

Photoallergic contact dermatitis caused by benzophenones in magazine inks

Lucrecia Infante Hernando¹, Esther Serra-Baldrich¹, Teresa Dordal² and Luis Puig Sanz¹

¹Department of Dermatology, Hospital de la Santa Creu i Sant Pau, Barcelona 08025, Spain and ²Department of Allergy, Hospital Municipal de Badalona, Barcelona 08025, Spain

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Case Report

This is the first reported case of non-occupational photoallergic contact dermatitis (PACD) caused by benzophenones contained in printing inks.

A 29-year-old woman with skin type 2 was seen at our outpatient clinic in March 2012 because of burning and itching erythematous patches with blisters on the fronts of both thighs. The lesions had developed 24 hr

Correspondence: Lucrecia Infante Hernando, Department of Dermatology, Hospital de la Santa Creu i Sant Pau, Barcelona 08025, Spain. Tel: +34 93 553 70 07; Fax: +34 93 553 70 08. E-mail: lucreciai@yahoo.com

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Table 1. Results of patch and photopatch tests

Allergen	Patch test		Photopatch test	
	D2	D4	D3	D4
Butylmethoxy dibenzoylmethane 10% pet.	–	–	–	–
Benzophenone-3 10% pet.	–	–	++	++
Ethylhexyl methoxycinnamate 10% pet.	–	–	–	–
Octocrylene 10% pet.	–	–	+++	+++
Isoamyl- <i>p</i> -methoxycinnamate 10% pet.	–	–	–	–
Ketoprofen 1% pet.	–	–	+++	+++
Cinnamal 1% pet.	–	–	–	–
Benzophenone-10 10% pet.	–	–	–	–
Benzophenone-4 10% pet.	–	–	–	–
Methyl methacrylate crosspolymer 2% pet.	–	–	–	–
Glycol dimethacrylate 2% pet.	–	–	–	–
Di-HEMA timethylhexyl dicarbamate 2% pet.	–	–	–	–
Vinyl caprolactam–VP–dimethylaminoethyl methacrylate copolymer 0.2% pet.	–	–	–	–

**Fig. 1.** Erythema and blisters after sun exposure.

after contact with the cover of a magazine that she had been reading while at the beach (Fig. 1).

The patient recalled having previous photoallergic reactions after applying ketoprofen in August 2009 and a sunscreen in June 2011. Previous patch tests at another institution in October 2011 had been positive for nickel sulfate (+++), *Myroxylon pereirae* (++), and palladium chloride (+).

Patch and photopatch tests were performed with the photopatch (meth) acrylate series and the sunscreen series (Chemotechnique Diagnostics, Vellinge, Sweden), and the patient developed positive reactions to benzophenone-3, octocrylene, and ketoprofen, but only on sites irradiated with ultraviolet A (UVA) at 5 J/cm² (Table 1).

To further investigate the relevance of the positive reactions, we contacted the manufacturer and requested data concerning the components of the inks used in the magazine. They were reported to contain dipropylene glycol diacrylate (40–70%), multifunctional acrylate (40–70%), and benzophenone (type not specified, 5–10%).

Diagnosis was confirmed by an open photopatch test with a page from the magazine on the patient's right arm

for 30 minutes and sunlight exposure for 20 minutes. Twelve hours later, the patient developed erythema and blisters.

Discussion

PACD is a type IV hypersensitivity reaction that occurs when an exogenous agent (photoallergen) is applied to the skin and exposed to ultraviolet and/or visible radiation (1). Organic sunscreen absorbers and topical non-steroidal anti-inflammatory drugs (NSAIDs) are the most frequent allergens causing PACD.

Many studies have shown an association between ketoprofen, octocrylene, and benzophenone-3 (1, 2), as they share a benzophenone-like structure, but octocrylene and benzophenone-3 may have their own photoallergenic potentials (2).

Benzophenones are organic compounds used in the printing industry as chemical ultraviolet filters, because they absorb light in the ultraviolet B spectrum and parts of the UVA and ultraviolet C spectra. They are also used in cosmetics and toiletries to retard photodegradation and extend shelf-life (3).

A photopatch test is required in patients with a history of skin reaction to sunscreens or topical NSAIDs, the most usual being ketoprofen and etofenamate. When the diagnosis is confirmed, patients must avoid sunscreen products containing octocrylene, benzophenone-3, and fragrances (4).

Patients with photocontact reactions to ketoprofen, octocrylene and benzophenones should be made aware of the presence of benzophenones in magazine inks and their relationship with sun exposure.

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