



JUGGLING FORMULATION CHALLENGES

Interview | Manuela Salmina-Petersen from Dr. Straetmans explains what ingredients serve best to make a formulator’s life easier.

► **Interview partner:**
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COSSMA: What are today’s major formulation challenges?

Manuela Salmina-Petersen, Dr Straetmans: One particular challenge when formulating an emulsion is to take important parameters such as its viscosity, body and sensorial profile into account. These parameters have to be brought to life without compromising the stability of the emulsion. Our **Symbiomuls** product range provides effective emulsifier blends which facilitate the formulation of a wide range of product concepts, including traditional as well as certified natural compliant cosmetic products,

without further need for stabilisers or co-emulsifiers.

The two O/W emulsifier blends, **Symbiomuls GC** and **Symbiomuls Rich**, both complement each other in their ability to cover the full range of viscosities, textures and skin feels. Both blends are naturally-derived and easy-to-use and can be combined with nearly any type of oil or active system. Furthermore, both blends provide basic antimicrobial activity so that preservatives, such as parabens, can be reduced or even replaced, especially in the presence of organic acids. While **Symbiomuls GC** helps to realise a large variety

MAIN CHALLENGES

Creating the right viscosity, body and sensorial profile without compromising the stability

Realise a large variety of different viscosities and textures without affecting the sensorial profile

of different viscosities and textures without affecting the sensorial profile, **Symbiomuls Rich** was designed for a wide range of nurturing cosmetic products, including anti-ageing, baby care, night care or protective cosmetics with viscosities ranging from lotions to creams – all with rich textures and a caring skin feel, but without any loss in the performance.

The easy-to use W/O emulsifier blend **Symbiomuls WO** is a versatile and natural cosmetic compliant blend, creating highly stable emulsions with a pleasant skin feel. It contains all the essential components necessary to create a



W/O emulsion and allows for all kinds of manufacturing processes, including hot, cold and one pot processes. For formulators who want to abandon aluminium from their emulsions, an aluminium-free version of this blend, **Symbiomuls WO AF**, exists, which also helps to formulate products with slightly higher viscosities.*

What are major challenges when formulating W/O emulsions?

In W/O emulsions, oil provides the outer phase and the emulsifiers are rather lipophilic. Therefore, they tend to appear somewhat greasy and tacky, creating a heavy film on the skin. For some concepts, e.g. baby care, it is precisely these skin protecting film-forming properties which are desired. In other areas, such as facial care, these properties limit their use as it is extremely difficult to formulate W/O creams that are sensorially pleasant.

One way to create sensorially appealing and light W/O emulsions is with our emulsifier **Dermofeel GO Soft**. The resulting emulsions provide a skin feel comparable to O/W emulsions. It improves the sensorial profile without compromising the benefits of W/O emulsions. This means the emulsions appear less greasy and tacky but offer the typical nurturing effects of W/O emulsions, such as forming a protective film on the skin and reducing the trans-epidermal water loss.

Another challenge of W/O emulsions is to provide antimicrobial protection. Although due to the outer oil phase a contamination is less likely to occur, it is by no means impossible and the selection of applicable antimicrobials is limited. For instance, multifunctionals such as surface active ingredients at higher concentrations tend to destabilise emulsions. Furthermore, in many microbiological challenge tests we have observed that the antimicrobial activity of organic acids seems to be reduced. A convenient solution is our emulsifier blend **Symbiomuls WO**. It already contains a wetting agent with antimicrobial properties in an optimal concentration so that the stability of the final emulsion is not jeopardised. Nevertheless, additional preservation is highly recommended; we recommend the use of zinc sulphate, as ethanol, a frequent choice, is not always compliant and can change the viscosity and smell of the emulsion which then does not comply with the expectations of consumers.

And what are the main challenges in the formulation of O/W emulsions?

With **Symbiomuls** blends, it is relatively easy to formulate a wide range of different emulsion concepts. However, certain concepts can only be achieved by skilfully

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combining single emulsifiers with specific co-emulsifiers, stabilisers or texturisers*.

In general, a good starting point and basis for many O/W emulsions ranging from sprayable to buttery concepts is a robust and flexible primary emulsifier such as **Dermofeel GSC**. This emulsifier inherently offers a discrete and light skin feel and usually results in emulsions with low to medium viscosities. Higher or even lower viscosities can be realised by varying the oil content and combining it with co-emulsifiers and rheological modifiers such as fatty alcohols.

Dermofeel PS represents an example of a co-emulsifier; when combined with **Dermofeel GSC**, it enables the formulation of an otherwise difficult to obtain highly-viscous O/W emulsion, with a still pleasant skin feel. This co-emulsifier provides a rich and caring skin feel and in this combination increases the viscosity of an emulsion. The result can be highly viscous, oily-rich butter formulations with a non-greasy and smooth sensory profile, which are easily applicable to the skin.

The rheological modifier **Dermofeel G 10 LW** reduces the viscosity of an emulsion without effecting its stability and sensorial profile. This characteristic enables the creation of otherwise difficult to realise sprayable, oil-rich O/W emulsions.

An alternative to improve the skin feel of O/W emulsions and to create a lasting, caring and water-resistant film on the skin is found in **Dermofeel Viscolid**, a ▶

naturally-derived thickener of oils and O/W emulsions and a stabiliser and thickener of W/O emulsions. In contrast to most other mineral-, wax- or emulsifierbased thickening systems, this raw material's thickening network of fine lipid crystals within the oil has a viscosity-increasing effect on liquid oils without altering its sensorial profile on the skin.

Regarding the type of oil and its concentration – what has to be considered in different product types in terms of a formulation's effectiveness and sensorial profile?

In skin care formulations, synthetic and natural cosmetic oils are used in strongly varying concentrations in order to achieve a desired conditioning effect and a proper skin feel.

In hair care, the wrong oil or excessive dosages could quickly lead to extensive negative effects such as overloaded and heavy hair, especially in natural cosmetics where silicones are not allowed. There, the search for a suitable natural cosmetic compliant ingredient to improve hair's gloss and smoothness without resting heavily on the hair proves to be quite challenging.

Dermofeel Sensolv* is a very lightweight and well spreading emollient of natural origin. Due to its silicone-like properties, it can be effectively used in both conventional and natural cosmetics in the field of skin and hair care, as

the choice of our prototype formulations* demonstrates.

What has to be taken into consideration by the formulator in product preservation?

Changes in the legal status of preservatives and growing concerns about the toxicity among some of them constantly pressure developers to find alternative preservation systems. One recent example regards the use of phenoxyethanol as a preservative. In 2012, the French **ANSM** (L'Agence nationale de sécurité du médicament et des produits de santé) recommended to lower the maximum authorised concentration from 1% to 0.4% in cosmetic products for children under three years.

In order to counteract such legal restrictions in the future, **Verstatil's** preservation systems prove reliable. Products of this brand includes a variety of listed preservatives with a clean record in combination with synergistically acting multifunctional additives. For instance, the newly launched **Verstatil MPC** combines future safe concentrations of phenoxyethanol with a multifunctional synergistic system consisting of methylpropanediol and caprylyl glycol from our **Dermosoft** brand.

This brand includes a variety of reliable and secure multifunctional raw materials and blends, not listed as preservatives under Annex V of the European cosmetic regulation. Multifunctionals

are a group of established organic acids and wetting agents with cosmetic properties such as moisturising, co-emulsifying or cosolubilising and additional antimicrobial activity. The high surface activity of amphiphilic wetting agents, such as **Dermosoft GMCY** and **Dermosoft Octiol**, destabilises microbial cell membranes, but when incorrectly applied can also account for instabilities of emulsions in a concentration-dependent way.

A solution is to lower the concentrations of wetting agents, at which they even support the formation of stable emulsions. In addition, synergistic combinations with other multifunctionals, such as mild organic acids, from the **Dermosoft** range can be applied. The synergistic antimicrobial effect between relatively low concentrations of wetting agents and organic acids, such as **Dermosoft Anisate**, is the result of wetting agents destabilising the microbial cell membrane and causing the formation of pores, which allows the organic acids to permeate more easily into the microorganisms. An alternative solution to bypass such instabilities provides our newly launched, highly water-soluble wetting agent **Dermosoft Hexiol**. It offers a better compatibility without jeopardising the emulsion's stability, despite of higher necessary usage concentrations.

Besides the destabilization effects on emulsions, interactions between ingredients can also influence the effectiveness of a preservation system. Surface active wetting agents in rinse-off products, for example, reveal a very limited antimicrobial activity because they tend to interact with the micelle structures of the surfactants in the product, which deactivates them. In addition, many more ingredients might interact and disturb the preservation system, including pigments, lecithins, polar



“MODERN CONCEPTS ACCELERATE THE DEVELOPMENT OF NEW PRODUCTS.”

Manuela Salmina-Petersen, Head of Formulation and Technology, Dr Straetmans

oils, UV filters or aloe vera. In order to bypass such incompatibilities, a sound formulating know-how and general understanding of the applied ingredients is essential.

Based on many years of experience in the field of alternative and modern preservation, we provide solutions for a variety of problems. In addition, we offer blends with a broad antimicrobial activity, such as **Dermosoft OMP**, **Dermosoft MCA Variante** or **Verstatil BOB**. These blends are easy to apply and can be used in a wide range of product concepts. Our formulary collection also includes a number of tested and effective antimicrobial combinations, which can assist formulators in their development efforts.

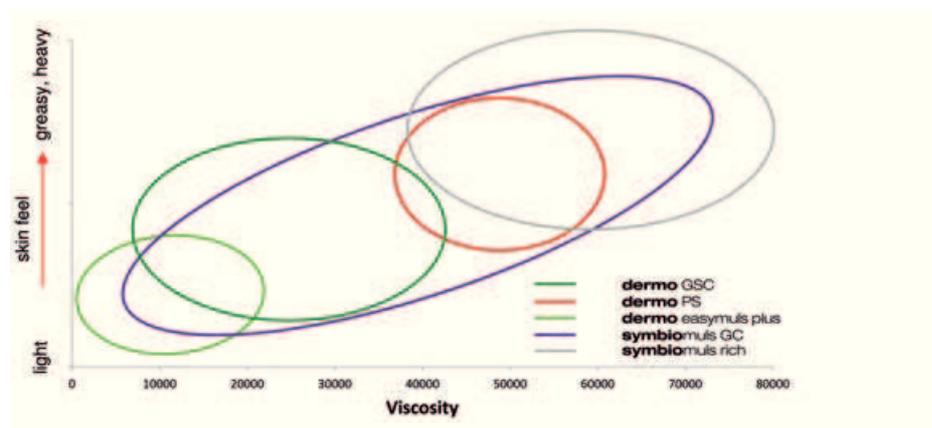
Which ingredients are particularly suitable for the challenge of cold manufacturing processes and which aren't?

Cold processes are applied in order to save production costs and to optimise the manufacturing process. However, the selection of suitable ingredients with certain chemo-physical characteristics, such as a liquid state and proper water-solubility, is limited. An example of a cold processable emulsifier for low-viscous, sprayable O/W emulsions is **Dermofeel Easymuls Plus**. It is particularly suitable for sprayable sun care concepts, caring wet wipe liquids or long lasting deodorant roll-ons. Without changing the viscosity of the emulsion, up to 30% of oil can be incorporated in an energy saving, low temperature process.

The possibilities to create high viscous cream formulations by thickening an oil phase with common consistency agents are quite limited at low temperatures, because most consistency agents, such as fatty alcohols, stearates, waxes and butters, are solid at room temperature and need to be

► O/W EMULSIFIERS: SENSORIAL PROFILES AND VISCOSITIES

The easy-to-use O/W emulsifier blends **Symbio Muls GC** and **Symbio Muls Rich** already cover a wide range of textures, skin feels and viscosities. However, many times the skilful combination of single emulsifiers with rheological modifiers allows a more specific development of certain product concepts. The graph schematically illustrates the inherent viscosity and skin feel range of O/W emulsions formulated with emulsifiers that were mentioned in the interview.



Viscosity and skin feel range of O/W emulsions formulated with different emulsifiers

melted before use. Therefore, a cold process of emulsions is often not applicable. A solution to these problems is our **Symbiomuls WO**, a ready-to-use, liquid W/O emulsifier blend with a pleasant skin feel, in which the waxes and consistency agents are already included and melted down.

Another challenge for a cold process is hygiene. Throughout the whole manufacturing process, a prerequisite in order to avoid microbial contaminations is careful handling and using sterile, germ-free raw materials. This holds particularly true for cold processes. However, it is difficult to obtain sterile manufacturing conditions and they are always associated with higher production costs.

Therefore, in order to tackle such contaminations and potential negative implications on the lifespan of cosmetic products, many producers ask for preservatives which are effective against the most relevant germs that occur in the production process, packaging and daily use. Unfortunately, due to the ongoing discussions about preservatives and their

safety, the list of eligible possibilities is shrinking.

A solution to this contamination risk is provided by **Verstatil Synacid**. The multifunctional organic acids of this preservative blend complement the efficacy of salicylic acid, providing an exceptional and proven efficacy against these resistant germs, which are usually not covered by standard challenge testing (e.g. Eu.Pharm. 5.1.3). The preservative blend is easy to handle and ideal for applications in surfactant- and aqueous-based product concepts. In emulsions it is recommended to combine it with a boosting wetting agent, such as **Dermosoft Octiol**.

Our modern formulations and trend concepts serve developers as basic recipes in order to quickly develop new products in a comparatively short amount of time. □

Our application technology department permanently works on new concepts and modern formulations for our customers – all tested for physical and microbiological stability.

* More detailed information on the properties of Dermofeel Sensolv in hair care published in COSSMA 4/2015, as well as additional information, also on the products mentioned can be found on the Internet – see download panel

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Dr Straetmans, talks about
how to juggle today's
formulation challenges

