

Allergic Contact Dermatitis from Carvone in Hair Conditioners

James Quertermous and Joseph F. Fowler Jr

Carvone has occasionally been reported as an allergen, usually in flavorings. Isomers of carvone have been either a mint or a rye flavor and aroma. We report a woman with positive patch-test reactions to carvone (newly added to the North American Contact Dermatitis Group standard series) and dermatitis on the head. She had used a hair conditioner with a "mint" scent, and the dermatitis resolved when she discontinued using this product. While the manufacturer would not confirm carvone as an ingredient, the clinical course, patch-test results, and ingredient list strongly suggest that this was a relevant allergen in this case of allergic contact dermatitis.

Case Report

A 39-year-old African-American female presented with a 6-month history of recurrent desquamative, erythematous, and pruritic dermatitis primarily involving the preauricular cheeks. She reported that the condition had worsened upon subsequent use of a specific mint-scented hair conditioner. After her avoidance of this product and treatment with topical corticosteroids, her dermatitis improved. Physical examination revealed postinflammatory hypopigmented lesions (consistent with healing dermatitis) on the face, as well as a few patchy areas of dermatitis on the trunk. The scalp appeared unaffected.

Patch testing was conducted with the North American Contact Dermatitis Group series of allergens. Patches were removed at 48 hours; reading was performed then and again about 48 hours later. A positive reaction to carvone 5.0% in petrolatum (pet) was noted. In addition, the patient also showed mild sensitivity to methyldibromoglutaronitrile/phenoxyethanol 2.0% pet. This finding did not appear to be clinically relevant because the chemical was not found in the patient's skin care or hair care products.

After she discontinued use of the hair conditioner, the patient's allergic contact dermatitis resolved. The manufacturers of the patient's hair care products were contacted in an attempt to determine if the products contained

carvone. The suspected hair conditioner's product label lists *Melaleuca alternifolia* (tea tree) leaf oil, *Mentha piperita* (peppermint) oil, *Rosmarinus officinalis* (rosemary) extract, and *Lavandula angustifolia* (lavender) oil as the primary components of the fragrance. Despite numerous efforts, we were unable to definitely confirm with the manufacturers the presence of carvone in the listed oils. However, based on the patient's response to avoidance, we feel it very likely that carvone was present in the product.

Discussion

Carvone is a chemical in the family of terpenoids and exists as two enantiomers. The main ingredient of spearmint (*Mentha spicata*) oil, l-carvone is also found in the natural oils of caraway, dill seed, and peppermint. As a result of its spearmintlike odor, it is widely used in products such as candies, chewing gums, toiletries, and cosmetics.¹ Carvone is also considered a secondary oxidation product of d-limonene, which is the principal constituent of the oil from several fruits of the genus *Citrus*.² Furthermore, l-carvone has been isolated from the volatile oil of *Chrysanthemum balsamita* L., and d-carvone (its isomer) has been isolated from *Artemisia vulgaris* (mugwort).³

Dermatologic reactions to carvone are rarely reported. The presence of carvone in toothpaste was previously documented to cause allergic contact cheilitis, which subsided following avoidance.³ A 26-year study conducted by Klaus E. Andersen found that, of 46,000 patients with eczema, only 5 had eczema caused by sensitization to toothpaste ingredients. In this report, carvone proved to be

From the University of Louisville, Division of Dermatology, Louisville, KY, USA.

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one of the primary sensitizing allergens.⁴ In addition, a significantly high rate of positive patch-test reactions to l-carvone was found among eczema patients. This same department also described an association between carvone allergy and sesquiterpene lactone, which was explained by carvone's being a terpene found in some species of Compositae plants.³ These past reports established carvone as an agent that has the potential to elicit an allergic response in select individuals.

Contact dermatitis caused by carvone in hair conditioning formulas has not been reported in the literature. However, fragrance ingredients in hair cosmetics have been linked to allergic reactions.⁵ Current US regulations do not require components of fragrances to be listed on product labels. This makes verifying carvone as an ingredient in personal grooming products difficult.

Although contact dermatitis from carvone appears to be infrequent, the cases described warrant further research on this chemical. Because of carvone's wide applicability to various commercial products, new cases of contact

dermatitis from carvone may emerge and should not be overlooked in attempts to identify causative allergens.

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