

Research letter

(Meth)acrylate allergy: frequently missed?

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DEAR EDITOR, Acrylates and methacrylates are monomers that polymerize to make acrylic plastics. Their use is widespread, including in orthopaedic surgery, dentistry and the printing and beauty industries. Acrylates are potent sensitizers and a common cause of allergic contact dermatitis (ACD).

The frequency of (meth)acrylate allergy has increased in recent years, with a shift in occupational and recreational exposure towards the beauty industry.^{1–3} There is soaring demand for acrylic, sculpted, gel or shellac nails, which contain (meth)acrylates, including artificial nails glued on with ethyl cyanoacrylate.

The rate of acrylate allergy in Leeds, U.K. has tripled from 2008 to 2014.² In Birmingham, U.K., there was a shift in exposure towards acrylic nails from 2002 to 2015.⁴ (Meth)acrylates were the most frequent source of ACD in U.K. beauticians from 1999 to 2011.³ In Portugal, from 2006 to 2013, nail (meth)acrylates were responsible for 76% of (meth)acrylate-related ACD.⁵ (Meth)acrylates were named contact allergen of the year by the American Contact Dermatitis Society in 2012 and were included in their baseline series in 2017.⁶ Screening with (meth)acrylates in the baseline series has also been carried out in international studies.⁷ To date, no (meth)acrylate has been included in the baseline (screening) patch test series in the U.K. and Europe.

We performed a retrospective multicentre study reviewing data from the clinical databases of nine U.K. dermatology units between 2008 and 2015. We aimed to assess the frequency of (meth)acrylate allergy in the U.K. over a 7-year period, to define the principal occupational groups affected and to estimate the minimum number of (meth)acrylate-sensitive patients in an unselected patient population. In addition, we wished to document information about patch testing practice to (meth)acrylates in different units.

In total 18 195 consecutive patients with eczema (70.3% female) were patch tested to the British Society for Cutaneous Allergy baseline series. Of these, 1306 (7.2%) selected patients with a history of (meth)acrylate exposure were patch tested to (meth)acrylates (Chemotechnique Diagnostics, Vellinge, Sweden). Allergens were prepared immediately prior to application; readings were carried out on day 2 and day 4 according to the European Society of Contact Dermatitis (ESCD) guidelines. Overall, 230 (17.6% of the 1306 tested; 1.3% of the 18 195 consecutive patients) tested positive to at least one

(meth)acrylate. The top three eliciting a positive reaction were 2-hydroxyethyl methacrylate (2-HEMA) 2% in petrolatum ($n = 125$, 0.7% of all patients), methyl methacrylate (MMA) 2% in petrolatum ($n = 75$, 0.4%) and ethylene glycol dimethacrylate (EGDMA) 2% in petrolatum ($n = 74$, 0.4%) (Table 1). Of the 230 patients who tested positive, 211 (91.7%) were female. Information on exposure source had been recorded in 120 (52.2%) of the patients. Sixty-eight had occupational exposure (58 in the nail and beauty industry) and 52 had recreational exposure from acrylic nail products.

There was significant variation in the number of allergens included in the (meth)acrylate patch test series, from seven in Kent to 30 in Cardiff (mean 16.3; median 15). All centres included 2-HEMA and EDGMA and eight centres included MMA. No centre tested (meth)acrylates in the baseline series.

We have shown that 2-HEMA is the most frequently positive (meth)acrylate in a large multicentre U.K. patch test population. The ESCD suggests that an allergen might be included in the baseline series when the proportion of consecutively patch tested patients with a positive test to a specific allergen exceeds 0.5–1.0%.⁸ 2-HEMA was positive in 0.7% of all patients tested and in 9.6% of cases selected because of occupational exposure to (meth)acrylates. Had we patch tested the remaining 16 889 patients to 2-HEMA in an extended baseline

Table 1 Number of patients patch testing positive to each (meth)acrylate allergen; predicted minimum percentage rate of allergy if testing in the baseline series in unselected patients ($n = 18\ 195$).

(Meth)acrylate allergen ^a	Number of patients who tested positive ^b
2-HEMA	2-Hydroxyethyl methacrylate 125 (0.7)
MMA	Methyl methacrylate 75 (0.4)
EDGMA	Ethylene glycol dimethacrylate 74 (0.4)
2-HPMA	2-Hydroxypropyl methacrylate 62 (0.34)
EMA	Ethyl methacrylate 55 (0.3)
2-HEA	2-Hydroxyethyl acrylate 45 (0.25)
TEGDMA	Triethyleneglycol dimethacrylate 37 (0.2)
THFMA	Tetrahydrofurfuryl methacrylate 30 (0.17)
1,4-BDMA	1,4-Butanediol dimethacrylate 17 (0.1)
ECA	Ethyl cyanoacrylate 14 (0.08)
BISGMA	Bisphenol A glycerolate acrylate 9 (0.05)
TEGDA	Triethylene glycol diacrylate 7 (0.04)

^aListed in order of the most common allergen to test positive.

^bOut of the 1306 selected patients tested to (meth)acrylates (% of the total patch test population).

series, it is likely that we would have detected further unsuspected cases, where the cause of dermatitis remained unknown. It was striking that the majority of (meth)acrylate ACD was associated with exposure in the nail and beauty industry, whether occupational or recreational, supported by the predominance of female patients.

There was variation between centres in the rate of (meth)acrylate allergy, from 0.3% to 4.5% (mean 1.3%). (Meth)acrylates sometimes cause irritant reactions; however, as the patch tests were interpreted by experienced patch test clinicians, we believe that incorrect interpretation was kept to a minimum. We also note the small risk of active sensitization from testing with (meth)acrylates.

A standardized recommended short (meth)acrylate series would be optimal. We plan to pilot the inclusion of 2-HEMA in an extended baseline series as a screen for (meth)acrylate ACD, to avoid missing treatable disease.

¹Royal United Hospital, Bath, U.K.

²Leicester Royal Infirmary, Leicester, U.K.

³South Infirmary Victoria University

Hospital, Cork, Ireland

⁴University Hospital of Wales, Cardiff, U.K.

⁵Ninewells Hospital, Dundee, U.K.

⁶Royal Free Hospital, London, U.K.

⁷Kent and Canterbury Hospital, Canterbury, U.K.

⁸Royal Gwent and Nevill Hall Hospitals, Newport, U.K.

⁹Leeds Teaching Hospitals NHS Trust, Leeds, U.K.

Correspondence: Deirdre A. Buckley.

E-mail: drdabuckley@gmail.com

S. ROLLS¹ 

S. RAJAN¹

A. SHAH²

J.F. BOURKE³

M.M. CHOWDHURY⁴

S.A. GHAFAR⁵

C. GREEN⁵

G.A. JOHNSTON²

D.I. ORTON⁶

C. RECKLING⁷

N.M. STONE⁸

S.M. WILKINSON⁹

D.A. BUCKLEY¹

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