

Alkalization of wall paint prevents airborne contact dermatitis in patients with sensitization to isothiazolinones*

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Isothiazolinones are widely used as preservatives in water-based paint, in particular, the combination of methylchloroisothiazolinone (MCI)

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and methylisothiazolinone (MI) commercially available as Kathon® CG, Euxyl K100®, or Acticide® among others (1). MCI/MI is known as a highly potent contact allergen and can provoke airborne contact dermatitis after exposure in freshly painted rooms. Because the sensitivity rate to MCI/MI remains relatively high among patch-tested individuals with 2–2.5% despite limiting its concentration in products (2), the number of individuals with airborne reactions to wall paint is increasing (1, 3, 4). To prevent this reaction, the paint industry developed preservative-free paint. This preservative-free paint was tested for tolerability in individuals with known airborne contact dermatitis to isothiazolinone-preserved wall paint.

Patients and Methods

Four individuals with previous airborne contact dermatitis to wall paint and verified sensitization to MCI/MI gave informed consent and were exposed for 2 hr at 28°C to the air of a 16-m² large room that was freshly painted on the preceding day with Alpina Sensan® (Deutsche Amphibolin-Werke, Oberamstadt, Germany). Before, and an hour after, exposure transepidermal water loss (TEWL) and dermal blood flow were determined on exposed volar forearms using a Tewameter (TM 210; Courage & Khazaka, Cologne, Germany) for TEWL and laser

Doppler imaging (Moor Instruments, Axminster, UK) for dermal blood flow measurements according to previous experiences (5).

Results

The details of the patients' previous airborne contact reactions to wall paint are summarized in Table 1. All developed rhinoconjunctivitis with redness, itching, tearing, eye swelling, and some sneezing shortly after exposure, or within 24 hr, and an itching and scaling eczema at non-protected skin areas within the next few days. All skin symptoms cleared after topical ($\times 3$) or systemic ($\times 1$) treatment with glucocorticosteroids. Two patients developed new flares after re-entering the painted rooms even after several weeks despite intensive ventilation. Two had known sensitization to MCI/MI or derivatives, and two demonstrated sensitization to MCI/MI (intensity $++$) after patch testing by applying aqueous allergen solutions in Finn Chambers® on Scanpor (Epitest, Tuusula, Finland) at the upper back for 48 hr.

The results of the provocation testing are also summarized in Table 1. Neither subjective nor objective symptoms had occurred in the days after exposure. No changes in TEWL and dermal blood flow nearly reached significance (given above one log difference) (5).

Discussion

Several approaches have already been followed to prevent airborne reactions to isothiazolinone-preserved paint. Ventilating and avoiding entering rooms for several weeks is possible, but not practical. MCI as the more potent sensitizer than MI has been abandoned from paint, but paints containing MI only also caused allergic contact dermatitis (6). Inactivating MCI/MI by over-painting fresh paint with 10% sodium bisulfite may diminish symptoms in some patients, but sodium bisulfite itself is a contact allergen, and alternative substances (e.g. 1% sodium thiosulfate or glutathione) may not be sufficient (1). The use of non-cross-reacting derivatives of isothiazolinones like benzo- (Proxel®) or octylisothiazolinone (Kathon 893® and Skane M-8®) may temporarily ameliorate the problem, but their sensitization rate could increase if used more widely (7).

According to our results, preservative-free paint was well tolerated by individuals with sensitization to MCI/MI and may therefore be a promising alternative. The Alpina Sensan used in our study belongs to the class of water-based dispersion paint that is free of any biocides. Prevention of microbial contamination is obtained by alkalization (pH 10–11) and an advanced, highly hygienic production process, leading to a guaranteed 2-year stability.

Table 1. Patients' information and results from provocation testing

Test person	1	2	3	4
Sex, age (years)	♂, 53	♂, 66	♂, 39	♀, 61
Atopic diathesis	No	No	Yes	No
History of previous airborne dermatitis to wall paint				
Paint used	Alpinaweiss®	Genius® pro	Alpinaweiss®	Brillux® latex
Paint preservative	Kathon® CG	Acticide® LA	Kathon® CG	Euxyl® K100
Self-painted	Yes	Yes	Yes	No
Immediate reactions of rhino-conjunctivae	Yes	Yes	Yes	Yes
Eczema	Yes	Yes	Yes	Yes
Flare up after re-entry	At 3 weeks	n.d.	At 2 months	In other newly painted rooms
Patch test positive for	MCI	MCI	MCI, Acticide LA, and DBDCB	Euxyl K100
Reactions after provocation testing				
Subjective symptoms	None	None	None	None
Objective symptoms	None	None	None	None
Δ TEWL	–1.2	–3.2	0.95	–0.8
Δ LDI	0.9	–16.2	49.6	–28.7

Δ LDI, difference in laser Doppler imaging for determination of dermal blood flow (in arbitrary units); Δ TEWL, difference in transepidermal water loss (mean of two measurements in g/m² hr); DBDCB, dibromodicyanobutane; MCI, methylchloroisothiazolinone; n.d., not determined.

In conclusion, Alpina Sensan and presumable comparable products such as Caparol Sensitive[®], Caparol Sylitol Bio[®], Brillux ELF 1806[®], Keim Allergosil[®], and other preservative-free paints can be recommended as alternative wall paints for individuals with sensitization to isothiazolinones.

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