

1 Introduction

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Although cosmetics for the purpose of beautifying, perfuming, cleansing, or rituals have existed since the origin of civilization, only in the 20th century has great progress been made in the diversification of products and functions and in the safety and protection of the consumer.

Before 1938, cosmetics were not regulated as drugs, and cosmetology could often be considered as a way to sell dreams rather than objective efficacy; safety for consumers was also sometimes precarious. Subsequently, the Food and Drug Administration (FDA), through the Federal Food, Drug, and Cosmetic Act, regulated cosmetics that were required to be safe for the consumer.

With industrialization, many new ingredients from several industries (oleo- and petrochemical, food, etc.) were used in preparation of cosmetics, offering a list of new functions and forms. For a better control of these ingredients, U.S. laws required ingredient classification and product labeling since 1966.

In Europe, the Council Directive 76/768/EEC of 27 July 1976 on the approximation of the laws of the member states relating to cosmetic products (“Cosmetics Directive”) was adopted in 1976 to ensure the free circulation of cosmetic products and improve the safety of cosmetic products by placing the responsibility of the product on the cosmetic manufacturer.

In 1991, the Cosmetics Directive was amended for the sixth time and prohibited the marketing of cosmetic products containing ingredients or combinations of ingredients tested on animals, as of 1998.

With the seventh amendment of the European Cosmetic Directive in 2003, a testing ban on finished cosmetic products was applied after 11 September 2004, whereas the testing ban on ingredients or combination of ingredients will be applied as soon as alternative methods are validated and adopted, with a maximum deadline of 11 March 2009, irrespective of the availability of alternative non-animal tests. For some endpoints (repeated-dose toxicity, reproductive toxicity, and toxicokinetics), a maximum deadline of 11 March 2013 was set up.

With regard to products, the latest innovation in the field of cosmetics is the development of active cosmetics (cosmeceuticals in the United States). Currently, cosmetics intend not only to improve the appearance or odor of the consumer but also to benefit their target, whether it is the skin, hair, nail, mucous membrane, or tooth. With this functional approach, products became diversified and started to claim a multitude of biologic actions. The cosmetic market then greatly extended with millions of consumers worldwide. The competitive environment pushed manufacturers to promise more to the consumers and to develop cosmetic products of better quality and higher efficacy. Today, many cosmetic products aim at hydrating the skin, reducing or slowing the signs of aged skin, and protecting the skin barrier and the skin in its entirety against the multitude of daily environmental aggressions. For cosmetic products to support these activities, raw materials became more efficacious, safe, bioavailable, and innovative, while remaining affordable. With the continuous improvement of basic sciences and the development of new sciences, new sources for pure raw material have been found. Raw materials are not only produced from natural sources and are highly purified, but they can also be specifically synthesized or even produced from genetically manipulated microorganisms. However, the availability and use of these sophisticated and active ingredients are not always sufficient for them to be optimally delivered to their targets and to sustain their activity. The cosmetic vehicle is also crucial to obtain this effect, and the role of the formulator is to combine the right ingredient into the appropriate vehicle. Cosmetology has thus become a science in its own, and the cosmetologist is not only a formulator chemist anymore but also a real-life science scientist who needs to fully understand the interaction of his or her products and ingredients with their

targets to deliver the promised benefits. This is the reason why, in this third edition of the *“Handbook of Cosmetic Science and Technology,”* the priority has been given to explaining the mechanism of action of cosmetic ingredients and products with their target.

Additional sciences also developed at parallel to active cosmetology and contributed significantly to its rise; this is the case for biometric techniques, which have been developing for more than two decades and allow a progressive and noninvasive investigation of many skin properties. Instruments and methods are available to objectively evaluate and measure cutaneous elasticity, topography, hydration, and turnover rate or even to see directly in vivo inside the skin through microscope evolution. Major innovations in the field are reported by the International Society for Biophysics and Imaging of the Skin. Guidelines for the appropriate usage of instrumental techniques and the accurate measurement of skin function and properties were published by expert groups such as the Standardization Group of the European Society of Contact Dermatitis or the European Group for Efficacy Measurement of Cosmetics and Other Topical Products (EEMCO). Any claimed effect of a cosmetic on the skin should today find appropriate techniques for a clear demonstration. Several other books describe in details all these methods, and so purposefully we have been very selective in this edition to cover only some very new, and maybe not so well known today, bioengineering methodologies that are emerging or are complementing other chapters of this handbook.

For better protection of the consumer against misleading claims, national or federal laws prohibit false advertisement of cosmetic products. In Europe, the sixth amendment of the European Directive on Cosmetic Products requires manufacturers to have readily available a dossier with the proof of the claims made on their products. The seventh amendment of the European Directive, published in March 2004, among several other requirements explained later in this book, also made information about the product more easily accessible to the public by any appropriate means, including electronic means.

Currently, big changes in the regulatory context are taking place and will greatly impact the cosmetic market. A recast of the European Cosmetic Directive has been adopted and is waiting for implementation very soon; this will strengthen consumer protection by limiting further the use of some ingredients and implementing stricter rules of postmarketing surveillance. The implementation of REACH (Registration, Evaluation, and Authorization of CHemicals) will also have implications by limiting the number of ingredients available to the cosmetic industry and creating high pressure on small and middle-size enterprises (SMEs). At a later stage, we may also expect changes in ingredient availabilities at a global level, with the set up of the global harmonization system (GHS). All the changes in the regulatory context are often an “affair of specialists,” and we are proud to have real experts who have accepted to discuss the latest developments in that field for the purpose of this handbook.

Another topic that is clearly of interest today is the replacement of animal testing by alternative methods for testing the safety of cosmetic ingredients. The cosmetic industry, by separate activities or via its association, the COLIPA (The “European Cosmetic, Toiletry, and Perfumery Association”), has been extremely active in developing in vitro methods and strategies for confirming the safety of their ingredients. Even if much work has still to be done, great progress has been realized. Some updates on method developments are described in this book, although it has not been possible to cover all of them.

Finally, cosmetology has become a science based on the combination of various expertise domains: chemistry, physics, biology, bioengineering, dermatology, microbiology, toxicology, statistics, and many others.

Because of such a complexity in cosmetic science, it was not possible to cover in a useful manner all the aspects in one book. Details in most of the above fields are covered in the different volumes of the *“Cosmetic Science and Technology”* series. In the first edition of the *“Handbook of Cosmetic Sciences and Technologies,”* we especially aimed at producing a useful formulation guide and a source of ideas for developing modern cosmetics. Four years later, with the second edition of the handbook, about 20 chapters were added, while the others were updated by trying to cover the most recent innovations in terms of ingredients and cosmetic vehicle forms that should orient the type of products of the future. The third edition is very different from the first two. A few chapters were updated from the first editions, but most are new, and the outstanding contributors were asked to deeply explain the science behind the products, ingredients, or methodology. Thus, the third edition may be seen, in some instances, as complementary to the two first editions.

The third edition of the handbook has been reorganized and subdivided into nine sections, including several chapters written by different authors. It may seem to some as too many chapters, but the editors chose this format intentionally to guarantee that each subject be described by a recognized expert in his/her field who is well aware of the latest development in the topic. Also, authors were selected worldwide. Indeed, cosmetology is universal, but there exists some regional specificity, which had to be addressed.

The first part of the handbook provides the reader with an overview of the different kind of skin types and their specificities. This is especially important at a time when cosmetic products become more and more diversified and targeted to ethnic skin, sensitive skin, elderlies, or others.

“Skin Hydration” (part II), “Skin Barrier” and “Skin pH” (part III) are then addressed from product or ingredient, mechanism, and assessment perspectives. Part IV (“Skin Aging and Sun Care products”) covers the latest development in terms of skin aging and sun care products, which represent a large contribution to the current cosmetic business.

Today, consumers are not satisfied anymore with the claims made on cosmetic products; they also want to see or perceive any claimed property of their product. This is why part V, devoted to skin perception, has been introduced with recent developments in measuring what has long been considered as subjective and not measurable. Covering various aspects of skin tolerance is an important section of the handbook (part VI) and provides the reader with up-to-date information on the mechanism of skin irritation, last developments about in vitro predictive methods, specificities related to body sites or skin types, and expert view on allergenicity and allergens.

The sections “Targeted Cosmetics” (part VII) and “Cosmetic Vehicles” (part VIII) have been considerably reduced in the third edition and intentionally focused on emerging products that will represent, for most of them, new trends in cosmetology. For more conventional cosmetic products, the reader is referred to some excellent chapters from the two first editions. Finally, the last section, “Ethics and Regulations” (part IX), provides a clear overview of the quickly evolving worldwide regulatory context and ethical requirements that should always lead any development and testing of new products.

Given the number of contributions, it has been a challenge to edit this third edition, only four years after the second; if it has been possible, it is because of the dedication of the authors and great support of Mrs. S. Beberman and D Bigelow from Informa Healthcare Inc. We thank all of them for making this enormous task easy, enjoyable, and fascinating.

