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Allergic contact dermatitis to 1,6-hexanediol diacrylate in a factory worker

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KEYWORDS

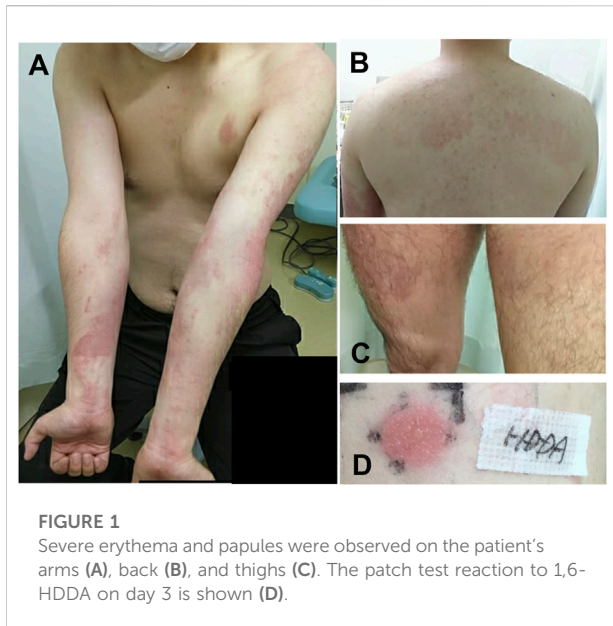
acrylates, hexanediol diacrylate, allergic contact dermatitis, patch testing, occupational contact dermatitis

Dear Editors,

A previously healthy 23-year-old male had worn protective clothing, gloves, and goggles and handled acrylic resin. He accidentally spilt 1,6-hexanediol dimethacrylate (1,6-HDDA, CAS no.: 13048-33-4) on his left arm over his workwear. At that time, he felt no discomfort and he did not change his workwear until closing time. A few hours after he finished work, pruritic erythema appeared on his left arm. He was initially treated with topical corticosteroid and avoided to contact with 1,6-HDDA. However, the rash spread over his body (Figures 1A–C) from the next day to a week after the exposure to 1,6-HDDA. He was treated with oral prednisolone (0.5 mg/kg/day) and topical corticosteroid for a couple of days as well as taking 2 weeks of work-leave. This led to the gradual resolution of the dermatitis.

Patch testing was performed using Japanese baseline series 2015, that consisted of the patch test panel[®] (S) (Sato Pharmaceutical Co., Ltd., Tokyo, Japan) and the patch test reagents (Torii Pharmaceutical Co., Ltd., Tokyo, Japan), 1,6-HDDA (0.1% pet.), and other resins with which he possibly came into contact, including bisphenol A (1% pet.), bisphenol A-glycidyl methacrylate (2% pet.), methyl methacrylate (2% pet.), N,N-dimethyl-p-toluidine (2% pet.), ethyleneglycol dimethacrylate (EGDMA) (2% pet.), triethyleneglycol dimethacrylate (2% pet.), diurethane dimethacrylate (2% pet.), and 2-hydroxyethyl methacrylate (2-HEMA) (1% pet.). The resins except 1,6-HDDA were allergEAZE[®] allergens (SmartPractice Canada, Calgary, Canada). 1,6-HDDA was obtained from his workplace and diluted to 0.1% pet. as previously described [1]. The results of the patch tests were determined on days 2, 3, and 7 according to the guidelines of the International Contact Dermatitis Research Group. Positive reactions (++) to 1,6-HDDA (0.1% pet.) were detected (Figure 1D), and weak reactions (?+) to ethyleneglycol dimethacrylate and triethyleneglycol dimethacrylate were seen. Diagnosis of occupational allergic contact dermatitis to 1,6-HDDA was made. After moving to another department to avoid the potential of contact with 1,6-HDDA, he has had no recurrence so far.

Acrylates are used as ingredients in an extremely wide variety of items, including paints, coatings, adhesives, printing inks, medical and dental applications, and cosmetics. In their monomer form, the acrylates are potential sensitizers. However, a completely polymerized or cured form is considered to be non-sensitizing and seldom causes



allergies. 1,6-HDDA is an acrylic monomer commonly used in the printing industrie, anaerobic sealants, and glues. In this case, the company subcontracted various materials for industrial use, and their uses were confidential. Therefore, it was not known in which industrial sector the chemical would be used. EGDMA and 2-HEMA are allergens recommended for screening of methacrylate allergy, and these two allergens are considered highly cross-reactive. It was reported that among 10 patients with allergic reactions to 1,6-HDDA, 5 patients had a positive reaction to EGDMA and 2-HEMA (One was not tested) [1], suggesting that 1,6-HDDA may not be highly cross-reactive to EGDMA and 2-HEMA. There are only a few cases of accidental exposure in occupational settings [2]. Outside the occupational settings, there have been few cases of sensitization to this allergen, including from a hospital wristband, and plastic banknotes [3, 4]. Allergic reaction to 1,6-HDDA has rarely been reported, however, Aalto-Korte K et al. reported that among 66 patients with allergic reactions to acrylic monomers, nine patients (14%) had a positive reaction to 1,6-

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HDDA [5]. Therefore, 1,6-HDDA may have been overlooked as a cause of contact dermatitis. 1,6-HDDA has been reported as a strong sensitizer [2]. In addition, acrylates can cause airborne dermatitis. Although this patient protected himself with workwear and wore a gas mask and goggles, sensitization had occurred presumably by penetration of 1,6-HDDA through his workwear or in an airborne manner. Considering the distribution of skin rashes, we assume that the 1,6-HDDA on his arm had volatilized and spread to the surrounding area in this case. Once sensitized, he had to change his department because handling 1,6-HDDA was not completely isolated within the factory. The workers should be aware of this potentially sensitizing allergen.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Written informed consent was obtained from the individual(s) for the publication of any potentially identifiable images or data included in this article.

Author contributions

HM, JH, and NI performed the examination and treatment of the case. HM and RT-M wrote the paper. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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