

Product analysis of acrylic resins compared to information given in material safety data sheets

MAJ-LEN HENRIKS-ECKERMAN¹ AND LASSE KANERVA²

¹Turku Regional Institute of Occupational Health, Turku, Finland

²Section of Dermatology, Finnish Institute of Occupational Health, Topeliuksenkatu 41aA, FIN-00250 Helsinki, Finland

Key words: (meth)acrylates; epoxy resin; material safety data sheets; chemical analysis; dental composite resins; adhesives; UV-cured coatings; allergic contact dermatitis. © Munksgaard, 1997.

Acrylics are well-known contact sensitizers (1-7). During a so-called directed market control (initiated by the Health and Safety Division of the Ministry of Labour, Finland) (8,9), we analyzed products containing acrylics and compared our findings with information given in material safety data sheets (MSDS). 10 acrylic products, namely dental composite resins and bonding materials, glues, paints, lacquers and UV-cured coatings (Table 1), were selected by the Health and Safety Division of the Ministry of Labour, Finland, and analyzed by gas chromatographic and mass spectrometric methods, as described previously (10). The chemicals identified in the products are given in Table 1. Our study showed that most of the analyzed acrylate products contained undeclared acrylics, most of which have been reported to be contact sensitizers (1-14). Therefore, better MSDS should be required from industry before products are put on the market (15).

References

1. Björkner B. Sensitizing capacity of ultraviolet curable acrylic compounds. MD Thesis. Lund, Sweden, 1984: 1-78.
2. Kanerva L, Estlander T, Jolanki R. Occupational skin allergy in the dental profession. *Derm Clinics* 1994; 12: 517-532.
3. Kanerva L, Henriks-Eckerman M-L, Estlander T, Jolanki R, Tarvainen K. Occupational allergic contact dermatitis and composition of acrylates in dentin-bonding systems. *J Eur Acad Derm Venereol* 1994; 3: 157-168.
4. Kanerva L, Jolanki R, Leino T, Estlander T. Occupational allergic contact dermatitis from 2-hydroxyethyl methacrylate and ethylene glycol dimethacrylate in a modified acrylic structural adhesive. *Contact Dermatitis* 1995; 33: 84-89.
5. Rustemeyer T, Frosch P J. Occupational skin diseases in dental laboratory technicians (I). Clinical picture and causative factors. *Contact Dermatitis* 1996; 34: 125-133.
6. Busschots A M, Meuleman V, Poesen N, Dooms-Goossens A. Contact allergy to components of glue in insulin infusion sets. *Contact Dermatitis* 1995; 33: 205-206.
7. Kanerva L, Lauerma A, Estlander T, Alanko K, Henriks-Eckerman M-L, Jolanki R. Occupational allergic contact dermatitis caused by photobonded sculptured nails and a review on (meth)acrylates in nail cosmetics. *Am J Contact Dermatitis* 1996; 7: 109-115.
8. Henriks-Eckerman M-L. Akrylaattiyhdisteiden määrittäminen. Loppuraportti Työsuojeluhallitukselle. Turun Alue-työterveyslaitos, Turku, Finland, 1992.
9. Henriks-Eckerman M-L. Akrylaattiyhdisteiden määrittäminen kemiallisista tuotteista. Esimerkki suunnatusta merkinvalvonnasta. (Analysis of products for (meth)acrylates. An example of directed market control, in Finnish with English abstract.) *Kemia-Kemi* 1994; 21: 124-127.
10. Henriks-Eckerman M-L, Kanerva L. Gas chromatographic and mass spectrometric purity analysis of acrylates and methacrylates used as patch test substances. *Am J Contact Dermatitis* 1997; 36: in press.
11. Condé-Salazar L, Guimaraens D, Romero L V. Occupational allergic contact dermatitis from anaerobic acrylic sealants. *Contact Dermatitis* 1988; 18: 129-132.
12. Nethercott J R. Allergic contact dermatitis due to an epoxy acrylate. *Br J Dermatol* 1981; 104: 697-703.
13. Jolanki R, Kanerva L, Estlander T. Occupational allergic contact dermatitis caused by epoxy diacrylate from ultraviolet light cured paint, and bisphenol A in dental composite resin. *Contact Dermatitis* 1995; 33: 94-99.
14. Jolanki R. Occupational skin disease from epoxy compounds. *Acta Dermato-venereologica* 1991; suppl 169: 1-80.
15. Kanerva L, Henriks-Eckerman M-L, Jolanki R, Estlander T. What is new in contact dermatitis from plastics/acrylic: material safety data sheets need to be improved. *Clinics Dermatol* 1997: in preparation.

Table 1. Chemicals identified by chromatographic analysis, compared to information given in material safety data sheets (MSDS).

	Concentration (%)	MSDS (%)		Concentration (%)	MSDS (%)
(A) Dental composite resins and bonding materials			<i>Product 6</i> (adhesive)		
<i>Product 1</i> (adhesive of dental composite resin)			tetrahydrofurfuryl methacrylate	80	55–65
BIS-GMA	7.6	NG	diglycidyl ether of bisphenol A (DGEBA)	~6	NG
triethyleneglycol dimethacrylate	24	NG	methyl methacrylate	0.54	NG
2-hydroxyethyl methacrylate	6.8	5–9	epoxy diacrylate	0.32	NG
decamethylene dimethacrylate	1.5	NG	n-butyl methacrylate	0.05	NG
diethyleneglycol dimethacrylate	0.5	NG	(C) Paints, lacquers and UV-cured coatings		
ethyleneglycol dimethacrylate	0.3	NG	<i>Product 7</i> (UV-lacquer)		
ethyl ester of dimethylaminobenzoic acid	0.3	NG	epoxy diacrylate	8.2	15–20
<i>Product 2</i> (light-cured adhesive)			tripropyleneglycol diacrylates	46	NG
BIS-GMA	57	55–65	oligotriacrylates (based on propyleneglycol)	2.4	NG
triethyleneglycol dimethacrylate	37	NG	hexanediol diacrylate	2.4	NG
diethyleneglycol dimethacrylate	1.5	NG	benzophenone	~2	NG
ethyleneglycol dimethacrylate	0.13	NG	trimethylolpropane triacrylate	0.2	35–45
(B) Glues			benzoylhexanol	~1	NG
<i>Product 3</i> (anaerobic adhesive paste)			urethane acrylate prepolymer	ND	10–20
triethyleneglycol dimethacrylate	69	<60	<i>Product 8</i> (shop primer for concrete floors)		
dibutyl phthalate	~20	NG	methyl methacrylate	91	73
2-hydroxypropyl methacrylate	7.6	NG	butanediol dimethacrylate	7.3	NG
mono- and diethyleneglycol dimethacrylate	0.3	NG	2-ethylhexyl acrylate	0.06	NG
methyl methacrylate	0.15	<1	n-butyl acrylate	0.05	NG
acetophenone+cumyl alcohol	~0.05	NG	toluidine	~1	1
N,N-dimethyltolueneamine	~0.1	NG	<i>Product 9</i> (raw material for lacquer)		
hydroquinone	ND	<0.1	poxy diacrylate	34	NG
<i>Product 4</i> (acrylic adhesive)			hexanediol diacrylate	26	20
2-hydroxyethyl methacrylate	26	NG	diglycidyl ether of bisphenol A (DGEBA)	0.2	NG
isobornyl acrylate	24	NG	<i>Product 10</i> (offset coating – for UV-cured coating)		
ethyleneglycol dimethacrylate	1.0	NG	oligotriacrylates (based on propyleneglycol)	13	NG
methacrylic acid	0.3	NG	hexanediol diacrylate	7.6	NG
acetophenone+cumyl alcohol	~0.1	NG	tripropyleneglycol diacrylates	1.3	NG
MDI-prepolymer	ND	30	methylaminobisethanol acrylate	7	NG
<i>Product 5</i> (acrylic adhesive)			methylaminobisethanol	4	NG
tetrahydrofurfuryl methacrylate	67	75–85	benzophenone	8	NG
2-ethylhexyl methacrylate	15	NG	vinyl-2-pyrrolidinone	2	NG
methacrylic acid	~6	10			
acetophenone+cumyl alcohol	~0.4	NG			

NG: not given; ND: not determined; BIS-GMA: 2,2-bis[4-(2-hydroxy-3-methacryloxypropoxy)phenyl]propane; MDI: 4,4'-di-phenylmethane diisocyanate.

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.