

Basic Overview of Preservatives Commonly used by Indie Formulators

Germaben II, a clear, viscous liquid, is a convenient, ready-to-use complete antimicrobial preservative system with broad spectrum activity. Germaben II minimizes the problems associated with incorporating solid parabens. The solubilized combination of Germaben II with Methylparaben and Propylparaben is effective against Gram-positive and Gram-negative bacteria and against yeast and mold.

INCI: Propylene Glycol (and) Diazolidinyl Urea (and) Methylparaben (and) Propylparaben.

PROS & CONS: Germaben II is a paraben based preservative system.

Germaben II is Acceptable for aerosolized sprays in Europe.

Germaben II is water soluble and mixes easily in mostly water formulations such as room and body sprays.

Germaben II-E is a clear, viscous, liquid preservative system designed for emulsion systems **with oil phases greater than 25%**. Germaben II-E includes a total concentration of 20% parabens predissolved in Propylene Glycol for easy and convenient addition to cosmetic formulations. It minimizes the difficulties associated with incorporating solid parabens. Germaben II-E is a complete broad spectrum antimicrobial preservative system that is effective against Gram-positive and Gram-negative bacteria, yeast, and mold.

Germaben II-E is approved for use in the Americas and all the components of Germaben II-E are permanently listed by the EU.

Applications

- Can be used in a wide pH-range (3.0-7.5).
- Compatible with most cosmetic ingredients.
- Readily soluble at a level of 1.0% in most water/oil and oil/water emulsions but not in water alone.
- Can be conveniently incorporated into **hot or cold processed** creams and lotions during their manufacture.
- Preferred method of addition is to add it slowly to the cosmetic formulation below 60°C (**140°F**) with good stirring after emulsification and just prior to the addition of fragrance; in fact, some fragrance materials are most effectively incorporated into cosmetics by pre-dissolving them in Germaben II-E and then adding the mixture slowly to the finished formulation.
- Recent data shows Germaben II E can be added at emulsification temperatures, but it is always best to add the preservative at the coolest temperature possible.

Recommended use level: is 0.5-1.0% of total formulation weight.

Directions: Add to formulation at temps of 60°C (**140°F**) or lower.

INCI: Propylene Glycol (and) Diazolidinyl Urea (and) Methylparaben (and) Propylparaben.

PROS & CONS: Germaben II E is best used in formulas that are at least 25% oil, or even in majority oil formulations such as water in oil emulsions. Germaben II E is ideal for anhydrous oil based sugar or salt scrubs, high oil content body butters, etc.

Germaben II E is a paraben based preservative system.

Liquid Germall Plus is a patented combination of Germall II and IPBC pre-dissolved in Propylene Glycol for ease of use. This combination exhibits a synergistic preservative effect, which reduces the total active preservative level necessary; provides for complete, broad spectrum preservation against Gram-positive and Gram-negative bacteria, yeast, and mold. **Germall Plus Liquid can be used in surfactant based systems.**

Liquid Germall Plus is approved for use in the Americas and the components of Liquid Germall Plus are individually listed by the EU: Diazolidinyl Urea at levels up to 0.5% without restrictions; IPBC permanently listed at levels up to 0.02% on a 100% basis without labeling requirements and up to 0.05% with labeling requirements. In the EU, IPBC should not be used in oral hygiene products, lip products, or in aerosolized sprays.

Applications

- Fully compatible with cationic, anionic, or non-ionic surfactants and emulsifiers, as well as proteins.
- Normal use levels of 0.05-0.2% will preserve most systems (0.2% is recommended for systems containing a large amount of protein and/or complex ingredients).
- Safe for both leave-on and rinse-off products.
- Can be used in a wide pH range (3.0-8.0).
- Water soluble up to 1.0%; also soluble in the emulsified portion of a cream, conditioner, or lotion from room to elevated temperatures.
- Add at 50°C (**122°F**) or below during the cool down stage of processing.

Recommended use level: 0.1%-0.5% of total formulation weight.

Directions: Add to formulation at temps of 50°C (**122°F**) or lower.

INCI: Propylene Glycol & Diazolidinyl Urea & Iodopropynyl Butylcarbamate.

Germall Plus, Powder is a white, free-flowing hygroscopic powder, is a unique and cost effective preservative system that provides a high level of antimicrobial activity in a wide variety of cosmetic and personal care formulations. This patented combination of Germall II (Diazolidinyl Urea) and IPBC has a dual mode of action that achieves a synergistic preservative effect. This system is highly effective in inhibiting the growth of Gram-positive and Gram-negative bacteria and troublesome house organisms, plus yeasts and molds, without the need for additional preservatives.

Germall Plus Powder is approved for use in the Americas and the components of Germall Plus are individually listed by the EU: Diazolidinyl Urea at levels up to 0.5% without restrictions; IPBC permanently listed at levels up to 0.02% on a 100% basis without labeling requirements and up to 0.05% with labeling requirements. In the EU, IPBC should not be used in oral hygiene products, lip products, or in aerosolized sprays.

Applications

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- Water soluble up to 1.0%; also soluble in the emulsified portion of a cream, conditioner, or lotion from room to elevated temperatures.
- Add at 50°C (**122°F**) or below during the cool down stage of processing.

Recommended use level: 0.1%-0.5% of total formulation weight.

Directions: Add to WATER PHASE of your formulation at temps of 50°C (**122°F**) or lower.

INCI: Diazolidinyl Urea & Iodopropynyl Butylcarbamate.

LiquaPar Optima is a broad spectrum preservative used in a wide range of cosmetic products such as: creams, lotions, ointments, exfoliants, lipsticks, liquid and cream makeup, eyeliners, mascaras, etc. LiquaPar is perfect for products ranging from salt scrubs to toners to lotions and creams. Not to mention shampoo and liquid soap. LiquaPar Optima is **effective in both aqueous and anhydrous applications.**

LiquaPar Optima as a liquid preservative system, is an optimized blend of Phenoxyethanol, Methylparaben, Isopropylparaben, Isobutylparaben, and Butylparaben. This unique blend of parabens is primarily antifungal, and when combined with Phenoxyethanol, the complete system has broad spectrum antimicrobial activity. These components partition within a formula according to their

water or oil affinity to provide total antimicrobial coverage of the water phase, oil phase, oil soluble components, and emulsion interfaces. LiquaPar Optima is effective against Gram-positive and Gram-negative bacteria, yeast, and mold. It does not contain halo-organic components, formaldehyde, or formaldehyde releasers.

LiquaPar Optima is approved for use worldwide.

Applications

- For use in a broad range of applications; especially effective in emulsions.
- Soluble in commonly used solvents and can be easily incorporated into most formulations; in **aqueous systems**, a co-solvent or surfactant may be needed to help solubilize the preservative.
- Can be used to preserve a wide range of leave-on and rinse-off products.
- Can be used in a pH range of 3.0-7.5.
- Higher levels of LiquaPar Optima may be required in formulations with higher levels of non-ionics and proteins since these compounds are known to interfere with parabens.
- Although Phenoxyethanol is slightly volatile, LiquaPar Optima is stable at temperatures up to 85°C (**185°F**), but it is always best to add preservatives at the coolest possible temperature.
- For cold mixed systems, add LiquaPar Optima early in the process to allow for adequate mixing.

Recommended use level: is 0.5% - 1.0% of total formulation weight.

Directions: Add to formulation at temps of 85°C (**185°F**) or lower.

INCI: Phenoxyethanol (and) Methylparaben (and) Isopropylparaben (and) Isobutylparaben (and) Butylparaben.

PROS & CONS: LiquaPar Optima is oil based and this has to be taken into consideration when formulating. For emulsions you will have not problems. However, LiquaPar Optima will need to be solubilized first for formulas that are mostly water. If using in a room or body spray you will need to solubilize LiquaPar Optima with polysorbate 20 before adding to your room spray solution. Properly solubilized in emulsions or with polysorbate 20 in mostly water based products, LiquaPar Optima remains an effective antimicrobial.

Liquapar Optima is a paraben based preservative system. Liquapar Optiima is one of the most easy to use, robust, and effective preservative systems available to use. Liquapar Optima is very easy to use and very economical.

Optiphen is a unique **paraben-free** and **formaldehyde-free** liquid preservative system which consists of Phenoxyethanol in an emollient base of Caprylyl Glycol. The combination of these ingredients provides optimized protection against microbial growth while imparting exceptional feel to the finished product. Optiphen can be used in both **aqueous and anhydrous** applications.

Optiphen is approved globally.

Applications

- Can be used in a wide variety of personal care products including **aqueous and anhydrous** systems and emulsions.
- Can easily be added directly to the formulation during pre- **or post-emulsification** at or below 60°C (**140°F**) .
- No pH restrictions; it is compatible with most raw materials.

Recommended use level: 0.75-1.5% of total formulation weight.

Directions: Add to formulation at temps of 60°C (**140°F**) or lower.

INCI: Phenoxyethanol (and) Caprylyl Glycol.

PROS & CONS: The levels of Phenoxyethanol will break any Sepigel 305 emulsion. This includes any emulsifier using the **INCI of Polyacrylamide and C13-14 Isoparaffin and Laureth-7**, regardless of the name the reseller gives the product.

Up to 2% of the population will have sensitivity to phenoxyethanol, exhibited by a warm feeling or redness in delicate tissue areas such as the face, eyes, neck, and on the thinner skin of babies and children.

Optiphen is not very water soluble. If using in a room or body spray you will need to solubilize Optiphen with polysorbate 20 before adding to your room spray solution. Properly solubilized in emulsions or with polysorbate 20 in mostly water based products, Optiphen remains an effective anti-microbial.

Optiphen is paraben free however, and a valuable tool in our cosmetic preservative toolboxes. The addition of Caprylyl Glycol in this preservative formula enhances the effectiveness of the Phenoxyethanol.

Optiphen Plus is an ISP patent-pending liquid preservative system featuring an innovative blend of Phenoxyethanol and Sorbic Acid in an emollient base of Caprylyl Glycol. The combination of ingredients in **Optiphen Plus** offers effective broad spectrum protection against Gram-positive and Gram-negative bacteria, yeast, and mold while imparting emolliency to finished formulations. **Optiphen Plus can be used in both aqueous and anhydrous applications.**

Optiphen Plus is approved worldwide.

Applications

- Can be used in a wide variety of personal care products including emulsions, **aqueous and anhydrous systems**, and wet wipes.
- Performs best in formulations below a pH of 6.0, but depending on the formulation, has also proven effective at pH levels above 6.0.
- Can be added directly to the formulation during pre- or post-emulsification at or below 60°C (**140°F**).
- Compatible with most raw materials.

Recommended use level: is 0.75-1.50%. of total formulation weight.

Directions: Add to formulation at temps of 60°C (**140°F**) or lower.

INCI: Phenoxyethanol (and) Caprylyl Glycol (and) Sorbic Acid.

PROS & CONS: The levels of Phenoxyethanol will break any Sepigel 305 emulsion. This includes any emulsifier using the **INCI of Polyacrylamide and C13-14 Isoparaffin and Laureth-7**, regardless of the name the reseller gives the product.

Additionally, the inclusion of Sorbic Acid in this preservative combination will prevent Optiphen Plus being used in any Carbomer based formulation. The acid will change the pH of your Carbomer based product and break the gel matrix.

Last, up to 2% of the population will have sensitivity to phenoxyethanol, exhibited by a warm feeling or redness in delicate tissue areas such as the face, eyes, neck, and on the thinner skin of babies and children.

Optiphen Plus is not very water soluble. If using in a room or body spray you will need to solubilize Optiphen Plus with polysorbate 20 before adding to your room spray solution. Properly solubilized in emulsions or with polysorbate 20 in mostly water based products, Optiphen Plus remains an effective antimicrobial.

Optima Plus is paraben free however, and a valuable tool in our cosmetic preservative toolboxes.

Suttocide A is sold as a 50% aqueous solution of Sodium Hydroxymethylglycinate. The solution is a clear alkaline liquid with a mild characteristic odor. This single preservative is a broad spectrum and cost effective anti-microbial that is active against Gram-positive bacteria, Gram-negative bacteria, and mold.

Suttocide A is approved for use in the Americas and is permanently listed by the EU at levels up to 0.5% active (1.0% as supplied) without restrictions.

Applications

- For use in shampoos and conditioners, when used at 0.4-1.0% as supplied.
- Sold as a pH 10-12 aqueous solution and can be used to neutralize Carbomer to form stable clear gels without losing antimicrobial activity.

- Highly effective when used in combination with other preservatives; in combination with LiquaPar® Oil, is particularly effective for preserving complex formulations.
- Stable and active up to pH 12; can be used in acidic conditions as low as 3.5, giving the formulator very broad pH flexibility, as well as being able to adequately preserve alkaline products, e.g., soap bars.

Recommended use level: 0.1 - 1.0% of total formulation weight.

INCI: Sodium Hydroxymethylglycinate.

Geogard® Ultra is a biocide derived from corn, introduced by Lonza in 2005 to meet the growing demand for alternative cosmetic preservatives. With growing concerns over traditional preservatives such as parabens, Geogard® Ultra provides a solution to companies seeking alternatives to traditional preservatives. Geogard® Ultra's global regulatory acceptance, broad-spectrum activity and multifunctionality means it can be utilized in a wide variety of cosmetic products like **shampoos, lotions and skin creams**. Unlike traditional cosmetic preservatives, Geogard® Ultra can be used in cosmetic products that are marketed in major markets around the world: **Europe, Japan, North America and South America**.

Geogard® Ultra helps prevent product spoilage by utilizing less aggressive: "**Hurdle Technology**." Instead of a harsh, aggressive approach with bacteria and fungi, Geogard® Ultra primarily **functions by creating a more hostile environment within the formulation for microbes to overcome**. Potentiators within Geogard® Ultra help create such hurdles, **increasing the self-preserving environment of your formulations**.

Geogard® Ultra also provides greater utility with its multifunctional action. Geogard® Ultra not only provides effective protection against product spoilage, **but it can also increase the skin moisturizing capacity of the formulation**.

Preservation Application:

- Naturally Derived Product.
- Broad spectrum protection across **pH range of 3.0-6.5**, if pH depression occurs, the formulation can be adjusted with citrate or phosphate buffering systems.
- Geogard Ultra is fully compatible with a wide variety of formulation ingredients as well as most types of **cationic, nonionic, and anionic** systems.
- Geogard Ultra is soluble up to 4% in ambient water and can be dispersed in glycols and alkyl sulphates.
- Improves skin moisture content.
- Generally Recognized as Safe (GRAS) ingredients.
- Exceptional toxicity profile, long history of use, non-sensitizing and non-irritating.

- No Animal testing, non GMO.

Recommended use level: is .75% - 2.0% of total formulation weight, for both rinse off and leave on formulations.

Directions: Add to formulation at temps of up to 75°C (**167°F**) or lower.

INCI: Gluconolactone (and) Sodium Benzoate.

PROS & CONS: I would say the only real draw back to Geoguard Ultra is that it requires a higher rate of usage in product: .75 to 2%, which is quite a bit higher than say Liquid Germall Plus. On the other hand, for home formulators it is much easier to weigh out this powder for small batch formulas than it is the Germall Plus powder, which has a usage of about .1% - .5% max usage. Geoguard Ultra is quite a bit more expensive per oz used in your formula than many of the other preservatives.

The Geoguard Ultra is compatible also with **anionic, cationic and nonionic** ingredients; mixes like a snap in the water phase or even completed, fully stabilized formulas (gels, lotions, creams). Geoguard Ultra also can be added at warmer temps (167 degrees max temp) than Optiphen (140 degree max temp), Germall Plus (122 degrees max), or Germaben II E (140 degree max temps).

Cosmocil CQ is a cationic preservative, originally formulated for contact lens solutions and eye care products. Cosmocil CQ is a gentle, non-irritating preservative that used in the correct type of formulation works very well. It's not a "strong" preservative and is not suited to all formulations. Cosmocil CQ is not robust enough on its own to stand up to long-term products that require hands to be inserted into the product repeatedly. Cosmocil CQ is more suited for closed delivery system products, such as disk top, dispenser top, or pump top. Since Cosmocil CQ is cationic, you will not have any formulating issues using it with cationic emulsifying conditioners such as BTMS, OCS (One Step Conditioner), or CR (Crème Rinse Concentrate). Cosmocil CQ's effectiveness is complimented by the natural tendency of these quaternary conditioners to inhibit mold and bacteria growth.

PROS & CON: Cosmocil CQ is cationic, making it have a more limited scope of compatibility. You will need to make sure that the ingredients you are formulating with can work with Cosmocil CQ. Most surfactant systems are anionic and can not be used with cationic ingredients. Cosmocil CQ is are more costly preservative option.

Cosmocil CQ is paraben free and is also not a formaldehyde donor.

Cosmocil CQ is a good choice preservative choice for watery products such as room or body sprays. Cosmocil CQ is very active against bacteria, but not as effective against yeast and mold spores. You can include the addition of about 0.1 – 0.2% potassium sorbate to your formula to reinforce your product against the yeast and mold in watery products when using Cosmocil CQ.

Tinosan SDC, also known as Citric Acid & Silver Citrate, is a new anti-microbial based on a stabilized silver complex produced by a unique electrochemical process with silver and citric acid. Tinosan SDC provides a broad spectrum anti-microbial activity and is effective against unwanted skin bacteria and pathogenic micro organisms. It's fast-killing activity makes Tinosan SDC an effective anti-microbial for home & personal care products.

Tinosan SDC shows good compatibility in most formulations at pH <7 with anionic and non-ionic surfactants, emulsifiers and with amphoteric surfactants. Tinosan SDC is compatible with many other anti-microbial actives including Irgasan® DP 300 and most preservatives. Combination of Tinosan SDC with cationic ingredients and incorporation in formulations with pH above 7 should be avoided. Exposure of Tinosan SDC or Tinosan SDC -containing formulations to light should be avoided and the product preferably be stored in containers that provide protection against light. Final formulations should be tested on light stability in case they are sold in transparent packaging.

Tinosan SDC is anionic and is not compatible with cationic ingredients such as BTMS, OCS (One Step Conditioner), or CR (Crème Rinse).

Tinosan SDC is highly water soluble and easy to incorporate into the aqueous phase of gels, surfactants and emulsions made by a cold process. In the manufacturing of emulsions produced by hot processes, the anti-microbial active should preferably be added to the final formulation after the emulsion has cooled down. For formulations sensitive to acids, Tinosan SDC can be pre-neutralized prior to addition to the product. Exposure of Tinosan SDC to pH's higher than 7 and temperatures above 50°C should be avoided in order to achieve optimal formulation stability. High salt concentrations can reduce the bactericidal activity whereas anionic surfactants in a concentration of 0.03% to 1% increase the biocidal efficacy of Tinosan SDC .

Usage Guidelines:

Skin Care products 0.1% - 0.3%
Home Care products 0.1% - 0.5%

INCI: Citric acid (and) silver citrate.

Recap on Preservatives

Ok, as you can see you have a lot of choices, and we only touched on some of the more commonplace and up and coming *new* preservatives.

The choices are fantastic. There is something to suit every formulation you might need, regardless of whether you need paraben free, glycol free, are making carbomer gels, using the Sepigel 305 gel matrix system, or working with surfactants.

Keep in mind, there is never a single preservative that can properly preserve *EVERYTHING* you might make. Keep a notebook that helps you understand and decide on which is the correct preservative to handle each formulating job you do. Eventually you will just automatically know.

Last thing. Preservatives also have shelf lives! Throw away anything on your formulating shelf if it has sat there for 2 years. Seriously. When I stock preservatives from the manufacturer I demand as close to the date of manufacture as possible.

This is because there is generally a 2 - 3 year span for the preservatives. I want that shelf life to be on YOUR shelf, not already spent up sitting in the manufacturers warehouse.

Be sure to ask your supplier what the Certificate of Analysis retest date is for the batch of preservative your purchase is stocking from. You need to know this. If they have a retest date of Sept 2008, than that means the manufacturer will only guarantee another month of effectiveness in the bottle before used in a formula. Now, usually there is at least another year if the supplier has stored in a climate controlled environment, but you are not privy to those sort of details.

So two things - try to source your preservatives from suppliers that are turning it over fast enough to keep your shelf life as long as possible, and only purchase what you know you can use in a 6 month to 12 month period of time.

I know it sounds ironic, but preservatives can expire when they get too old.