

Allergic contact dermatitis caused by isocyanates in resin jewellery

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Case Report

A 35-year-old female office worker attended a popular weekend course to develop her interest in making resin jewellery. This involved using a two-part polyurethane resin system that, according to the Material Safety Data Sheet (MSDS), contained 70–90% 4,4'-dicyclohexylmethane-4,4'-diisocyanate (DMDI; CAS 5124-30-1). The two components were mixed, poured into a silicone mould, and allowed to set. On one occasion when the patient did not use gloves, her skin came into direct contact with the polyurethane mixture. The next day, she developed an acute pruritic eruption on her right index finger. Two weeks later, after further resin jewellery making, she developed a pruritic eczematous eruption on her face, neck, and hands. This resolved with topical and oral corticosteroids and avoidance of further jewellery making. There were no associated respiratory symptoms. She no longer undertakes any jewellery making, and has had no recurrences.

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Patch testing was performed with the Chemotechnique European baseline series, including diaminodiphenylmethane (MDA) (0.5% pet.), toluene diisocyanate (2% pet.), 4,4-diphenylmethane diisocyanate (2% pet.), 1,6-hexamethylene diisocyanate (HDI) (0.1% pet.), and the patient's own polyurethane resin system (2% pet.). The main component of the patient's own product, DMDI, was not available for testing. Patch tests were read on D3 and D6 according to the International Contact Dermatitis Research Group criteria as seen on Table 1. Positive reactions were observed to the patient's own system (D3 ++, D6 ++), HDI (D6 +) and MDA (D6 +).

Discussion

Isocyanates are low molecular weight, aromatic and aliphatic chemicals with a highly reactive group that form polyurethane through the addition of polyols.

Polyurethane resins are used in the manufacture of rigid and flexible foams, elastomers, fibres, and surface coatings, including paints and varnishes (1–12).

Allergic contact dermatitis caused by isocyanates has mainly been reported in connection with occupational exposure in the manufacture of polyurethane products used in the plastics, car and textile industries, flooring, and the manufacture of medical, electronic and foam

Table 1. Epicutaneous patch testing

Allergen	D3	D6
Toluene diisocyanate (2% pet.)	–	–
1,6-Hexamethylene diisocyanate (0.1% pet.)	–	+
Diaminodiphenylmethane (0.5% pet.)	–	+
4,4-Diphenylmethane diisocyanate (2% pet.)	–	–
Patient's resin part A (2% pet.)	+	++
Patient's resin part B (2% pet.)	–	–

products (1–12). It has also been reported in sculptors and a moulder (13, 14). The only non-occupational cases were reported in one series, and were thought to be related to the lining of athletic shoes (2).

We describe the first case of allergic contact dermatitis caused by isocyanates, specifically DMDI, in resin jewellery making. Furthermore, this is not occupationally related.

DMDI is an aliphatic isocyanate that is known to be a strong sensitizer. Allergic contact dermatitis caused by DMDI has been reported in workers handling a DMDI-coated cartridge to create resin-coated labels, and in workers involved in the manufacture of medical equipment, and the coating of car badges, name plates and glass bottles, and with exposure to an isocyanate lacquer in floor laminate (1, 3, 4, 5, 11).

In this case, the patient reacted to HDI, which was not found in the polyurethane resin system according to the MSDS, and which, to the best of our knowledge, she had no prior exposure to. HDI, like DMDI, is an aliphatic isocyanate, and cross-reactivity between HDI and other isocyanates has been shown (1, 2). The patient also reacted to MDA without any prior exposure. MDA is thought to be a marker of isocyanate sensitivity (2). In the past, it was thought this was attributable to the conversion of MDI to MDA upon reaction with water, but, more recently, it has been shown that this change is much more complex (6).

Late positive reactions are typical of this allergen, and it is recommended that patch tests should be read at D3 and D7 (6). This case highlights the value of patch testing with the patient's own products (1).

Conclusion

We report the first case of allergic contact dermatitis caused by isocyanates in a non-occupational setting through the use of a two-part polyurethane system to make resin jewellery. As this hobby becomes more popular, allergic contact dermatitis caused by isocyanates may become more than a rare occupational disease. The case highlights the importance of testing with the patient's own materials and the late reading of patch test reactions.

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