

Severe bullous allergic contact dermatitis caused by diethylthiourea 20 years after sensitization to neoprene

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Diethylthiourea (CAS no. 105-55-5) is mainly used as an accelerator in the vulcanization process for several types of rubber, including neoprene (trademark for chloroprene) (1). The chemical formula is $(C_2H_5NH)_2CS$, and other designations include 1,3-diethylthiourea, 1,3-diethyl-2-thiourea, *N,N'*-diethylthiocarbamide, DETU, *N,N*-diethyl-2-thiourea, and Pennzone E. Several case reports have described allergic contact dermatitis caused by diethylthiourea in neoprene products, such as wet suits, sports equipment, gloves, shoes, and orthopaedic joint braces (2, 3).

Case Report

A 50-year-old male was referred to the dermatological inpatient clinic with severe bullous reactions on both feet and lower legs, with eczema spreading to the trunk and upper extremities (Fig. 1). Initially, in the medical emergency room, it was suspected that the patient suffered



Fig. 1. Severe bullous reaction 2 days after the patient had worn new rubber boots.

from bullous vasculitis. Two days previously, the patient went fishing for 8 h in his new rubber boots. He was wearing woollen socks, and the boots were made of a polymer blend of neoprene with natural rubber latex. There was no history of dermatological disease or atopic dermatitis; however, he recalled an eczematous reaction ~20 years ago, after wearing a knee brace.

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Fig. 2. Patch test reading on day 3 with bullous (+++) reactions to samples from the rubber boots.

A punch biopsy from the affected skin showed dermatitis and eosinophilia, and immunofluorescence was negative. The patient was treated with antibiotics and potassium permanganate baths for secondary infection, and with a potent topical steroid and oral prednisolone. He recovered completely after 2 months. Patch testing was performed with the European baseline series, additional rubber series (Chemotechnique, Vellinge, Sweden, and Trolab®, Reinbek, Germany) and samples of his rubber boots (tradename: Seeland) with Finn Chambers® (Epitest, Tuusula, Finland) on Scanpor® tape (Alpharma, Oslo, Norway). Patch testing was performed according to ICDRG guidelines. The patch tests were occluded for

2 days, and reactions were read on day (D) 3 and D7; a positive reaction was defined as at least homogeneous infiltration and erythema (4). Positive reactions (+++) on D3 and D7 to diethylthiourea 1% pet. and +++ reactions to both the inner layers of the boots and the sole were found (Fig. 2). The product data sheet of the rubber boots showed that they contained neoprene.

Discussion

Diethylthiourea is considered to be a weak hapten (5). Recently Ramzy et al. suggested that diethylthiourea can act as a prehapten, yielding allergens with stronger sensitizing potential, such as ethyl isothiocyanate (1). In this case, the patient had a severe bullous reaction mimicking other dermatological bullous diseases, and we found strong positive patch test reactions to diethylthiourea and to the boots. The patient was probably sensitized to diethylthiourea 20 years ago. At that time, he was patch tested with a sample from his knee brace, which gave a positive reaction, and told that he was allergic to neoprene. This case illustrates a severe reaction to a known allergen with a very long latency since sensitization, and thereby the importance of a careful past and present exposure analysis for relevant allergens also in cases with an atypical presentation of possible allergic contact dermatitis. It is important to give careful information, preferably written, about allergies and how to avoid them in the future, as patients often forget about their allergies once they have recovered (6).

References

- 1 Ramzy A G, Hagvall L, Pei M N et al. Investigation of diethylthiourea and ethyl isothiocyanate as potent skin allergens in chloroprene rubber. *Contact Dermatitis* 2015; **72**: 139–146.
- 2 Liippo J, Ackermann L, Hasan T et al. Sensitization to thiourea derivatives among Finnish patients with suspected contact dermatitis. *Contact Dermatitis* 2010; **63**: 37–41.
- 3 Friis U F, Johansen J D, Krongaard T, Menné T. Quantitative assessment of diethylthiourea exposure in two cases of occupational allergic contact dermatitis. *Contact Dermatitis* 2011; **64**: 116–118.
- 4 Johansen J D, Aalto-Korte K, Agner T et al. European Society of Contact Dermatitis guideline for diagnostic patch testing – recommendations on best practice. *Contact Dermatitis* 2015; **73**: 195–221.
- 5 Ikarashi Y, Ohno K, Momma J et al. Assessment of contact sensitivity of four thiourea rubber accelerators: comparison of two mouse lymph node assays with the guinea pig maximization test. *Food Chem Toxicol* 1994; **32**: 1067–1072.
- 6 Jamil W N, Eriksson I, Lindberg M. How well is the outcome of patch testing remembered by the patients? A 10-year follow-up of testing with the Swedish baseline series at the Department of Dermatology in Örebro, Sweden. *Contact Dermatitis* 2012; **66**: 215–220.