

• CONTRIBUTIONS TO THIS SECTION MAY NOT UNDERGO PEER REVIEW, BUT WILL BE REVIEWED BY THE EDITOR •

Occupational contact dermatitis caused by (3-mercaptopropyl)trimethoxysilane in a windscreen repairer

Maria Pesonen, Outi Kuuliala and Kristiina Aalto-Korte

Occupational Medicine, Finnish Institute of Occupational Health (FIOH), 00250 Helsinki, Finland

doi:10.1111/cod.12453

Key words: adhesion promoter; CAS no. 4420-74-0; glazier; organosilane.

Windscreen repairers and glaziers may be exposed to various allergens that are present in glues, sealants, and windscreen repair products. Occupational contact dermatitis caused by methacrylates in windscreen repairers has been reported previously (1–3). We present a patient involved in windscreen replacement work with contact allergy to an organosilane present in an adhesion promoter solution.

Case Report

A 33-year-old glazier presented with fingertip eczema. He worked in a car repair shop in windscreen repair and replacement. When installing a new windscreen, he first treated the windscreen edges with a primer, and then treated them with adhesion promoter solution prior to the application of the windscreen adhesive. The adhesion promoter solution was applied with a cloth soaked in the solution. The patient used textile gloves coated with polyurethane or natural rubber. After 10 years of such work, he developed fingertip eczema with painful fissures, which he associated with handling the adhesion promoter solution. The fingertip eczema healed during sick leave.

According to the material safety data sheet, the adhesion promoter (Sika Activator PRO®) contained 1–2.5% (3-mercaptopropyl)trimethoxysilane (trimethoxysilylpropanethiol, CAS no. 4420-74-0) (Fig. 1). The primer contained 5% to <10% isophorone diisocyanate and 5% to <10% homopolymers of hexamethylene-1,6-diisocyanate, and the windscreen adhesive contained 0.1–1% diphenylmethane-4,4'-diisocyanate.

Correspondence: Maria Pesonen, Occupational Medicine, Finnish Institute of Occupational Health, Topeliuksenkatu 41 aA, FI-00250 Helsinki, Finland. Tel: +358 30 4741; Fax: +358 9 5875449. E-mail: maria.pesonen@ttl.fi

Funding: No external funding.

Conflict of interests: The authors declare no conflict of interests.

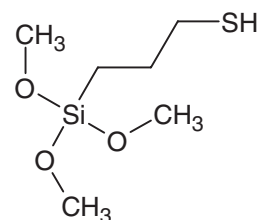


Fig. 1. Chemical structure of (3-mercaptopropyl)trimethoxysilane (CAS no. 4420-74-0).

Patch tests were performed with a modified European baseline series, isocyanate, acrylate, epoxy and glues and plastics series, and the patient's own substances from the workplace, including the adhesion promoter and the primer. Patch testing showed positive reactions to the adhesion promoter in a concentration as low as 0.032% (Table 1) on D4. The patient was patch test negative for the primer, and for the isocyanate series and 4,4'-diaminodiphenylmethane. In further patch testing, (3-mercaptopropyl)trimethoxysilane (Sigma-Aldrich Chemie GmbH, Steinheim, Germany)

Table 1. Patch test results at D4 with the adhesion promoter and its ingredient (3-mercaptopropyl)trimethoxysilane

Adhesion promoter		(3-Mercaptopropyl)trimethoxysilane	
Concentration (%)	Reaction	Concentration (%)	Reaction
3.2	++	0.5	+++
1	++	0.16	++
0.32	+	0.05	++
0.1	+	0.016	++
0.032	?+	0.005	?+
0.01	Negative	0.0016	?+
		0.0005	Negative

Pet. was used as the vehicle.

was positive down to a concentration of 0.0016%, that is, 16 ppm (Table 1), on D4. Subsequently, (3-mercaptopropyl)trimethoxysilane was patch tested as 1% pet. in 20 control patients, with negative results.

Our patient continued in his work. He avoided skin contact with the adhesion promoter by wearing disposable nitrile rubber gloves when applying it. He also avoided contact with the primer and adhesive. At a follow-up visit after 8 months, fingertip eczema had not recurred.

Discussion

(3-Mercaptopropyl)trimethoxysilane is an organosilane. These compounds may be used as coupling agents to

enhance bonding between inorganic surfaces such as glass or metal and organic compounds, as sizing agents for glass fibres, and as coating for glass filaments (4). Cases with occupational contact allergy to organosilanes have been previously reported in glass filament manufacture, in which the reported allergens were (vinylbenzylaminoethyl)aminopropyltrimethoxysilane and 3-(2-aminoethyl aminopropyl)trimethoxysilane (5–7). To our knowledge, this is the first report of contact allergy to (3-mercaptopropyl)trimethoxysilane. This is probably a rare occupational allergy, the diagnosis of which requires patch testing with the patient's own materials and the product ingredients.

References

- 1 Banerjee P, White I R. Allergic contact dermatitis at the application site of an electrosurgical earthing plate occurring in a windscreen repairer. *Contact Dermatitis* 2001; **44**: 97.
- 2 Le Coz C J. Occupational allergic contact dermatitis from polyurethane/methacrylates in windscreen repair chemical. *Contact Dermatitis* 2003; **48**: 275–276.
- 3 Bang Pedersen N. Allergic contact dermatitis from acrylic resin repair of windscreens. *Contact Dermatitis* 1998; **39**: 99.
- 4 Rösch L, John P, Reitmeier R. Silicon compounds, organic. In: *Ullmann's Encyclopedia of Industrial Chemistry*, 7th edition: Weinheim, Wiley-VCH Verlag GmbH & Co, 2012: pp. 637–669.
- 5 Toffoletto F, Cortona G, Feltrin G, Baj A, Goggi E, Cecchetti R. Occupational contact dermatitis from amine-functional methoxysilane in continuous-glass-filament production. *Contact Dermatitis* 1994; **31**: 320–321.
- 6 Heino T, Haapa K, Manelius F. Contact sensitization to organosilane solution in glass filament production. *Contact Dermatitis* 1996; **34**: 294.
- 7 Hughes T M. Occupational sensitization to methoxysilane in fibreglass production. *Contact Dermatitis* 2001; **44**: 129–130.