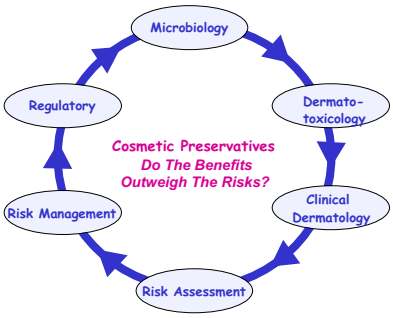
Nordic Round Table on Contact Dermatitis Aspects of Cosmetic Preservatives – Do the Benefits Outweigh the Risks?

Introduction

On March 25th 2002 the first Nordic Round Table discussion took place in Gothenburg, Sweden. The topic of this meeting was contact dermatitis aspects of cosmetic preservatives. This forum provided the opportunity for a great number of specific contributions by clinical dermatologists, scientists and those engaged in the field of occupational dermatology to address the benefits and risks of the use of preservatives in cosmetic products.



Recognized experts reported on their experiences including those related to: microbiology of preservation; dermatotoxicology; diagnosis, epidemiology and pathogenesis of contact dermatitis, risk assessment for safe use of preservatives in cosmetic products, risk management considerations and regulatory aspects of cosmetics products preservation.

Overview

The use of preservatives in cosmetic products serves a two-fold function:

- To prevent the proliferation of micro-organisms leading to deterioration of a product and "spoiling" it. Bacteria, yeast or fungi, all of which have different and very versatile metabolic activities, can cause microbial contamination. This means that almost any ingredient in a product is susceptible to degradation from a suitable micro-organism. The risk for micro-organism proliferation is higher in water-based products.
- To prevent pathogenic micro-organisms posing a potential health risk to the user during their repeated use, often by many persons, over extended periods of time. Although exposure to micro-organisms is a normal part of everyday life and we live in equilibrium with a wide range of micro-organisms that are ever present in our everyday environment such as in the home, confirmed reports do exist in the literature of contaminated cosmetic products resulting in infections. Pathogenic micro-organisms found in cosmetic products have, in the past, included *Staphylococcus aureus*, *Pseudomonas* species and on rare occasions *Clostridium tetani*.

It is now generally recognised that the incorporation of a preservative system within a product is necessary and should be a primary consideration rather than an after-thought. In each case, in deciding which preservation system to use, it is necessary to take into consideration the benefit to be gained and to balance this against not only the risks of inadequate preservation but also the possibility of adverse reactions resulting from the preservatives used.

The Round Table of experts agreed that the primary challenge is to achieve a balance between choice of the right preservative system and concentration level that protects the product from spoilage and the consumer from exposure to potentially pathogenic micro-organisms but does not cause adverse effects – such as contact allergy – among the consumers.

This review summarises, in abstract form, the discussions and conclusions made by the panel of experts. In order to arrive at the conclusions, it was necessary to revisit some areas that have been discussed previously within

Professor Jan E Wahlberg, Moderator of the Round Table meeting.

the Dermatology community. For these topics, an exhaustive discussion was not necessary. Some of the topics however, represented more recent developments and as such necessitated more extensive discussion to ensure a comprehensive understanding of their role in the field of Dermatology. Some abstracts are therefore presented in greater depth. This review should serve both as a source of general information and further understanding of this important topic.

The roundtable discussion was moderated by Professor emeritus Jan Wahlberg and the presenters included Petr Adamek, Ulf Rönner, Anders Boman, Magnus Bruze, Birgitta Gruvberger, Matti Hannuksela, Charlotte Devantier Jensen, Klaus Ejner Andersen, Chris Anderson, Pauline McNamee, Eeva-Liisa Sainio, Kristiina Alanko, Taina Paarmas and Olof Holmer. Participants in addition to the presenters were Tuula Estlander, Riitta Jolanki both from Helsinki, Finland and Anna Hannuksela-Svahn from Oslo, Norway.

This Round Table discussion was organised by The Swedish Cosmetic, Toiletry and Detergent Association, KTF.

Conclusions

The participants of the first Nordic Round Table discussion agreed upon the following conclusions:

- Preservatives are necessary in cosmetic and toiletry products unless product design and/or packaging negate the need for their use.
- The safety of cosmetics and toiletries should be assured in terms of risk rather than hazard at the population level.
- The interests of the individual should be protected by the use of accurate product ingredient labelling.
- The respective competencies of producers, regulators, healthcare and basic researchers should work in unison to ensure appropriate use of preservatives.
- There is a need for continuous development of tools, risk assessments, monitoring and consumer education concerning the appropriate use of preservatives in cosmetics and toiletry products.

Finally, the participants of this first Nordic Contact Dermatitis Round Table discussion all agreed upon the importance of informal discussions of this type that provide a forum for open exchange of information and opinions on challenging and interesting topics in the field of Dermatology.

Professor emeritus Jan E. Wahlberg, Moderator, Stockholm, Sweden

Microbiological Aspects

The Hurdle technology

Petr Adamek and Ulf Rönner, The Swedish Institute for Food and Biotechnology (SIK), Gothenburg, Sweden

In shared use cosmetic products, micro-organisms found on human hands (*Staphylococcus. aureus*, *Staphylococcus epidermidis*, *Corynebacter* species, yeasts) are the initial contaminants. However when these products absorb moisture, *Pseudomonas* species predominate and are responsible for product spoilage. One common scenario in spoilage of cosmetics is that yeast contamination occurs first and creates condition of water availability leading to secondary contamination by various cocci followed by *Pseudomonas* species.

In the formulation of products, it is important to control intrinsic factors, mainly water activity. Lowering of water activity is achieved by adding glycerol, polyethylene glycols or sucrose. In cosmetic creams, polyacrylamide hydrogel is also used. Another intrinsic factor is lowering of pH, which is commonly performed for food products. The pH of cosmetics, however, should stay around neutral, which is beneficial to the growth of micro-organisms.

The most commonly used preservative is parabens, followed by imidazolidinyl urea, isothiazolinones, quaternium-15, formaldehyde and phenoxyethanol. It can be an advantage to add several anti-microbial substances in small doses in order to obtain a wider combined anti-microbial spectrum. Such an anti-microbial system can also result in synergistic effects. This

is an example of using the Hurdle technology, a commonly used concept in the food industry.

Discussion

- A trend today within the food industry is to replace the "old" preservatives with naturally occurring ingredients that possess anti-microbial properties. This is also consumer-driven. This trend is likely to spread also to cosmetic products. Essential oils from plants, fatty acids (their esters and monoglycerides), bacteriocins (nisin, pediocin, lactoperoxidase, etc.) are examples of this new trend. A lot of research activities are currently focused on these types of materials.
- The risk of micro-organisms developing resistance towards the new compounds has to be evaluated before legislation provides clearance for widespread use.
- An understanding of the mechanisms of microbial control will be beneficial in further developing preservative systems for the future.

Dermatotoxicology Aspects

What are the validity, reliability and relevance of results obtained with predictive tests and use tests on products containing preservatives?

Anders Boman, Dermatoxicologist, Department of Occupational and Environmental Dermatology, Occupational and Environmental Medicine, Stockholm County Council, Stockholm, Sweden

The purpose of predictive and use tests is to estimate the sensitisation potential and/or elicitation capacity of chemicals. When it is necessary to test products, the Buehler test and Local Lymph Node Assay (LLNA) are the methods of choice. Predictive tests in humans are not performed in these geographies for ethical reasons (although results from such studies are considered in risk assessment if available).

Assessment of elicitation is preferably performed as a use test and must be performed on patients with known allergies. Elicitation studies using presensitised animals can also be used to collect data for risk assessment. The reliability of the tests is considered to be high. The animal tests detect allergens known to be human allergens and the grading of allergenicity in animal tests is well correlated to allergenicity in man.

Discussion

- Although animal tests can detect clinically relevant allergens, there is not a good correlation between results obtained in animal tests and the clinical importance of an allergen. This is often controversial because there are major differences in exposure patterns between the standardized predictive tests and the real life situation. Exposure varies considerably with use of products and is more often spread over a wider time frame than the test can allow for, thus potentially leading to an underestimation of the sensitising capacity of ingredients in many products.

Clinical Dermatology Aspects

What is the relevance of positive patch test reactions to preservatives?

Magnus Bruze and Birgitta Gruvberger, Department of Occupational and Environmental Dermatology, Malmö University Hospital, Malmö, Sweden

Arrival at a diagnosis of allergic contact dermatitis from a preservative requires a 3-step procedure:

1. Contact allergy has to be established by patch testing.
2. There has to be an exposure to the preservative or possibly a cross-reacting substance.
3. The exposure must be known or shown to provide a sufficient number of molecules of the preservative to the viable epidermis to explain the dermatitis under investigation with regard to type of dermatitis, localisation and course.

Contact allergy incidence rates to pre-

Chris Anderson (Linköping, Sweden), Tuula Estlander (Helsinki, Finland), Anders Boman (Stockholm, Sweden), Kristiina Alanko (Helsinki, Finland) and in front Olof Holmer (KTF, Stockholm, Sweden) in a panel discussion on clinical dermatology aspects.

servatives may not be comparable between dermatological centres as there may be differences in patient materials and test methodologies.

The contact allergy incidence rate is dependant on the true presence of contact allergy to the preservative in those tested as well as the test preparation that is used to trace the allergy. For example, a certain preservatives irritant properties and the risk of active sensitisation at patch testing may limit the concentration that can be used for routine patch testing.

Diagnosis and prevention of allergic contact dermatitis from preservatives in cosmetic products requires accurate product ingredient labelling. Chemical analysis for the presence of 9 different preservatives in 100 moisturisers and 100 shampoos on the Swedish market demonstrated a significant number of cases of incorrect labelling of the preservatives on the product packs. For example, preservatives labelled as being present in the moisturisers or shampoos were not detected, while preservatives not declared were detected.

Discussion

- Chemical analyses have demonstrated a high number of cases of incorrect labelling of preservatives on products even though European legislation requires that cosmetics and toiletries are labelled with preservatives present in the product
- Information from experimental, controlled provocation studies with cosmetics and toiletries containing preservatives are missing for most preservatives.

Matti Hannuksela, Lappeenranta, Finland and Anna Hannuksela-Svahn, Oslo, Norway.

Disappearance of patch test positivity

Matti Hannuksela Department of Dermatology, South Karelia Central Hospital, Lappeenranta, Finland

The reproducibility of patch test reactions depends on the reactivity of the patient's skin, the quality of the test substance and the test method. In a recent study from Denmark, persistence of contact allergy was investigated by patch testing a random sample of 365 adults with the TRUE Test ™ (ALK-Abelló) in 1990 and again in 1998.

In 1998, nickel was positive in 19 out of 24 people (79%) who had previously reacted in 1990. Reactivity to cosmetic ingredients persisted in only 5 out of 10 people. Balsam of Peru, fragrance mix, paraben mix, Kathon® CG, Quaternium-15 and wool alcohol were tested on both occasions. The authors did not state which reactions were lost during the 8 years. In a review article by Lee & Maibach (1) the loss of nickel allergy in eczema patients was only 4–13% in 3–6 years, that of cobalt allergy 42% in 5 years, and that of colophony allergy 19% in 9–13 years.

Eleven leg ulcer patients with positive patch test reactions to 20% cetylstearyl alcohol were retested 2–4 years later with 20% cetylstearyl alcohol, 30% stearyl alcohol and with 5% cetyl alcohol in a study by von der Werth et al. (2). Only 2 patients reacted to any of the 3 test substances and the repeated open application tests were negative in both.

Carmichael & Foulds (3) retested 37 patients with relevant positive patch test reactions to lanolin within the previous 5 years. Only 41% of them showed a positive result. The strength of the original response showed no correlation with the result of the second test. Patch test reactions to parabens and Kathon®CG are even more interesting. In simultaneous testing, Kathon®CG gave discordant reactions in nearly 50% and parabens in over 50% of the patients.

Paraben patch test substances from two manufacturers caused discordant reactions in 10 patients and concordant results in only 2 patients in a study by Wolf & Brenner (4).

Discussion

- Why does a patient with positive patch test reaction either to paraben mixture or to cetylstearyl alcohol show no reaction in re-testing 2 years or more after the original testing – a question still to be answered.
- Such "paradoxes" might well be much more common than is realised today.

1. Lee EE, Maibach HI. Is contact allergy in man lifelong? An overview of patch test follow-ups. Contact Dermatitis 2001; 44: 137–139.
2. von der Werth JM, English JS, Dalziel KL. Loss of patch test positivity to

cetylstearyl alcohol. Contact Dermatitis 1998; 38: 109–110.
3. Carmichael AJ, Foulds IS. Loss of lanolin patch test positivity. Br J Dermatol 1991; 126: 573–576.
4. Wolf R, Brenner S, Another "paraben paradox": Int J Dermatol 1995; 34: 21–22.

The Odense experience

Charlotte Devantier Jensen and Klaus Ejner Andersen, Dept. of Dermatology, Odense University Hospital, University of Southern Denmark

The standard series patch test results for selected preservatives from the period 1995–2001 in our department were presented. Of particular interest are the results for methyldibromoglutaronitrile (MDBGN).

In Europe the average frequency of sensitivity to the preservative MDBGN seems to be increasing. In Odense we recorded in 2000 a high frequency of MDBGN-sensitive patients (8.9% (n=482)) which constitutes a dramatic increase.

The test concentration has been identical in the last 4 years and the test procedure has not been altered. It was speculated that the high level of sensitisation might be linked to a particular industry with an occupational use of an MDBGN-preserved product. Examination of the records of positive patients registered in 2000 and 2001, however, did not reveal any connection between occupation and MDBGN sensitivity.

Klaus Ejner Andersen discussing his "Odense Experience"

For all patients but one where the preservative allergy was concluded to be of possible relevance to their skin disease, toiletries and cleaning agents were found to be the causative products. In one case, water-based paint was the likely source of the allergic reaction.

Discussion

It is striking that Odense has an unusually high frequency. After careful investigation the Odense group found that all of their positive patients actually had been pre-exposed to MDBGN in their daily life. Whether this is the explanation for the apparent discrepancy remains to be shown, but these results emphasise the importance of the patient's daily habits for patch test results.

The paraben paradox

Chris Anderson, University Hospital, Linköping, Sweden

Parabens, extensively used as preservatives in food, toiletries, skin care products and cosmetics are active against yeast and moulds as well as Gram-negative and Gram-positive bacteria. Use is approved (EU regulations) in concentrations up to 0.4% for individual esters – and 0.8% in total combination. Use in topical pharmaceuticals, cosmetics and toiletries aims mainly at prevention of contamination arising after packs have been opened with use concentrations varying according to the composition of the product.

In routine patch testing series, the incidence of paraben sensitivity is now low – probably around 0.1%, having previously been higher. Testing is conducted with a mix – methylparaben, ethylparaben, propylparaben and butylparaben – each at 3 or 4% in a petrolatum vehicle. More detailed testing of cases shows sensitisation to individual parabens but cross-reactivity within the parabens is also common and is also seen to other allergens.

Fischer (1) coined the term "paraben paradox" in 1973. He noted that parabens in topical pharmaceuticals seemed to sensitise whereas parabens in cosmetics used on normal skin were "safe". Sensitised patients could sometimes use paraben-containing products on their normal (as opposed to their diseased or healed) skin. Additionally he noted the difficulty in diagnosing paraben allergy in normal skin. Paraben sensitivity for instance in leg ulcer patients led to a trend away from the use of parabens in products destined for use on abnormal skin. There is currently good general agreement that parabens are useful and safe in wash off, skin care and cosmetics products. Some resistance is still felt to use of paraben in topical pharmaceuticals for use on diseased skin but it seems that, used appropriately, parabens can be a good choice even for pharmaceuticals.

Discussion

Though parabens are generally safe, it may be that selective use of parabens could be recommended depending on product formulation (physico-chemical principles) or user groups (risk group status)

1. Fisher A A.The paraben paradox. Cutis 1973; 1: 830.

Pauline M. McNamee giving her talk on "Risk assessment".

Risk Assessment Aspects

Risk assessment for preservative use in cosmetics and toiletries

Pauline M. McNamee, Invited Consumer Products Toxicologist, Procter & Gamble, UK

The qualification of a preservative for use in cosmetic products requires, as part of the pre-marketing safety assessment, a thorough evaluation of its potential to induce contact allergy and/or elicit clinically relevant Allergic Contact Dermatitis (ACD). The fact that a chemical is a contact allergen does not mean that it cannot be formulated into a consumer product at safe levels.

For example, it is well known that ingredients that have known contact allergy potential can be formulated into consumer products at levels that do not result in an unacceptable incidence of skin reactions, so long as the in-use exposures are below the recognized thresholds for induction and elicitation of sentsitisation. It is equally well known that preservatives can trigger significant ACD when formulated into products inappropriately, e.g. at too high a level. This is based on the knowledge that all allergens demonstrate dose-response and threshold characteristics and that exposure is a key parameter to take into account.

An essential element of the skin sensitisation risk assessment process is the evaluation and understanding of the relationship between skin sensitisation hazard (the inherent potential of an ingredient to cause allergic skin sensitisation) and actual skin sensitisation risk where the latter relates to the induction of contact allergy and/or elicitation of ACD under conditions typical of all intended and foreseeable uses of the product by consumers (1).

The dose response for induction of skin allergy and elicitation of ACD can be directly influenced by a number of factors including, for example, the vehicle system/product matrix in which the allergen is presented to the skin, the frequency and duration of exposure, underlying skin irritation and whether the ingredient/product is occluded (e.g. deodorant application versus shampoo use).

It has been known for over a decade that an understanding of the concentration (dose/unit area) of allergen applied to skin, rather than the absolute amount (volume) applied is more important to the understanding of skin sensitisation risk (2). It is only relatively recently, however, that such exposure scenarios have been used to understand whether consumer exposure in-use to an allergen is acceptable, relative to known allergenic thresholds, through use of established “uncertainty” factors. Such uncertainty factors are calculated taking into account the differences that might exist between the potential in-use exposure for the consumer versus No Effect level (NOEL) exposures determined from pre-clinical studies and confirmed in human studies such as the Human Repeat Insult Patch Test (HRIPT) (3).

Such exposure-based risk assessments very effectively allow the identified hazards of a material to be placed in the context of human exposure. Using this approach, it has been established that those substances which are found to be useful as preservatives are materials which have a sufficiently large margin between the effective anti-microbial concentration in the products to be preserved and the concentration which could be potentially harmful to the consumer under exposure conditions of intended and foreseeable uses.

Discussion

- Human data are part of the overall data package used in the risk assessment process. The hazard data are generated pre-clinically with the techniques available in this area. Hazard data are not generated in humans due to ethical considerations. Historical human data play an important part in the identification and understanding of known benchmarks.
- The approach to risk assessment is focused on the induction of contact allergy but there is no reason why the same principles cannot be applied to the elicitation of ACD. However, this area of risk assessment is currently less advanced due to the lack of elicitation threshold values for many allergens.

1. Robinson MK, Gerberick GF, Ryan C A, McNamee PM, Basketter DA. The importance of exposure estimation in the assessment of skin sensitization risk.

Contact Dermatitis 2000; 42: 251–259.
2. Friedmann PS. Clinical aspects of allergic contact dermatitis. In: Dean JH, Luster MI, Munsen AE, Kimber I (eds): Immunotoxicology and Imunopharmacology. 2nd edn. Raven Press, 1994; 589–616.
3. Gerberick GF, Robinson MK, Felter SP, White IA, Basketter DA. Understanding fragrance allergy using an exposure-based risk assessment approach. Contact Dermatitis 2001; 45: 333–340.

Can use of preservatives in cosmetics be minimized?

Eeva-Liisa Sainio, Product Safety, Toxicologist, Consumer Agency, Helsinki, Finland

Cosmetic products need to be able to withstand microbial effects for lengthy periods, sometimes for years. Amounts of a face cream, for example, may be removed using the fingers from a container with a wide opening. It has been shown that a product packed in a normal glass container which had been used for 14 days since it was first opened (after leaving the factory in perfect condition) was contaminated with relatively high numbers of many pathogens by the end of that period.

Eeva-Liisa Sainio (Consumer Agency in Helsinki, Finland) on use of preservatives in cosmetics.

Results of our evaluation in 1995 of 36 face creams showed that 5–8 preservatives were most commonly used (1). Numbers of preservatives in the products varied from 2–8. Thirty one of the 38 products were packed in glass or plastic containers with wide openings, through which the creams were, obviously, removed using the fingers. Excessive exposure to preservatives can result in chronic allergic contact dermatitis. It has been suggested that widespread use of preservatives results in bacteria becoming resistant to them. However, preservatives must obviously be used to the extent that they ensure "safe" cosmetic products from a microbiological point of view.

Up until today, legislation relating to cosmetic products provides that no expiry date need be stated if a product is stable for more than 30 months. The Council of the European Union, however, will soon handle the proposal (2) that "consumers should be given more detailed information about periods during which a product may safely be used".

Discussion

- Requirement for an expiry date on all products and detailed regulations relating to the purity of raw materials may decrease needs for preservatives or diminish amounts needed.
- The increasing use of "naturals" can be particularly challenging since they may carry a heavy microbial load as they enter the manufacturing system, be good energy sources for micro-organisms and it may not be possible to sterilise them as raw materials if they are heat-sensitive.

1. Summary of a panel discussion at "Contact Allergy 2000" on September 9, 2000 in Pullach.Sainio E-L. Composition and safety of skin creams, deodorants and hair dyes. National Consumer Administration Publication Series 6/1995.
2 Draft Directive on the Safety of Cosmetics, issued by the Parliament and Council of the European Union. 2001.

Risk Management Aspects

A counselling service for people with contact allergies to cosmetics

- Register of ingredients in cosmetic products kept by the Helsinki Allergy and Asthma Association

Kristiina Alanko, Finnish Institute of Occupational Health, and Taina Paarmas, Helsinki Allergy and Asthma Association, Finland

The Helsinki Allergy and Asthma Association is a patient support organization, which operates a counselling service for people with contact allergies to ingredients in cosmetics. The database contains information on skin care products, hair care products, basic personal care products, make-up products, and toothpaste. A telephone counselling service answers questions on allergic reactions to cosmetics and choice of products. At the end of year 2001 the database listed 3824 INCI names of 4184 products and 125 trademarks, and it is continuously updated.

Since 1994 this has been a full-time job. A voluntary expert group helps in the improvement of the database, as well as in the allergy counselling. The group consists of specialists in dermatology, allergology, toxicology and sales markets. The counselling service has actively contacted the cosmetic companies.

An inquiry is sent to the companies twice a year concerning possible new products and changes in the ingredients of former products. In 2001 the data on 3284 products were updated. Ninety five percent of the products have been updated during the past two years. In 2001 altogether 248 new products were added to the database.

In the years 1988–2000 the counselling service had a total of 3427 customers with 7975 registered allergic reactions. Kathon®CG was the most frequent allergen during the first years. Later formaldehyde ranked first, and recently fragrance allergy has been the most common contact allergy among the customers. Its list includes two quite common allergens, colophony and thimerosal which, however, are very rare components in cosmetics. In these cases, the source of the allergy is probably not from cosmetics. There have been some newcomers to the lists over the years. Methyldibromoglutaronitrile (Euxyl K400) appeared on the list in 1992, with only a few cases until 1996, when there was a leap in the occurrence. Compositae mix first appeared on the list in 1998. Compositae mix had been included in the patch test standard series in Finland since 1997- according to the recommendation of the Finnish Contact Dermatitis Group. Many natural cosmetic products contain Compositae extracts.

The counselling service has proven to be useful to both allergic patients, professionals in health care and beauty care, and as well as the cosmetics industry. Some customers order new, updated lists every year. The counselling service activity will continue, but funds from Finland's Slot Machine Association (RAY), which allocates its profit to non-profit health organizations, must be requested each year. It has been planned that in future the database with varied access rights would be available in the Internet. Funds have been requested from RAY also for these operations.

Regulatory Aspects: Preservatives in cosmetic products

Olof Holmer, Ektoxilog, General Manager KTF, Stockholm, Sweden

We are facing continuing discussions and media attention on the use of preservatives in cosmetic products. At the same time we have a very stringent legislation regarding which preservatives can be used and for what purposes. The Scientific Committee on Cosmetics and Non Food Products, (SCCNFP) within the EU, has the scientific responsibility for authorisation of preservatives and there are today 52 substances that might be used with individual restrictions on concentrations and product types.

It is our conviction that the use of preservatives in cosmetic products should be based on criteria that secure the safety of cosmetic products for the consumer and not only the inherent properties of the different substances. As such, a more potent preservative with the right restrictions might work as well and be as safe as a less potent one of higher concentration.

From our point of view there are very strong arguments for allowing a wide range of preservatives in cosmetics:

- The preservative must suit the product; all types of products are not compatible with all types of preservatives.
- A wide range of preservatives means that you are not exposed to the same substance from every cosmetic product.
- There are known cases of allergic reactions from all preservatives. With the help of the compulsory ingredient list on the product label and the use of many different substances, consumers can always avoid a product that contains ingredients to which they have an allergy.
- Fewer substances used for preservation increases the risk for microbial resistance, and thus higher concentrations must be used to avoid growth of micro-organisms.

Conclusions

The roundtable participants agreed on five main conclusions:

- Preservatives are necessary in cosmetic and toiletry products unless product design and/or packaging negate the need for their use.
- The safety of cosmetics and toiletries should be assured in terms of risk rather than hazard at the population level.
- The interests of the individual should be protected by the use of accurate product ingredient labelling.
- The respective competencies of producers, regulators, healthcare and basic researchers should work in unison to ensure appropriate use of preservatives.
- There is a need for continuous development of tools, risk assessments, monitoring and consumer education concerning the appropriate use of preservatives in cosmetics and toiletry products.