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Occupational contact allergy to the epoxy methacrylate 2,2-bis[4-(2-methacryloxyethoxy)phenyl] propane in an anaerobic glue

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doi:10.1111/cod.12025

Key words: allergic contact dermatitis; CAS 24448-20-2; chemical analysis; patch test.

2,2-Bis[4-(2-methacryloxyethoxy)phenyl] propane (bis-EMA; CAS 24448-20-2) is an epoxy methacrylate that was developed as a substitute for another epoxy methacrylate, 2,2-bis[4-(2-hydroxy-3-methacryloxypropoxy) phenyl]propane (bis-GMA; CAS 1565-94-2), used in dental composite resins. In the 2012 Finnish Product Register of Chemicals, bis-EMA appears in some anaerobic glues and in one gelcoat. Some cases of allergic reactions to bis-EMA have been reported in the literature, many of them among dental personnel (1–4), and often with a simultaneous reaction to diglycidylether of bisphenol A (DGEBA) epoxy resin (2, 4, 5) and bis-GMA (1, 2, 4, 5). However, we have found no detailed descriptions of primary sensitization with known exposure to bis-EMA. One cleaner, previously reported by the Finnish Institute of Occupational Health, had allergic reactions to bis-EMA before she developed symptoms from bis-EMA-containing temporary crown paste (6). Here, we describe a patient who was sensitized to bis-EMA in anaerobic glue.

Case Report

A 61-year-old male machinist developed hand dermatitis on his wrists, fingers and dorsal palms in 2010. He had used anaerobic Loctite® 620 retainer (Henkel AG & Co., Munich, Germany). On patch testing with Finn Chambers® in 2012, he reacted to Loctite® 620 (D4, +++, 2% pet.; D4, +++, 1% pet.) and bis-EMA (D4, +, 1% pet., Chemotechnique, Vellinge, Sweden), but did not react to DGEBA epoxy resin in the baseline series or any other allergen in our special series of 30 acrylic compounds. The safety data sheet of Loctite 620 declared 1–5% hydroxypropyl methacrylate (HPMA) but no other methacrylate or epoxy (meth)acrylate. We analysed a sample of Loctite® 620 for the content of monomethacrylates and dimethacrylates by gas chromatography, using a mass selective detector. Epoxy (meth)acrylates were analysed by liquid chromatography with ultraviolet detection. We found that 73% of Loctite 620 consisted of bis-EMA, 2.2% of HPMA, 0.064% of triethyleneglycol dimethacrylate (TREGDMA), and about 0.1% of other propylene/ethyleneglycol-based dimethacrylates.

Discussion

Most anaerobic glues are based on (poly)ethyleneglycol dimethacrylate, and they usually sensitize to aliphatic methacrylates such as HPMA or TREGDMA (7). Glues may also contain the epoxy (meth)acrylates bis-EMA, bis-GMA, glycidyl methacrylate (CAS 106-91-2), and 2-bis [4-(2-hydroxy-3-acryloxypropoxy)phenyl] propane (bis-GA; CAS 37625-93-3). In the United States, 3 glue-related cases were positive to glycidyl methacrylate, and 1 of them had used an anaerobic sealant that contained glycidyl methacrylate (8). Quite recently, we described a patient sensitized to bis-GA in an anaerobic sealant (4). A large majority of allergic patch test reactions to epoxy (meth)acrylates are not associated with specific exposure, and are best explained by cross-allergy to DGEBA epoxy resin. The bis-EMA reaction of the present patient could not, however, be explained by DGEBA allergy. In our previous work, we noticed that independent reactions

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Conflicts of interest: The authors have declared no conflicts.

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to epoxy (meth)acrylates without contact allergy to DGEBA indicated specific exposure (4). The present case strengthens this concept. Anaerobic sealants may induce sensitization not only to aliphatic (meth)acrylates, but also to the aromatic epoxy (meth)acrylates glycidyl methacrylate, bis-GA, and bis-EMA.

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