

Patch Testing in Children: Not Just Little Adults

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PRACTICE POINTS

- Pediatric allergic contact dermatitis (ACD) is common with children having unique product exposures.
- Children suspected to have ACD should be patch tested with customized panels based on history and exposure.
- Common pediatric allergens have been identified in personal care products, household products, and recreational gear and toys.

Allergic contact dermatitis (ACD) is prevalent in children, often with unique allergen sensitivities. Pediatric exposures are not the same as adults and specific patch testing considerations are necessary, including reduced surface area, customized panels, and distraction techniques. Given the unique exposures in children, patch testing with customized panels is recommended.

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The pediatric population has a unique product exposure profile due to the many care products specifically marketed for use in children. In fact, the prevalence of allergic contact dermatitis (ACD) in children may be as high as 24.5% in the United States.¹ In patch tested children, relevant positive reaction rates of 56.7% and 48% have been reported by the North American Contact Dermatitis Group and the Pediatric Contact Dermatitis Registry, respectively.^{2,3} In this article, we provide an overview of current trends in pediatric patch testing as well as specific considerations in this patient population.

Patch Test Reactions in Children

Several publications have documented pediatric patch test reactions. The North American Contact Dermatitis Group reported patch test results in 883 children from the United States and Canada (2005-2012).² The most common reactions were nickel (28.1%), cobalt (12.3%), neomycin (7.1%), balsam of Peru (5.7%), lanolin (5.5%),

and fragrance mix I (5.2%). When compared to adults, children were more likely to have relevant positive patch tests to nickel, cobalt, and compositae mix.² In comparison, data from the Pediatric Contact Dermatitis Registry showed that the most common reactions in 1142 children in the United States (2015-2016) were nickel (22%), fragrance mix I (11%), cobalt (9.1%), balsam of Peru (8.4%), neomycin (7.2%), and propylene glycol (6.8%).³

Allergen sensitivities may vary based on geographic region. In Spain, children showed the highest sensitivities to thiomersal (10.2%), cobalt (9.1%), colophony (9.1%), paraphenylenediamine (8.3%), mercury (7.9%), potassium dichromate (7.9%), and nickel (6.4%).⁴

Pediatric Patch Testing Pearls

History of Product Use—From diapers to drama club, pediatric exposures and sources of ACD are not the same as those seen in adults. Because obtaining a medical history from a toddler can be exasperating, the patient's caregivers should be asked about potential exposures, ranging from personal care products and diapers to school activities, hobbies, and sports.^{5,6} It is important to keep in mind that the patient's primary caregiver may not be the only individual who applies products to the child.⁷

Application of Allergens—Children are not merely small adults, but they usually do have smaller backs than adult patients. This reduced surface area means that the patch tester must carefully select the allergens to be patch tested. For reference, the back of a typical 6-year-old child can fit 40 to 60 allergens during patch testing.⁸

Patch Test Chambers—In children, the use of plastic patch test chambers may be preferred over aluminum chambers. Children with persistent pruritic subcutaneous nodules induced by aluminum-based vaccines also may have delayed-type sensitivity reactions to aluminum.⁹ These patients could react to the aluminum present in some patch test chambers, making interpretation of the results difficult. The authors (A.R.A. and M.R.) typically use plastic chambers in the pediatric population.

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Managing Expectations—As with other procedures in the pediatric population, patch testing can elicit emotions of fear, anxiety, and distrust. Video distraction and/or role-playing games may help capture the attention of children and can be particularly helpful during patch application. Children may be apprehensive about the term *allergy testing* if they are familiar with the term *needle testing* from previous allergies.⁵

Securing Patches—Young children can be quite active, posing another challenge for keeping patches in place. We recommend using extra tape to secure the patches in place on a child's back. In addition, a large transparent film dressing (ie, 12×8 in) can be used if quick application is needed. For extra precaution, the use of a tight T-shirt or favorite onesie during the patch test process may be helpful, making it more difficult for little fingers to remove tape edges.

Duration of Patch Testing—Some authors have proposed application of patch tests for 24 hours in pediatric patients, as compared to 48 hours in adults.¹⁰ This recommendation is based on a theory that the reduced application period will decrease the risk for irritant reactions in pediatric patients.

Pediatric Patch Test Screening Series

A summary of the published screening series for patch testing in the pediatric population is provided (Table).

The T.R.U.E. Test (SmartPractice) is approved by the US Food and Drug Administration for use in patients 6 years and older¹¹; however, it may not adequately represent allergen exposures in the pediatric population. Brankov and Jacob¹⁴ found that 10 (40%) of their proposed top 25 pediatric allergens were not detected using the T.R.U.E. Test.

In 2014, the North American Pediatric Patch Test Series was proposed as a basic screening panel for children aged 6 to 12 years.¹² This series of 20 allergens was developed based on a literature review of pediatric patch test results and case reports as well as a database review. The authors proposed additional allergens to be considered based on patient history.¹²

More recently, a 2017 American Contact Dermatitis Society physician work group proposed the Pediatric Baseline Patch Test Series. This series of 38 allergens for children aged 6 to 18 years was developed based on expert consensus.⁸ Studies to determine the efficacy of this series have yet to be conducted, but it may have high sensitivity in detecting relevant allergens in children as demonstrated by a theoretical detection rate of 84%.¹⁴

There are 2 recommended patch test series for allergic diaper dermatitis.¹⁵ The first series focuses on 23 potential allergens found in wet wipes and topical diaper preparations. The second series contains 10 potential allergens found in diapers. These series contain common topical

Pediatric Patch Testing Screening Series

	Screening Series		
	T.R.U.E. Test ¹¹	North American Pediatric Patch Test Series ¹²	Pediatric Baseline Patch Test Series ⁸
Description	35 allergens and control, FDA approved in 2017 for use in patients ≥6 years	20 allergens, developed based on literature and database review, published in 2014	38 allergens, developed based on expert opinion and poll data, published in 2018
Benefits	Ready to use, may be more practical for clinicians who patch test a small number of patients annually	Basic panel developed for the pediatric population; contains the fewest number of allergens; contains CAPB, compositae mix, fragrance mix II, and PG (not tested in the T.R.U.E. Test)	First comprehensive pediatric panel in the United States, includes both MCI/MI mix and MI alone
Limitations	Allergens relevant to children may go undetected; does not include MI, PG, fragrance mix II, Amerchol L101, CAPB, decyl glucoside, propolis, compositae mix, sorbitan sesquioleate, or cinnamic aldehyde	Custom series that requires preparation and may have a limited shelf life; not comprehensive, developed from commonly reported allergens in North American children only; tests MCI/MI mix (3:1 ratio) but not MI alone, which may miss up to 60% of MI allergies ¹³	Custom series that requires preparation and may have a limited shelf life, allergens selected for final inclusion were based on a majority vote from poll data rather than weighted by clinician experience
Detection rate of top 25 allergens, % (n) ¹⁴	60 (15/25)	56 (14/25)	84 (21/25)

Abbreviations: FDA, US Food and Drug Administration; CAPB, cocamidopropyl betaine; PG, propylene glycol; MCI, methylchloroisothiazolinone; MI, methylisothiazolinone.

medications for children including corticosteroids, antimicrobials, and sensitizers specific to diapers such as rubbers and adhesives.¹⁵

Similar to adults, it may be difficult to designate one screening panel that can identify all relevant allergens in children; thus, it is always important to obtain a thorough exposure history and customize testing to suspected allergens and/or patient products based on history and clinical relevance.

Unique Pediatric Allergens

Hobbies—Sports gear such as shin guards and splints often contain allergens such as formaldehyde resin, thiuram mix, and dialkyl thioureas.¹⁶ Perioral dermatitis may be caused by musical instrument mouthpieces containing nickel.⁶

Preservatives—Commonly reported causes of ACD in children include methylisothiazolinone (MI) and methylchloroisothiazolinone (MCI) found in wet wipes. A 2016 analysis of diaper wipes showed a low prevalence of MI (6.3%) and MCI (1.6%) in these products, which may reflect the industry's awareness of these potential allergens and a subsequent change in the preservatives they utilize.¹⁷ However, the prevalence of MCI/MI contact allergy may be on the rise due to the popularity of homemade slime, which is made from common household products such as laundry detergent, dishwashing soap, and liquid glue. The Pediatric Baseline Patch Test Series captures most of the potential allergens in these homemade slime recipes and is recommended for use in pediatric patients suspected of having dermatitis secondary to playing with slime.^{8,18}

Toilet Seat Dermatitis—Toilet seat dermatitis presents as a pruritic dermatitis on the posterior upper thighs and buttocks. Although most cases of toilet seat dermatitis are irritant rather than allergic, potential allergens include plastics, fragrances, and components of cleaning products. Thus, physicians should maintain a high index of suspicion for ACD to toilet seats.¹⁹

Fragrance and Natural Ingredients—A 2018 study evaluating personal care products marketed specifically for infants and children found that 55% of products (294/533) contained at least 1 common allergen, with fragrance being the most common (48% [255/533]). Other common allergens include betaines (18%), propylene glycol (9%), lanolin (6%), and MCI/MI (3%).²⁰ Caregivers should be advised against the myth that natural products are safer and less allergenic and should be provided with resources such as the Contact Allergen Management Program (CAMP) database (<https://www.contactderm.org/resources/acds-camp>) for safe alternative personal care products.

Metal Allergens—Nickel, the American Contact Dermatitis Society 2008 Allergen of the Year, is another common allergen that affects children. Nickel allergy, commonly thought to affect the ears due to jewelry and ear piercing, may actually be found in a wide range of daily items such as braces, eyeglasses, keys, zippers, school chairs, electronics, toys, and even food.^{3,6,21,22} With increased use of electronics in children of all ages, nickel found in mobile phones and

other devices may be of particular concern. Caregivers can use a case or cover for metallic-appearing electronics.

Final Interpretation

Pediatric ACD is common. With limited surface area for patch testing in children, we recommend customized panels based on patient history and exposure. It is important for clinicians to recognize the unique causes of ACD in children and develop age-appropriate management plans.

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