

7 years experience of photopatch testing with sunscreen allergens in Sweden

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Since 1990 7 sunscreen allergens have been included in the standard photopatch protocol at 2 Swedish dermatology clinics. 355 consecutive patients with suspected photosensitivity were tested, and in 28 of these (7.9%), a total of 42 allergic reactions were found. 80% of the reactions were of photocontact origin. The most common allergen was benzophenone-3 (Eusolex 4360), with 15 photocontact and 1 contact allergic reactions, followed by isopropyl dibenzoylmethane (Eusolex 8020) (8 photocontact, 4 contact) and butyl methoxydibenzoylmethane (Parsol 1789), with 6 photocontact reactions. There were 2 cases of photocontact allergy to phenylbenzimidazole sulfonic acid (Eusolex 232), which has not been reported previously. 1 case of contact urticaria from benzophenone-3 was accidentally found. In addition, 21 + reactions of doubtful relevance were noted in 14 patients: 16 on irradiated and 5 on non-irradiated test sites. Among these, irritant and phototoxic reactions may be included. These results indicate that the inclusion of UV filters in the standard photopatch protocol is important. Immediate-type testing for urticaria could also be of value.

Key words: photopatch test; sunscreens; adverse effects; photosensitivity; photocontact dermatitis; contact dermatitis; phototoxic dermatitis; toxic dermatitis; contact urticaria; benzophenones; cinnamates; camphor; cosmetics. © Munksgaard, 1998.

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A standard procedure for photopatch testing has been used in Scandinavia since 1980, including a standard photopatch series and uniform techniques for application of the test substances, irradiation and evaluation of the tests (1). Over the years, modifications have become necessary, and at the Departments of Dermatology in 2 Swedish academic medical centres, 7 sunscreen allergens were added in 1990, since reactions to such substances were becoming more common with the increasing use of sunscreen products, and the inclusion of sunscreens in other skin care products. In this report, 7 years experience of photopatch testing in 355 consecutive patients is described.

Patients and Methods

The photopatch tests were performed between 1990 and 1996 at the Departments of Derma-

tology of the Karolinska Hospital, Stockholm, and the University Hospital, Uppsala, during which period, 355 consecutive patients (274 in Stockholm and 81 in Uppsala) were tested. 246 women and 109 men, with a mean age of 43.9 years (range 8–82), were tested. In 133 patients, the diagnosis that led to referral for photopatch testing was polymorphic light eruption and in 121 patients atopic dermatitis or other eczemas. The remaining 101 patients underwent the tests as part of an investigation of photosensitivity.

The photopatch test procedure was carried out according to the Scandinavian standard photopatch test protocol (1). The 7 sunscreen allergens included are shown in Table 1. The test substances were purchased from Chemotechnique Diagnostics, Malmö, Sweden. The patch test reactions were read at 1 and 2 days (D), and at D1, 1 of the 2 identical test panels was irradiated with 5 J/cm² in Stockholm and 10 J/cm² in Uppsala (by tradition),

Table 1. Results of photopatch testing with sunscreen allergens in 355 consecutive patients; INCI names (2) and trade names (in brackets) are given

	Concentration	Photocontact reaction	Contact reaction
benzophenone-3 (Eusolex 4360)	2% pet.	15	1 + 1 ^{a)}
isopropyl dibenzoylmethane (Eusolex 8020)	2% pet.	8	4
butyl methoxydibenzoylmethane (Parsol 1789)	2% pet.	6	0
octyl methoxycinnamate (Parsol MCX)	2% pet.	3	0
PABA	5% alc.	2	1
phenylbenzimidazole sulfonic acid (Eusolex 232)	2% pet.	2	0
4-methylbenzylidene camphor (Eusolex 6300)	2% pet.	0	0
total		36	6 + 1 ^{a)}

^{a)}Urticarial reaction.

using a UVASUN 3000 (Mutzhas Co, Munich, Germany) with a UVA filter. The 2 test panels were always evaluated 1 day after irradiation, and most often also at 3 days. Here the results after 1 day are shown. The test reactions were graded as follows: 0=no reaction, +=erythema, ++=erythema and oedema, +++=erythema, oedema and papules, ++++=erythema, oedema, papules and vesicles. Only reactions graded ++ and stronger were considered to indicate true photocontact or contact allergy (1): + reactions were considered to be of questionable relevance.

Results

The photopatch test results for the sunscreen allergens are shown in Table 1. 43 positive reactions (42 allergic and 1 contact urticaria) were found in 28 patients (18 women and 10 men, mean age 52.4 years; 34 reactions in 20 patients in Stockholm, and 9 reactions in 8 patients in Uppsala). Photocontact reactions by far outnumbered the contact reactions, 36 being of photocontact (29 in Stockholm) and 6 of contact origin (5 in Stockholm). Positive photocontact or contact reactions were found to all the 7 substances except 4-methylbenzylidene camphor. In addition, 21 + reactions were seen in 14 patients (12 women and 2 men, mean age 43.4 years). 16 (10 in Stockholm) of these reactions appeared on irradiated and 5 on non-irradiated test sites.

Discussion

Positive photocontact or contact allergic reactions were found in 7.9% of our patients. The proportion of reactions was similar at the 2 centres (7.3% in Stockholm, 8.6% in Uppsala) in spite of the different UV-doses used. This is in accordance with a recent study on photopatch testing with sunscreens (3), in which the test results obtained with the standard 5 J/cm² did not seem to be

affected by the up to 16-fold increases in UVA dosing. The patients with positive test reactions were somewhat older (mean 52.4 years) than the mean for the group as a whole (43.9 years), confirming the finding in a Danish study that adverse reactions to cosmetics were more common in older people (4).

Photocontact or contact allergy to sunscreens is known to be the most common allergy in sun-sensitive patients (5) and is reported to occur in 5–16% of such patients tested (6–8). There is increasing evidence that some subjects with photodermatoses show increased sensitivity not only to light but also to chemicals (9). The addition of UV filters to the photopatch test standard protocol is thus of value and is recommended. 80% of our reactions were of photocontact origin, indicating that when testing with sunscreens, photopatch in addition to patch tests should always be performed.

Morphologically + reactions of doubtful relevance on non-irradiated skin were found in 1.4% of our patients. Among these, irritant reactions may be included. At least in healthy people, irritant reactions to sunscreens are probably more common than allergic reactions. In a recent Swedish evaluation of customers' complaints about sunscreens sold by the National Corporation of Swedish Pharmacies (10), stinging pricking pain associated either with no objective signs or with oedema and redness was reported by about 1/2 of the complaining customers. In an Australian study (11), 14.9% of 603 people who applied a sunscreen daily for 7 months developed an adverse inflammatory reaction to the cream, but when 1/2 of these persons were patch tested and photopatch tested, none was found to be allergic to the active sunscreens. These studies on sunscreens are in accordance with the opinion that the majority of side-effects of cosmetics are probably due to irritation (12, 13).

On irradiated skin, 10 + reactions were found

in 6 patients (2.2%) in Stockholm and 6 reactions in 6 patients (7.4%) in Uppsala. It is possible that the higher UVA dose (10 J/cm²) used in Uppsala could have induced more phototoxic reactions. There is no consensus on what UVA dose to use in photopatch testing, and the risk of phototoxic reactions from sunscreens has been little discussed. Hölzle et al. (14) reported from 5 years experience of photopatch testing in Germany, Austria and Switzerland, that all substances tested, included sunscreens, were capable of producing phototoxic reactions after irradiation with 10 J/cm² UVA. For chlorpromazine, phototoxic reactions could be prevented by reducing the UVA dose from 7 J/cm² to 4 J/cm² (15). Corresponding dose-response studies for sunscreens are awaited.

In our study, benzophenone-3, which is known to be a fairly common photo-allergen (9), gave the largest number of allergic reactions: 15 photocontact and 1 contact. This sunscreen also caused an urticarial reaction in 1 patient, in whom the test material accidentally came off after 20 min. Immediate reactions were otherwise not evaluated. There are few reports on contact urticaria in reaction to sun screens (11, 16). This reaction is probably uncommon, but immediate-type testing is seldom performed and cases may be missed. We now plan to include this type of test in our standard photopatch test procedure.

The 2nd most common allergen was isopropyl dibenzoylmethane, with 12 positive reactions. This has been a frequent cause of allergy for which reason in 1993 the manufacturers decided voluntarily to withdraw this UV filter from the market (17).

Butyl methoxydibenzoylmethane, which is one of the most frequently used UV filters in Europe and is considered to have a very good safety profile (18), yielded 6 cases of photocontact allergy in our study, an unexpectedly large number.

Octyl methoxycinnamate, also commonly used in Europe, seems to be relatively safe in our study.

2 patients had photocontact allergy to phenylbenzimidazole sulphonate, which has not been reported before. We also found 2 + reactions to this substance on the irradiated side. Hitherto, there has only been 1 report of 2 cases of contact allergy to this substance (19).

The few reactions to PABA reflect the decreasing use of this substance.

In conclusion, we found that reactions to sunscreens were reasonably common among patients referred for photopatch testing because of suspected photosensitivity. These patients are heavily exposed to suncreening substances and are thought to be more sensitive to chemicals than others (7). In healthy individuals, on the other hand, allergic reactions to sunscreens are few, and

the risk of developing such reactions should not prevent the use of suncreening products.

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