A Lifetime of Preservation

Authors: Daniel Whitby, Cornelius Group plc, Bishops Stortford, Hertfordshire, United Kingdom
Christina Bachmann-Roth, Lonza Ltd, Basel, Switzerland

Abstract

Preserving personal care products adequately is one of the toughest challenges facing today's formulation scientists. Preservation must be efficacious not only during manufacture and packing but also throughout the product's lifetime. This article gives an overview of the consequences of inadequate preservation for both the product and the end consumer. Ingredients which can boost preservation, new approaches such as 'Hurdle Technology' and the use of natural oils to preserve products are also covered. The risks of preservative free products are explored and also the difficulty of preserving organic and natural formulations. The article concludes with a recommendation for formulators to work with their preservative suppliers to ensure products are properly preserved and, above all, safe.

Introduction

From a personal care perspective preservation is the protection of products and raw materials from the effects of bacterial and fungal growth. While this sounds simple enough in practice, selecting the right preservative system can be one of the toughest challenges facing a formulator. It is not sufficient to merely ensure the finished product is sterile or contains an acceptable level of organisms. Further steps must be taken to minimise contamination and spoilage of the product during storage and use [1]. Spoilage due to inadequate preservation can include loss of viscosity, breakdown of emulsions, colour change, malodour, the production of harmful toxins and potentially skin irritation and disorders. The importance of preservation after the product is placed into the market place is emphasised by the recommendation of setting a date of durability, or period after opening (POA). According to Article 6(1) (c) of the Cosmetic Directive (76/768/EEC), the period of time after opening shall be indicated for all the products which are not single-use products or that cannot lead in case of deterioration to damages to the human health according to article 2 of the same directive. The expiry date of a product is obviously influenced by the preservatives used in the formulation [2]. To give an idea of the potential scale of contamination, a study by Baird [3] investigated 232 products intended for use on babies and found that 53 of these were contaminated (23%). The study included products which had not been used, products used in the domestic environment, and products used at a maternity ward in a hospital; contamination was found in all three groups. *Staphylococcus* spp. and *Pseudomonas* spp. were among the isolated bacteria.

A preservative is defined as a substance used to protect food, wood etc against decay, discolouration or spoilage [4]. Although there are many hundreds of chemicals which meet this definition the cosmetic scientist is restricted by legislation to a limited number of chemistries, and further still by the level at which these chemistries are allowed to be included in a product. In a perfect world, we would incorporate a single preservative which possessed broad spectrum activity, efficacy at low concentrations, excellent water solubility, compatibility with all other cosmetic ingredients, no significant odour or colour, pH tolerance, global approval and heat stability. Of course being perfectly safe, easy to handle and cheap would also be welcome attributes. Unfortunately, at the present time, this material simply does not exist.

Skin Interaction

Skin itself provides a virulent medium upon which microorganisms can grow so has adapted various defence mechanisms to prevent or inhibit microbial invasion and growth [5]. As always, certain microorganisms have developed ways of circumventing these mechanisms, and whilst generally innocuous, these can prove dangerous if a person's skin is damaged or the immune system compromised. For example, *propionbacterium acnes* is a common, usually innocuous, resident of the skin but can, in some cases, contribute to the development of acne [6]. It is also important than any product applied to the skin poses no threat to the natural system but supports the natural defence mechanisms already in place.