

**Allergic contact dermatitis
from occupational
exposure to dibutyl
maleate**

Contact Dermatitis 2009; 60: 298–300

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Key words: acrylates; allergic contact dermatitis; dibutyl maleate; dimethyl fumarate; occupational dermatitis.

Gelcoats are liquid resins applied to the surface of articles made of composite materials and subsequently polymerized to impart a glossy, water-, chemical-, and ultraviolet (UV) light-resistant finish. They are ideally suited for use on boat hulls, recreational vehicles, truck cabins, baths, and shower cubicles. These coatings are usually based on epoxy or polyester resins. They are mixed with various additives such as pigments, UV absorbers, plasticizers, and reactive diluents. Initiators and catalysts are required for polymerization, which occurs at room temperature or by heating. Some of the ingredients of a gelcoat system possess irritating or sensitizing properties.

Case Report

Four months after a 47-year-old woman began employment as a batch mixer in a factory that produces gelcoats and specialty paints for use on composite materials, she developed eczematous lesions on the inner wrists and forearms. These areas were regularly in contact with chemicals and were inadequately protected by a Tyvek® (Dupont, Wilmington, DE, USA) suit and rubber gloves. The lesions were treated with topical corticosteroid creams, but progressively worsened and cleared only when the patient was withdrawn from work.

She was patch tested with the North American Contact Dermatitis Group standard series; a plastics, glues, and adhesives series as well as with products from the workplace (Table 1). The standard series was placed on Finn Chambers® (Epitest Ltd Oy, Tuusula, Finland), while other allergens were mounted on IQ Ultra™ Chambers (Chemotechnique Diagnostics, Vellinge, Sweden) and secured with Scanpor® tape (Alpharma AS, Venne-sla, Norway). Readings were performed at D2 and D4, and reactions were rated according to International Contact Dermatitis Research Group standards. At both reading times, only dibutyl maleate 5% pet. gave a 1+ reaction.

Five controls were also tested, and four had no reaction. One subject, who had known allergies to multiple acrylates but had never been knowingly exposed to dibutyl maleate,

Table 1. Patch test results to standard allergens and workplace chemicals

Allergen	%	Vehicle	D2	D4
NACDG standard series			—	—
Plastics, glues, and adhesives			—	—
Styrene monomer	1	o.o.	—	—
Diethylene glycol	50	aq.	—	—
Diethylene glycol	10	aq.	—	—
Diethylene glycol	2.5	aq.	—	—
Octabenzene	10	pet.	—	—
Octabenzene	5	pet.	—	—
Octabenzene	1	pet.	—	—
Dibutyl maleate	5	pet.	+	+

aq., aqueous; NACDG, North American Contact Dermatitis Group; o.o., olive oil.

developed a reaction to this chemical, graded as 1+ at D2 and 2+ at D4.

Discussion

Dibutyl maleate (CAS number 105-76-0) is also known as dibutyl maleinate and maleic acid dibutyl ester. Dibutyl maleate is a colourless, transparent, and oily liquid; it is mostly used as plasticizer in water-resistant films, intermediate in the production of paints, ingredient in polyvinyl ace-

tate (PVA) glues, and in vinyl and acrylic emulsion polymers.

Malten mentioned the strong sensitizing properties of dibutyl maleate (1). However, a search of the English literature retrieved only two simultaneously published reports that describe occupational allergic contact dermatitis from dibutyl maleate (2, 3). In both publications, a PVA glue was the source of exposure. In the paper by Thorman et al., 11 of 20 workers became sensitized, triggering

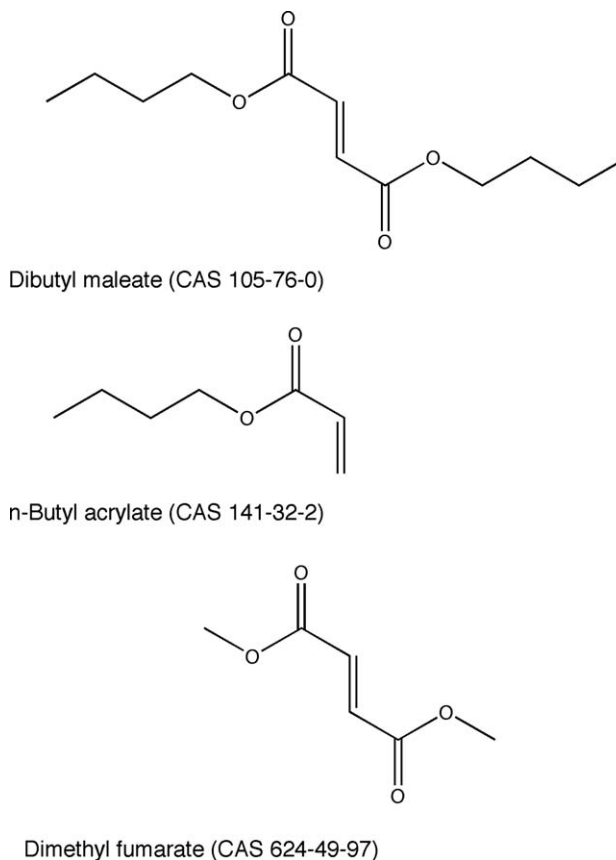


Fig. 1. Chemical structures showing similarities between esters of maleic, acrylic, and fumaric acid.

an outbreak of dermatitis in an envelope-making factory (2).

The formulas of dibutyl maleate, n-butyl acrylate, and dimethyl fumarate show obvious similarities in the chemical structure of these molecules (Fig. 1). It is therefore likely that esters of acrylic and maleic acid cross-react, as exemplified by our acrylate-sensitized control subject, who displayed positive reactions as early as D2 when patch tested to dibutyl maleate, to which he had no known prior exposure.

Dimethyl fumarate has recently become notorious as the allergen behind the Chinese sofa dermatitis epidemic (4, 5). Dimethyl fumarate has caused active sensitization and recommended patch testing concentrations range from 0.1% to 0.001%. Fumaric acid is the *trans* isomer of

maleic acid and, here again, cross-reactions between fumarates, maleates, and acrylates appear likely. In fact, some of the patients investigated in Finland during the sofa dermatitis epidemic also reacted to ethyl acrylate (4).

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