

Formaldehyde-negative allergic contact dermatitis from melamine-formaldehyde resin

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Melamine-formaldehyde resin (MFR) is used as a textile finish, in tableware, in surface coatings, and in glues in the furniture and wood industry. MFR is considered to be an infrequent sensitizer. Contact allergy to MFR is often combined with formaldehyde allergy. Patients allergic to textile finish often react to MFR, although other finishes are nowadays more commonly used. Besides allergy to textile finish, allergic contact dermatitis from MFR has been described in workers in composite production and in an orthopaedic plaster technician. To our knowledge, there are no previous reports of contact allergy in the plywood industry from MFR. We describe 3 cases of occupational allergic contact dermatitis from MFR without contact allergy to formaldehyde, 1 in the plywood industry, 1 in the production of melamine-laminated chipboard and 1 in laboratory work.

Key words: chipboard; contact allergy; laboratory work; melamine-formaldehyde resin; occupational; plywood industry. © Blackwell Munksgaard, 2003.

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Melamine-formaldehyde resin (MFR) is an amino plastic formed by the reaction between formaldehyde and melamine (2,4,5-triamino-1,3,5-triazine). There is always some unreacted formaldehyde in the resin. MFR has excellent water resistance and is relatively inert to solvents, oils and greases. It is used in surface coatings and glues in the furniture and wood industry. It is also used to improve the strength of paper and the crease resistance of textiles. Tableware, such as cups and plates, is commonly made of MFR (1). Water-resistant orthopaedic plaster (2), medium-density fibreboard (MDF) (3) and fibre-resin composite (4) may all contain MFR.

Urea-formaldehyde resin (UFR) and MFR were the first resins to be used as textile finishes (5). Cyclized urea derivatives are nowadays most frequently used. The formaldehyde content of textiles was often high in the 1960s and '70s, and patients with textile finish dermatitis had probably been primarily sensitized to formaldehyde. The pattern of reactivity in these patients is gradually changing as the industry is moving away from problematic textile resins. In a recent report, 1 out of 3 of the patients were not allergic to formaldehyde. The patients frequently had multiple resin reactions, and 75% reacted to MFR (6).

Previously, allergic contact dermatitis from MFR has been described in 5 workers in com-

posite production (4) and in an orthopaedic plaster technician (2). All these patients were formaldehyde negative on patch testing. 6 patients using MFR-reinforced orthopaedic plasters developed allergic contact dermatitis under the plaster. They were formaldehyde positive on patch testing, but MFR was not tested (7). A single case of formaldehyde dermatitis from MFR-containing gypsum moulds has also been reported (8). 1 patient had eczema one day after sawing and sanding MDF. He reacted to formaldehyde and MFR but not to UFR on patch testing. Allergy to MFR was probably the cause of his dermatitis (3).

We describe 3 cases of occupational allergic contact dermatitis from MFR without allergy to formaldehyde, 1 in the plywood industry, 1 in the production of melamine-laminated chipboard, and 1 in a laboratory (analysis and production of resins).

Case reports

Patient no. 1

Patient no. 1 was a 38-year-old compositor in a chipboard factory with no history of atopy. In 1973, she had had transient eczema on her neck after handling melamine film. In 1976, she started to coat chipboard with melamine film. After 2 weeks, she developed eczema on her wrists and

backs of her hands, and, later, on her arms, fingers, upper back and feet dorsally. The skin symptoms relieved on sick leave. In 1977, on patch testing she had allergic reactions to melamine-formaldehyde film, melamine-formaldehyde dust and 2 phenol-formaldehyde glue films, but not to 2% formaldehyde or the other allergens of the standard series. No control tests were performed.

Patient no. 2

Patient no. 2 was a 38-year-old laboratory technician in a chemical factory manufacturing, e.g. MFR for the plywood industry. She had had occupational allergic contact dermatitis from diphenylmethane-4,4-diisocyanate and concomitant sensitivity to diaminodiphenylmethane. She had non-occupational contact allergy to nickel but no history of atopy. After several years without any skin symptoms, in 1994, she developed generalized itching at work, recurrent oedema of her face and eye irritation. In the laboratory, she had been working in the production and analysis of various glues, mainly MFR, but also phenol-formaldehyde resin (PFR). She suspected MFR to be the cause of her symptoms.

In 1999, she presented with eczema on her face. On patch testing with a modified European standard, medicament, cosmetics, resin series and her own products, she had ++ reactions to nickel sulfate, 2 different PFRs and her own PFR (5% petrolatum). Balsam of Peru (Myroxylon Pereira resin), fragrance mix and another PFR gave ?+ reactions.

3 months later, she had positive reactions to balsam of Peru (++), PFR (++) (Chemotechnique, Malmö, Sweden), MFR (+) (Chemotechnique) and her own MFR (5% ++; 2% ?+ pet.). Fragrance mix, novolac PFR (Trolab, Reinbek, Germany), resol PFR (Trolab, Reinbek, Germany), UFR, 4-tertiary butyl phenol, 2-monomethylolphenol and 4-tertiary butylcatechol were negative.

Patient no. 3

Patient no. 3 was a 26-year-old plywood worker with a history of metal contact dermatitis and allergic rhinitis. After 3 months in the laying-up of plywood, he developed eczema on the dorsal side of his hands and fingers. PFR was used in this work, and he wore leather gloves. The eczema healed during sick leave but relapsed several times at work and spread to his palms, ankles, arms and the dorsal side of his feet. The symptoms relapsed also after being transferred to the continuous gluing of veneer, where MFR glue was used.

On initial patch testing in the local hospital, he had ++ reactions to nickel sulfate, cobalt chloride and potassium dichromate. A dilution series of potassium dichromate was positive down to 0.32%.

Patch tests with a modified European standard, antimicrobial, medicament and cosmetics, rubber chemical, plastics, glues, resin series and with his own products were performed in March 2002 at the FIOH. Potassium dichromate was not retested. There was a +++ reaction to nickel sulfate and a ++ reaction to cobalt chloride. There were doubtful reactions to 5 different PFRs, his own PFR (5 and 2% pet.) and MFR glue (5 and 2% pet.). MFR (Chemotechnique), a test substance used for 19 months, was negative. His eczema healed during sick leave, but reappeared at work after a few days, although he no longer wore chrome-tanned leather gloves.

5 months later new patch tests were performed. In the plastics and glue series with fresh test substances, there was a ++ reaction to MFR and a ?+ reaction to PFR (both from Chemotechnique). His own MFR gave allergic reactions (10% ++, 3.2% ++ and 1% ?+ pet.). His own PFR gave an irritant reaction at 10% (pet.), 3.2% and 1% were negative. 20 control tests with the patient's own MFR (10, 3.2 and 1% pet.) were negative.

In December 2002, a 3rd patch test session at the FIOH was performed. In Chemotechnique's textile finish series, MFR and ethyleneurea/MFR gave ++ reactions. In the resin series, an MFR and a urea-melamine-formaldehyde resin gave + reactions and a PFR a ++ reaction. Chemotechnique's PFR was also positive (+).

Discussion

MFR allergy in patient no. 1 was not entirely certain because no control tests were performed, and commercial test substances were not available. Patient no. 2 had occupational allergic contact dermatitis from PFR and MFR. Positive reaction to balsam of Peru possibly represented cross-allergy to PFR (9). Patient no. 3 had occupational allergic contact dermatitis caused by MFR in a glue and possibly also the chromium in his leather gloves. In the succeeding patch test sessions, he had occasional weak reactions to various PFRs but not to his own PFR. The relevance of the PFR reactions remains unclear. The false-negative reaction to MFR at the first patch test session was probably due to degradation of the allergen.

There are clear difficulties regarding patch testing with MFR. Patient no. 2 reacted more strongly

to her own MRF than to the commercial test substance, and patient no. 3 had a false-negative reaction to a commercial MFR test substance used for 19 months. MFR test substances should be changed at least every year, perhaps even more often. It is recommended to test with the patient's own freshly made MFR (5–10% pet.) to avoid false-negative results.

1 of our patients worked in the plywood industry. To our knowledge, there are no previous reports of MFR dermatitis in this field. All our patients were also exposed to PFR, but only 1 of them was undoubtedly sensitized to it.

Between 1991 and 2001, at FIOH, there have been 15 other patients with allergic reactions to MFR (1.7% of 863 tested). All the patients were formaldehyde-positive. They had been exposed to formaldehyde or its liberators (in cosmetics, liquid soaps, cleaning agents, freezing liquids, developers, furs and topical medicament), or to textile finishes in work clothes or other textiles.

Formaldehyde sensitivity is not necessarily accompanied by simultaneous sensitivity to formaldehyde resins, and vice versa (10). Patients allergic to textile finishes frequently have multiple reactions to resins (6). This may be due to concomitant exposure or cross-allergy via formaldehyde liberation or other structural similarity. The exposure to MFR in our 3 patients was probably much stronger than that from resin-finished textiles. All 3 patients were formaldehyde-negative like the patients who were sensitized to MFR in composite production (4) and from handling MFR-reinforced plaster bandages (2).

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