

• CONTRIBUTIONS TO THIS SECTION MAY NOT UNDERGO PEER REVIEW, BUT WILL BE REVIEWED BY THE EDITOR •

Contact allergy to capryldiethanolamine in metalworking fluids

Katri Suuronen, Kristiina Aalto-Korte and Sari Suomela

Occupational Medicine, Finnish Institute of Occupational Health (FIOH), Topeliuksenkatu 41 a A, FIN-00250 Helsinki, Finland

doi:10.1111/cod.12323

Key words: capryldiethanolamine; contact allergy; ethanolamines; metalworking fluid; MWF; occupational.

Ethanolamines are well-known allergens in water-miscible metalworking fluids (MWFs). We report 2 cases of contact allergy to a new ethanolamine derivative.

Case Histories

We patch tested the present two machinists in 2012–2013, according to the recommendations of the International Contact Dermatitis Research Group. We read the tests on D2, D3, and D4, on D2, D3, and D6, or on D2 and D5, depending on the day of application. The tests included a modified baseline series, antimicrobials, oils and cutting fluids, ethanolamines, and coconut fatty acid derivatives, as well as MWFs, liquid soaps, and other cleansers from the workplace. When positive reactions to own substances were seen, we ordered the respective ingredients and tested them separately.

Case 1

A 61-year-old male had worked as a borer and filer-machinist since 1984. He had already had dermatitis on the hands at the beginning of the 1990s. Patch tests including his own MWFs were performed in 1992 and 2001, without positive results. At the Finnish Institute of Occupational Health (FIOH), his current MWF (MWF1) and benzisothiazolinone (BIT) elicited positive reactions: MWF1 10% +, 3.2% +, and 1% +; and BIT 0.05% +. Monoethanolamine (MEA) elicited a ?+ reaction. Diethanolamine (DEA), triethanolamine,

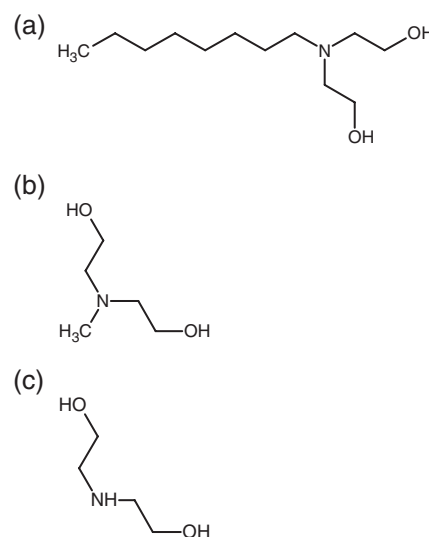


Fig. 1. (a–c) Chemical structures of capryldiethanolamine (CDEA) and the related ethanolamine derivatives methyldiethanolamine (MDEA) and diethanolamine (DEA). (a) CDEA, also termed octyldiethanolamine or octylimino-bis-ethanol, CAS no. 15520-05-5. (b) MDEA, also termed methylimino-bis-ethanol, CAS 105-59-9. (c) DEA, CAS 111-42-2.

methyldiethanolamine (MDEA) and cocamide-DEA were negative. BIT was identified in none of the patient's materials. Tests with the ingredients of MWF1 showed allergy to one of its components, capryldiethanolamine (CDEA; CAS no. 15520-05-5; Fig. 1): 2% ++, 1% +, 0.32% +, 0.1% +, and 0.032% ?+ (tested in pet.). Twenty control patients reacted negatively to 2% CDEA (pet.).

Case 2

A 38-year-old female had worked as a machinist since 1996, with occasional skin symptoms. She had been diagnosed with contact allergy to formaldehyde, formaldehyde liberators, nickel and chromium in 2003.

Correspondence: Katri Suuronen, Occupational Medicine, Finnish Institute of Occupational Health (FIOH), Topeliuksenkatu 41 a A, FI-00250 Helsinki, Finland. Tel: +358-30-4741; Fax: +358-9-5875 449. E-mail: katri.suuronen@ttl.fi

Funding: No external funding.

Conflict of interest: The authors declare no conflicts of interest.

Her dermatitis worsened after she returned from maternity leave in 2010, and she was patch tested in a local hospital, with a positive reaction to formaldehyde, and doubtful reactions to MWFs. Formaldehyde was not identified in her safety data sheets (SDSs), and she was referred to the FIOH. In addition to formaldehyde and nickel, she reacted to glyoxal (1% +), MEA (2% +), DEA (2% ?+), an industrial cleanser (10% +), and to her most used MWF (MWF2) (10% ?+). Other ethanolamine derivatives were negative. The industrial cleanser was found to contain MEA and formaldehyde. Exposure to glyoxal could not be identified. Further tests with MWF2 ingredients showed allergy to its components: MEA 2% +, MDEA 2% +, and CDEA 2% ++, 1% ++, 0.32% ++, 0.1% ++, 0.01% ++, 0.0032% ?+, and 0.001% ?+.

Discussion

CDEA is a DEA derivative of the eight-carbon aliphatic chain (Fig. 1). It is closely related to MDEA, to which

case 2 was exposed and also reacted. MDEA allergy has been reported by Geier et al. (1), but, to our knowledge, allergy to CDEA has not been diagnosed. According to the manufacturer of both MWFs, MWF1 contained ~22% and MWF2 ~30% of a salt formulation. CDEA and other ethanolamines are present in this salt formulation as borate salts or fatty acid salts. Allergy to alkanolamine-borates (2) has been reported. CDEA might be equally allergenic on its own and as its salts. The concentrations of CDEA in the MWF concentrates were low: ~0.5% in MWF1, and probably <0.1% in MWF2. The concentration of CDEA in the emulsions is even lower, because the MWFs are diluted to approximately 3–10% in water. CDEA or its derivatives were not listed in the SDSs. CDEA was probably the main reason for case 1's dermatitis, whereas case 2 had several allergies explaining her dermatitis.

Ethanolamines in some form are essential and thus very common in water-miscible MWFs. Exposure to them may be difficult to identify from the SDS.

References

- 1 Geier J, Lessmann H, Frosch P J et al. Patch testing with components of water-based metalworking fluids. *Contact Dermatitis* 2003; **49**: 85–90.
- 2 Bruze M, Hradil E, Eriksson I L, Gruvberger B, Widström L. Occupational allergic contact dermatitis from alkanolamine-borates in metalworking fluids. *Contact Dermatitis* 1995; **32**: 24–27.