

Acrylates

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ACRYLATES are salts or esters of acrylic acid ($\text{CH}_2=\text{CH-R}$).¹ These chemical monomers (powders, liquids, or gels) are polymerized through various curing processes (including self-curing, catalyst-driven, ultraviolet light or heat processes and the absence of oxygen) to form solid plastic substances.² The low-molecular-weight monomers are the allergens, whereas the fully polymerized forms are nonallergenic. Hardened and seemingly polymerized acrylates can still contain residual monomers that can elicit an allergic response.² Self-cured acrylates typically contain much more residual monomer than acrylates cured by other processes.³

Neither ethyl acrylate nor methyl methacrylate are allergens used by the Thin-Layer Rapid Use Epicutaneous (T.R.U.E.) Test (Mekos Laboratories, Hillerød, Denmark); however, both were part of the North American Contact Dermatitis Group (NACDG) 2007 standard screen.² They account for 0.4 to 1.7% of allergies detected by NACDG patch testing.^{1,4} On more-extensive patch testing with 30 (meth)acrylates on persons with a history of exposure, 17.5% of those tested had an allergic reaction to at least one acrylate or methacrylate.⁵

The commercial use of acrylates started in the 1930s. The use of acrylates has since become widespread, as has an increasing incidence of allergic contact dermatitis (ACD) from the myriad products made from acrylates.¹ Among the most common occupational contact allergens for European dental personnel are acrylic monomers.⁶ Acrylate adhesives and artificial fingernail products are also important sources of contact dermatitis.⁷⁻⁹

In this era of plastics, acrylates and methacrylates are nearly ubiquitous, being found in adhesives, paints, printing ink, solvents, soft contact lenses, artificial nails, bone cement, orthopedic implants, dental restorations, dentures, hearing aids, and other biomaterials^{2,10-13} (Table 1).

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Acrylate resins cured with ultraviolet (UV) light are used to repair windshield glass, to manufacture computer hard disks, and as components of wood lacquers.¹⁴⁻¹⁶ Acrylic adhesives are used in certain glues and wig-fixing adhesive tapes as well as in television manufacturing and glass repairing.^{7,17,18}

ACD from resins, glues, and inks that contain acrylates or methacrylates can cause xerosis, painful fissuring, and vesicles on the hands (resembling dyshidrotic eczema) but can also cause pruritic erythematous scaling on the hands or arms or other areas of contact.^{7,14,15} Fingertip dermatitis, or periungual erythema, is the typical presentation for an allergy to acrylate-containing artificial nails, but eyelid dermatitis can also be seen.^{8,9} Dental exposure can cause an occupational hand dermatitis in dental professionals and can cause painful, red, and burning stomatitis in patients with dental restorations containing acrylates.¹⁹ In addition to causing ACD, acrylates and methacrylates have been observed to cause complaints of paresthesia of the fingertips, rhinitis, conjunctivitis, dyspnea, and wheezing.¹

Avoiding contact allergy to acrylates is problematic because different monomers can cross-react and because methyl methacrylate can penetrate latex gloves in as little as 60 seconds.²⁰ However, the use of gloves made of neoprene, neoprene with nitrile, butyl rubber, or polyvinyl alcohol may protect for hours against acrylates.^{21,22} Boiling dentures has been shown to decrease the allergic potential of acrylates, presumably by curing residual monomers.¹⁹ If one is allergic to acrylic artificial nails, the use of preformed plastic nails applied with cyanoacrylate glues (which are not thought to cross-react with methyl methacrylate) will limit exposure to the inciting allergen.^{2,23} Biomaterials and hearing aids can be made of silicone to avoid acrylates.²⁴

Because of the already pervasive use of acrylates in everyday items and because of their broad adaptability and

Table 1. Potential Sources of Acrylates and Methacrylates

Dental sources
Dentures
Restorations
Fillings
Crowns
Veneers
Medical sources
Adhesive tape
Conducting gel in disposable blue diathermy pads
Contact lenses
Microporous biomaterials
Hearing aids
Bone cement
Orthopedic prostheses
Nail product and cosmetic sources
Certain exfoliating cleansers
Sculptured nails
Nail hardeners
Nail extenders
Light-curing gels
Industrial sources
Adhesives (certain glues, epoxies, and tapes)
Sealants
Paints
Inks
Printing plates
Coatings for glass, rubber, leather, textiles, and wood

utility, the use of acrylates will likely continue to expand, potentially causing ever-growing numbers of contact allergy cases. It is hoped that manufacturers will continue to ensure that monomers are used less frequently and that complete polymerization is achieved when they are used. Also, better barrier protectants and suitable nonacrylate synthetics must be developed.

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