

Contact dermatitis from methylisothiazolinone in a paint factory

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Introduction of new potential contact-sensitizing chemicals have in the past led to epidemics of contact dermatitis. A new preservative containing only methylisothiazolinone (MI) and not methylchloroisothiazolinone (MCI) has recently been introduced in the European Union for use in products, such as paint, glue and cosmetics. The objective of this article is to describe a factory outbreak of contact allergy to MI and MCI preservatives. This factory outbreak describes allergic contact dermatitis towards MI in 4 patients of 14 persons working at a paint manufacturer. Patch test results from all patients showed positive reactions for MI and MCI/MI. The reactions were stronger for MI than MCI/MI indicating a primary sensitization to MI. The combination of MCI/MI remains widely used, and therefore various patterns of exposure and sensitization could be seen in the future. Our data show that MI holds a potential for eliciting and probably inducing contact allergy in humans. Whether this preservative is safe to use in cosmetics where billions of consumers are exposed needs a careful monitoring.

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Biocides are potential contact allergens (1). Exposure to occupationally used products as well as personal care products could involve contact with the same range of biocides.

Introduction of new potential contact sensitizing chemicals have in the past led to epidemics of contact dermatitis (2, 3). Recently, a new preservative containing only methylisothiazolinone (MI) and not methylchloroisothiazolinone (MCI) has been introduced in the European Union (EU) for use in products, such as paint, glue and cosmetics. Currently, the experience with MI contact allergy is limited (4).

We report a factory outbreak of occupational contact dermatitis after exposure to MI-containing paint products.

Patients and Methods

Work place description

In a Danish paint factory, workers were exposed to different solvents and solids in the production of water-based paints. The water-based paints have 4 basic components: pigments, binders,

liquids and additives. Additives include thickeners, surfactants, defoamers and biocides.

The paints were produced in big containers placed in floor level. The workers added pigments and binders by means of bags containing 25 kg of powder. The bags were carried from a nearby wagon to a table above the mixing container. An opening was cut in one end of the bag, and the powder was poured into the container. Big bags containing 500 kg of powder were added by means of a lift. The big bag was lifted above the mixing container, and by dragging a rope the bag was opened, and the powder was poured into the container. Both the process of pouring the powder and the following handling of the empty bags were partly dusty.

The liquid portion of the paint, which was water, was added automatically to the mixing container by tubes.

Most of the additives were also in a liquid form. They were tapped from medium-sized containers directly into zinc buckets. The buckets were then carried manually from the middle of the room or from a nearby room some metres to the mixing container wherein the liquid was

poured. Both by tapping these liquids and by pouring those into the mixing container, the workers were exposed to droplets of the liquid. During the production, the workers were wearing gloves, forearm protections, aprons and a filter mask, however, not used consequently.

The paints were produced from different prescriptions with varying amounts of the products. 3 additives were suspected for sensitizing the workers. One additive introduced in the department February 2004 contained MI in 7%–10% and octylisothiazolinone (OIT) in 1%–2.5%. Another product which contained MI in 0.2%–0.4% and MCI in 0.5%–1% had earlier been used manually but was changed to a tube system. Some exposure to this additive was though still observed in the department in small amounts. A third product contained MI in 2.5% and benzisothiazolinone (BIT) in 2.5%.

Clinical description

Between 2004 and 2005, a total of 4 patients were referred to the department of occupational health from the above mentioned paint factory. Dermatitis developed mainly following the introduction of additives containing 7%–10% MI.

The first patient was a 55-year-old male with dermatitis on both hands that spread to involve the neck, chest and armpits. The second patient was a 40-year-old male with dermatitis involving both hands, forearms and the feet. The third patient was a 34-year-old male with hand and neck dermatitis. The fourth patient was a 53-year-old male with dermatitis on both hands and forearms as well as his abdomen, neck and left leg.

All 4 patients had unremarkable medical histories without atopic dermatitis or other previous skin disorders. Topical corticosteroids was administered and effectively cleared skin lesions in all 4 patients.

Results

We used an extended European standard test series (Hermal[®], Reinbek, Germany) supplemented

with a paint test series (Chemotechnique[®] and Hermal[®]) containing various preservatives. Methyl-4-isothiazolinone-3-one was obtained from Neolone 950 (Rohm and Hass[®], Surrey, UK) and was tested in an aqueous solution with a concentration of 1050 p.p.m. Finn chambers[®] (Epitest Oy, Helsinki, Finland) were used for occlusion and were fixed with Scanpor[®] (Alpharma A/S, Vennessla, Norway) tape to the skin. The patches were removed after day 2, and readings were taken on day 3 and day 7 according to the International Contact Dermatitis Research Group guidelines (5). A positive reaction (+) was defined as homogeneous redness and palpable infiltration in the test area. Patch test results can be seen in Table 1.

Discussion

This factory outbreak describes allergic contact dermatitis in 4 patients of 14 persons working at a paint manufacturer. The paint production at this facility is performed with an open system. This increases the risk of contamination with potential allergens and remains a threat for future employees.

The combination of MCI and MI is a preservative applied in widely different areas. MCI/MI is effective at low doses and has been widely used since 1980s (6). Skin exposure to MCI/MI could cause severe chemical burn in high concentrations but also induce sensitization (7, 8).

Biocides containing exclusively MI without MCI are now used in different products, including paints. The total number of paints and lacquers containing MI has increased from 497 in 2002–2145 in 2005 in Denmark (9). The combination of MCI/MI remains widely used, and therefore various patterns of exposure and sensitization could be seen in the future.

Patch test results from all patients in this factory outbreak showed positive reactions for MI and MCI/MI (Table 1). The reactions were stronger for MI than for MCI/MI indicating a primary sensitization to MI. However, the experience with the used MI patch test concentration is

Table 1. Selected patch test results from 4 employees working at a paint factory using preservatives

	Patient 1		Patient 2		Patient 3		Patient 4	
MCI/MI (3:1 100 ppm) (0.01% aqua)	+?	+	+?	+	+?	+	++	++
MI (0.105% aqua)	+	++	+	+	++	++	+	++
BIT (0.05% pet)			+?	+?	+			
OIT (0.1% pet)			+	+	+	+	+	+

BIT, benzisothiazolinone; MCI, methylchloroisothiazolinone; MI, methylisothiazolinone; OIT, octylisothiazolinone.

limited. Available data show that there is a factor 30 difference in the sensitization potential between MCI and MI (10, 11). They also indicate that the more weakly sensitizing isothiazolinones do not elicit allergic reactions in subjects sensitized to MCI (12).

It cannot be excluded that all 4 patients had previously been sensitized to MCI/MI and therefore had positive patch tests to MI. However, they all presented with dermatitis after the introduction of additives containing 7%–10% MI. Primarily, sensitization to MI and allergic contact dermatitis towards this are therefore likely.

Human studies support this finding (13, 14). When patients who are sensitized to MCI/MI are patch tested separately with MCI and MI, the majority of patients have positive reactions to MCI and negative reactions to MI.

In 3 of the patients, positive patch tests to OIT were observed. Furthermore, a positive patch test to BIT was observed in one of these patients. It is generally agreed that cross reactivity between MCI/MI and BIT and OIT is a rare event and that separate sensitization explains most cases (15, 16).

MI in a concentration of 100 p.p.m. was recently approved for use as a biocide in cosmetic leave-on products in the EU. Our data show that MI holds a potential for eliciting and probably inducing contact allergy in humans. Whether this preservative is safe to use in cosmetics where billions of consumers are exposed needs a care full monitoring.

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