

Allergic contact dermatitis from a diisocyanate in wool processing

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Key words: allergic contact dermatitis; polyurethane; diisocyanates; dicyclohexylmethane-4,4'-diisocyanate; HMDI; occupational; textile industry; wool processing. © Munksgaard, 1997.

In a 1988 NIOSH and Bureau of Labor Statistics survey, the prevalence of occupational contact dermatitis for operators of machines that process wood, paper, textiles or leather was 3.0% ($\pm 0.9\%$), compared with 1.7% ($\pm 0.1\%$) for the general workforce (1). Common causes of allergic and irritant contact dermatitis in textile industry workers are textile dyes, dye-manufacture-related chemicals, and textile finishes (formaldehyde and formaldehyde resins) (2).

Case Report

A 47-year-old textile worker presented with a pruritic, papulovesicular eruption on the dorsum of her hands, forearms, axillae, sternum and anterior neck. 4 years previously, she had had a similar rash involving her hands and arms while processing raw wool with 3 chemical plasticizers. Near-continuous use of a group II topical corticosteroid provided relief. After 1½ years in wool processing, she stopped working for the company and her rash resolved. 5 months prior to presentation, she had resumed her same post and the rash recurred almost immediately. The dermatitis was no longer responsive to topical corticosteroids nor to brief courses of systemic corticosteroids. During the month prior to patch testing, she was not involved in processing wool and noted marked improvement in her condition. She was not involved in dyeing wools. She had never experienced problems with wearing wool sweaters or gloves. Physical examination of the previously affected areas revealed minimal post-inflammatory changes and no active dermatitis.

Patch testing to work-related chemicals revealed strong positive reactions to dicyclohexylmethane-4,4'-diisocyanate (HMDI, 0.5%, 0.1% and 0.05% pet.) and triethylenetetramine (TETA, 0.5% pet). She had handled woolen materials damp with these chemicals. Since fully cured isocyanate resins are not allergenic, the patient was informed that she could continue handling the textiles before plasticizing or after the textiles had been properly treated and the resin fully cured. Due to potential airborne exposure to TETA, a volatile substance, adequate ventilation in her work area was recommended. The patient has since returned to work where she handles pretreated wool without problems.

Discussion

Dicyclohexylmethane-4,4'-diisocyanate is also known as Desmodur W, PICM, hydrogenated MDI (HMDI), reduced MDI (RMDI), H₁₂ MDI, saturated MDI

(SMDI), or methylene bis(4-cyclohexylisocyanate). HMDI is used in the manufacture of high-performance specialty polymers such as elastomers, light fast and color stable urethane coatings, and foams. The main applications are in floor coatings, textile coatings, powder coatings, bottle coatings and urethane water dispersions. In addition to being a potent sensitizer, HMDI is a known cutaneous, conjunctival and respiratory irritant.

Based on mouse ear swelling tests (MESTs), HMDI has been reported to be less sensitizing than diphenylmethane-4,4'-diisocyanate (MDI), but more sensitizing than 1,6-hexamethylene diisocyanate (HDI) and toluene diisocyanate (TDI) (3). Following sensitization to HMDI, cross-reactions can occur to MDI and HDI (MDI eliciting a greater response than HDI), but not to TDI (3). Animal tests have revealed a significantly increased rate of sensitization with small increases in the inducing concentration of HMDI, suggesting a small margin of safety in its use (4).

Despite their sensitizing potential, there are few reports of contact sensitivity to isocyanates. In these cases, polyurethane in molding, special finishes, plastic watchbands, soldering, surface coatings and spectacle frames was responsible (5–7). To our knowledge, this is the 1st confirmed case report of occupational contact dermatitis from HMDI in a textile worker.

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