Allergic contact dermatitis to glutaraldehyde in a hair conditioner[1]

Christine Jaworsky, M.D.
James S. Taylor, M.D.
Phylis Evey, R.N.
Daniel Handel, M.D.[2]

Occupationally related allergic contact dermatitis to glutaraldehyde has been well documented. The authors report the first case of allergic contact dermatitis to glutaraldehyde in a personal-care item—a hair conditioner. Glutaraldehyde was found to be present in 74 cosmetics, providing potential for sensitization from nonoccupational exposure.

Index terms: Aldehydes, adverse effects · Dermatitis, contact · Dermatology features

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Allergic contact dermatitis to glutaraldehyde has been infrequently documented. Most occurrences have been in medically or industrially exposed personnel.[1-3] We report a case of glutaraldehyde sensitivity in a young woman after use of a glutaraldehyde-containing hair conditioner.

See also the editorial by Menné (pp 377–378)

Case report

A 22-year-old white woman was seen at the Department of Dermatology in February 1985 with a seven-month history of acute and chronic eczematous changes of the scalp with secondary infection and alopecia. The patient had required both systemic corticosteroids and antibiotics prior to her visit. Despite these measures, her dermatitis continued to flare, with accompanying significant hair loss.

The patient related the onset of her scalp problem to the use of a new hair conditioner, although her husband stated that she scratched and manipulated her scalp. She reported initial use of the conditioner shortly before the onset of the dermatitis. In retrospect, she recalled improvement in the dermatitis after stopping all hair cosmetics for one week. She then changed shampoos but resumed use of the same conditioner until February 1985. The history was positive for eczema as a child and hay fever, as well as contact dermatitis to mascara. The review of systems was unremarkable except for a history of lead poisoning which required hospitalization as a child. Medications at the time of her first visit included oral contraceptives, Prednisone (5 mg, every other day), erythromycin orally, and applications of fluocinolone acetonide solution 0.01% and mineral oil and P and S liquid to the scalp.

Physical examination showed large subacute, oozing eczematous plaques of the posterior and parietal areas of the scalp with large areas of hair loss. Left posterior auricular and cervical adenopathy were present. Wood's lamp examination and potassium hydroxide scrapings of the scalp areas were negative. No facial eczema or nail changes were present. Review of previous laboratory work showed a normal complete blood count and SMA-18 and an elevated IgE level (202 U/mL). The patient was instructed to stop use of all products for her hair. The antibiotic was changed from erythromycin to dicloxacillin after a bacterial culture from the scalp dermatitis grew beta lactamase positive *Staphylococcus aureus*. Fungal culture from the scalp was negative at 30 days. A scalp biopsy specimen showed alopecia and subacute spongiosiform dermatitis, suggestive of hypersensitivity dermatitis. A direct immunofluorescent biopsy specimen was negative for deposition of immunoglobulins and complement.

On follow-up visit two weeks later, the patient's scalp dermatitis showed a 90% improvement. To rule out secondary syphilis, lupus erythematosus, and thyroid disease, the following additional laboratory work was performed and

[1] Department of Dermatology, The Cleveland Clinic Foundation. Submitted for publication Nov 1986; accepted Jan 1987.
[2] Address: 45 N. Canfield, Niles Rd., Ste. 500, Youngstown, OH 44515

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was negative or normal: rapid plasma reagin, antinuclear factor, thyroid stimulating hormone, microsomal and thyroglobulin antibodies, and thyroid profile (T_4, T_3 U, FTI).

Five weeks after her initial visit, she was patch tested with the standard screening tray of the American Academy of Dermatology,[4] beauticians' tray,* her hair spray (as is), her conditioner diluted 1:5 aqueous, and glutaraldehyde 2% aqueous (a labeled ingredient of the conditioner). Standard patch testing procedures were employed using Finn chambers (on Scanpore) as the patch test unit. At 72 hours, the patient showed a 2+ reaction to glutaraldehyde, but not to the diluted conditioner. Additional patches with 1%, 0.5%, 0.1%, and 0.05% glutaraldehyde were applied the same day and all but the 0.05% concentration showed positive reactions at 72 hours. The conditioner manufacturer was contacted and stated that the concentration of glutaraldehyde as a preservative in the preparation was less than 1%.

The patient performed a provocative use test with the conditioner, applying it twice daily to her forearm. After three days, the patient reported redness and itching at the site. She was provided with a list of products containing glutaraldehyde, as well as instructed on label reading and avoidance of these products in the future. There was no occupational or other known exposure to glutaraldehyde. By telephone communication in August 1985, the patient stated her hair had regrown since discontinuation of use of glutaraldehyde-containing hair products.

Discussion

Glutaraldehyde, an agent capable of causing allergic contact dermatitis, has numerous uses in industry and medicine.[5–8] It is used as a hardening agent in photographic gelatin and as an enzyme immobilizer.[1] It increases water resistance of wallpaper, and in addition to its use in tanning shoe leather, it enhances the resistance of hide to sweat. Glutaraldehyde is used as an antimicrobial in cold sterilizing solutions, as a tissue fixative, as embalming fluid, and in x-ray solutions. Its properties are used to therapeutic advantage in cases of plantar hyperhidrosis, onychomycosis, and verruca vulgaris.[5] Between 1973 and 1984, nine companies had voluntarily registered 74 glutaraldehyde-containing cosmetics with the Food and Drug Administration (Dekker R, personal communication). These include hand creams, moisturizers, cleansing lotions, toners, astringents, liquid facial makeups, pressed powders, blushes, lip tints, concealers, and eye colors. Haircare items such as conditioners, finishing rinses, and curl activators contain glutaraldehyde. The ingredient is usually listed under the Cosmetic, Toiletry and Fragrance Association name of glutaryl, although rarely it may be listed as glutaric dialdehyde or pentanedial.[9]

* The beauticians' tray included glyceryl monothioglycolate 1% in petrolatum, ammonium thioglycolate 2.5% in petrolatum, toluene sulfonamide formaldehyde resin 1% in petrolatum, ammonium persulfate 2% in petrolatum, diglyceryl dithioglycolate 1% in petrolatum, and sodium bisulfite 1% aqueous.

Although the first patch test with glutaraldehyde was applied at 2% instead of the recommended 1%, the response was allergic rather than irritant in appearance. It is unlikely this test induced the remaining positive reactions since rechallenge was performed within 72 hours, which is an insufficient amount of time to induce delayed hypersensitivity.[1,4] Since we were unable to obtain an exact concentration of the glutaraldehyde in the conditioner, assuming its presence at 0.5% (less than 1% as stated by the manufacturer), our initial patch-test dilution of the conditioner (1:5) was too low to elicit a positive reaction. Re-use of the conditioner by the patient on her scalp and subsequent positive provocative use test confirmed the patient's sensitivity to the preparation, while positive patch tests down to a concentration of 0.1% pinpointed the glutaraldehyde as the culprit. Patch testing of 10 controls with full-strength conditioner were all negative.

The relatively low use concentrations (<1% in our case) of glutaraldehyde in cosmetic and toiletry items may partially explain the rarity of contact dermatitis.

James S. Taylor, M.D.
Department of Dermatology
The Cleveland Clinic Foundation
9500 Euclid Avenue
Cleveland, OH 44106

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