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Skin Toxicity of Selected Hair Cosmetic Ingredients: A Review Focusing on Hairdressers

Zohreh Hashemi Dezaki*

Department of Psychology, Faculty of Humanities, University of Maragheh, Maragheh, Iran

Abstract

Due of skin damage from their jobs, hairdressers are a high-risk category for occupational skin illnesses. Therefore, hand dermatitis is the most common OSD. Hairdressers had a pooled lifetime incidence of HE of 38.2 percent and a 1-year prevalence of 20.3 percent, according to a recent systematic review and meta-analysis of published material from 2000–2021. The most important variables in the development of HE in this occupational field are wet work and skin contact with irritants and allergens. Numerous primary components in numerous hair cosmetics are serious allergies. The likelihood of getting occupational contact dermatitis increases due to the loss of the epidermal barrier function caused by the typical work practises of hairdressers and the emergence of an inflammatory environment.

Keywords: Skin sensitization • Non-animal • Test methods *In vitro* • In silico • Exposure • Cosmetics • Hair dyes • Fragrances

Introduction

The human skin shields the body against contaminants found in cosmetics, prescription formulations and the environment. To safeguard the general public and in particular the populations that are sensitive, it is necessary to assess the risk for chemical compounds in cosmetics as well as their final products to cause severe skin irritation (like children). Skin irritation, which can be defined as "the reversible damage of the skin following the application of a test substance for up to 4 h," is the most common local toxic effect following exposure to dermally applied cosmetic products, whereas skin corrosion can be defined as "irreversible damage to the skin, namely visible necrosis through the epidermis and into the dermis, following the application of a test substance for the duration period of 3 min up to 4 h."

Discussion

In the past, the Draize skin irritation test on rabbits was used to assess the potential toxicity of a chemical ingredient or a cosmetic end product. In terms of ethics, the Draize test has the potential to significantly inflict pain and suffering on animals. The European Union outlawed using animals to evaluate the safety of cosmetic components on March 11, 2009.

Hairdressers may be exposed to cosmetics for up to eight hours per day, five or six days per week, during their careers, in contrast to the majority of consumers who use them for only a few minutes each day. The majority of scientific SCCS opinions do not address the significant excess of exposure to hazardous substances that a hairdresser experiences because the Scientific Committee on Consumer Safety (SCCS) does not have a mandate to assess risk specifically of occupational exposures, but rather of general consumer exposures. Similar to this, the 2009 European Cosmetics Regulation is inadequate to fully address dangers related to hairdressers' occupational use of cosmetic compounds because it is primarily designed to protect consumers and has just a few safeguards for professional users [1].

The prevalence of sensitization determined by patch testing clinical samples served as the primary effect measure (patients with suspected allergic contact dermatitis potentially sensitised to the tested substances, e.g., by exposure to hair cosmetics). Where it was feasible, further stratification was done for patients versus hairdressers in the clinical samples [2]. Risk quotients were determined in terms of relative risk (RR), which is technically assessed by a prevalence ratio (PR), that is, by dividing the prevalence in hairdressers by the prevalence in the relevant control group, assuming stratification was available within one research.

A large number of ingredients used in hair products, the majority of which have a significant irritating and/or allergy potential, are exposed to hairdressers. This explains a number of compounds, including detergents used in shampoos and sprays as well as film-forming and hair-waving agents in perming solutions. The six target substances presented here provide an indicative group of significant, widespread components. Hairdressers handle these items far more frequently than customers simply because to their everyday employment, hence it must be expected that risk assessments designed for normal home users are unlikely to account for the significantly higher occupational exposure of a professional [3].

In the severely skin-stressed occupational group of hairdressers, this must be seen as worrisome. Allergens and irritants are able to penetrate the skin barrier more readily as a result of the impaired epidermal barrier function and the proinflammatory skin milieu that an irritant HE entails. As a result, allergic HE may be acquired more readily than it would be without pre-existing irritant damage. Allergen avoidance is the only practical solution as there is yet no causal therapy for allergic HE (i.e., in terms of a type IV hypersensitivity, also known as delayed-type hypersensitivity). Hairdressers may face insecure working conditions, such as the need to change careers or, in the worst case scenario, leaving the workforce, if this is not allowed at the place of employment.

This review's restriction should be the fact that some of the compounds under investigation have insufficient data. These information gaps highlight the need for more exposure and exposure-related contact dermatitis studies to be carried out in the future in order to enable accurate risk assessment. It may be demonstrated that perm solutions and hair colours are the primary culprit exposures for cysteamine HCl. Due to their professional responsibilities, it must be anticipated that hairdressers have a larger chance of developing quantum sensitivity against cysteamine HCl than a consumer [4].

***Address for Correspondence:** Zohreh Hashemi Dezaki, Department of Psychology, Faculty of Humanities, University of Maragheh, Maragheh, Iran; E-mail: z.hashemidez@maragheh.ac.ir*

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Given that PVP and eicosene alone are known to be non-sensitizing but their copolymer may do so, the absence of knowledge on the skin toxicity of PVP is not surprising. The main sources of PVP copolymer exposures seem to be skin care products like moisturisers and lip cosmetics like lipstick. This suggests that hairdressers, who often use the aforementioned goods, can expose themselves more by keeping up the professional image necessary in the hairdressing industry than by doing their job duties. Customers should be cautious while applying sunscreen because PVP copolymers have been linked to similar situations in the past [5].

Conclusion

The main aim of this study was to evaluate the skin irritation potentials of topically used cosmetic end-products which were marketed during 2015–2017, by using the EpiDerm *in vitro* 3D-human skin model as an alternative test of skin irritation. To our concern, this is the first study that evaluates the skin irritation potentials of final cosmetic products marketed, with alternative *in vitro* methods.

Acknowledgement

None.

Conflict of Interest

The authors declare that there is no conflict of interest associated with this manuscript.

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