

Occupational conjunctivitis as the sole manifestation of airborne contact allergy to trimethylolpropane triacrylate contained in a UV-cured paint

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A 28-year-old non-atopic man presented with a 2-month history of itching of both eyes with redness of the conjunctiva. These eye symptoms had begun 1 month after he had started to use a screen-printing process and ultraviolet (UV)-cured paint to print onto plastic bottles at work. Apart from wearing cotton gloves, no other preventive measures were taken. The symptoms improved at weekends and disappeared while away from work for a week. After a working day, swelling of the eyelids and a mild hyperaemia of the bulbar and tarsal conjunctivae without papillary or follicular hypertrophy were noted. A conjunctival scraping showed a moderate lymphocytic reaction with increased level of eosinophils. A conjunctival bacterial culture was negative. An ophthalmologist had considered his conjunctivitis as probably allergic. There were no skin lesions in any other body areas. Nasal, pharyngeal, and chest symptoms were not present.

The UV-cured paint contained dipropylene glycol diacrylate (DPGDA) (20–30%), tripropylene glycol diacrylate (TPGDA) (5–10%), trimethylolpropane triacrylate (TMPTA) (15–25%), and a reactive polyacrylate resin mixture (20–30%), according to the material safety data sheet and information supplied by the manufacturer. Patch tests were carried out with the European baseline series, the paint (tested at 0.2%, 0.1%, and 0.05% in pet.), and a (meth)acrylate series (Table 1). The allergens of the (meth)acrylate series were chosen according to the material safety data sheet and to data reported in the liter-

ature (1–6). All the allergens, including two ingredients of the paint (TMPTA and DPGDA), were obtained from Firma Diagent (Florence, Italy), except for TPGDA and urethane diacrylate, which were from Chemotechnique Diagnostics AB (Malmö, Sweden). The paint was brought by the patient and prepared in our laboratory. Patch tests were applied to the back for 2 days using Finn Chambers® on Scanpor tape (Epitest Ltd Oy, Tuusula, Finland). Readings were made on D2, D3, D5, and D7, and the reactions were scored according to International Contact Dermati-

tis Research Group (ICDRG) criteria. On patch testing, in addition to the paint, the patient reacted both to TMPTA 0.1% pet. and to pentaerythritol triacrylate 0.1% pet., the latter not being present in the paint and probably cross-reacting with TMPTA. He did not develop a positive patch test reaction to any other allergen of our series. The patient was then patch tested with a dilution series of TMPTA that gave a positive result at 0.01% and at 0.001% (Table 1). Concurrently with the positive patch tests to TMPTA, the patient experienced a focal flare of his conjunctivitis. Ten control patients

Table 1. Patch test materials and summary of results

	Concentration (%) (pet.)	D2	D3	D5	D7
European baseline series	NA	–	–	NR	NR
Paint	0.2	++	++	+	+
Paint	0.1	++	++	?+	–
Paint	0.05	+	+	+	?+
(Meth)acrylate series					
Acrylonitrile	0.1	–	–	–	–
BIS-GA	0.5	–	–	–	–
1,4 Butanediol dimethacrylate	2	–	–	–	–
Butyl acrylate	1	–	–	–	–
N-Butyl methacrylate	2	–	–	–	–
Diethylene glycol diacrylate	0.1	–	–	–	–
DPGDA	0.1	–	–	–	–
Epoxy acrylate	0.5	–	–	–	–
Ethyl acrylate	1	–	–	–	–
Ethyl methacrylate	2	–	–	–	–
Ethylene glycol dimethacrylate	2	–	–	–	–
2-Ethylhexyl acrylate	0.5	–	–	–	–
1,6-Hexanediol diacrylate 0.1	–	–	–	–	–
2-Hydroxyethyl acrylate	0.1	–	–	–	–
2-Hydroxyethyl methacrylate	5	–	–	–	–
2-Hydroxypropyl acrylate	0.1	–	–	–	–
2-Hydroxypropyl methacrylate	2	–	–	–	–
Methyl acrylate	–	–	–	–	–
Methyl methacrylate	5	–	–	–	–
Pentaerythritol triacrylate	0.1	++	++	+	+
TMPTA	0.1	++	++	++	+
TMPTA	0.01	+	++	++	+
TMPTA	0.001	–	?+	+	?+
TPGDA*	0.1	–	–	–	–
Triethylene glycol diacrylate	0.1	–	–	–	–
Urethane diacrylate (aliphatic)*	0.1	–	–	–	–
Urethane diacrylate (aromatic)*	0.05	–	–	–	–
Dibutyl phthalate	5	–	–	NR	NR
Diethyl phthalate	5	–	–	NR	NR
Diethyl phthalate	2	–	–	NR	NR
Tricresyl phosphate	2	–	–	NR	NR
Triphenyl phosphate	5	–	–	NR	NR
Hydroquinone monobenzyl ether	1	–	–	NR	NR
Resorcinol monobenzoate	1	–	–	NR	NR
Benzoyl peroxide	1	–	–	NR	NR
Benzophenone	1	–	–	NR	NR

BIS-GA, 2,2-bis[4-(2-hydroxy-3-acryloxypropoxy)phenyl]-p; DPGDA, dipropylene glycol diacrylate; NA, not applicable; NR, not read; TMPTA, trimethylolpropane triacrylate; TPGDA, tripropylene glycol diacrylate.

*Supplied by Chemotechnique Diagnostics AB; all the other allergens were obtained from Firma Diagent.

were patch tested for TMPTA 0.1% pet. with negative results at D2 and D3.

In order to assess immediate contact hypersensitivity, scratch-chamber tests were performed according to the ICDRG recommendations with the ingredients of the paint (TMPTA 0.1% pet., DPGDA 0.1% pet., and TPGDA 0.1% pet.), and the results were all negative.

The patient was advised to avoid any further work with the UV-cured paint and his symptoms have resolved.

Comment

The following reasons provide sufficient evidence for the diagnosis of occupational conjunctivitis from contact allergy to TMPTA, a multifunctional acrylic monomer contained in the UV-cured paint.

- 1) The close relationship between flares of conjunctivitis and use of the UV-cured paint containing TMPTA;
- 2) The positive patch test reaction to TMPTA at the lower concentration;
- 3) The local flare-up of conjunctivitis during patch test with dilution series of TMPTA.

These findings suggest that conjunctivitis may be caused by delayed contact allergy to TMPTA; it is a well-known type IV contact allergen (1–3).

We report this case to emphasize the exclusively conjunctival involvement from airborne exposure to TMPTA and the consequent diagnostic difficulty. On reviewing the literature, allergic contact dermatitis with or without conjunctivitis is extensively described as being caused by exposure to TMPTA and to other acrylic monomers (1–6); in contrast, the exclusively conjunctival involvement is a very rare finding (6).

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