

Short Communication

Allergic contact dermatitis from phenoxyethoxy ethylacrylates in optical fiber coating, and glue in an insulin pump set

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Case Reports

Patient no. 1 was a 53-year-old woman working on quality control in an optical-fiber manufacturing plant. The fibers were coated with a UV-curable acrylate resin. After 2 months such work, she developed dermatitis on her face, hands and forearms, which improved on holidays, but reappeared on return to work.

Patient no. 2 was a 38-year-old woman with diabetes, being treated with an insulin pump. After 4 years' such treatment, dermatitis began to appear at the contact sites of the "butterfly" of the infusion set, after 24 h exposure, and healed leaving leukoderma (1). A glue attached the needle and catheter to the "butterfly" and dermatitis had developed in relation to this glue.

On patch testing, patient no. 1 reacted to the acrylate-coated fibers (Table 1), the UV-curable acrylate coating resin and hexanediol diacrylate (HDDA, ++; 0.1% pet.). 27 other (meth)acrylates (Chemotechnique) were negative, including, e.g., epoxy dimethacrylates (2). The manufacturer then supplied 19 components of the UV-

curable acrylate coating: component no. 15, 2-phenoxy ethylacrylate, gave +++ reactions at 0.1–0.01%, ++ reactions at 0.003–0.0003% and a + reaction at 0.0001%. Component no. 3, tetraethylene triacrylate, gave a ++ reaction at 0.1% and a ?+ reaction at 0.03%, 0.01% being –. On chemical analysis, component no. 15 was found to contain 84% 2-phenoxy ethylacrylate (Fig. 1, $n=0$), and 12% other phenoxyethoxy ethylacrylates ($n=1-3$), and component no. 3 was found to contain 1.2% 2-phenoxy ethylacrylate. HDDA was not found in the coating resin.

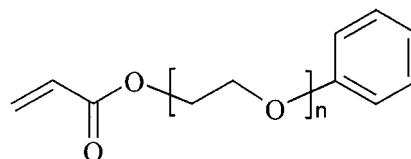


Fig. 1. Phenoxyethoxy ethylacrylates (2-phenoxy ethylacrylate, $n=0$).

Table 1. Patch test results in patient no. 1

<i>Patient's own materials</i>		
acrylate-coated fibers	as is with drop of water	++
acrylate-coated fibers	as is with drop of acetone	++
UV-curable acrylate coating resin	1–0.1% pet.	+++
<i>(Meth)acrylate series</i>		
hexanediol diacrylate (HDDA)	0.1% pet.	++
<i>Components of the UV-curable acrylate coating resin</i>		
<i>(Table 2)</i>		
component no. 3, tetraethylene triacrylate	0.1% pet.	++
component no. 3, tetraethylene triacrylate	0.03% pet.	?+
component no. 3, tetraethylene triacrylate	0.01% pet.	–
component no. 15, 2-phenoxy ethylacrylate	0.1–0.01% pet.	+++
component no. 15, 2-phenoxy ethylacrylate	0.003–0.0003% pet.	++
component no. 15, 2-phenoxy ethylacrylate	0.0001% pet.	+

Table 2. Gas chromatography/mass spectrometry analysis of component nos. 3 and 15 of the fiber-coating resin (patient no. 1)

Substance analyzed	% w/w
<i>UV-curable acrylate coating resin</i>	
<i>Component no. 3, tetraethylene triacrylate</i>	
polyethyleneglycolpolyacrylates	75
2-phenoxy ethylacrylate (Fig. 1, $n=0$)	1.2
1,4-butanediol dimethacrylate	0.6
triethyleneglycol diacrylate	0.2
trimethylolpropane triacrylate	0.1
triethyleneglycol dimethacrylate	0.1
other acrylates	3.8
<i>Component no. 15, 2-phenoxy ethylacrylate</i>	
2-phenoxy ethylacrylate (Fig. 1, $n=0$)	84
phenoxypolyethoxy ethylacrylates (Fig. 1, $n>2$)	12
<i>Insulin pump set glue</i>	
<i>Component PEEA phenoxypoly(ethyleneoxy)ethyl acrylate</i>	
2-phenoxy ethylacrylate (Fig. 1, $n=0$)	0.9
phenoxyethoxy ethylacrylates (Fig. 1, $n=1$)	13
phenoxydiethoxy ethylacrylates (Fig. 1, $n=2$)	22
phenoxytriethoxy ethylacrylates (Fig. 1, $n=3$)	21
phenoxypolyethoxy ethylacrylates (Fig. 1, $n>3$)	38
tripropyleneglycol diacrylate	1.5

Table 3. Summary of main analytical findings

Substance analyzed	2-phenoxy ethylacrylate (% w/w)	Phenoxyethoxy ethylacrylates (% w/w)
component no. 3 (patient no. 1)	1.2	<0.05
component no. 15 (patient no. 1)	84	12
component PEEA (patient no. 2)	0.9	94

Patient no. 2 reacted on patch testing to the infusion set at the site of the "butterfly" glue. All 8 components of the glue (the same UV-cured Loctite® as in ref. (2)) were then patch tested. The patient reacted to 1 of the components, phenoxypoly(ethyleneoxy)ethyl acrylate (PEEA). This gave a ++ reaction at 0.01% pet. (lowest % tested). β -carboxyethyl acrylate (3) also gave a ?+ reaction at 0.5%, 0.16% and 0.05% being -. Isobornyl acrylate and 1-benzoyl cyclohexanol were also -, in contrast to the previously reported patient (2).

By gas chromatography/mass spectrometry analysis (4), phenoxypoly(ethyleneoxy)ethyl acrylate was found to contain around 10 phenoxyethoxy ethylacrylates of different chain length, totalling 95% phenoxyoligoethoxy ethylacrylates (Table 2). The proportion of the monomer 2-phenoxy ethylacrylate was 0.9%.

Discussion

It can be concluded that both 2-phenoxyethyl acrylate monomer (CAS 48145-04-6) and its oligomers are contact sensitizers (Table 3). Like the Busschots et al. (3) 2 patients, our patient no. 2, did not react to any chemicals in the (meth)acrylates series, whereas Van den Hove et al. (5) had such a patient who reacted to many (meth)acrylates in this series. Boom & Van Driel (6) reported allergic contact dermatitis from epoxy resin in such infusion sets. Nickel contact dermatitis from the needles of infusion pumps has also been reported (7). We have not found earlier reports of occupational allergic contact dermatitis from phenoxy ethylacrylates in optical fibers, though sensitization has been reported from other acrylates (8).

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