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THE SOME FEATURES OF IMPACT OF SYNTHETIC COSMETIC INGREDIENTS ON HUMAN HEALTH AND THE ENVIRONMENT

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Doi: https://doi.org/10.52340/jecm.2025.04.18

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სინთეტიკური კოსმეტიკური ინგრედიენტების გავლენის ზოგიერთი თავისებურებები ადამიანის ჯანმრთელობასა და გარემოზე

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რეზიუმე

სინთეზური კოსმეტიკური საშუალებების გამოყენების გლობალური ზრდა მნიშვნელოვნად ზრდის ადამიანის ჯანმრთელობასა და გარემოზე ზემოქმედების რისკებს. ნაშრომში განიხილულია სინთეზური კოსმეტიკური ინგრედიენტების მოკლე და გრძელვადიანი ჯანმრთელობის რისკები, როგორიცაა ალერგიული რეაქციები, ჰორმონული დარღვევები და მძიმე მეტალების ტოქსიკურობა. აგრეთვე, აღწერილია გარემოსთვის მიყენებული ზიანი – წყლის დაბინძურება, წყალში მცხოვრებ ორგანიზმებში ბიოაკუმულაცია, მიკრობული ბალანსის დარღვევა და მიკროპლასტმასებით დაბინძურება. ანალიზი აჩვენებს რეგულირების სისტემაში არსებულ ხარვეზებს და ხაზს უსვამს მომხმარებელთა განათლების, მდგრადი წარმოების და უსაფრთხოების მკაცრი სტანდარტების მნიშვნელობას.

Introduction: Cosmetics play an integral role in modern society, facilitating self-expression, enhancing aesthetics, and contributing to personal hygiene. However, behind the appeal of these products lies a growing concern regarding their environmental and health impacts. The mass production, chemical composition, and waste associated with synthetic cosmetics are increasingly recognized as contributors to ecological degradation and adverse health outcomes. Every year, the beauty industry generates about 120 billion units of packaging waste, much of which is non-recyclable. Simultaneously, the demand for naturally derived ingredients, such as essential oils, contributes to deforestation, soil erosion, and chemical runoff from agricultural practices. Compounding these environmental issues are the health risks posed by various ingredients in synthetic cosmetics—including allergens, endocrine disruptors, and heavy metals—that can lead to both acute and chronic conditions. This article reviews the health and environmental consequences of synthetic cosmetic usage, analyzes the regulatory landscape, and provides recommendations for safer, more sustainable practices.

Aim of the research was to study and analyze the impact of synthetic cosmetic ingredients on human health and the environment.

Methodology: Research studies are based on a review/overview assessment of the development of critical visibility and overlook of the modern scientific literature. Use the following databases (for extensive literature searches to identify the particularities of some key issue aspects of the impact of synthetic cosmetic ingredients on human health and the environment): PubMed, Scopus, Web of Science, and Clinical key, Tomson Reuters, Google Scholar, Cochrane Library, and Elsevier Foundations.

Results and Discussion. The increasing global consumption of synthetic cosmetics, driven by consumer demand for aesthetically appealing and affordable products, has raised significant concerns regarding their safety and long-term effects on human health and the environment. Synthetic cosmetic ingredients, while often cost-effective and easily manufactured, may pose considerable toxicological and ecological risks that have not yet been fully evaluated, particularly in contexts of chronic exposure and bioaccumulation. From a human health perspective, the presence of endocrine-disrupting chemicals (EDCs), such as parabens, phthalates, and triclosan, in cosmetic products is of growing concern. These substances can mimic or interfere with endogenous hormonal systems, potentially leading to reproductive abnormalities, metabolic disorders, and carcinogenesis. Although concentrations in individual products are typically low, the cumulative effect from repeated and prolonged exposure—termed the "cocktail effect"—may result in significant health impacts, particularly among vulnerable populations such as pregnant women, infants, and individuals with pre-existing conditions. Dermal absorption remains a key route of exposure to synthetic cosmetic ingredients. While the stratum corneum provides a primary barrier, many substances are lipophilic and capable of penetrating into deeper layers of the skin, reaching systemic circulation. Studies have indicated that compounds like formaldehyde-releasing preservatives and certain synthetic fragrances can trigger allergic reactions, contact dermatitis, and other immunological responses. Furthermore, the frequent use of nanoparticle-sized synthetic ingredients in sunscreens and anti-aging products introduces additional safety uncertainties, particularly regarding their ability to cross biological membranes and their effects on cellular function and oxidative stress.

Equally critical is the environmental dimension of synthetic cosmetic use. After application, many of these chemicals enter wastewater systems through washing, bathing, and rinsing, often bypassing complete degradation in sewage treatment plants. As a result, persistent synthetic compounds—such as silicones, microplastics, and UV filters—accumulate in aquatic ecosystems. These substances have been detected in rivers, lakes, and marine environments, where they disrupt aquatic life by interfering with hormonal systems in fish, inhibiting algal photosynthesis, and altering microbial communities. The ecological consequences of long-term exposure to such contaminants may extend to bioaccumulation in food chains, with indirect effects on human health through consumption of contaminated seafood.

Health Risks of Synthetic Cosmetics: Allergic Reactions and Irritation: Preservatives such as parabens and synthetic fragrances are frequent allergens in cosmetic products. These compounds can cause contact dermatitis, rashes, and aggravate conditions like eczema and asthma. The cumulative exposure to these substances is particularly concerning for sensitive skin populations and individuals with pre-existing allergies.

Endocrine Disruption and Cancer Risk: Ingredients like oxybenzone, octinoxate, phthalates, and bisphenol A (BPA) act as endocrine disruptors. These compounds interfere with hormone regulation and are linked to reproductive toxicity, developmental anomalies, and an increased risk of hormone-related cancers. Long-term, low-dose exposure presents a significant public health concern due to their bioaccumulative nature and interference with hormonal homeostasis.

Heavy Metal Contamination: Toxic heavy metals—lead, mercury, arsenic, and cadmium—are sometimes present in cosmetics due to contamination or as colorants. These elements pose neurological, renal, and systemic toxicity risks. Lead, for instance, has been associated with developmental delays in children and reproductive harm in adults.

Aquatic Bioaccumulation: Chemicals like parabens and UV filters (e.g., benzophenones) frequently enter water bodies via wastewater. These substances persist in the aquatic environment and

accumulate in the tissues of marine organisms. They are known to disrupt hormonal systems in fish and amphibians, leading to reproductive failure and population decline.

Disruption of Microbial Communities: Triclosan, an antimicrobial frequently used in soaps and creams, has been shown to impair aquatic microbial ecosystems. It contributes to the development of antibiotic-resistant bacteria and affects essential microbial functions such as nutrient cycling and organic matter decomposition.

Microplastic Pollution: Plastic microbeads used in exfoliating products constitute a pervasive form of pollution. These microplastics are consumed by aquatic organisms, causing physical damage, chemical leaching, and biomagnification of toxins through the food chain. Their persistence in marine environments presents a long-term threat to biodiversity.

Conclusion: Synthetic cosmetics, though central to modern grooming and beauty routines, present considerable health and environmental risks. Harmful ingredients can cause allergic reactions, disrupt endocrine function, and contribute to chronic diseases. Their environmental consequences—particularly in aquatic ecosystems—are equally alarming, involving pollution, toxicity, and bioaccumulation. Despite growing evidence of these hazards, current regulatory frameworks are fragmented and insufficient. Consumer ignorance further exacerbates the problem, allowing unsafe products to proliferate. A coordinated approach—encompassing stricter regulations, industry innovation, and public education—is essential to address these challenges. Only by transforming both policy and practice can the cosmetic industry become a safer and more sustainable sector.

References:

1. Alam MN, Anwar S, Jahan I. Heavy metals in cosmetics: A review of their health and environmental impacts. Environ Res. 2019;170:123–31.
2. Kaličanin B, Velimirović D. A study of the possible harmful effects of cosmetic products on human health. Biol Trace Elem Res. 2016;170(1):276–84.
3. Sulashvili N, Beglaryan M, Gorgaslidze N, Kocharyan S, Chichoyan N, Gabunia L, et al. The disclosure of features, characteristics, possibilities and specialties of clinical pharmacists as mediator among doctors and patients for enhancement public health sector in a global world. Exp Clin Med Georgia. 2023;(4):57–62. doi:10.52340/jecm.2023.04.15
4. Sulashvili N, Davitashvili M, Gorgaslidze N, Gabunia L, Beglaryan M. The scientific discussion of some issues of features and challenges of using of CAR-T cells in immunotherapy. Georgian Sci. 2024;6(4):263–90. doi:10.52340/gs.2024.06.04.24
5. Sulashvili N, Gorgaslidze N, Gabunia L, Giorgobiani M, Ratiani L. Manifestation of the particularities of the usage features of monoclonal antibodies in various pharmacotherapeutic applications. Exp Clin Med Georgia. 2023;(4):52–7. doi:10.52340/jecm.2023.04.14
6. Sulashvili N, Gorgaslidze N, Gabunia L, Ratiani L, Khetsuriani S, Kravchenko V, et al. Manifestation of the particularities of some key issue aspects of new immunotherapy challenges and perspectives by CAR-T cell therapy. Exp Clin Med Georgia. 2024;(4):119–21. doi:10.52340/jecm.2024.04.32
7. Scientific Committee on Consumer Safety (SCCS). The SCCS notes of guidance for the testing of cosmetic ingredients and their safety evaluation (11th Revision). Brussels: European Commission; 2021.
8. Siti Zulaikha R, Suhaimi N, Norazah A. Heavy metals in personal care products: Review on their toxicity and environmental impact. J Chem Health Risks. 2015;5(4):253–68.
9. Weatherly LM, Gosse JA. Triclosan exposure, transformation, and human health effects. J Toxicol Environ Health B. 2017;20(8):447–69.

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SUMMARY

The increasing global use of synthetic cosmetics has raised serious concerns regarding their impact on human health and the environment. This review examines the short- and long-term health risks associated with synthetic cosmetic ingredients, including allergic reactions, hormonal disruptions, and heavy metal toxicity. It also explores the environmental consequences, such as water pollution, bioaccumulation in aquatic organisms, microbial disruption, and microplastic contamination. The analysis highlights significant regulatory gaps and emphasizes the importance of consumer education, sustainable production, and stricter safety standards. The study concludes with practical recommendations for regulators, industry stakeholders, and consumers to mitigate the adverse effects of synthetic cosmetics and promote safer, more environmentally friendly alternatives.

Keywords: Synthetic cosmetics, health risks, environment, heavy metals, microplastics