

A case of acute contact dermatitis induced by formaldehyde in hair-straightening products

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doi:10.1111/cod.12181

Key words: allergic contact dermatitis; Brazilian keratin treatment; formaldehyde; formaldehyde-releasers; hair smoothing; hair straightening.

Hair-straightening (also known as hair-smoothing or Brazilian keratin) treatments, that is, methods used

by hairdressers to straighten curly hair, have recently become fashionable in hair salons. They are generally based on formaldehyde, which alters hair keratins in order to provide a smoothing effect on frizzy hair. The treatment process usually includes three tasks: (i) applying the product to the hair, (ii) blow-drying the hair, and (iii) heat-treating the hair (generally with a flat iron). However, hair straightening products may produce extremely severe allergic

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Conflicts of interest: The authors have declared no conflicts of interest.



Fig. 1. Acute contact dermatitis on the face with important eyelid oedema.

contact dermatitis, the responsible allergens being most often formaldehyde and its releasers (1, 2).

Case Report

An otherwise healthy and non-atopic 41-year-old woman presented with acute oozing eczema of the scalp, forehead, and neck, and important oedema of the eyelids (Figs. 1 and 2). She had performed a hair-smoothing treatment the day before, using a product (INOAR Moroccan Hair Treatment®) containing formaldehyde that had been bought in Morocco by her hairdresser. It was her fourth smoothing treatment during the last 2 years, each treatment being followed by an increasingly itchy eruption. The patient was treated with oral methylprednisolone, and showed a rapid improvement after 1 week. Patch tests were performed with the European baseline series (Chemotechnique, Vellinge, Sweden), a hairdresser's series (Chemotechnique; Trolab, Almirall Hermal, Reinbek, Germany), a preservatives and antiseptics series (Chemotechnique; Trolab, Almirall Hermal), and the personal product used, namely INOAR Moroccan Hair Treatment®, tested 'as is' and diluted 10% and 1% in normal saline. The patch test materials used were IQ Ultra Chambers® (Chemotechnique) covered on the upper back with Mefix® (Mölnlycke Healthcare, Gothenburg, Sweden). The patch tests, read at D2 and D4 according to ICDRG criteria, showed positive



Fig. 2. Acute oozing eczema of the scalp, forehead and neck following hair-smoothing treatment.

reactions to formaldehyde (CAS no. 50-00-0) (++), the formaldehyde-releasers, that is, imidazolidinyl urea (CAS no. 39236-46-9) (+), diazolidinyl urea (CAS no. 78491-02-8) (+), and 2-bromo-2-nitropropane-1,3-diol (CAS no. 52-51-7) (+), and INOAR Moroccan Hair Treatment® (++) (Fig. 3).

Discussion and Conclusion

Hair-straightening products are used by hairdressers, but many users also obtain them via the internet. Despite the increasing frequency of allergic contact dermatitis reported during congresses and via cosmetovigilance networks, this is the first case reported in the literature. The responsible allergens in these products are primarily formaldehyde and its releasers. Following the European directive on cosmetics (3), the maximum authorized concentration of these substances in final cosmetic products is 0.2%. Despite this, allergic contact dermatitis is observed in previously sensitized patients, and patients using smoothing products containing high formaldehyde concentrations coming from foreign countries that are not controlled by the EU directive (North Africa). This was



Fig. 3. Positive patch test reactions (D2) to formaldehyde, formaldehyde-releasers, and the smoothing product used (INOAR Moroccan Hair Treatment®). Germall II; diazolidinyl urea.

the case in this patient, who used a product that, following analyses by titration and gas chromatography–mass spectrometry by Atlantic Product Safety Health Canada, contained formaldehyde at 2.84% (4, 5). Currently, more and more people are using smoothing products without formaldehyde, but the results in terms of efficacy are not very convincing. Hence, alternative hair-straightening

products are not equivalent to the ones containing formaldehyde.

Acknowledgement

The authors thank Professor An Goossens for careful reading and judicious remarks.

References

- 1 Pierce J S, Abelman A, Spicer L J et al. Characterization of formaldehyde exposure resulting from the use of four professional hair straightening products. *J Occup Environ Hyg* 2011; **8**: 686–699.
- 2 Monakhova Y B, Kuballa T, Mildau G et al. Formaldehyde in hair straightening products: rapid H NMR determination and risk assessment. *Int J Cosmet Sci* 2013; **35**: 201–206.
- 3 Règlement européen 1223/2009, annexe III (13.) et annexe V (préambule + 5). Available at: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:342:0059:0209:EN:PDF> (last accessed 22 December 2009).
- 4 Santé Canada Plusieurs solutions de lissage des cheveux contiennent des concentrations excessives en formaldéhyde, Avis 12 avril 2011. Available at: 110413_solutions_lissage_cheveux_formaldehyde.pdf (last accessed 12 April 2011).
- 5 ANSM. Liste des produits de lissage capillaire contenant des concentrations en formaldéhyde supérieures à la limite réglementaire et identifiés en France. Available at: http://ansm.sante.fr/var/ansm_site/storage/original/application/46a17154c4e51b70f66a836c24588e70.pdf (last accessed 18 June 2013).