

Allergic contact dermatitis caused by a skin-lightening agent, 5,5'-dipropylbiphenyl-2,2'-diol

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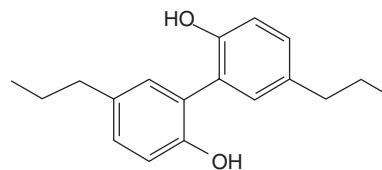
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Many skin-lightening agents are currently available, including kojic acid, arbutin, hydroquinone, and 5,5'-dipropylbiphenyl-2,2'-diol (Fig. 1); the last of these is a relatively new skin-lightening agent that has been used in Japanese cosmetics since 2006. 5,5'-Dipropylbiphenyl-2,2'-diol is a biphenyl derivative, and downregulates melanin synthesis by inhibiting tyrosinase maturation, leading to accelerated tyrosinase degradation (1). Here, we report a case of allergic contact dermatitis caused by 5,5'-dipropylbiphenyl-2,2'-diol.

Case Report

A 45-year-old female presented with a 2-month history of an itchy erythematous rash on her cheek and neck. She had a negative history for dermatitis. Previously, she had been instructed to apply 0.3% prednisolone valerate acetate ointment twice daily by another dermatologist, but as cosmetic dermatitis was not suspected at the time, she had continued to use her cosmetics, with gradual worsening of the symptoms. We treated her with a regimen of oral prednisolone 20 mg daily for 4 days, olopatadine hydrochloride 10 mg daily for 1 week, and 0.1% hydrocortisone butyrate ointment, and advised her to stop using her cosmetics; her symptoms subsequently improved. Patch tests were performed with her personal cosmetics and 17 cosmetic allergens, using Finn Chambers[®] on Scanpor[®] tape. Readings were performed on D2 and D4 according to the International Contact Dermatitis Research Group guidelines. The patient showed positive reactions to a cream (+ on D2



Molecular formula: C₁₈H₂₂O₂

Molecular weight: 270.372

CAS number: 20601-858-8

Fig. 1. Chemical formula of 5,5'-dipropylbiphenyl-2,2'-diol.

and D4) and beauty essence (+ on D2 and D4), both of which were started 2 months prior to appearance of the rash. In the second patch test, with cosmetic ingredients provided by the cosmetic supplier, she reacted only to 5,5'-dipropylbiphenyl-2,2'-diol (0.5% pet., + on D2 and D4), which was present in both the cream and the beauty essence as a skin-lightening agent. The skin did not lighten over the area of the patch test with this chemical. Other cosmetic ingredients and cosmetic allergens gave negative reactions. Patch tests with 5,5'-dipropylbiphenyl-2,2'-diol 0.5% pet. in 4 control subjects gave negative results.

Discussion

Cosmetics with skin-lightening agents are popular in Japan. Cosmetics containing skin-lightening agents such as arbutin (2), hydroquinone and kojic acid have been reported to cause allergic contact dermatitis. 5,5'-Dipropylbiphenyl-2,2'-diol, an inhibitor of melanin synthesis synthesized by an oxidative coupling method (3), is a relatively new skin-lightening agent that has been marketed in Japan since 2006. Initial studies on this agent did not find adverse skin reactions. A double-blind test

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was conducted on 43 subjects to determine the efficacy of formulations containing 0.5% 5,5'-dipropylbiphenyl-2,2'-diol for the treatment of ultraviolet (UV)-induced pigmentation, and showed a significant difference in pigmentation score from placebo, with no adverse skin reactions (4). The skin-lightening effects of 6 months of application of 0.5% 5,5'-dipropylbiphenyl-2,2'-diol for facial hyperpigmentation were studied in 51 Japanese females, and no adverse effects were recorded (5). Another study investigating its effect on UV-induced facial skin hyperpigmentation in 300 Japanese females did not report adverse effects after application for 1 month (6).

The first case of allergic contact dermatitis caused by 5,5'-dipropylbiphenyl-2,2'-diol was described in

2009 (7). This first case reacted positively to 5,5'-dipropylbiphenyl-2,2'-diol 1% pet. In the present case, patch testing was performed with 5,5'-dipropylbiphenyl-2,2'-diol 0.5% pet., as the amount of 5,5'-dipropylbiphenyl-2,2'-diol permitted for use in cosmetics is less than 0.5%.

This case highlights the possibility of allergic contact dermatitis caused by skin-lightening agents in cosmetics. Determination of the optimum patch test concentration of 5,5'-dipropylbiphenyl-2,2'-diol may be required in further cases of allergic contact sensitivity caused by this agent.

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