

LETTER TO THE EDITOR

Allergic contact dermatitis caused by diethyl thiourea in a neoprene-containing wet suit

Dear Editor,

Neoprene, which is a synthetic polychloroprene-based rubber made by polymerization of chloroprene, is widely used in many goods such as sports items, gloves, shoes and orthopedic devices.¹ Neoprene contains numerous sensitizing additives including vulcanization accelerators such as thiourea compounds.¹ Some cases have been reported to have allergic contact dermatitis due to neoprene, but no case diagnosed by patch testing in Japan has been published. We report the first case of allergic contact dermatitis (ACD) due to diethyl thiourea (DETU) in a neoprene-containing product in Japan.

A 53-year-old man developed an itchy erythematous eruption, confined to the skin under his neoprene wet suit 1 h after he had taken off the suit. He had worn a wet suit for 3–4 h for water sports. Two months after the incident, he consulted our hospital to have the allergen of his eruption investigated. He had no history of atopic dermatitis or other allergic disorders.

The patient was patch tested with the six wet suit materials of neoprene and a lining material, a Japanese standard series of allergens including p-tert-butylphenol formaldehyde resin (PTBP-FR), a rubber chemical series (including DETU, diphenyl thiourea [DPTU] and dibutyl thiourea [DBTU]) and a plastic series. Patch testing was performed using a patch tester (Torii Pharmaceutical, Tokyo, Japan) applied to the patient's back for 48 h. Results were evaluated according to International Contact Dermatitis Research Group guidelines. At 48 and 72 h, positive reactions to materials of neoprene and DETU (1% pet.) were observed (Table 1, Fig. S1). All positive products of neoprene contained DETU. Our final diagnosis was ACD due to DETU in neoprene.

Some cases of ACD caused by neoprene have been reported previously. The main contact sensitizers in neoprene products are thiourea derivatives.¹ Recently, several cases of ACD due to PTBP-FR in neoprene products have been reported.^{2,3} There have also been reports of ACD from colophonium,³ zinc diethyl dithiocarbamate¹ and nickel¹ in neoprene products, as rare cases.

Thioureas include DETU, DPTU, DBTU and ethylenethiourea. They are used mainly as accelerators in the rubber industry. Thioureas are also found in polyvinyl chloride adhesive tapes, diazo paper, glue removers, fungicides and pesticides.¹ A positive patch test reaction to the thiourea mixture was noted in 0.39% of Finnish general dermatology patients with suspected contact dermatitis.⁴

A recent study suggested that DETU acts as a prehapten.⁵ Ethyl isothiocyanate (EITC) is shown to be continuously produced from DETU in the neoprene materials when they were

Table 1. Results of patch test

Sensitizers	48 h	72 h
Piece of wet suit (outer material)	+	+
Piece of wet suit (middle material of sponge)	+	+
Piece of wet suit (lining)	+	+
Lining material (brand-new)	–	–
p-tert-Butylphenol formaldehyde 1% pet.	–	–
Neoprene sponges (including diethyl thiourea)	+	+
Neoprene sponges (without diethyl thiourea)	–	–
Diethyl thiourea 1% pet.	+	+
Diphenyl thiourea 1% pet.	–	–
Dibutyl thiourea 1% pet.	–	–

heated to 37°C for a few hours. Therefore, DETU contained in a neoprene product may easily form the extreme sensitizer EITC at body temperature resulting in contact allergy to EITC. In our case, dermatitis on the skin under the neoprene wet suit and positive reaction of patch testing may be due to EITC produced during skin contact. ACD from thioureas may be underdiagnosed in Japan, as they are not tested as part of the Japanese standard patch test series. Patients suspected of ACD from neoprene need to be patch tested with components in neoprene such as thioureas and PTBP-FR.

CONFLICT OF INTEREST: None declared.

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- 3 Martellotta D, Costanzo LD, Cafiero M, Bella SL, Balato A. Contact allergy to p-tert-butylphenol formaldehyde resin and zinc diethyldithiocarbamate in wet suit. *Dermatitis* 2008; **19**: E3–E4.
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SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article:

Figure S1. Patch test results showed + in the International Contact Dermatitis Research Group criteria for (a) neoprene sponge and (b) diethyl thiourea at 72 h.