

CONTACT POINT

Occupational airborne allergic contact dermatitis caused by N-(4-hydroxyphenyl)benzenesulfonamide

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The diagnosis of occupational allergic contact dermatitis can be challenging if the workplace allergens involved are not commercially available and if guidance in the literature on possible test conditions for such chemicals is lacking. We here report on the practical work-up of 2 patients with severe occupational (and primarily airborne) allergic contact dermatitis caused by N-(4-hydroxyphenyl)benzenesulfonamide (HPBS) (CAS no. 5471-90-9; Figure 1), which is used as an intermediate in the production of heat-sensitive recording material for the healthcare sector.

CASE REPORTS

Two atopic males, aged 53 years and 58 years, were referred for evaluation of severe dermatitis on their faces, notably the eyelids (Figure 2), lips, and nose, along with eczema of the neck, and, occasionally, more widespread lesions on the trunk and in the elbow folds. Besides itching, burning skin sensations were noted, accompanied by erythema and oedema followed by desquamation. During the working week, symptoms were aggravated, whereas when the patients were off work the lesions diminished and even completely disappeared. Both patients were employed as labourers in a factory producing heat-sensitive recording materials, namely, polyethylene terephthalate (PET) films, for use in the healthcare sector. Their work involved the weighing and emptying of bags filled with white powders used as intermediates in the production of the PET films. Both patients mentioned inadequate ventilation, leading to airborne exposure to the

powders; the temperature on the workfloor was high, resulting in sweating and sticking of the powders to the skin. Both patients reported that, despite skin protection with overalls, masks, glasses, and gloves, direct and airborne skin exposure on unprotected skin parts still occurred. The first patient put his protective glasses in his overall pockets, and developed additional skin lesions underneath these. In the second patient, dermatitis was also noted under a watch-strap. As the first patient had even experienced airborne symptoms only when passing through the work place, strong sensitization to a work-related contact allergen was suspected.

Consultation with the occupational physician showed that, shortly before the skin problems started, the composition of the powders had changed; that is, 4-(*p*-tosyl)catechol (PTC) (CAS no. 107065-85-0) and HPBS had been added. Both patients were patch tested with allergens from the Belgian baseline series and a cosmetic series (all from Chemotechnique Diagnostics, Vellinge, Sweden), mounted on Allergeaze patch test chambers (SmartPractice, Calgary, Canada) and fixed with Fixomull stretch (BSN Medical, Hamburg, Germany). In the second patient, both suspected powders were patch tested semi-open: a very small amount was directly applied on the skin and covered with Micropore (3M, Maplewood, Minnesota). For the first patient, the powders were not available. Following 2 days of occlusion, the tests were read, according to ESCD guidelines,¹ on day (D) 2, D4, and D7. No positive results were observed, except for reactions to sodium metabisulfite 1% pet. and linalool hydroperoxides 1% pet. in the first patient that were not considered to be relevant. In the second patient, the powders tested "as is" gave no reactions. Following a multidisciplinary discussion of both cases with members of the Federal Agency for Occupational Risks (FEDRIS) dealing with occupational skin diseases, we decided to perform additional occluded patch tests with

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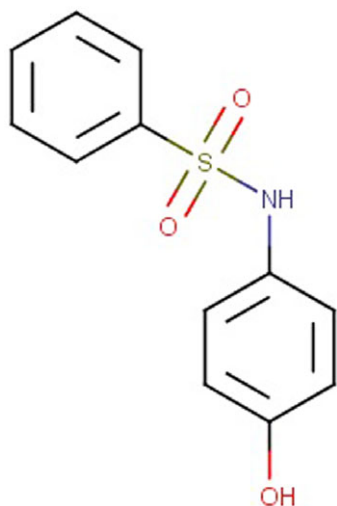


FIGURE 1 N-(4-hydroxyphenyl)benzenesulfonamide



FIGURE 2 Eyelid dermatitis in case 1 as a result of airborne exposure and sensitization to N-(4-hydroxyphenyl)benzenesulfonamide

both powders. The test concentrations for HPBS and PTC were guided by the test concentrations of similar molecules used in commercialized series (Chemotechnique Diagnostics), such as *N*-ethyl-*p*-toluenesulfonamide 0.1% pet. in a dental series, and *p*-tert-butyl-catechol 0.25% pet. in a plastics and glues series, respectively. Because strong sensitization was suspected, we chose 0.1% pet. as the patch test concentration for both molecules. Besides these 2, seemingly related molecules, such as *N*-ethyl-*p*-toluenesulfonamide 0.1% pet., *p*-tert-butyl-catechol 0.25% pet., toluenesulfonamide formaldehyde resin 10% pet., sulfanilamide 5% pet., *N*-cyclohexyl-2-benzothiazolesulfenamide 1% pet., cotrimoxazole 10% pet. and diaminodiphenyl sulfone (dapson) 10% pet. were also tested. The tests were performed as above, and showed only reactions to HPBS 0.1% pet. in both patients, + on D2 and ++ on D4 (Figure 3). Five control patients showed negative results with HPBS 0.1% pet.

The first patient, who had more severe skin symptoms, was offered another job at another work floor within the same company, and has since remained free of symptoms. The second patient decided, as advised by the occupational physician, to resume the same work with improved skin protection, including a full protective face mask with a positive airway pressure device.



FIGURE 3 Positive patch test reaction to N-(4-hydroxyphenyl)benzenesulfonamide 0.1% pet. (++) on day 4 in case 1

DISCUSSION

HPBS, which is synthesized by the reaction of benzene sulfonyl chloride with *p*-aminophenol, is available as a white powder, and, according to the European Chemicals Agency, is manufactured in and/or imported into the EU in a quantity of 1 to 10 tonnes per year.^{2,3} No public data are available on where this chemical is used, or in which products it might be present.³ As far as skin sensitization is concerned, the material safety data sheet mentions only H317 ("may cause an allergic skin reaction"), and states that it is a white powder with only limited solubility. Patch testing with the powder "as is", as recommended for powders or dust,⁴ unfortunately gave a negative result in the one patient tested. We speculate that testing with the powders "as is" in the second patient, who had milder skin symptoms, and who was potentially less sensitized, would not have resulted in skin reactions, because: (a) the skin dose might have been too low, (b) the semi-open patch test was inadequate, and (c) the real-life conditions of higher environmental temperature and sweating, potentially also influencing skin penetration, were absent. The use of a fixed dose, in an occlusive vehicle, under occlusion, probably created better test conditions in this regard. Given the limited water solubility of HPBS, and to obtain a penetration-enhancing effect, we had chosen pet. as the vehicle, although ethanol and/or acetone could have been used as well. Future studies might address different patch test conditions for this allergen. Nevertheless, the patch test results and also negative

results in five control patients confirm the allergic rather than irritant nature of the reactions.

In conclusion, the approach eventually led to correct diagnosis and management, and identified the first two cases of (primarily) airborne allergic contact dermatitis caused by HPBS.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interests.

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