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Occupational contact dermatitis caused by methylchloroisothiazolinone/methylisothiazolinone through exposure to filler dust containing this preservative and with a positive patch test reaction to the dust

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Contact allergy to methylchloroisothiazolinone (MCI)/methylisothiazolinone (MI) is common in the workplace and domestically. Painters are almost always exposed to this preservative or to MI alone, as water-based paints and fillers almost always contain these preservatives. We present, to our knowledge, the first case of contact allergy to, and allergic contact dermatitis caused by, a grinding dust containing MCI/MI who showed a positive patch test reaction to the dust.

Case Report

A 57-year-old professional painter, with 30 years of experience in the trade, suddenly suffered from a very pruritic, eczematous dermatitis on his torso and arms. At the time, he had plastered ceilings with a water-based filler, Scotte LH (AlcroBeckers AB, Stockholm, Sweden), and afterwards ground the ceilings, thus being exposed to grinding dust. He had never experienced skin problems before, except for previous slight pruritus in his axillae and groins, or any atopic symptoms from the respiratory tract. Because of suspected work-related contact dermatitis, he was referred to us. At presentation almost 2 months later, he was free of eczema, after his general practitioner had treated him with oral and topical corticosteroids, and because he had ceased grinding after

Table 1. Test results for the D3 and D7 readings

Test substance	Concentration	D3	D7
Fragrance mix I	8.0%*	+	+
MCI/MI	200 ppm	+	+
MI	2000 ppm	++	+
MCI	150 ppm	+	–
OIT	0.1%*	–	–
Grinding dust	'As is'	+	?
Grinding dust	'As is'	+	NR

MCI/MI, methylchloroisothiazolinone/methylisothiazolinone; NR, not read; OIT, 2-n-octyl-4-isothiazolin-3-one.

Fragrance mix I was tested in pet. (%), preservatives were tested in aq., except for OIT, and the dust was tested 'as is' (repeat tested during a second consultation).

*Tested in pet.

the dermatitis had appeared. He was patch tested with the Swedish baseline series (Chemotechnique Diagnostics, Vellinge, Sweden), the supplement to the baseline series used in Malmö, our paint series, and a sample of his own grinding dust 'as is' brought from the workplace by him. Patch testing was performed with Finn Chambers[®] (diameter 8 mm) (SmartPractice, Phoenix, AZ, USA) covered with Scanpor[®] tape (Norgesplaster A/S, Vennesla, Norway). Readings were performed on day (D) 3 and D7, according to ICDRG criteria. The patient reacted to MCI/MI, MI on its own, MCI on its own, Kathon[™] 893 [2-n-octyl-4-isothiazolin-3-one (OIT)] in the paint series, his own grinding dust, and fragrance mix 1 (Table 1 and Fig. 1). A chemical investigation of the grinding dust was performed.

The following chemicals were used: ethyl acetate and acetonitrile (BDH Prolabo, Fontenay-sous-Bois,

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Fig. 1. A positive patch test reaction on the patient's upper arm to the filler dust containing methylchloroisothiazolinone/methylisothiazolinone on D3.

France), MCI/MI (The Dow Chemical Company, Midland, MI, USA), and MilliQ water (Millipore, Molsheim, France) (this is deionized water that has been further purified). The dust sample was chemically analysed with high-performance liquid chromatography (HPLC). For analysis of MCI and MI, the dust was extracted in 5 ml of acetonitrile/water (30/70 vol/vol) in an ultrasonic bath for 5 min. The resulting solution was filtered and used for the HPLC analysis. A ThermoFinnigan system was used, consisting of a P4000 quaternary pump, an ultraviolet (UV) 6000 diode array detector, and an AS3000 autoinjector (ThermoFinnigan, San José, CA, USA). The system was software-controlled by CHROMELEON 7 (Fisher Scientific, Gothenburg, Sweden). The injection volume was 20 µl. The column (4.6 mm internal diameter × 250 mm) was packed with Nucleosil (100 Å, 5 µm) (Macherey-Nagel & Co., Düren, Germany). The flow rate was 1.0 ml/min. The detector scanned the eluate in the range 200–400 nm. The isocratic elution was performed with acetonitrile/water (30/70 vol/vol). The identity of the substances was determined from the retention time and the UV spectrum. The detection limit was <0.05 ppm. A sample of Kathon™ CG (Rohm and Haas Company, Philadelphia, PA, USA) was used as a reference for MCI and MI. MI was detected at 0.27 ppm/g grinding dust and MCI at 0.1 ppm/g grinding dust.

For analysis of OIT, the dust was extracted in 5 ml of acetonitrile/water (60/40 vol/vol) in an ultrasonic bath

for 5 min. The resulting solution was filtered and used for HPLC analysis. An HPLC system was used, consisting of an HP 1100 binary pump (Hewlett-Packard Sverige AB, Malmö, Sweden), an HP 1100 variable-wavelength detector, and an HP 3396 series III integrator. The system was equipped with a Rheodyne 772 5i injector (Rheodyne, Cotati, CA, USA) with a 20-µl loop. The column (4.6 mm internal diameter × 250 mm) was packed with Nucleosil C18 5-µm particles (Macherey-Nagel & Co.). The system was software-controlled by AZUR version 4.0. The isocratic elution was performed with acetonitrile/water (60/40 vol/vol). The flow rate was 1 ml/min, and the eluate was monitored at 280 nm. The detection limit for OIT was <0.1 ppm; no OIT was detected in the sample. According to the material safety data sheet, MCI/MI was present in the filler (<15 ppm), but OIT was not.

Discussion

Contact allergy to MCI/MI and also MI on its own is very common in painters, owing to exposure to paints containing these preservatives (1). MCI/MI is also commonly found in water-based fillers. However, to our knowledge, this is the first case in which a patch test with filler dust has given a positive result and been associated with contact allergy to MCI/MI, and in which these two allergens were detected by chemical analysis of the filler dust. To substantiate the test result, the patient was tested on two separate occasions with the dust, and reacted positively both times. The dust sample was taken from the workplace, and the patient had been exposed to exactly this dust. Even though the amount of MCI/MI found in the dust was low, sweating and friction of the dust against the skin may have increased the penetration of this preservative into the skin, explaining the eczematous skin reaction. The patient has experienced no recurrences since diagnosis, and has avoided this work material.

Because the patient reacted to OIT, we wanted to rule out the presence of this isothiazolinone in the dust by chemical analysis. Contact allergy to OIT is also common in painters exposed to paint, glue and similar materials.

The painter's contact allergy to fragrance mix 1 could have been relevant for his former pruritus in his axillae.

References

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