA the FDA recommends that users are advised to apply a sunscreen, wear protective clothing and to limit sun exposure while using an AHA product and for a week afterwards.

In Europe the Scientific Committee on Cosmetic Products and Non-Food Products Intended for Consumers (SCCNFP) performs a similar function to the CIR in the USA. In 2004 it published its updated opinion (SCCNFP/0799/04) that glycolic acid may be used safely at a level of up to 4 % and a $\text{pH} \geq 3.8$ and lactic acid up to a maximum level of 2.5 % and a $\text{pH} \geq 5.0$. The document discusses the risk of increased percutaneous absorption if the barrier function of the epidermis is disturbed and the risk of increased photosensitivity caused by using AHAs. An SCCNFP opinion on salicylic acid suggests that its use be restricted to 2.0 % for leave on and rinse-off cosmetic products and 3.0 % for rinse-off hair products.

These opinions are not legal obligations and there are considerable differences between those of the CIR and SCCNFP on AHAs but all formulators should take heed and consider the end use and user very carefully. However Canada places legal limits on the use of AHAs and also extends the list of glycolic and lactic acid to include citric acid, malic acid, mixed fruit acid, triple fruit acid, tri-alpha hydroxy fruit acids and alpha hydroxy and botanical complexes. These are permitted at concentrations equal to or less than 10%, with a $\text{pH} \geq 3.5$. Bath bombs may contain levels of citric acid exceeding 10% and preparations containing higher concentrations of AHAs may be permitted for use if the manufacturer provides Health Canada with evidence of their safety, pH levels, and the directions for use. Precautionary labelling is also required.

A gentler method of skin peeling is by the use of enzymes. Proteolytic enzymes mimic the role of the body's own natural protease enzymes to promote decay of protein impurities, dissolution of dead skin cells and acceleration of cell renewal. This type of skin exfoliation works best when used daily and is suitable for all skin types with little risk of irritation.

Glycolic acid is generally accepted as the most efficacious AHA because of its small molecular size, which allows deeper penetration than those of larger molecular weight. Although widely available as a commodity item very pure grades are available through **IMCD** as either 100% powder or a 70% aqueous solution.

AHAs of natural origin move the technology away from the commodities market and into that of fruits and vegetables. As ever, ingredients of natural origin are perceived by consumers as safer and of greater benefit to the user and AHAs and BHAs are excellent examples of this trend. **Active Concepts** offers **ACB Fruit Mix**, a mixture of extracts from *Saccharum officinarum* (Sugar cane), *Vaccinium myrtillus*, *Citrus aurantium dulcis* (Orange), *Acer saccharinum* (Sugar maple) and *Citrus medica limonum* (Lemon). Combined these extracts provide five of the more commonly used AHAs; glycolic acid, lactic acid, citric acid, malic

acid, and tartaric acid. [Not sure if they count towards the 5 fruits or veg per day recommendation]

Multifruit BSC from **Arch Personal Care** is a mixture of *Acer saccharinum*, *Citrus sinensis* and *Vaccinium myrtillus* (Bilberry) extracts with Blackstrap powder. **Actiplex 1071 Fruit Acid Complex** from **Active Organics** is a mixture of fruit extracts from *Fragaria chiloensis* (Strawberry), *Pyrus malus* (Apple), *Actinidia Chinensis* (Kiwi) and *Vitis Vinifera* (Grape). **Provital** offers **Pronalen Fruit Extract 20** containing extracts of *Passiflora quadrangularis* fruit, *Ananas sativus* (Pineapple) fruit and *Vitis vinifera* and other mixtures are available from this company.

Rayolys D from **Greentech** is said to combine the powerful anti-tyrosinase action of peach leaves with the clarifying action of raspberries and apples in its mixture of extracts from *Prunus persica* leaves, *Rubus idaeus* fruit and *Pyrus malus* fruit, which yield citric, malic and tartaric acids. Also from **Greentech**, *Hibiscus sabdariffa* extract is the source of the active constituents of **Flower Acids**, which are said to increase cell turnover, decrease wrinkles and dark spots, improve skin structure and hydration and add brightness to the complexion.

Salicylic acid can be found in **ABS White Willow Bark Extract Powder** (INCI: *Salix Alba* (Willow) bark extract) from **Active Concepts**. Initially, the bark of the white willow is subjected to a fermentation process by *Lactobacillus lactis* bacteria. After fermentation the product is filtered so that the salicylic acid content may be concentrated to levels of 10% and 20%.

A negative side effect of AHA treatment can be a stinging or burning sensation directly after product application; particularly on people with sensitive skin. In order to mitigate the irritation potential of using glycolic acid **Exsymol** promotes the use of it in nanosphere form, which allows controlled release of the active into the epidermis. **Laracare**, INCI: Galactoarabinan, is a natural polymer linked with sugar units consisting of galactose and arabinose from **Cornelius** that is said to increase the effectiveness of AHA's while being non-irritating to the skin, thus lower concentrations may be used.

Amphoteric Hydroxy Acid Complexes were developed at **Laboratoires Sérobiologiques** to get the same effect as from AHAs, but with less possible irritation. These complexes contain the cation form of the amino acid arginine, with the anion of glycolic acid or lactic acid plus undisassociated AHA molecules. The AHA molecules are tightly bound to the central complex by hydrogen bonds, dipole-dipole interactions and van de Waal's forces. The net effect is a slow release of the AHA after application, thus reducing the AHA concentration at any given time.

Proteases are a group of enzymes that digest proteins by hydrolysis of the peptide chain that links amino acids to form proteins. They can be very specific in their activity, requiring an optimum pH and their activity can be inhibited by other ingredients, particularly chelating agents such as EDTA and its salts. When properly formulated they can be very effective exfoliating agents and their activity is gentler than the use of AHAs. Papain from papaya and Bromelain from pineapple are the most widely used enzyme skin exfoliation treatments. Both are available from **A&E Connock**.

IMCD offers two enzyme-based ingredients from **Active Concepts**: they are **ACB Pumpkin Enzyme**, INCI: *Lactobacillus/ pumpkin pepo fruit ferment extract* and **ACB Pomegranate**

Enzyme, INCI: Lactobacillus/ Cucurbita fruit ferment filtrate. By fermenting the fruit with *lactobacillus lactis* many of the complex bio-molecules in the fruit are broken down releasing isolated phytochemicals. Through the use of selective filtration techniques the proteolytic fractions can be isolated and concentrated. **Protease** from **Greentech** is a mixture of Subtilisin and glucose; it is an enzyme derived from micro-organisms that shows 66% increase in keratolytic action by cleaving peptide bonds, thus releasing dead skin cells from the stratum corneum.

Prozymex T LS 9142 from **Laboratoires Sérobiologiques** is an active ingredient consisting of an immobilised enzymatic complex of botanical and biotechnological origin. The main components of the enzymatic complex are proteases, which have a mild keratolytic effect and stimulate the turnover of epidermal cells. **Exfolactive** from **Silab** is an active ingredient rich in purified oligosaccharides extracted from the fruit of *Opuntia ficus indica* (Prickly Pear). It boosts the natural peeling process by increasing the activity of the cathepsin-D enzyme, which is involved in desquamation of dead skin cells. It is also claimed to increase the activity of two other enzymes that promote skin renewal, the stratum corneum chymotryptic enzyme and stratum tryptic chymotryptic enzyme.

Lines and wrinkles may take years to develop to the point where the owner feels the need to reduce their appearance but once that decision is made their removal becomes a matter of urgency. Four “instant” methods are available; skin tightening; the Botox effect; skin plumping and clever use of make-up.

Osilift is an *Avena sativa* (Oat) kernel extract from **Silab** that is described as a three-dimensional high-molecular weight network made of complex sugars linked by hydrogen bonds. Being both elastic and flexible, It is said to have a distinct tensor effect and when topically applied to the skin it forms a continuous, cohesive elastic film that helps to bind skin cells closer together. Its anti-wrinkle effect is noticeable after 30 minutes, and long term wrinkle reduction is noticed when used twice daily for a month. It is near colorless, water soluble and largely unaffected by pH and salts.

Argatensyl from **Laboratoires Sérobiologiques** is an *Argania spinosa* kernel extract from the argan fruit that gives an immediate physical effect to reduce the wrinkles. The argan tree, *Argania spinosa*, resembles an olive tree and grows only in the south of Morocco It bears small yellow fruits which become brown on ripening. Precious oil extracted from the kernel of the fruit has been used for centuries by local populations for skin and hair care as well as for cooking. After oil extraction the left-over pressed kernels represent a raw material rich in high molecular weight proteins with interesting surface properties. When applied on skin they form a network having a high affinity to the skin’s surface and develop an immediate and perceivable tightening effect. In parallel, these proteins have shown a biological effect over time leading to an improvement in wrinkle reduction. **Argatensyl** is available as an organic certified powder or as a preserved solution.

Liftiliss from **Greentech** contains the fruit pulp of the Baobab tree, which contains 9.5% AHAs and mucilage rich in sugars, xylose and polyphenols and it has an immediate tensing and smoothing effect on the skin. **Dynalift** from **Sederma** is *Sorghum bicolor* stalk juice, which forms a stretching film on the surface of the skin to provide an immediate and durable tightening effect. The juice is rich in polyosides and it is claimed that the numerous hydroxyl functional groups of the polyosides interact with each other and with the keratin of

corneocytes to form a tightening film on the skin surface. The attractive force of each bond creates a tension that produces micro-lifting effect on the skin.

A mixture of Acacia senegal gum and hydrolyzed rhizobian gum form the basis of **Easyliance** from **Soliance**, claimed to instantly tighten and improve skin appearance. **Tensea Lift** from **Unipex** is a mixture of chitosan and glycolic acid. It is cationic in character, enhancing its adhesion to skin, and it provides an instant tensing effect. It also contains MDI Complex, which is a metalloproteinase inhibitor that acts on the extra-cellular matrix of the dermis protecting the fibres of collagen and giving a long-term improvement in skin appearance.

For a Botox effect **Laboratoires Sérobiologiques** offers a small polypeptide extracted from *Hibiscus esculentus* under the trade name of **Myoxinol LS9736**. It is in powder form with Ecocert certification and is shown to have a strong anti-wrinkle capacity, due to its ability to reduce facial muscle contraction via topical application, combined with a protective efficacy towards oxidative stress.

Also reducing micro-contractions of facial muscles, **Gatuline Expression** from **Gattefossé** is based on an extract from the *Acmella oleracea* plant, cultivated and harvested on the island of La Réunion in the Indian Ocean. The extract contains isobutylamides of polyenic and polyenylic acids of which spilanthol is the molecule mainly responsible for its myorelaxing activity. **Gatuline Intense** is a concentrated oily extract from the flowers of the *Spilanthes acmella* plant that acts on the supportive tissue to have an instant effect on wrinkles and a long-term improvement if regularly applied.

Various ingredients are claimed to have a plumping effect: **Commiphoriline** from **Soliance** is an extract of *Commiphora mukul* in caprylic/capric triglyceride. It is said to activate the G3PDH enzyme required for triglyceride synthesis and inhibit AMPc, which is needed in the Kinase A triglyceride degradation process. As well as plumping out facial wrinkles the material is also recommended for enhancing breast size.

Pulpactyl from **Silab** is an aqueous-glycolic extract from the male Southernwood, *Artemisia abrotanum*. It is rich in oligosides and stimulates the synthesis of PPAR- γ ; a transcription factor involved in the fat cell differentiation program. It works to swell fat cells by stimulating the synthesis and storage of triglycerides, thus providing a plumping effect.

Soft-focus is popular way of disguising wrinkles. The perception of lines and wrinkles is brought about by light illuminating the skin surface, where glare and reflected light on the surface and in depth accentuate shadows on and in the zone of imperfection revealing lines and wrinkles. **Soft~Gliss hBn** from **Optima Chemicals** is a light sensitive polycrystalline particle of boron nitride with enhanced optical performance designed to fill uneven and irregular skin surfaces and at the same time capture penetrating light, which is then scattered as diffused light inside the lines or wrinkles. The result is immediate, creating a smoothing soft focus effect on the skin.

Grant Powders range from shiny light reflecting polymethylsilsesquioxane to polysilicone-11 that leaves the skin with a matt finish. All these powders fill fine lines and diffuse light to disguise wrinkles [Ref 2]. An extension to these is **Granpowder Lumière** powders that are micron sized polymethylsilsesquioxane (PSQ) spherical powders with an entrapped photoluminescent diamond core that emit an intense blue glow when illuminated by long wave UV.

The coloured **Granpowder Lumière** powders contain cosmetic approved dyes complexed to diamond in such a way that they neutralise skin discolorations without leaving an opaque and mask like appearance. The powders can be blended together to create unique and radiant shades, specific to the intended application and the synergy between the optically transparent PSQ, photoluminescent diamond, and complexed dye leaves skin looking young, even toned and healthy. **Grant-X**, also from **Grant Industries**, combines soft-focus effects with immediate freezing of muscular contraction and long-term improvement in skin condition. It is a mixture of cyclopentasiloxane, water, Polysilicone-11, aminobutyric acid, barium sulfate with extracts of Panax ginseng, Portulaca oleracea and Centella asiatica.

Chromocare from **Sederma** acts on the three visible skin chromophores by reducing melanin and haemoglobin and improving collagen. It is a mixture of Siegesbeckia orientalis extract and Radosia rubescens extract in aqua/butylene glycol solution. Unlike most of the other materials described in this feature its effect is not immediate but very significant within two months.

Many of the materials described are available with Ecocert certification and all have documentary evidence to demonstrate their efficacy. The INCI names shown in the text are the principal ingredients and secondary ingredients may also be present.

Ref 1 http://www.connock.co.uk/articles_exfoliants.htm

Ref 2 http://grantinc.com/cosmetics/powders/powders_index.php

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www.creative-developments.co.uk