THE IMPACT OF PHARMA TECHNOLOGY ON COSMETICS

ADVANCEMENTS AND INNOVATIONS

Editors:
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FOREWORD

The merging of pharmaceutical technology and cosmetics has led to notable breakthroughs and innovations in the beauty business in recent times. This convergence has raised the bar for safety, efficacy, and customer happiness in addition to resulting in the development of skincare, haircare, suncare, and fragrance products that are more advanced. Understanding how pharmaceutical novel technology has been modified and incorporated into cosmetic formulas is necessary to comprehend the significance of cosmetic product developments.

Formulation research and development is one of the areas where pharmaceutical technology has made the most impact on cosmetics. This knowledge has been applied to improve the way important skincare ingredients like vitamins, peptides, and antioxidants are delivered so they can more deeply penetrate the skin barrier and provide their positive benefits. For example, innovations like microencapsulation and nanoencapsulation have made it possible to stabilize volatile or sensitive chemicals, increasing their bioavailability when given topically and extending their shelf life.

In summary, this book inspires readers to indulge and acquire knowledge of pharmaceutical technology, which has had a revolutionary effect on the cosmetics industry, bringing in a new era of sophisticated formulas, focused therapies, and customized skincare regimens. The beauty business has improved its ability to offer safe, effective, and scientifically validated products by using pharmaceutical concepts that include effective component distribution, strict testing guidelines, and biotechnology developments. Looking ahead, the continued correlation between the pharmaceutical and cosmetic industries will result in more innovations and breakthroughs that will raise consumer well-being and alter skincare and epidermal tissue norms.

I applaud Mr. Sudhanshu Mishra and her colleagues for their commitment to bringing this book for readers, researchers, and students to acquire knowledge about the convergence of pharmaceutical technology and cosmetics, which has spurred innovation in a sustainable and eco-friendly manner. This book covers broad areas like gene therapy, personalized solutions, the role of fragrance in mood swings, and much more. This shift towards sustainability along with more potency not only meets consumer expectations but also aligns with global efforts towards environmental conservation.

With best wishes

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PREFACE

This book was written after being inspired by nearly two decades of treating patients with cosmeceutical products. The objective here is to educate readers on the background of cosmeceutical compounds, their scientific basis, various herbal phytoconstituents, and their role in the development of cosmetic products. The purpose of this book is to debunk myths and false beliefs about the capabilities and limitations of particular substances. As you read this book, you will learn that cosmetics are not as superficial as people think, even if they frequently appear that way. This book contains various chapters written by experts in their field including subtle techniques. The book highlights the role of novel and advanced formulations like micro and nanotechnology for the production of cosmeceuticals to enhance skin permeation and improve their effectiveness.

The role of peptides and related bioactive compounds is highlighted as a powerful anti-aging tool to reduce skin wrinkles. Cosmetic formulators are bound to reevaluate their products due to a number of factors, including the swift and significant changes in the global regulatory framework governing cosmetics, growing restrictions and limitations in the selection of cosmetic components, and consistent media pressure. For all those reasons, as well as the fact that increasingly knowledgeable and demanding customers are requesting for more advanced cosmetics, the content of this book is designed to cater to these requirements. This book emphasizes gene therapy and personalized products for beautification as well as for various skin and hair disorders. Cosmetics available today are of excellent quality. To further enhance their quality, we must have a deeper comprehension of the ways in which those substances or items act to enhance their biological effect, safeguard their intended use, or support their inherent qualities. Therefore, significant advancements in our comprehension of the mechanisms underlying the effects of cosmetics are being made every day. This book focuses on cosmetics for different types of the skin, the effect of aging, hair quality and type, and personalized components for each type.

This book also covers the role of artificial intelligence in revolutionizing the cosmetic industry. Artificial intelligence opens up new possibilities for product development and improvement by assisting businesses in better understanding the needs and preferences of their customers. AI may also encourage innovation in the cosmetics sector by helping businesses develop distinctive goods that satisfy changing customer needs. I hope that those interested in cosmetic products as well as cosmetic scientists will find this book relevant and interesting.

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CHAPTER 1

The Intersection of Pharmaceutical and Cosmetic Technologies

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Abstract: Traditional cosmetic products are developed to improve the beautification or appearance purpose only without addressing the underlying cause and associated adverse effects. These cosmetic products contain different types of chemical substances (most commonly preservatives, solvents for dyes, perfumes, *etc*.) that may be harmful (allergic reactions are very frequent, carcinogenicity) to the human body. Another important factor that needs to be considered is the barrier function of the skin, which causes the ineffectiveness of most traditional cosmetic products. The stratum corneum layer is the outermost layer of skin, which is impermeable to most of the substances. These reasons necessitate the design, development, and evaluation of cosmetic products by integration of pharmaceutical technologies. Pharmaceutical technology provides an exhaustive and science-based application of materials, processes, and equipment for the development of different types of cosmetic products. It is now extensively reported that a suitable selection of biocompatible ingredients, used in appropriate proportions in cosmetic products, has shown improvement in the beautification of hair, skin, and nails with less adverse effects, decreased application frequency, deeper penetration into skin layers, reduction in overall cost, and minimization in the root causes of skin, hair, and nail problems. Nanotechnology-based (niosomes, liposomes, *etc*.) cosmetic products are the most commonly investigated platforms in recent years. In the initial sections, this chapter contains basic aspects of cosmetics and its challenges. In subsequent sections, important aspects of pharmaceutical technology and the intersection of pharmaceutical technology in cosmetics are discussed. Further, applications of pharmaceutical technology-mediated cosmetic products are summarized.

Keywords: Biocompatibility, Cosmetics, Liposomes, Niosomes, Nanotechnology, Pharmaceutical technology.

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Sudhanshu Mishra, Shivendra Mani Tripathi, Smriti Ojha & Shom Prakash Kushwaha (Eds.)

INTRODUCTION

Cosmetics are products used to alter or enhance appearance. *Kosmetikos* is the Greek word from which the word cosmetic is derived,and it originally meant *"skilled in adornment." Kosmein* means *"to arrange/adorn,"* and *kosmos* means *"order/ornament."* Additionally, it denotes "to create beauty, particularly for appearance" or "correcting defects, especially of the face" [1]. While it is generally accepted that India and Egypt are the birthplaces of conventional cosmetology, historical documentation of cosmetic ingredients and their uses go back to the Indus Valley Civilization between 2500 and 1550 BC [2]. Along with its historical, philosophical, and cultural roots, cosmetics have a long history that dates back to the time of the Greeks, Romans, and Arabs. These influences continued throughout the Middle Ages, the Elizabethan period, and modern/developed times [3]. In 1938, the Food, Drug, and Cosmetic Act was introduced to address the possibility of harmful effects from cosmetics made without safe ingredients. As a result, the Food and Drug Administration (FDA) was now in charge of cosmetics in addition to food and drugs [4]. Cosmetics are classified by the (FDA) as "*the articles intended to be rubbed, poured, sprinkled, or sprayed on, introduced into, or otherwise applied to the human body or any part thereof for cleansing, beautifying, promoting attractiveness, or altering the appearance"* [5].

In the twenty-first century, there is a huge need for cosmetics, and as technology advances, new and creative formulas incorporating cutting-edge technologies are created [6]. Considering the variety of cosmetic goods available and the degree of their use, cosmetics may be categorized based on their purpose, form, and application area using quality control guidelines and legal criteria. However, *New Cosmetic Science* classifies cosmetics based on cosmetic usage as "*cosmetics for oral health, body, hair, and skincare, as well as makeup and scents,"* as shown in Table **1** [7]. In terms of quality control and ingredient selection, cosmetic items are now regarded on par with medicinal products. Additionally, they must adhere to Current Good Manufacturing Practices, or cGMPs, during the manufacturing process. Examples of such practices are Schedule M–II of the Drug and Cosmetic Act of 1940 and Rules 1945. The advent of cosmeceuticals, or cosmetics containing physiologically active substances, has made it more challenging to distinguish between medications and cosmetics in the current day. It has been shown that incorporating pharmaceutical technology into cosmetic formulations might enhance their efficacy and mitigate some drawbacks associated with traditional cosmetics [8, 9]. We have tried to present a thorough overview of the state of the art on the several facets of pharmaceutical technology in cosmetic care products in this chapter.

Table 1. Classification of cosmetics based on usage [2 - 5].

Types of Cosmetics	Purpose	Usage	Examples
Cosmetics for skin repair	Cleaning, preserving, holding onto moisture, and shielding against Ultraviolet (UV) light.	Cleansers.	Face cleansing creams, foams, and gels.
		Protectors.	Moisturising creams, Milky Lotions.
		Conditioners.	Massage creams, packs, and lotions.
Makeup cosmetics	Protecting skin, enhancing appearance, and showcasing a sense of self-care.	Base Makeups.	Foundation, Powder, and Primers.
		Point Makeups.	Lipsticks, Blush, Eye Shadow, and Eyeliner.
		Nail care.	Nail Enamels and Nail Removers
Body cosmetics	Cleansing, exfoliating, and protecting, as well as replenishing and revitalizing the skin.	Bath.	Soaps and Bath gels.
		Sun-protectants.	Sunscreen cream and Sunscreen lotion.
		Bleaching.	Bleaching cream.
		Depilatory.	Depilatory creams and foams.
		Insect repellents.	Insect-repellent cream, gel and sprays.
Hair care cosmetic	Restoring hair cuticle damage and preventing hair breakage, removing dirt from the scalp and hair, keeping it in a clean condition, enhancing shine, smoothness, and manageability.	Preventing and improving hair condition.	Hair growth promoters Hair lotion, hair serum, and hair oils. Hair Treatment: Split hair coating lotion.
		Hair Colouring.	Hair dye powder and hair dye cream.
		Hair Cleansing.	Shampoo and Rinse.
		Hair Styling.	Hair gel, Hair lotion, and Permanent waving lotion.
Oral cosmetics	External use preparations thoroughly clean the teeth and surrounding tissue, refresh the mouth, and prevent dental caries and periodontal diseases.	Dentifrice.	Tooth powder, Toothpaste, Moist tooth powder, and Tooth gel.
		Mouthwash.	Liquid mouthwash and Sprays.