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Sunscreen Sensitization: a 5-year Study

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The purpose of this study was to evaluate the prevalence of sunscreen contact allergy and/or contact photoallergy in 370 patients with suspected photodermatitis. Patch and photopatch tests were performed using the French Society of Photodermatology (SFPD) standard series. A total of 57 cases of contact allergy and/or photocontact allergy to sunscreens were diagnosed (15.4%). Amongst these, 27 reactions were related to oxybenzone and 14 to isopropyl dibenzoylmethane. These results, obtained from January 1990 to December 1994, confirm that, given the high frequency of photosensitization cases, a large part of the battery of photopatch tests should be dedicated to sunblocks. *Key words: photoallergy; photopatch tests; oxybenzone; dibenzoylmethane.*

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For several years we have observed a marked increase in the use of sunscreen agents, particularly because they have been incorporated in cosmetic products to prevent photoageing and the carcinogenic effects of solar radiation. As a result, publications about allergy and/or photoallergy to UV filters are now more frequent than in the past (1, 2). The purpose of this study was to evaluate the prevalence of sunscreen contact allergy and/or contact photoallergy in 370 patients with suspected photodermatitis.

Table I. *Battery for patch and photopatch tests: January 1990 to December 1992*

Sunscreen agents
P-aminobenzoic acid (PABA) 5% Pet.
Escalol 507 (octyldimethyl PABA) 2% Pet.
Parsol MCX (2-ethylhexyl-*p*-methoxycinnamate) 2% Pet.
Isoamyl *p*-Methoxycinnamate 2% Pet.
Eusolex 6300 (3-(4-methyl benzylidène) camphor) 2% Pet.
Eusolex 8020 (isopropyl dibenzoyl methane) 2% Pet.
Parsol 1789 (butyl methoxydibenzoylmethane) 2% Pet.
Eusolex 4360 (2-hydroxy-4-methoxybenzophenone) 2% Pet.
Benzophenone 4 2% Pet.[a]
Other photosensitizing substances
Chlortetracycline 3% Pet.
Hexachlorophene 1% Pet.
Bithionol 1% Pet.
Chlorpromazine 0.1% Pet.
Promethazine 1 % Pet.
Musk ambrette 5% Pet.
Sulphanilamide 5 % Pet.

[a] Tested since July 1991.

PATIENTS AND METHODS

From January 1990 to December 1994, 370 patients (130 men and 240 women; mean age 44 years) with suspected photodermatitis were patch-tested and photopatch-tested using the French Society of Photodermatology standard series (TROLAB, Hermal D21462 Reinbek RFA) in triplicate (Tables I and II). The photobiological testing was performed with a polychromatic irradiation (1000 W Xenon light, Dermolum III K-Müller, Moosinning Germany) filtered with a Schott WG 305 filter, and a high-pressure metal halide UVA lamp (2000 W,

Table II. *French Society of Photodermatology standard series: used January 1993 to December 1994*

Antiseptics
Triclosan (Irgasan DP 300) 2% Pet.
Tetrachlorosalicylanilide 0.1% Pet.
Tribromosalicylanilide 1% Pet.
Hexachlorophène 1% Pet.
Bithionol 1% Pet.
Fentichlor 1% Pet.
Chlorhexidine digluconate 0.5% water
Cosmetics
Fragrance mix 8% Pet. (cinnamic alcohol, cinnamic aldehyde, hydroxycitronellal, eugenol, isoeugenol, geraniol, oak moss absolute, amylcinnamaldehyde)
Musk ambrette 5% Pet.
6-Methyl Coumarine 1% Pet.
Formaldehyde 1% water
Peru balsam
Vegetal products
Wood tar mix 12% Pet. (pine, beech, juniper, birch)
Frullania 1% Pet.
Oak moss absolute 1% Pet. (atranorin, evernic acid, usnic acid)
Lactone mix 0.1% Pet.
Sunscreen agents[a]
P-aminobenzoïc acid (PABA) 10% Pet.
Escalol 507 (octyldimethyl PABA) 10% Pet.
Parsol MCX (2 ethylhexyl para-methoxycinnamate)10% Pet.
Isoamyl P methoxycinnamate 10% Pet.
Eusolex 6300 (3-(4 methylbenzylidène) camphor) 10% Pet.
Eusolex 8020 (isopropyldibenzoylmethane) 10% Pet.
Parsol 1789 (butylmethoxydi benzoylmethane)10% Pet.
Eusolex 4360 (2-hydroxy-4-methoxybenzophenone) 10% Pet.
Mexenone (2-hydroxy-methoxymethylbenzophenone) 2% Pet.[b]
Benzophenone 4 – 10% Pet.
Eusolex 232 (2 phenyl 5 benzymidazol sulph. acid) 10% Pet.[c]
Miscellaneous
Nickel sulphate 5% Pet.
Potassium bichromate 0.5% Pet.
Cobalt chloride 1% Pet.
Promethazine 1% Pet.
Chlorpromazine 0.1% Pet
Quinine sulphate 1% Pet.

[a] Concentration of 10% has been used since 1994 (except Mexenone 2%).[b] Tested since March 1993.[c] Tested since August 1994.

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Table III. *Number of positive patch tests reactions in 370 patients*

Contact (107)	Photocontact (126)
Sunscreen agents 18	Sunscreen agents 39
Wood tar mix 16	Promethazine 32
Peru balsam 12	Chlorpromazine 16
Nickel sulphate 10	Wood tar mix 8
Fragrance mix 11	Fragrance mix 7
Chlorpromazine 7	Hexachlorophène 7
Musk ambrette 6	Musk ambrette 4
Cobalt chloride 5	Peru balsam 4
Potassium bichromate 5	Nickel sulphate 1
Frullania 5	Bithionol 3
Promethazine 4	Chlorhexidine 2
Oak moss absolute 3	Frullania 1
Hexachlorophène 3	Lactone mix 2
Cobalt chloride 1	Lactone mix 1
Formaldehyde 1	

Table IV. *Number of positive reactions to sunscreen contact allergy (CA) and photoallergy tests (PA)*

	CA	PA	CA+PA
P-aminobenzoic acid (PABA)	1	1	0
Escalol 507 (octyldimethyl PABA)	2	1	0
Parsol MCX (2-ethylhexyl-*p*-methoxycinnamate)	0	2	0
Isoamyl *p*-methoxycinnamate	0	0	0
Eusolex 6300 3 (4-methyl-benzylidene) camphor	2	1	0
Eusolex 8020 (Isopropyl dibenzoylmethane)	3	7	4
Parsol 1789 (butyl methoxydibenzoylmethane)	0	4	0
Eusolex 4360 (2-hydroxy-4-methoxybenzophenone)	2	21	4
Mexenone (2-hydroxy-methoxymethylbenzophenone)	0	0	0
Benzophenone 4	0	2	0
Eusolex 232 (2 phenyl 5 benzymidazol sulph. acid)	0	0	0
Total	10	39	8

SUNLAB). The irradiation energy of UVB was 2.7 mW/cm^2 and that of UVA 40 mW/cm^2 (Dosimetry OSRAM UV Centra, München, Germany). The patches were removed after 24 h. One set was irradiated with 13 J/cm^2 of UVA, and the second set was irradiated with a sub-erythemal dose of polychromatic irradiation (75% strength UVB MED). The third non-irradiated set served as the patch test. The reading was assessed at 24 and 48 h after irradiation.

RESULTS

We diagnosed 107 positive patch test reactions and 126 positive photopatch test reactions (Table III). A total of 57 positive reactions (15.4%) due to contact allergy and/or photocontact allergy were related to sunscreens (Table IV) and judged relevant in 41 cases (72%) of patients presenting dermatitis (photodistributed eczema). A total of 13 of the patients with contact allergy or photocontact allergy to sunscreens were also affected by polymorphous light eruption. A total of 8 patients had contact or photocontact allergy to several sunscreens.

DISCUSSION

In our study, the prevalence of contact allergy and/or contact photoallergy to sunscreens was similar to previous French series (16–20%) (1, 3) and higher than Italian, English and American (5–7%) series (2, 4, 5). Among sunscreens the allergen most frequently present is oxybenzone and we observed mainly photoallergic contact reaction as reported in the literature (4, 6, 7). Most of these cases (81%) were diagnosed before 1993. For some years now, oxybenzone has not been incorporated in sunscreens in France even if it is still used in cosmetics and daily moisturizers. The second main group of positive reactions was observed with dibenzoylmethanes, most of which were diagnosed after 1993. Eusolex 8020 has been widely used in European sunscreens since 1980 (4, 6). In the USA, sunscreen manufacturers stopped incorporating Eusolex 8020 in their products in the late 1980s and in France it has not been used since 1995 (6). Many reports have shown that Parsol 1789 is a weaker sensitizer than Eusolex 8020 (8).

Only a few patients had photoallergy or contact allergy to PABA and parsol MCX or Eusolex 6300 as in another recent French study (1), whereas in the USA PABA is the main photocontact allergy sensitizer (6). Our results may be explained by the low rate of use of this filter in France.

Phenothiazines, wood tar mix, fragrance mix and Peru balsam are known as phototoxic substances (9) and are probably responsible for some unspecific phototoxic reactions, without clinical relevance, given the relatively high UVA irradiation dose we used.

Previous studies showed that fragrance, cosmetics and medications were leading sensitizers (9–11). Given the high frequency of photosensitization, a large part of the photopatch test battery should be dedicated to UV filters (12, 13).

Irradiation of UV filter patch tests is necessary considering the predominance of photoallergy compared with contact allergy induced by these molecules. An alternative is the use of physical blockers such as titanium dioxide, or camouflage creams, which have the advantage of not being sensitizing.

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