

How to Use Preservatives in Cosmetics

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Especially as a cream in jars, cosmetic products come in frequent contact with the non-sterile human skin, thereby becoming easily contaminated by microbes. Containing water, oils, peptides, and carbohydrates cosmetics are a very good medium for growth of microbes. All these factors contribute to the fact that cosmetic products need very good preservation to prevent microbial growth and spoiling of the cosmetic product and also infection of the skin. Generally, shampoos and other rinse-off products need less preservatives than leave-on products as creams and decorative cosmetics. Mostly one or more of the paraben type of preservatives are used which are very effective and the safest.

The ability of microorganisms to grow and reproduce in cosmetic products has been known for many years. Microbes may cause spoilage or chemical changes in cosmetic products and also injury to the user. Methods routinely used by the cosmetic industry for the isolation of microbes from cosmetic products include direct colony counts and enrichment culturing. The aim is to identify all kinds of microbes including bacteriae and fungi (molds and yeasts).

Commercial cosmetics are not expected to be completely sterile; however, they must be free of high-virulence microbes and the total number of aerobic microbes per gram must be low. For eye-area products counts should be <500 CFU/g (CFU= bacteria colony forming units); for non-eye-area products counts should be <1000 CFU/g.

What Makes a Good Preservative?

To overcome the broad spectrum of microbes, and at the same time, not to be harmful to the skin and deleterious to other ingredients in a cosmetic product, it is critical to use the right preservative. The optimal preservative should have the following attributes:

- Broad spectrum activity (bacteriae & fungi)
- Be effective over the anticipated shelf life
- Be preferably liquid and water soluble
- Be effective over a wide pH range
- Not be deactivated by other ingredients
- Be odorless, colourless, and safe

The following table gives an overview of the most used synthetic preservatives in the cosmetic industry. They all have been tested for efficacy and safety. By far the most used preservatives are the parabens (in about 80%).

Preferred Synthetic Preservatives

- Parabens:
Methyl-, Ethyl-, Propyl-, Butylparaben
- Urea-Derivatives:
Imidazolidinyl Urea, Diazolidinyl Urea
- Isothiazolones:
Methylchloro-, Methyl-Isothiazolinone
- Halogen-Organic Actives:
Iodopropynyl Butylcarbamate, Methyl-dibromo Glutaronitrile
- Organic Acids & Others:
Sodium Benzoate, Chloracetamide, EDTA, Phenoxyethanol, Triclosan, DMDM-Hydantoin, Quaternium-15

Are There Natural Preservatives?

There are indeed some natural agents showing antimicrobial activity. As compared to synthetic preservatives, however, the activity is generally lower and directed to a less broad spectrum of microbes. The preservative effect of most natural agents is primarily based on their antioxidant activity preventing oils and fats to become rancid.

Natural Preservatives

- Extracts (Grapefruit Seed, Rosemary)
- Essential Oils (Tea Tree, Neem Seed, Thyme)
- Vitamins (Vitamin E, Vitamin C)

Appropriate Use of Preservatives

Every cosmetic formulation requires a tailor-made preservative system to meet its specific needs. Several factors influence the choice and dosage of a preservative:

- Working conditions (clean environment and equipment reduces amount of preservatives)
- Type of product (leave-on and eye-area products require more preservatives)
- Type of formula (some preservatives work less effectively in complex emulsions)
- Combinations (by combining preservatives the amount of each agent can be reduced)
- Length of shelf life (the longer the desired shelf life the more preservatives are needed)

Based on these factors there is no standard preservative system that can be utilized for all kinds of cosmetic products. Nevertheless the following table gives some clues on how the shelf life of a cream can be prolonged:

Approximate Shelf Life of a Cream

- **No Preservative: A few days**
- Grapefruit Seed Extr. (1%): A few weeks
- Methylparaben (1%): A few months
- Propyl-, Methylparaben, Diazolidinyl Urea (total 1%) & Grapefruit Seed Extr. (1%): Several months to more than a year

Note: these shelf lives can vary significantly dependent upon type of cream and storage conditions!

Measures to Reduce Preservatives

Although preservative-related side-effects as skin irritations and allergies occur very rarely, use of preservatives should not be excessive (do not use them at higher concentrations than allowed by the FDA or other authorities). There are additional possibilities to avoid premature spoilage of homemade cosmetics:

- Disinfect the working utensils and containers with isopropyl alcohol or by putting them in boiling water for 20 minutes.
- Use sterilized (boiled for 20 minutes) and distilled water for your products
- Make your products in small batches only and not in family sizes that last forever
- Do not dip your fingers into your products (particularly creams). Use a spatula or spoon
- Store your products in the refrigerator and label the product with the date of production. Keep products out of the sunlight and sunheat.

Loss of Effect of Preservatives

Besides a gray-green layer of mold on the surface of a product, there are several other factors indicating that a cosmetic product is severely contaminated with microbes:

- Loss of viscosity (product becomes thinner)
- Emulsion break (separation of water and oil)
- Cloudiness of previously clear products
- Loss or change of color or malodorousness
- Drop in pH (product becomes more acid)

In conclusion, it is strongly recommended to preserve your homemade products! Do not be afraid of using synthetic preservatives. They are truly effective and safe. But do not forget to work clean! If your product has spoiled though, throw it away. Adding preservatives will not make it usable again.