

Epoch-making Optiphen GP preservative solution is mild to skin, strong against contamination, but easy to use. In recent years the preservative, an essential additive in personal care products, has been widely discussed by the personal care industry due to consumers' increasing focus on the safety of cosmetic products.

The invention of preservatives has undoubtedly been a great impetus for the industrialisation of the cosmetics industry. As the name 'preservative' indicates, the function of this category of ingredients is to protect products against spoilage caused by the growth of microorganisms, so as to offer safe products to the consumers. Yet today's formulators are facing constant challenges:

1. The global trend towards using more natural or naturally-derived components adds nutrient-rich ingredients into cosmetic formulations, imposing higher requirements on antimicrobial technologies.

2. Preservatives boosters, like polyol-based molecules, are not effective at low levels. Higher dosages can improve performance, but may result in subjective irritation problems and/or formulation instability.

3. Some traditional preservatives, though highly effective, face the pressure from public opinion. The era when one preservative applies to almost all products will never repeat itself.

4. Organic acid-based preservatives have reduced applicability due to pH limitations and some can cause discoloration of end products. As such, they can hardly replace traditional preservative technologies.

The personal care industry is being pushed by increasing demands from consumers searching for milder, safer and more eco-friendly preservative technologies.

Addressing these market needs, Ashland has developed an epoch-making preservative solution – Optiphen GP, which substantially revolutionises the antimicrobial technology market as it provides an excellent skin compatibility, wide applicability and broad spectrum antimicrobial performance.



TOUGH ON MICROBES & KIND TO SKIN

Personal care manufacturers face demand for products made using milder, safer and more eco-friendly preservative technologies. **Karen Winkowski** and **Andrea Wingefeld** present an effective and mild new solution

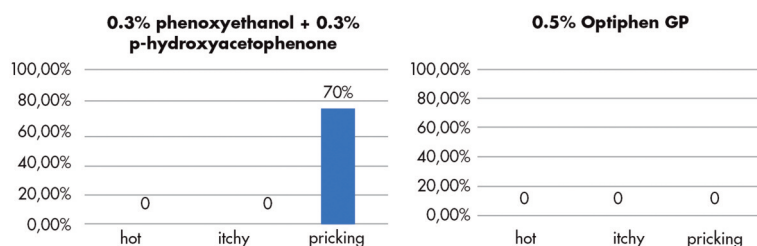
The popularity of natural and naturally-derived cosmetic ingredients means finished products are more nutrient rich than in the past and in need of more effective yet also mild preservation

Each preservative active has its unique properties. For example, phenoxyethanol provides a good antimicrobial effect on bacteria but relatively weaker inhibition against mould and yeasts; and vice versa for parabens. The broad spectrum antimicrobial performance of a preservative is determined by a balanced inhibitory effect on bacteria, mould and yeast. Optiphen GP preservative, designed with Ashland's unique propylene carbonate-based delivery technology, features broad antimicrobial spectra at usually low dosages. This innovative solution combines low levels of phenoxyethanol with o-cymen-5-ol and additional boosters like propanediol and caprylhydroxamic acid. Optiphen GP preservative therefore provides full protection against bacteria, mould and yeast for formulas within the wide pH range of 4-8. In addition, its good water solubility (soluble in water at a concentration of 0.7% or less), low odour and colourless properties make it applicable for and compatible with a wide range of product formulas.

Launch trends provided by Mintel data research clearly indicate a strong trend towards alcohol-based preservation, like benzyl alcohol or phenoxyethanol. Phenoxyethanol is number one

Figure 1

Sensory evaluation result of Optiphen GP





Studies clearly underline that Optiphen GP preservative offers no skin irritation and is suitable for applications like facial masks

Sensory evaluation

Volunteers: ten healthy volunteers, aged 20-40 (Shanghai residents).

Method:

mask preparation: after folding the mask base cloth into the mask bag, fill it with 15g mask liquid essence/half piece, and gently press it after sealing to ensure full infiltration;
in vitro experiment: comparatively test the sensory stimulation of the two preservative systems infiltrated in the mask;
 sensory evaluation: double-blind half-face randomised controlled test.

Result: 70% of the ten volunteers rated the '0.3% phenoxyethanol + 0.3% p-hydroxyacetophenone' as pricking, but there was no subjective irritation for the 0.5% Optiphen GP (figure 1).

These studies clearly underline that Optiphen GP preservative offers no skin irritation in the population tested, has excellent compatibility and is suitable for applications like facial masks.

Optiphen GP offers a broad antimicrobial spectrum. Minimum Inhibitory Concentration (MIC) assays demonstrate the efficacy of the Optiphen GP preservative against gram-negative and gram-positive bacteria, yeast and fungi, providing a well-balanced profile. The MIC was determined *in vitro* as the lowest concentration of Optiphen GP that inhibited visible growth of the microorganism tested.

The efficacy of Optiphen GP was demonstrated through challenge testing of the different products including a Moisturizing Facial Mask (formula 1), an Anti-aging Gel (formula 2) and an Essence Lotion (formula 3). The products were inoculated with a double inoculation protocol. The microbial inoculum

globally, as well as in Asia and China. Caprylhydroxamic acid and o-cymen-5-ol are also very much accepted and their use in personal care products show significant growth rates. They are focused ingredients for Asia and China.

Wellbeing is one of the global trends and this includes skin safety: an important need for cosmetic products.

During the development of Optiphen GP preservative, skin mildness and applicability in facial masks were major goals. To prove the skin behavior of Optiphen GP preservative, the following studies were performed:

Dermal sensitisation testing

Method: human repeated insult patch test (HRIPT) on 205 volunteer panelists. A patch of ¾ inch x ¾ inch (approximately 2cm) is applied to the upper back of test subjects; 0.2ml of each sample in 10% concentration is added to the patch

Carrier: water

Evaluation criteria: clinical evaluation scoring
Result: the test substance did not demonstrate a potential for eliciting dermal irritation or inducing sensitisation.

Formula 1: Moisturizing Facial Mask

Phase A

Water	Water	qs 100	Local
Natrosol HEC	Hydroxyethylcellulose	0.25	Ashland

Phase B

Disodium EDTA	Disodium EDTA	0.05	Local
Lubrajel Oil Hydrogel	Glycerin, glyceryl acrylate/acrylic acid copolymer, propylene glycol, PVM/MA copolymer	8.0	Ashland
1,3-Butylene Glycol	Butylene glycol	2.0	Local
Sodium Hyaluronate	Sodium hyaluronate	0.03	Freda

Phase C

Gp4G SP	Water, Artemia extract	1.0	Ashland
Aqua-Osmoline	Water, glycerin, Ceratonia siliqua (carob) seed	1.0	Ashland
Optiphen GP preservative	Phenoxyethanol, propanediol, propylene carbonate, caprylhydroxamic acid, o-cymen-5-ol	0.5	Ashland

consisted of a bacterial composite containing: *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli* and *Burkholderia cepacia*, and a yeast or a mould composite containing *Aspergillus brasiliensis* and *Candida albicans*.

The products were inoculated at the onset of testing (0 hours) and sampled at two, seven, 14 and 21 days. At 21 days, the formulations were re-inoculated, and sampled at 28 and 35 days. The final inoculum concentration in each sample was 10⁵-10⁶cfu/ml.

MOISTURIZING FACIAL MASK

Optiphen GP at 0.4% by wt. effectively inhibited bacterial growth within 72 hours and inhibited the yeast and mould within 14 days.

Increasing the concentration of Optiphen GP to 0.5% reduced the recovery of yeast and mould within 72 hours by two orders of magnitude.

When compared with the performance of a combination of 0.3% phenoxyethanol + 0.3% p-hydroxyacetophenone, Optiphen GP was more effective in inhibiting the mould inoculum within 72 hours.

ANTI-AGING EYE GEL

The addition of 0.8% Optiphen GP inhibited

Optiphen GP has good water solubility properties, is effective over a broad pH range and has low odour

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the growth of mould and yeast within seven days. No microbial growth was detected by day 14. No microorganisms were recovered after re-inoculation on day 28. The control, however, was susceptible to microbial growth.

ESSENCE LOTION

The performance of Optiphen GP when compared with that of a blend of phenoxyethanol : ethylhexylglycerin (9:1) at same levels (0.7%) shows a faster kill rate versus fungi. While fungi is being recovered by day seven and day 35 (after second inoculation) in the blend containing phenoxyethanol : ethylhexylglycerin (9:1), no fungal recoveries were detected with the Optiphen GP.

In summary, Optiphen GP offers excellent efficacy and compatibility in a wide range of personal care applications such as facial masks, fragrance-free products, colourless gels and mother and baby products. Moreover, it allows for a better user experience as no subjective skin irritation is detected when tested in facial masks. Optiphen GP has good water solubility properties, is effective over a broad pH range, has low odour and does not contribute to colour development in end products. All of these attributes make the Optiphen GP preservative a preferred choice for personal care formulators ●

Formula 2: Anti-aging Eye Gel

Phase A

Water	Water	qs 100	Local
Natrosol Plus 330 CS	Cetyl hydroxyethylcellulose	0.2	Ashland
NaOH (10%aq solution)	Sodium hydroxide	0.15	Local
UltraThix P-100 Polymer	Acrylic acid/VP crosspolymer	0.8	Ashland
EDTA-2Na	Disodium EDTA	0.05	Local

Phase B

Lipex Shea	<i>Butyrospermum parkii</i> (shea butter)	1.1	AAK
GTCC	Caprylic/capric triglyceride	3.5	Local

Phase C

Lubrajel CG Hydrogel	Glycerin, glyceryl acrylate/acrylic acid copolymer, propylene glycol	5.0	Ashland
KF-96A-6CS	Dimethicone	4.0	Shin Etsu

Phase D

Water	Water	3.0	Local
NaOH (10%aq solution)	Sodium hydroxide	1.3	Adjust

Phase E

Ederline L Biofunctional	Hexyldecanol, <i>Pyrus malus</i> (apple) seed extract	3.0	Ashland
Gp4G Biofunctional	Water, <i>Artemia</i> extract	2.0	Ashland
Collaxyl Biofunctional	Water, butylene glycol, hexapeptide-9	1.5	Ashland
Optiphen GP preservative	Phenoxyethanol, propanediol, propylene carbonate, caprylhydroxamic acid, o-cymen-5-ol	0.8	Ashland

Formula 3: Essence Lotion

Phase A

Water	Aqua	qs 100
Glycerin	Glycerin	6.0
1,3-butanediol	Butanediol	1.0
EDTA-2Na	EDTA-2Na	0.05
Stabileze QM	PVM/MA decadiene	0.3

Phase B

Ceraphyl 230	Diisopropyl adipate	2.0
Ceraphyl 375	Isostearyl neopentanoate	4.0
BRIJ 72	Steareth-2	2.55
BRIJ 721P	Steareth-21	1.65
Tegosoft DEC	Diethylhexyl carbonate	4.0
DC 200	Polydimethylsiloxane	2.0

Phase C

AMP (sol à 50%)	Aminomethyl propanol	0.33
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Phase D

	Preservative	
Stratixy	Aqua, glycerine, hydrolyzed	1.0
Prolixir ICE	Aqua, butanediol, <i>Oriza sativa</i> extract	1.0

who is the safety belt
for your cosmetics?

—
we are.



Safe and effective preservation combined with skin mildness is an important aspect for all water-based formulations, especially for high water containing ones such as face masks, essences and serums. Ashland's new Optiphen™ GP preservative designed to meet this market need has been tested on delicate Asian skin, which tend to be more sensitive. Optiphen™ GP colorless and odorless liquid preservative is easy to handle, and offers broad spectrum protection across a wide pH range.

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