

Allergic contact dermatitis caused by tetrahydroxypropyl ethylenediamine in cosmetic products

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Case Reports

Between 2004 and 2010, we observed 5 patients with contact allergy to the cosmetic ingredient tetrahydroxypropyl ethylenediamine (INCI). In 4 of them it had caused or aggravated the dermatitis, but in the fifth patient the relevance could not be determined.

Case 1

A 35-year-old atopic woman presented with an 8-month history of eczema that had started on the back of both hands and later spread to her forearms, legs, and abdomen. She never wore protective gloves when performing household tasks.

Patch testing with the European baseline and rubber series, as well as her own cosmetic products, showed positive reactions to nickel sulfate and palladium chloride (explaining jewellery intolerance), as well as to the hand cream that she had used (Table 1). Patch testing with its ingredients showed a positive reaction to tetrahydroxypropyl ethylenediamine. These results were relevant for the eczematous lesions at the back of the hands and wrists, as the patient had regularly used this hand cream. The more widespread eczema on the forearms

and abdomen was interpreted as spread from the hand dermatitis. The patient was instructed to avoid this hand cream, and became free of symptoms.

Case 2

A 59-year-old non-atopic woman, who also had rosacea, presented with a 9-month history of recurrent eyelid dermatitis. Two weeks prior to the consultation, the dermatitis had extended to the face and 'V' of her neck (Fig. 1), and the patient ascribed this to the application of Roc[®] anti-ageing creams.

Patch testing was performed with an extended European baseline series, cosmetic series, and her own cosmetic products. She reacted positively to methylisothiazolinone (added to our baseline series), which was present in a shampoo and a hair and body cleanser that she used, as well as to both Roc[®] creams (Table 1). The patient was subsequently tested with their constituents (provided by the company), and tetrahydroxypropyl ethylenediamine was the only ingredient that gave a positive reaction. When exposure to the two allergens was stopped, her eczema cleared completely.

Case 3

A 24-year-old non-atopic man presented with a 2-month history of hand dermatitis, which initially affected the right ring finger before spreading to the backs of both hands and wrists. Three days prior to the consultation, eczematous involvement of his eyelids occurred.

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Table 1. Patch test results

Allergens	Case 1		Case 2		Case 3		Case 4		Case 5	
	D2	D4	D2	D4	D2	D4	D2	D4	D2	D4
Fragrance mix I ^a	—	—	—	—	+?	—	+	+	++	++
Fragrance mix II ^a	—	—	—	—	—	—	—	—	+	++
Cinnamal ^a	NT	NT	NT	NT	—	—	+	++	—	—
<i>p</i> -Phenylenediamine ^a	—	—	—	—	—	—	—	+	—	—
<i>Myroxylon pereirae</i> resin ^a	—	—	—	—	—	—	+	+	—	—
Nickel sulfate ^a	++	+++	—	—	—	—	+	+++	+	+
Colophonium ^a	—	—	—	—	—	—	—	—	+	+
Cobalt chloride ^a	—	—	—	—	—	—	—	—	+	+
Lanolin (wool alcohols) ^a	—	—	—	—	+	+	—	—	—	—
Hydroxyisohexyl 3-cyclohexene carboxaldehyde ^a	—	—	—	—	—	—	—	—	+?	+
Palladium chloride ^b	—	+	—	—	NT	NT	NT	NT	NT	NT
Nivea cream® (Beiersdorf AG, Hamburg, Germany)	NT	NT	NT	NT	—	+	NT	NT	NT	NT
Methyldibromo glutaronitrile ^a	—	—	—	—	—	—	+?	++	—	—
Methylisothiazolinone 1000 ppm ^c	NT	NT	—	+	—	—	—	—	—	—
Dermalex® hand cream (Omega Pharma, Nazareth, Belgium)	+	++	NT	NT	NT	NT	NT	NT	NT	NT
Tetrahydroxypropyl ethylenediamine 10% pet.	—	+	NT	NT	NT	NT	NT	NT	NT	NT
Tetrahydroxypropyl ethylenediamine 1% pet.	NT	NT	—	+++	+	++	—	+	—	+
Roc® complete lift day cream (Roc Division, Johnson & Johnson Consumer France s.a.s., Issy, France).	NT	NT	+?	++	NT	NT	NT	NT	NT	NT
Roc® complete lift day cream (Roc Division, Johnson & Johnson Consumer France s.a.s., Issy, France).	NT	NT	—	+?	NT	NT	NT	NT	NT	NT
Galenco Neo-Dermalex® skin lotion (Omega Pharma, Nazareth, Belgium)	NT	NT	NT	NT	+	++	NT	NT	NT	NT
Benzalkonium chloride 0.1% aqua ^b	NT	NT	NT	NT	+	+	NT	NT	NT	NT
Cocamide DEA 0.5% pet. ^b	NT	NT	NT	NT	+	+	NT	NT	NT	NT
Hydroxycitronellal ^a	NT	NT	NT	NT	—	—	—	—	+	+
Isoeugenol ^a	NT	NT	NT	NT	—	—	—	—	+	+
<i>Evernia prunastri</i> (oakmoss) ^a	NT	NT	NT	NT	—	—	—	—	+	+
Citral ^a	NT	NT	NT	NT	—	—	—	—	+	+
Farnesol ^a	NT	NT	NT	NT	NT	NT	—	—	—	+

NT, not tested.

^aTrolab (Almirall Hermal, Reinbek, Germany).^bChemotechnique Diagnostics, Vellinge, Sweden).^cObtained from Magnus Bruze (Malmö).

The patient worked as a laboratory technician, and observed a strong relationship with his job, noticing improvement of the skin lesions during his holidays, but deterioration when he resumed his work. On the basis of the history and clinical examination, an irritant dermatitis with a possible concomitant contact allergy was suggested. Patch testing was performed with the European baseline series, rubbers series, and the ingredients of the products used at work and the toiletries used at home. Positive results (Table 1) were obtained with lanolin, benzalkonium chloride (present in the disinfectant from his workplace), cocamide diethanolamine (DEA), and two cosmetic products that he used to apply at his work (Table 1), one of which contained lanolin, and the other of which was a skin lotion containing tetrahydroxypropyl ethylenediamine

as the only responsible allergen. The actual relevance of cocamide DEA could not be determined. The patient was advised to use products not containing the allergens, and has remained free of symptoms since.

Case 4

A 47-year-old atopic woman was referred with a 2-month history of hand eczema, mainly localized at the backs of both hands and fingers. The eczema had been initially treated with a strong corticosteroid cream and a hydrating cream, but had quickly reappeared after cessation of the steroid treatment.

Previous patch tests had shown contact allergy to *p*-phenylenediamine, nickel sulfate (jewellery intolerance), *Myroxylon pereirae*, fragrance mixes I and



Fig. 1. Tetrahydroxypropyl ethylenediamine as a sensitizer in anti-ageing cosmetics.

II in the European baseline series, and pieces of nitrile rubber and PVC gloves that she had worn at work.

Additional patch testing was performed with a rubber series, the individual components of fragrance mixes I and II, and her own cosmetic products, along with the ingredients. She now also showed a reaction to methyldibromo glutaronitrile (present in a cleansing product that she used) and to tetrahydroxypropyl ethylenediamine, which had been tested in this patient as a control (Table 1). Upon specific questioning, she admitted having used in the past the same popular Belgian hand cream as patient 1, which contains this allergen.

The patient was diagnosed with both irritant and allergic contact dermatitis from the cleansing products that she came into contact with.

Case 5

A 49-year-old atopic woman presented with a 2-month history of recurrent facial eczema, which was particularly pronounced around the mouth and the eyes.

She was known to have a type I allergy to latex proteins and contact allergy to potassium dichromate, cobalt chloride, nickel sulfate, colophonium, lanolin, *M. pereirae* and fragrance mix I. She was patch tested again with the European baseline series (eliminating nickel and cobalt salts), the individual components of fragrance mixes I and II, and her own cosmetic products, along with the ingredients. Positive reactions were found to colophonium, fragrance mixes I and II, and several components (Table 1); she also reacted to her own perfumes, the perfume of her husband and sons, and to tetrahydroxypropyl ethylenediamine, which had been tested in this subject as a control.

We concluded that the atopic eczema of our patient was most probably aggravated by both direct and airborne contact with perfumes. We could not determine any relevance for the positive reaction to tetrahydroxypropyl ethylenediamine; however, as she had used several moisturizers in the past, contact with products containing it seemed likely.

All 5 subjects were also tested with ethylenediamine dihydrochloride (1% pet.) and with disodium EDTA (2% pet.), but were negative. Thirty-three further control subjects were tested with 1% tetrahydroxypropyl ethylenediamine in pet., and all gave completely negative results.

Discussion and Conclusion

Tetrahydroxypropyl ethylenediamine (INCI) (CAS 102-60-3; INN editol) is used as a chelating agent in several cosmetic products, such as anti-ageing products, sunscreens, sunless tanning, hand creams, moisturizers, deodorants/antiperspirants, shaving preparations, and hair sprays, and also in lubricants/spermicides (1, 2). It is very similar to tetrahydroxyethyl ethylenediamine, which is used in cosmetics for its buffering and chelating properties (1).

The 5 patients described here were contact allergic to tetrahydroxypropyl ethylenediamine, which, for four of them, was present in some very popular cosmetic products used in Belgium, and which had caused, or aggravated, a pre-existing dermatitis. The fifth patient, tested as a control subject, also reacted, with a clear positive response, to tetrahydroxypropyl ethylenediamine; the

present relevance of this could not be determined. All but one (case 2) were subjects with multiple sensitivities. However, none reacted to ethylenediamine dihydrochloride or disodium EDTA (disodium edetate).

We have found only one previous case report of contact allergy to tetrahydroxypropyl ethylenediamine present in a sunscreen (3); no reaction to ethylenediamine was observed in this case either.

References

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