

Short Communication

Occupational allergic contact dermatitis from isophoronediamine (IPDA) in operative-clothing manufacture

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Isophoronediamine (IPDA), 3-amino-methyl-3,5,5-trimethylcyclohexylamine, is a cycloaliphatic epoxy resin hardener (CAS 2855-13-2). It is a well-known human sensitizer (1–6), and has also been shown to be an extremely strong sensitizer by the guinea pig maximization test (7). In addition, IPDA is a cause of occupational asthma (5). Contact allergy to IPDA has been reported from epoxy floor-laying (2, 8), painting (5), manufacture of tennis rackets (1) and epoxy floor coating (5).

Case Report

A non-atopic 39-year-old man contracted hand dermatitis in 1992 after 2 years work at a lamination machine. He had had no previous skin problems except photosensitization in the 1990s. He worked in a plant making various clothing articles for use in hospitals, especially in operating theatres for the sterile protection of patients and personnel. The clothes were made of various synthetic fabrics. His task was to operate a machine that laminated a waterproof plastic film onto fiber cloth using a 2-component glue. The resin component contained 10–15% epoxy resin and the hardener 26% IPDA. Before onset of dermatitis, the patient had been exposed to unhardened glue components while mixing them. In the lamination machine, a 2-layered fabric was manufactured and then wound into large rolls. While handling the rolls, the operative was also exposed to unhardened resin at the sides of the fabric, and to airborne dust from cutting of the fiber cloth.

At presentation, the patient had eczema on the hands and wrists, as well as on the right upper arm.

After the 1st patch test session in 1993 (Table 1), he continued in his original job, but the enclosure of the process was improved. In 1996, his dermatitis worsened and spread to his face, especially the eyelids, as well as to the extensor aspects of the hands, wrists, arms, and ankles. The dermatitis healed during 2 weeks of sick leave. During the 2nd patch test session (Table 1) in May 1997, the patient had dermatitis on his face, neck, arms

Table 1. Patch test results

Test substance (pet.)	1993		1997	
	D3	D5	D3	D5
epoxy resin	+	+	?+	?+
MDA	+	+	–	–
perfume mix	–	–	+	+
IPDA	NT	NT	++	++
own resin 1%	?+	–	++	++
hardener 1%	?+	+	++	++
hardener 3%	NT	NT	++	++
fiber cloth	NT	NT	+	+

MDA: diaminodiphenylmethane; IPDA: isophoronediamine.

and hands, typically at sites of sun exposure. On a follow-up visit in October 1997, small patches of chronic eczema could be seen only on the fingers. He was still working at the same workplace, trying to avoid contact with unhardened resin.

Patch testing was performed using Finn Chambers with an occlusion time of 2 days and 3 readings, as previously described (9). The European standard series, a series of plastics and glues (Chemotechnique Diagnostics AB, Malmö Sweden), and the 2 glue components brought in by the patient were tested (Table 1). In addition, IPDA (Chemotechnique Diagnostics AB) was tested at 1%, and plastic-laminated fiber cloth as such.

On the 1st patch testing, the patient reacted to standard epoxy resin, diaminodiphenylmethane (MDA) and the glue hardener. On the 2nd patch testing, he reacted to perfume mix, IPDA, epoxy resin, both glue components, and the finished 2-layered fiber cloth (Table 1).

IPDA and epoxy resin (MW 340) were extracted from the fiber cloth with acetone. They were analyzed by reverse-phase liquid chromatography, using a diode array detector (10). The amine was determined after derivatization with dansyl chloride (11). Fiber cloth was found to contain 0.07% IPDA and 0.28% DGEBA epoxy resin MW 340.

Discussion

To our knowledge, allergic contact dermatitis due to IPDA in fiber cloth has not been reported previously. Airborne allergic contact dermatitis from IPDA has previously been reported (8). The material safety data sheet of the 2-component glue informed that the IPDA was a hardener component, which helped in identifying the allergen. The patch test reaction to MDA remains unexplained. An association with photoallergy has also been suggested, but few cases of photosensitivity due to epoxy resin have been reported (13). Dermatitis on the face, especially the eyelids, is, however, common in persons contact sensitized to epoxy compounds (14).

The laminated fiber cloth is stored for 3 days before sterilization and further processing into garments. Gowns made of the laminated cloth are used in hospitals only when special protection against water or blood is needed. Therefore, the risk of patients being sensitized is minimal, whereas handling the gowns might be a risk for personnel in daily contact with the fiber cloth. Although most epoxy resin patch test reactions are found to be relevant (14), sometimes, the cause of the associated allergic reactions remains obscure. When searching for uncommon sources of epoxy resin compounds, one should bear in mind that hospital protective clothes are one possibility (15).

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