

Short Communication

Occupational contact sensitization to 1,2-diaminocyclohexane

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Case Reports

Case no. 1

A 48-year-old laboratory technician, working with epoxy resins, amine hardeners and phenol-formaldehyde resins, presented with an itchy vesicular eczema primarily on the hands. His forehead, periorbital regions, arms, legs and back were also involved. This had persisted in spite of disposable gloves, protective glasses and using a fume cupboard. His condition improved at weekends and on holidays, only to recur promptly on return to work.

Initial extensive patch testing was negative. Subsequently, he was patch tested to a further 4 suspected amines. Positive reactions were noted to 1,2-diaminocyclohexane at 0.2% and 1% pet. Control tests with 1,2-diaminocyclohexane at 0.2% were negative.

Case nos. 2 and 3

2 men, aged 54 and 46 years, respectively, had long been employed as paint sprayers in the same aerospace paintshop as in case no. 1. The 1st had had acute eczema on the face and neck on return to work after a holiday, which had worsened over 24 h. A milder eczema of the lower legs had occurred a few months previously. The 2nd patient gave a 5-month history of itchy eczema on the shins.

At work, both wore shorts under paper overalls, which became saturated with paint. They worked in booths with extraction systems (1 of which was faulty) and wore air-fed hoods and masks while spraying (a gap below the hood allowing paint contact). A new brand of 2-part, epoxy resin-based paint had been introduced to the workplace 2 months before the onset on their legs.

Patch tests with the European standard series, facial and preservative, plastics and glues, and oil series, were negative. Further tests were positive to the recently-introduced paint hardener at 1% pet. Patch testing with its individual components showed positive reactions at 2 and 4 days to Eurodur 1% pet. Further patch testing with the individual constituents of this component gave reactions at D2 and D4 to m-xylenediamine (50% o.o.)

and ED47/PFA, a derivative of 1,2-diaminocyclohexane, at 0.01% +, 0.1% ++ and 1% pet. +++ . 8 controls did not react to this latter compound.

Both reverted to using the old paint, with clearance of their rash.

Case no. 4

A 53-year-old man paint sprayer for a different aircraft manufacturer gave an 8-month history of work-related blistering and fissuring of the skin of his fingers, skin protection consisting of paper overalls and plastic gloves, which tended to split. The same paint as in case nos. 2 and 3 had been introduced 1 month before the onset.

Patch testing with the European standard, facial, preservative, plastics and glue series was negative. He too gave positive reactions at D2 and D4 to the paint hardener and to its constituents m-xylenediamine (50% o.o.) and 1,2-diaminocyclohexane (0.1% pet.) as EDA47/PFA.

Discussion

Occupational contact sensitization runs at a rate of 0.5–1.9 per 1000 full-time workers (1). 1,2-diaminocyclohex-

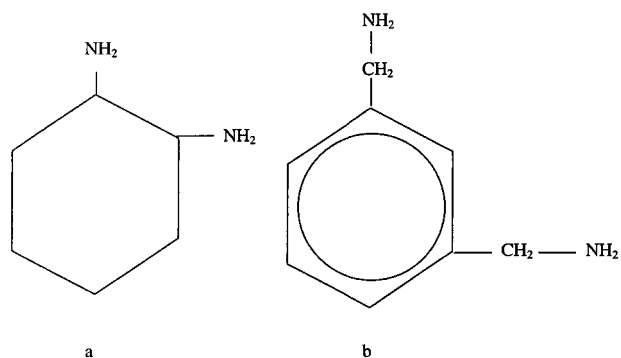


Fig. 1. The structures of 1,2-diaminocyclohexane (a) and m-xylenediamine (b).

ane (Fig. 1) exists as a mixture of cis and trans isomers, and is used as a chelating agent, epoxy hardener, herbicide intermediate and scale/corrosion inhibitor. Laboratory personnel are more prone to irritant contact dermatitis than allergic, though the latter was found in 31 cases among 12,000 laboratory assistants in 1 study (2). The molecules of the aromatic amine m-xylenediamine and the cycloaliphatic amine 1,2 diaminocyclohexane are of similar size and structure (Fig. 1), and cross-reactivity may account for the positive reactions in case nos. 2–4. However, there was no such cross-reactivity with para-phenylenediamine.

Painters are at relatively high risk of contact dermatitis (3). Our painters were exposed to an epoxy-resin-based paint with a polyamide hardener. Epoxy resins are the most common cause of occupational contact sensitization in some countries (4), while their hardeners account for less than 10% of allergic contact dermatitis due to epoxy systems (5). Cycloaliphatic polyamines can be associated with strong sensitization (5, 6). Patch testing with a series of the commoner amines, as well as with appropriate dilutions of the patient's own materials, is

advisable in cases of suspected occupational contact sensitization to epoxy systems.

References

1. Diepgen T L, Coenraads P J. The Epidemiology of occupational contact dermatitis. *Int Arch Occup Environ Health* 1999; 72: 498–506.
2. Jolanki R, Estlander T, Kanerva L. Occupational dermatoses among laboratory assistants. *Contact Dermatitis* 1999; 40: 166–168.
3. Moura C, Dias M, Vale T. Contact dermatitis in painters, polishers and varnishers. *Contact Dermatitis* 1994; 31: 51–53.
4. Jolanki R, Estlander T, Kanerva L. Occupational contact dermatitis and contact urticaria caused by epoxy resins. *Acta Dermato-venereologica* 1987; 134 (suppl): 90–94.
5. Thorgeirsson A. Sensitization capacity of epoxy resin hardeners in the guinea pig. *Acta Dermato-venereologica* 1978; 58: 332–336.
6. Mathias C G T. Allergic contact dermatitis from a non-bisphenol A epoxy in a graphite fibre reinforced epoxy laminate. *J Occup Med* 1987; 29: 754–755.