

Contact Allergy to Pentylene Glycol

To the Editor:

A significant increase in hypersensitivity to cosmetic products has been observed over the last two decades.¹ Not only the greater number of consumers but also an enlarged number of ingredients used in cosmetics may explain this observation. Usually, recently introduced cosmetic constituents are recognized as rare allergens. However, frequent use will show whether a new cosmetic ingredient remains a rare allergen or is revealed after some time to be an important sensitizer. A 33-year-old German lady worked for 3 years in the office of a ship chandler in northern Italy. Allured by the warm weather, she frequently spent her leisure time in the sun. To protect her skin, she used different kinds of effective sunscreens. After 2 years, eczematous reactions began to develop on her face, involving especially the periorbital region, with pruritus and swelling. A patch test performed by an Italian dermatologist showed a strong reaction to quaternium-15. However, the physician informed her neither on its use and prevalence in cosmetics nor on the importance of side effects. After her return to Germany, the lesions cleared up. A severe relapse occurred in June 2005, after a weekend at the seaside. She developed swelling of the face and eczematous reactions on her neck, arms, hands, fingers, and thighs. The consulted emergency doctor prescribed fexofenadine (6×120 mg) and methyl prednisolone (12×40 mg) for internal use and gave her a hypoallergenic cream for later treatment of residues. Weeks later when she applied this ointment to her face, it became extensively swollen the next day. Immediately she stopped its use.

Epicutaneous tests were performed 1 month later with the European Standard series, antioxidants, preservatives, disinfectants, emulsifiers, and toluene sulfonamide formaldehyde resin. The patches were applied on the back and removed after 24 hours. The 72-hour reading showed very strong reactions to quaternium-15 and formaldehyde (+++), moderate ones to imidazolidinylurea and diazolidinylurea (++) and a weak response to fragrances (+).

As neither formaldehyde or quaternium-15 nor any other formaldehyde releaser did occur in the hypoallergenic cream,

the patient was requested to perform an open repeated application test on a 5×5 cm² area in her left elbow flexure. Only 6 hours after the first application, an eczematous reaction began to develop (Fig 1), which spread after 72 hours to an area of 10×10 cm while the dermatitis of her face flared. Two weeks later, further patch tests were performed with the 12 ingredients of the ointment incorporated in white petrolatum (provided by the manufacturer). No test concentrations were given. The patient reacted strongly (+++) and solely to 1,5-pentylene glycol (Table 1). After getting the results, the manufacturer revealed that the test concentration had been 2%. To prove whether cross-reactions to near-related glycols might occur, further patch tests were performed with the derivatives 1,3-butylene glycol, 1,2-propylene glycol, and 1,5-hexylene glycol. The



Figure 1. Allergic contact dermatitis began developing 6 hours after the beginning of a repeated open application test with the dermatologic ointment in the patient's left elbow flexure. This photograph shows the lesions after 24 hours.

From the Division of Allergology, Dermatology Center, Elbcklinikum Buxtehude, Buxtehude, Germany.

Reprints not available.

DOI 10.2310/6620.2006.06016

Table 1. Results of Patch Tests

Compounds*	Concentration [†]	24 Hours	72 Hours
Hydrogenated lecithin [‡]	ng	--	--
Pentylene glycol [‡]	2%	++	+++
Caprylic/capric triglyceride [‡]	ng	--	--
Squalene [§]	ng	--	--
Xanthan gum [‡]	ng	--	--
Sodium carbomer [‡]	ng	--	--
<i>Butyrospermum parkii</i> [‡]	ng	--	--
<i>Cocos nucifera</i> [‡]	ng	--	--
Carbomer [‡]	ng	--	--
Glycerol [‡]	ng	--	--
Hydroxyethyl cellulose [‡]	ng	--	--
Ceramide 3 [‡]	ng	--	--
1,3-Butylene glycol	5%	--	--
1,2-Propylene glycol	5%	--	--
1,5-Hexylene glycol	5%	--	--

ng = not given.

*White petrolatum was the vehicle for all compounds.

[†]Except for pentylene glycol, the concentration of the submitted compounds were not given by the manufacturer.

[‡]Ingredients of the hypoallergenic cream.

[§]Manufacturer Alfa Aesar GmbH & Co., Karlsruhe, Germany.

substances were purchased from Fluka/Sigma-Aldrich (Taufkirchen, Germany), examined for purity by thin-layer chromatography, and incorporated 5% in petrolatum. Controls on the author's skin and that of five volunteers showed that 5% was a proper test concentration. Tests with these glycols remained negative (see Table 1).

While still in Italy, the patient had already found out that quaternium-15 and other formaldehyde-releasing agents are used more frequently in Italy than in sunscreens sold in Germany. It becomes highly probable that she acquired her hypersensitivity to the formaldehyde releasers by contact with these sunscreens. However, it might be speculated as well that pentylene glycol was another (but unrecognized) constituent in some of the cosmetic items she had purchased and used during her stay in northern Italy.

In industry, 1,5-pentylene glycol (1,5-pentane diol) (Fig 2) serves as a plasticizer, emulsifying agent, solvent, preservative, and initial product for chemicals. In cosmetics, its antimicrobial and outstanding humidity binding properties are the reason for its increasing use during

the last 10 years. Our patient reacted immediately after the first contact although she had never before applied the hypoallergenic cream to her skin. While propylene glycol is a known sensitizer, the dermatologist recommending the cream did not take into account that the related pentylene glycol possibly might be a sensitizer too. It is remarkable that the patient reacted to pentylene glycol alone and not to any of the other related glycols.

One former case of allergic contact dermatitis from pentylene glycol has been published so far.² The patient, a 39-year-old man, had used an emollient cream that (and this is noteworthy) had also been manufactured in Italy. He reacted strongly to pentylene glycol and weakly to the phytoalexin resveratrol. The test concentration was 10% in water.

Björn M. Hausen, PhD

Division of Allergology

Dermatology Center

Elbcklinikum Buxtehude

Buxtehude, Germany

References

1. Kohl L, Blondeel B, Song A. Allergic contact dermatitis from cosmetics. *Dermatology* 1002;204:334–7.
2. Gallo R, Viglizzo G, Vecchio F, Parodi A. Allergic contact dermatitis from pentylene glycol in an emollient cream with possible co-sensitization to resveratrol. *Contact Dermatitis* 2003;48:176–7.



Figure 2. Structure of 1,5-pentylene glycol.