

Occupational contact allergy to bisphenol A

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Bisphenol A (4,4'-isopropylidenediphenol; CAS 80-05-7), is used in the manufacture of epoxy, polycarbonate and unsaturated polyester resins, as well as that of epoxy di(meth)acrylates or vinyl ester resins, and as an antioxidant, fungicide, and antimicrobial in cosmetics (1, 2). Sensitization has been reported, though rarely, from epoxy and vinyl ester resin products (2-4), the manufacture of epoxy resins (5), and also non-epoxy products (6, 7).

Case Report

A 44-year-old female packer had had atopic dermatitis as a child, and since then occasional hand dermatitis. She had also reacted to certain adhesive tapes and plasters for 10 years. She worked in the food industry, where her job was to fill polyvinyl chloride (PVC) and glass containers with jams and to apply various labels, including those with price codes, as well as to wash and clean the containers. She had protected her hands with natural rubber latex (NRL) or PVC gloves of household type for 4 years, before she had developed glove-shaped hand eczema.

On patch testing with Finn Chambers[®] to relevant series (Chemotechnique) and her own samples, she developed the following reactions: PVC glove: inside moistened with water or acetone ++; outside +; label with codes (upper side) ++; and bisphenol A 1%+, diphenylthiourea 1%+ + +, tricresyl phosphate 1%+, colophony 20%+, abitol 10%?+, and Euxyl K 400 0.5%+, each in pet.

Chemical analyses (Table 1) revealed 0.5% bisphenol A, but no tricresyl phosphate, in the PVC glove, 1.5% bisphenol A in the price code ink and 0.7% in the label without ink. Resin acids of colophony (Table 1) were found in all 5 label materials at 0.29%–1.2%,

and in trace amounts in the glove, but not in the code ink.

The patient was followed up for 16 months. She was able to continue her job by protecting her hands with PVC gloves from another manufacturer and avoiding contact with the code ink.

Discussion

PVC gloves rarely cause allergic contact dermatitis, the precise sensitizer seldom being known (8–11), though an organic pigment, Irgalite Orange F2G, and epoxy resin of bisphenol A diglycidyl ether type have both been reported (8, 12, 13). Epoxy resins can be used as plasticizers and stabilizers in PVC and polyvinyl acetate plastics, as well as in synthetic rubbers (12, 13).

The PVC gloves to which this patient was sensitized are commonly used in Finland, and available as hypoallergenic vinyl gloves in department stores. They are used in both the workplace and the home. She was also positive to bisphenol A, but not to epoxy resin. Chemical analysis of the glove material revealed bisphenol A, which was probably the sensitizer in the gloves. A previous patient of ours was also patch-test-positive to similar PVC gloves (9), but was negative to both epoxy resin and bisphenol A.

Bisphenol A in the guinea pig maximization test is not a sensitizer (14), but it seems to be a weak one in humans. Products that have induced sensitization to it include glass fibre, dental composite resin, denture material, semisynthetic waxes and plastic footwear (2–6). It has also been reported to be a photosensitizer (15).

Bisphenol A epoxy resin is used in printing inks and coloring agents (16), and has been the cause of textile label dermatitis (17). The analyses of our patient's price code ink and code label material also disclosed bisphenol A, probably contributing to the dermatitis, and partly explaining why it recurred at work despite changing gloves. She also reacted to tricresyl phosphate, a plasticizer in PVC (18), though the gloves did not contain this. Our previous patient allergic to PVC gloves also reacted to tricresyl and triphenyl phosphate (9). The present patient's allergies to diphenylthiourea (DPTU) and colophony may have derived from adhesive tapes or plasters (21). PVC adhesives may contain DPTU (19, 20), but the patient did not react to the glued side of the code label. 0.29–1.2% resin acids, corresponding to 0.4–1.7% colophony, were found in label materials, but not in the ink. The source of her Euxyl K 400 allergy remained unknown, but was probably non-occupational.

Table 1. Results of gas chromatographic analyses of acetone extracts of samples

Sample	Bisphenol A	Resin acids of colophony	Tricresyl phosphate
PVC glove	0.5%	0.001%	<0.002%*
price code ink	1.5%	<0.004%*	ND
price code label (without ink)	0.7%	0.29%	ND
contents label 1	ND	0.87%	ND
contents label 2	ND	1.1%	ND
contents label 3	ND	1.2%	ND
contents label 4	ND	1.1%	ND

ND: not determined; * detection limit.

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Fragrance sensitivity in allergic contact dermatitis

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Key words: fragrance mix; balsam of Peru; allergic contact dermatitis; extended European standard series; fragrance series; cinnamic aldehyde; cinnamic alcohol; flavourings. © Munksgaard, 1999.

Patients and Methods

1780 patients (male – 1078, female – 702), aged between 19 and 75 years and suspected of allergic contact dermatitis, were patch tested between 1989 and 1998 with the European standard series (Chemotechnique), extended with cresol, lanolin and gentamycin. Van der Bend chambers were used. Readings were made at 2 and 3 days, as per ICDRG recommendations, and reactions $\geq +$ to fragrance mix and/or balsam of Peru were noted. 10 of the positive patients were further patch tested with a fragrance series (Chemotechnique).

Results

95 patients (5.3%), 62 male and 33 female, showed positive reactions, 53 to fragrance mix, 17 to balsam of Peru and 25 to both. Of the 10 tested with the fragrance series, 7 were positive to both cinnamic aldehyde and

cinnamic alcohol, 1 to ylang ylang oil, 1 to eugenol and 1 to both ylang ylang oil and eugenol.

Discussion

Fragrances are among the top 5 most frequent contact allergens (2), accounting for 4–18% of all cases of allergic contact dermatitis (3). In our study, the frequency was 5.3%. Cinnamic aldehyde and cinnamic alcohol were the commonest sensitizers, both being found as fragrance and flavourings in colas, vermouths, bitters chewing gums, mouthwashes, toothpastes and soaps. Many fragrance allergens are either ingredients of balsam of Peru or closely related to them. In our study, 42 patients reacted to balsam of Peru. Thus, it remains a useful marker of fragrance sensitivity.

Our findings underlined the frequency of fragrance allergy in our male patients, the need for a high degree of suspicion of fragrance sensitivity in chronic dermatitis, and the importance of advising patients to avoid