

Hair Care Feature
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John Woodruff

The average scalp supports about 100,000 hairs, which grow at a rate of around 125mm per month. Each hair lasts between three and ten years and between 50 and 100 hairs are lost per day. The hair care market itself is very fragmented with products targeted for each and every stage of treatment; for every type of hair, for every hair colour, for different ethnic origins and for the age of the user. Following is a selection of new ingredients aimed at the hair care market.

Surfactant systems for shampoos

Concerns about traditional surfactant systems for shampoos, both real and imagined, have caused manufacturers to look at alternative systems and have inspired material suppliers to offer new ingredient ideas.

Soliance is offering Appygreen 812 containing decyl glucoside, xylose and decyl alcohol as a material based on natural renewable resources that acts in synergy with SLES to improve viscosity and foam. It enables a reduction in the level of SLES and is said to be suitable for sulphate-free systems and examples of its effectiveness with sorbitan esters and polyglucosides show remarkable foaming properties. **Soliance** also offers a non-ethoxylated perfume solubiliser that is comparable to PEG-40 hydrogenated castor oil. It is named Sophogreen and produced from plant materials by a fermentation and bioconversion process.

Miracare SLB365 [Sodium trideceth sulfate, sodium lauroamphoactetate, cocamide MEA] from **Solvay** is a system that allows the formulator to incorporate high levels of oils, pigments, cationic materials and silicones into a foaming shampoo. Miracare SLB 365 spontaneously forms liquid crystal spherulites to give a structured pourable system. It is advantageously used in conjunction with Jaguar cationic guar derivatives from **Solvay** to improve suspension stability and contribute to the conditioning effects.

Stepan offers Stepan-Mild GCC as a naturally derived alternative to cocamide CDE. It is glyceryl caprylate/caprinate and may be used as a thickener, foam enhancer, co-emulsifier and solubilising agent. Another alternative is Antil SPA 80 from **Evonik**. Antil SPA 80 [Isostearamide MIPA; glyceryl laurate]. It is a liquid that gives efficient thickening and conditioning properties to skin and hair cleansing formulations.

Adding gloss and shine from shampoos

Adding gloss and shine is an effect that is appreciated whatever hair product has been used. Glossyliance from **Soliance** comprises extracts of sugar cane and lemon zest with alpha-hydroxy acids and test results show that the addition of 5% Glossyliance to shampoo smoothes cuticle and that as little as 1% improves hair shine and softness. Glossamer L6600 [brassica campestris/aleurites fordii oil copolymer] from **TRI-K Industries** is described as a natural polymer for hair care applications to improve moisture levels and to add gloss and shine. **Croda Europe** incorporates polyquaternium-70 in its Lustreplex for delivering shine and conditioning effects from shampoos.

Aquarich from **Rahn** is an aqueous/glycolic extract of Avena strigosa seeds that contain polysaccharides and amino acids. It also contains plant-based lecithin and is said to have a repair effect and a new study shows that 0.5% in a shampoo prevents the formation of split ends. A half head test revealed that 1% Aquarich in a shampoo

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improved gloss and bounce back of hair after blow drying as well as providing enhanced skin feel and foam during washing.

Delivering ingredients that must remain on the hair shaft from shampoos requires careful formulation. NHance SP-100 is a material from **Ashland** [Acrylamidopropyl trimonium chloride/acrylamide copolymer] that forms a coacervate with anionic surfactants. It promotes the deposition of silicone, emollients and anti-microbial agents such as zinc or selenium onto hair and skin. Laboratory trials show that it may be 40% more effective than cationic guar in aiding silicone deposition from conditioning shampoos.

Continuing the improved deposition theme **Siltech** is a company that specialises in silicone compounds for the cosmetic industry. Silplex J2S [Silicone quaternary-20] is a complex of cationic and anionic silicone derivatives developed to maximize the disruption of hydrogen bonding between water molecules. The result is a complex that, despite its water solubility, achieves lowest free energy by deposition on the hair and it imparts outstanding conditioning effects. It is recommended for use in a 2-in-1 shampoos and for adding sheen and softness to colour treated hair.

Multifunctional ingredients are always of interest to the formulator. Sofcare GP-1 from **Kao** is a clear liquid conditioning polymer that can be used in shampoos, conditioners and hair care products for conditioning, manageability, shine and hair styling. It does not cause turbidity when added to clear shampoos and test results show it to improve foam texture and stability. It improves adsorption of silicones to the hair so reducing the level needed in 2-in-1 shampoos and it is also suggested as a silicone replacement when gloss and shine are required from conditioners. It is of interest for hair styling because of its uniform hydrophobic distribution on the hair, which improves curl retention.

Hair straightening

Silicones are not only added to shampoos for conditioning effects. At In-Cosmetics 2013 **Grant Industries** launched Gransil NYKY-P, which is designed for hair straightening and styling applications. It is a mercapto-containing dimethicone copolymer [Dimethicone/mercaptopropyl methicone copolymer, phenyl trimethicone, Melaleuca alternifolia (tea tree) leaf oil] that can be added to shampoos, smoothing treatments, heat protection serums and rinse-off conditioners. Once deposited on the hair shaft it penetrates the cuticle and is then heat activated with a blow dryer or ceramic tongs. Phenyl trimethicone is present for added shine and the tea tree oil helps mask the mercapto-odour.

Lucas Meyer offers a natural alternative for hair straightening named Phytensio. It is extracted from soybean [Phospholipids, glycine soja (soybean) oil] and contains specific phospholipids that are biomimetic to the ones in hair fibres. Because of its bioaffinity with hair Phytensio adheres to the fibre and surrounds it with a smoothing and sheathing film, which straightens hair through a physical action. Tests show that when 2% is added to a shampoo curly hair is elongated by 7.6% and the effect continues with further shampooing. Phytensio contributes to the styling of curly and frizzy hair, which is most often difficult to manage in conditions of high humidity.

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Croda Europe offers a hair smoothing and straightening system based on Crodasone Cystine. It is described as a highly specialised cystine/silicone copolymer [Cystine Bis-PG-propyl silanetriol], which cross-links on drying to form a protective film. It can be added to shampoos, conditioners and hair treatment products.

Hair Conditioning

Traditionally hair conditioners were a mixture of cetrimonium chloride or bromide with cetearyl alcohol. More recently quaternary ammonium compounds based on fatty alcohols with longer chain length were found to be less irritating and to impart better conditioning. The C22 behenyl molecule is particularly effective and is the basis of Genamin BTMS [Behentrimonium methosulfate] from **Clariant**, which also supplies Genamin KDMP [Behenyl trimonium chloride]. Other conditioning compounds from **Clariant** include Genamin SPA [Stearamidopropyl dimethylamine] and Genamin BAP, a mixture of behenamidopropyl dimethylamine and stearamidopropyl dimethylamine. They are aimed at formulators of cream rinses and are acidified with citric, glycolic or lactic acid to give excellent wet and dry combing properties, to increase hair volume and to provide hold without build-up.

Symbioquat [Hydroxypropyl oxidized starch PG-trimonium chloride, starch hydroxypropyltrimonium chloride, sodium lactate] from **Dr Straetmans** is a conditioning agent claimed to reduce measurable combing forces by 90% yet it does not build up on the hair. It is suggested that it be used with polyquaternium-10 to obtain maximum conditioning performance. A combination of sodium PCA with a multitude of amino acids comprises ProdeW 500 from **Ajinomoto**. It is claimed to be a combination that is almost identical to the composition found in human hair. In particular, the amino acid L-arginine and sodium PCA work in synergy to provide frizz control, improve manageability, reduce colour fade and provide moisture and hair shine.

The amino acid sequences of the peptides found in Keramimic 2.0 from **Croda** also match those present in the keratin proteins found in human hair. It is laurdimonium hydroxypropyl hydrolyzed keratin and is described as a highly substantive conditioning active that provides targeted repair to the most damaged areas of the hair's surface. More information about this and hair protein structures are fully described on the Croda website <https://pc.crodadirect.com>.

Leave-in conditioners are an alternative to the traditional wash-off cream type: **Dow Corning** is promoting DC CE-7080 Amino Elastomer Emulsion for leave-in conditioning with styling properties. Its principal ingredient is silicone quaternium-16/glycidoxy dimethicone crosspolymer and it imparts frizz control and curl retention with wet and dry combing benefits. **Belsil** has added Belsil ADM 8301E to its extensive portfolio of silicone-based conditioning aids. It is a microemulsion of amodimethicone for easy incorporation into the formulation to provide conditioning and to provide heat and colour protection to the hair.

Epiprotectyl UV from **Rovi** contains the UV absorbers octocrylene and butyl methoxydibenzoylmethane with inulin lauryl carbamate, caprylic/capric triglyceride and behentrimonium chloride and sucrose laurate for leave-on hair products. It holds up to 50 % UV filters in a hydrophilic medium, which allows for a long lasting adhesion of the filter to the hair fibre surface. ChromVeil from **Croda** [Quaternium-

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95, propanediol] absorbs both UVA and UVB radiation to protect hair from colour fade from leave-in and rinse-off conditioning systems.

Mibelle offers various UV protection materials for hair utilising cationic nanoemulsions prepared with phospholipids and a microfluidizer for improved substantivity to hair. Mibelle claim that the filters encapsulated in a cationic delivery system protects both hair and scalp on a long-term basis and preserves hair quality by their film forming properties.

Anti-Aging Hair Complex from **Elemetis** is a blend of *Crambe abyssinica* seed oil to provide added lustre and emolliancy; hydrogenated polyisobutene for shine and slip, PEG-2 dimeadowfoamamidoethylmonium methosulfate to enhance conditioning and protect hair colour and *Olea europaea* (Olive) oil unsaponifiables, which contains betasitosterols that help regulate the oil/water balance within the scalp and hair shaft.

As with all branches of cosmetics there is a lot of interest in ingredients of natural origin for hair products. **Dr. Straetmans** offers Dermofee P-30 [PCA glyceryl oleate] as a plant-derived hair and skin conditioner. It attaches to the hair's cuticle to renew the lipid layer removed by hair treatments. Like classical conditioning agents, it reduces the combing resistance in wet hair and may be added to shampoos and conditioners seeking natural certification.

Pentaclethra macroloba seed oil is rich in behenic acid and is supplied by **Beraca** as Beracare BBA. Beraca reports that Beracare BBA will condition hair by improving wet and dry combability and by delivering softness and smooth feel and shine. It can be used alone or in conjunction with traditional cationic conditioning actives at a level of 1% to 2%.

Protecting the hair

Sensient offers Fucomer and Fucosorb as naturally derived materials to protect the hair during aggressive treatments such as perming and colouring. They are obtained from red and brown algae collected on the Brazilian north eastern coast. Fucomer is a 100% active powder and Fucosorb is supplied as a 14% solution in sorbitol. They are rich in sulphated polygalactosides that are substantive to the hair, providing a protective and moisturising film. In addition they are able to reduce the spread of sebum on the hair, leaving hair clean and manageable for longer.

Protection of hair during chemical and physical treatments is a reoccurring theme in hair ingredient literature. **Silab** suggests Amanduline SG [*Prunus amygdalus* extract] that is claimed to be a natural restructuring agent for hair fibres and it increases shine, volume and manageability while protecting it from external aggressions. Also from **Silab** is Amanduline HC Bio [Hydrolyzed sweet almond seedcake]. It preserves the internal structure of hair by limiting the alteration of hair fibre proteins and has a coating effect to improve hair shine and volume.

Microsil Volume from **Chemsil**: is a clear, cationic, silicone micro-emulsion of propoxytetramethyl piperdiny dimethicone. The active silicone acts as free radical scavenger and anti-oxidant and it provides protection from heat, UV rays and other environmental factors. The same polymer appears in various forms in the Mirasil ADMH range from **Blue Star Silicones**. Blue Star publishes full claim substantiation data including protection from damage caused by straightening irons, protection

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against breakage and for improved colour retention and frizz control in high humidity conditions.

Minimising hair loss

Retarding hair loss is an effect sought by many hair product manufacturers and has been the cause of much research over the years. In the past we have had weird and wonderful and sometimes dangerous preparations but there are now materials available with clinical evidence that they work. Minoxidil is the only material approved by the FDA as a treatment for male pattern baldness. Its mechanism of action is unclear but it is suggested that it has a direct effect on the proliferation and apoptosis of dermal papilla cells by dilating blood vessels and increasing the flow of oxygen, blood and nutrients to the hair follicle. In Europe minoxidil is not considered a cosmetic ingredient and it appears in Annex II as a substance prohibited in cosmetics. Outside of Europe its regulatory status varies from country to country and those interested are urged to consult local regulations.

Kumar Organic Products markets minoxidil as Kopdil and **Salvona Technologies** supplies several versions encapsulated in SalSperes. **Salvona** is a company that specialises in encapsulation and sustained release technology and it has encapsulated minoxidil at 2% and 5% for alcohol-free topical hair regrowth products. SalSphere Intense Hair Regrowth is a complex of ingredients, including minoxidil, procapil, and procyanidin, encapsulated within sub-micron spheres for robust hair regrowth and hair retention treatment.

An alternative to minoxidil is Kopexil [Diaminopyrimidine oxide] from **Kumar**. Kopexil is thought to work by inhibiting the activity of the enzyme lysyl hydroxylase, which catalyses the formation of hydroxylysine that contributes to collagen synthesis. Increased levels of collagen cause hardening and shrinking to occur around the hair follicles, which retards hair growth and the hair follicles to atrophy. Kopexil softens the collagen around the hair follicle and is claimed to improve hair growth by dilation of blood vessels on the scalp.

Decreased microcirculation is one of the main causes of hair loss and treatment with vasodilators plays a key role in extending the anagen or growing phase of hair. Three products from **Indena** take this approach: Sabeselect is an extract of *Serenoa repens* with essential oils; Esculoside is esculin isolated from *Aesculus hippocastanum* that improves capillary permeability and Ximenoil is ximenynic acid, which improves microcirculation. Indena offers an extensive range of ingredients for hair, which are featured in its publication of Selected Botanical Actives for Hair Care Applications.

Nucleo Trico-Hyal from **I.R.A.** was specifically developed to stimulate hair growth, improve cellular integrity and reconstruct the hair. It includes sodium hyaluronate crosspolymer, *Olea europaea* fruit extract, cytidine phosphate and adenosine phosphate in its INCI listing. The cross-linked hyaluronic acid enables the polyphenols and polynucleotides to slowly release into the hair to combat greying caused by aging and to provide improved follicular activity. It is claimed that polynucleotides penetrate the follicle with a stimulating, nourishing and reinvigorating action to optimise bulb oxygenation and increase cellular metabolism.

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Capixyl from **Lucas Meyer** is a biomimetic peptide, acetyl tetrapeptide-3, combined with a red clover extract aimed at providing stronger, healthier and thicker hair. Its efficacy is based on the association and synergistic action of its two principal ingredients. L-carnitine plays a key role in beta-oxidation, giving it the potential to enhance skin's cellular energy via increased cellular metabolism. Carnipure Crystalline from **Lonza** is pure L-carnitine and is suggested as a means of re-energising hair growth. Vitasol from **Berkem** is a polyphenol extracted from grapes that protects hair from oxidative damage and improves microcirculation in the scalp, resulting in stronger hair growth.

Using natural ingredients avoids the regulatory problems posed by minoxidil and in the spring of 2013 **Symrise** introduced an algae extract named SymHair Force 1631. It is an extract of *Isochrysis galbana* in pentylene glycol that is claimed to prevent hair thinning and loss while thickening and strengthening hair. Clinical tests show it to increase anagen hair life by 10.5% and telogen hair life by 11.7% when compared against a placebo. SymHair Force 1631 received the Innovation Zone Best Ingredient Award among more than 70 products at In-Cosmetics 2013.

Anageline from **Silab** is extracted from sweet white lupine said to be rich in glutaminated peptides, oligo-elements and vitamins. Anageline [Hydrolyzed lupine protein] is claimed to control the hair cycle by regulating the hormonal balance, reactivating the microcirculation and by stimulating cell metabolism. **Salvona** offers SalSphere Natural Hair Growth Promoter, which is encapsulated procyanidin designed to preserve the potency of the natural ingredient and target its delivery to the hair follicles on the scalp for enhanced efficacy.

AnaGain from the **Mibelle Biochemistry Group** is based on organic pea sprouts [*Pisum sativum* sprout extract] to reactivate hair growth by directly targeting the dermal papilla cells that are key to the hair growth cycle. Application results in a shorter telogen phase and it is claimed to stimulate hair growth at the root, prolong the life cycle of hair and to restore its vitality, leading to denser hair in just 3 months.

Mibelle also offers PhytoCellTec Malus Domestica claimed to maintain the vitality of skin stem cells and to delay the senescence of the hair follicle. In this way it maintains the regenerating power of the hair and increases the longevity of the hair follicle by prolonging the anagen phase. Vital Hair & Scalp Complex from **Arch/Lonza** was developed to improve follicle health by improving the ability to anchor hair to the scalp, while also reducing hair loss. It is a mixture of natural extracts with hexapeptide-11. The combination of alpha hydroxy acids in the extracts promotes cell renewal on the scalp; keeping follicles clear and open for healthier hair growth. Hexapeptide-11 is a peptide responsible for collagen production and of important extracellular matrix components such as hyaluronic acid.

Please note: only the principal actives are shown against trade names and all the suppliers of all the materials named can provide full details including efficacy data.

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www.creative-developments.co.uk