

## Cosmetic Preservation 2017

1<sup>st</sup> published in SPC 2017

John Woodruff

Despite an impressive number of preservatives permitted in Annex V very few are without criticism, real or imagined. At In-Cosmetics 2017 Nirmal Koshti, **Galaxy Surfactants**, summed up the situation by stating that consumers expect preservatives to be free from parabens, formaldehyde releasers, halogenated chemicals, isothiazolinones and phenolic/alcoholic/glycolic molecules so only organic acids, dehydroacetic acid, benzyl alcohol and phenoxyethanol are left. The answer from Galaxy is to combine benzoic acid and dehydroacetic acid, which are good antifungal agents, with capryloyl glycine and undecylenoyl glycine, which are good antimicrobial agents. The result is Galguard NT, described as a composition for personal care products based on non-toxic, non-controversial antimicrobials, which in combination show synergy and the four-pronged attack is a good deterrent for microbes to develop resistance.

Maximising the efficacy of listed preservatives and utilising the antimicrobial properties of non-listed ingredients was a reoccurring theme at In-Cosmetics 2017. Jan Jänichen, **Dr Straetmans**, discussed efficacy boosting by maintaining the preservative system in the aqueous phase. He said that caprylyl glycol at 0.5% could be adequate in an emulsion containing a non-polar oil phase such as mineral oil but could fail if a more polar oil like decyl cocoate or triheptanoin was substituted for it as the caprylyl glycol would migrate into the more polar oil phase. His proposal was to find a suitable solvent that would be readily water-soluble, be of sufficient lipophilicity and be cost effective. Of those investigated he found methylpropanediol to be the most suitable when added to the aqueous phase. Experiment showed that methylpropanediol could significantly shift the concentration of caprylyl glycol between an aqueous and a C8/10 triglyceride phase. The distribution did not follow a linear relationship; maximum was reached at a concentration of 3% methylpropanediol in 70% water and this improved the antimicrobial efficacy of caprylyl glycol. Further experiment led to the development of Dermosoft OMP [Methylpropanediol, caprylyl glycol, phenylpropanol], Dermosoft OM [Methylpropanediol, caprylyl glycol] and Verstatil MBO [Methylpropanediol, caprylyl glycol, benzoic acid], this latter being suitable for wet wipes.

Although not featured at In-Cosmetics 2017, **Dr Straetmans** has developed several other mixtures with antimicrobial properties including Verstatil TBG [INCI: Triethyl citrate, glyceryl caprylate, benzoic acid] that is effective for pH 4 – 6, and Verstatil BOB [INCI: Benzyl alcohol, caprylyl glycol, benzoic acid] that is effective for pH 3 – 8. There is also Dermosoft [INCI: Sodium anisate], which is a completely water-soluble salt of p-anisic acid that can be added directly to the cold water-phase before heating. The fungicidal activity of Dermosoft Anisate can be used in combination with other Dermosoft multifunctional ingredients with microbial activity to develop cosmetic products with no further need for traditional preservatives.

Caprylyl glycol appears in many other offerings of alternative preservatives. For example: **Salicylates and Chemicals** supplies it in association with phenoxyethanol as Saliguard PG and with the addition of propylene glycol as Saliguard PCG. **Sharon Laboratories** mix it with phenethyl alcohol as Sharomix CPP and with phenylpropanol as Sharomix CPP. **Symrise** add it to 1,2-hexanediol in SymDiol 68, **Active Micro Technologies** mix with herbal extracts to form Synercide Herbal Infusion and **Cosphatec** supplies it in combination with propanediol and phenylpropanol as Cosphaderm POP.

**Cosphatec** also markets many other alternative multifunctional ingredients obtained by careful and gentle extraction processes that are used to isolate ingredients that are EcoCert and Cosmos accredited. These include Cosphaderm LA-T [INCI: Levulinic Acid, glycerine, sodium levulinate, aqua], which is derived from sugar cane and vegetable oil: Cosphaderm GMG [INCI: Glyceryl caprylate, propanediol natural, glycerine, Magnolia officinalis bark extract, Psidium guajava leaf extract] and Cosphaderm Sodium pAS Natural that is sodium anisate from Star Anise and is claimed to have

Cosmetic Preservation 2017

1<sup>st</sup> published in SPC 2017

John Woodruff

fungicidal activity. Cosphaderm Magnolia Officinalis Bark Extract] is said to be bactericidal, anti-yeast and anti-fungal activity. It also supplies nature-identical propanediol, caprylyl glycol, phenylpropanol and 1-2, hexanediol that are made synthetically to optimise costs.

The use of unlisted materials with antimicrobial action is sometimes questioned but suppliers quote the definition within the Cosmetic Product Regulations that defines preservatives as substances which are exclusively or mainly intended to inhibit the development of microorganisms in the cosmetic product. This is believed to pave the way to use multi-functional additives which are not mainly intended to inhibit microorganisms but still may have a certain efficacy. It has to be admitted that most of the data that accompanies multifunctional ingredients refers more to their antimicrobial properties than to their emollient or moisturising attributes.

**Schulke** sees the trend in preservatives is towards organic acids, alcohols, chelating agents and multifunctional additives and suggests a combination of different substances as an advantageous way to improve the efficacy of preservative systems or to reduce the concentration of single ingredients in final compositions. Following this concept, it offers three mixtures: Euxyl K903 [INCI: Benzyl alcohol, benzoic acid, dehydroacetic acid, tocopherol] for products pH<6 and said to give a broad balanced spectrum effect against bacteria, yeasts and moulds and is suitable for leave-on and rinse-off products including wet wipes. Euxyl K940 [INCI: Phenoxyethanol, benzyl alcohol, ethylhexylglycerin, tocopherol] may be used up to pH 12 and is stable to hydrolysis, temperature and pH. The third material from Schulke is Sensiva PA40 [INCI: Phenylpropanol, propanediol, caprylyl glycol, tocopherol], also stable to pH 12 and comprising natural and nature-identical ingredients with mild humectant and emollient properties.

A personal communication from **Inolex** says that the main multifunctional compounds with antimicrobial activity used in cosmetics are the medium chain length diols; caprylyl glycol, ethylhexylglycerin, glyceryl caprylate and 1,2-hexanediol. They all work by membrane disruption and reduction of water activity and are good at controlling the growth of bacteria and yeast. However, they are not particularly functional against mould and shouldn't be considered broad spectrum. Both caprylyl glycol and glyceryl caprylate are not liquid so require a certain amount of warming and mixing before use and they have a certain level of surface activity, so have the potential to disrupt emulsions. **Inolex** has now launched Lexgard O-EZ. [INCI: Caprylyl glycol, propanediol], which is fully liquid and allows the formulator to incorporate the highest level of caprylyl glycol using a cold process ingredient. There is also Lexgard Natural, which is a COSMOS certified blends of glyceryl caprylate and glyceryl undecylenate. It is an emollient, co-emulsifier, skin re-fatting agent, and biostatic system effective at pH 4.0 - 7.5, with optimal results at pH 5.5 or lower and is recommended for emulsion systems.

The major problem with using organic acids as preservatives is that they rapidly lose efficacy at increasing pH. Caprylhydroxamic acid (CHA) is a chelating agent with a high affinity for iron (Fe 3+) ions, which is an essential mineral for the growth of mould. When CHA forms a complex with iron, it no longer allows the mould to use it and in-turn prevents it from growing. It is functional when in the acid form, and as it is a hydroxamic acid and not a carboxylic acid, it has a higher pKa at 9.4, therefore has full activity up to at least pH 8. CHA is a patented material unique to Inolex and it is available in combination with different multifunctional diols to give a range of globally approved antimicrobial mixtures suitable for all the different types of cosmetic compositions.

**Chemunion** has developed several products based on xylitol esters that have antimicrobial activity. Herbeatol Plus is xylityl sesquicaprylate, which shows synergy with IPBC or phenoxyethanol when

Cosmetic Preservation 2017

1<sup>st</sup> published in SPC 2017

John Woodruff

tested on an o/w emulsion. It also showed synergy with CTAC and BTAC when tested in hair conditioner formulations and to be effective in shampoo. Herbeatol BA [INCI: Benzyl alcohol, xylitol, caprylic acid] is described as a synergistic combination of xylitol ester with benzyl alcohol for skin care products at pH 3.5 – 7.0. Herbeatol PSVG [INCI: Xylitol, caprylic acid, potassium sorbate, glycerine, water] is described as a synergistic combination of xylitol ester and potassium sorbate and to be Ideal for skin and hair care formulas, including sunscreens.

**Sharon Laboratories**, which markets both listed and multifunctional preservative blends, decided to create a preservative mixture based entirely on nature identical ingredients. It synthesised thymol, which is the major constituent of thyme oil, and linalool, found extensively in citrus oils, to create a number of preservative blends available under its SharoSENSE trade name. Sharon Laboratories launched its Sharomix Amplify range at In-Cosmetics 2017 as a new preservative solution that is claimed to be broad spectrum with superior activity allowing for a significantly lower level of use in the finished product. Currently there are two products in the range: Sharomix AM11/15 [INCI: Phenoxyethanol, ethylhexylglycerin, ethyl lauroxy arginate] and Sharomix AM12 [INCI: Phenoxyethanol, chlorphenesin, ethyl lauroyl arginate].

Hydroxyacetophenone is a nature identical compound, found in *Lampaya hieronymi*, a herb, native to Latin America, and in *Rubus chamaemorus* or cloudberry, found in Alpine regions. **Symrise** has synthesised the material and studies show it to be an antioxidant with skin soothing and anti-irritant properties. It also has preservative boosting properties so can be described as a true multi-functional ingredient. Symrise offers it as the neat powder as SymSave H and as a liquid solution in phenoxyethanol as SymOcide PH.

The human microbiome was the subject of the In-Cosmetics 2017 presentation of Natural Antimicrobials and The Beauty Microbiome given by Durant Scholz, **Active Micro Technologies (AMT)**, who described it as a unique interface between us and our environment, providing protection against pathogenic invaders and acting as the first real barrier of skin defence. Scholz said that microbes were the first life forms on Earth and 37% of human DNA is inherited from bacteria and there are billions of bacteria, viruses, and fungi within our bodies. Microorganisms on the skin surface perform a wide variety of functions; for example, *Staphylococcus epidermidis* produces a secretion that reduces inflammation, speeds wound healing and inhibits tissue colonisation by *S. aureus*. Scholz suggested that preservatives incorporated into personal care products can disrupt the natural microflora of the skin leaving it prone to attack by pathogenic organisms that can cause skin inflammation and stress and leave it prone to atopic dermatitis, psoriasis and acne. AMT focused on a solution involving antimicrobial peptides derived from fermentation of lactic acid bacteria, which effectively eliminates unwanted microbes without negatively altering, and perhaps even promoting, the skin's commensal microflora.

The human biome is a relatively new and exciting area of research for the cosmetic industry. Literature from **GOVA** states that the main skin function is to build a protective barrier against the aggressive environment. The epidermis and more specifically the horny layer forms a shield that keeps out undesirable chemicals and bacteria and recent scientific research discovered that our barrier is protected by a layer of microorganisms covering the epidermis. Each skin cell is guarded by a unit of at least 10 beneficial microorganisms so 90% of our skin is formed by this human skin flora. This microbiotic film forms an impenetrable labyrinth for foreign and harmful microorganisms and skin imperfections and skin discomfort are caused by a disturbance of our protective microflora.

Cosmetic Preservation 2017

1<sup>st</sup> published in SPC 2017

John Woodruff

**Gova** suggests that the solution to slow down skin aging and to keep the skin in a healthy shape is to energize and to protect the skin microbiota barrier and it has developed preBIULIN FOSTM as a prebiotic that makes skin microbiota and skin more resistant. A prebiotic is a selective food supplement for protective and beneficial skin microbiota and harmful microorganisms cannot metabolise it, hence natural skin flora is reinforced and balanced, while harmful microorganisms are disadvantaged. preBIULIN FOSTM is a polyfructose extracted from chicory root, *Inctybus chiorium*, and enzymatically purified towards a chain length of 10 fructose units and higher.

A final footnote is that although the safety of poly(hexamethylene) biguanide hydrochloride (PHMB) was called into question, vigorous defence of this ingredient led by **Lonza** has resulted in a positive outcome with the decision that PHMB is safe as a preservative in all cosmetic products up to 0.1%. It is available from Lonza as a 20% aqueous solution trade-named Cosmocil CQ and described as a mild, water-soluble, broad spectrum, fast-acting bactericide that is heat and UV stable.

**John Woodruff**

**[www.creative-developments.co.uk](http://www.creative-developments.co.uk)**