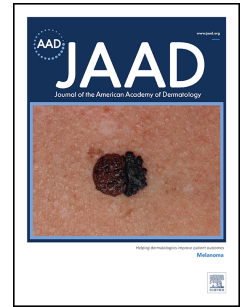


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Evaluating the Inclusiveness of Common Allergens in Expanded Series Patch Tests for Children in the Pediatric Allergic Contact Dermatitis Registry

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Article type: Research Letter

Title: Evaluating the Inclusiveness of Common Allergens in Expanded Series Patch Tests for Children in the Pediatric Allergic Contact Dermatitis Registry

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To the Editor:

Allergic contact dermatitis (ACD) is reported to occur in 15-25% of the pediatric population¹, although which allergens to patch test given space limitations is still debated. The Pediatric Allergic Contact Dermatitis Registry was created in 2018, compiling patch test data of children (0-17 years) from 10 institutions across the United States². In addition to the standard Pediatric Baseline Series² and Thin Layer Rapid Use Epicutaneous Patch (TRUE) tests (Smart Practice, Phoenix, AZ), partner institutions utilized six expanded patch test series in the evaluation of pediatric ACD rates (Supplementary Table 1 found at <http://dx.doi.org/10.17632/hg8zvfx4th.6>). Expanded series patch tests have proven efficacious in their ability to more thoroughly evaluate possible etiologies of ACD^{3,4}. This analysis aims to compare the rates at which various expanded series patch tests sample the most common pediatric allergens.

A total of 296 children were tested between January 2016 and July 2020: 113 boys (38.2%) and 183 girls (61.8%). The mean (SD) age was 10.6 (4.8) years. Of the top 10 and top 20 pediatric allergens, the North American Comprehensive (NAC)-80 (Dormer, Toronto, Canada) series detected 100% (10/10) and 95% (19/20), respectively (Table 2). Of the top 50 most common pediatric allergens, the American Contact Dermatitis Society (ACDS)-80 captured the highest number at 82% (41/50) (Table 1, Supplementary Table 2 (<http://dx.doi.org/10.17632/hg8zvfx4th.6>)).

In patients ages 1-5-years-old, the North American Contact Dermatitis Group (NACDG)-70 had the highest percentage of the top 10 and top 20 most common allergens at 70% (7/10) and 75% (15/20) respectively. Of the top 49 in this age group (there were only 49 unique allergens with

>= 1 reaction in this category), the ACDS-80 contained the highest percentage at 85.7% (42/49) (Table 1, Supplementary Table 3a (<http://dx.doi.org/10.17632/hg8zvfx4th.6>)).

In patients ages 6-12-years-old, the NAC-80 series included the highest percentage of the top 10 and 20 at 100% (10/10) and 100% (20/20) and was tied with the ACDS-80 at 82% (41/50) of the top 50 (Table 1, Supplementary Table 3b (<http://dx.doi.org/10.17632/hg8zvfx4th.6>)).

In patients ages 13-17-years-old, the NAC-80 (WashU) and NAC-80 included the highest percentage of the top 10 at 90% (9/10). The ACDS-80 and ACDS-80 (WashU) contained the highest percentage of the top 20 at 85% (17/20), and the NAC-80 contained the highest percentage of the top 50 at 92% (Table 1, Supplementary Table 3c (<http://dx.doi.org/10.17632/hg8zvfx4th.6>)). The TRUE test contained the fewest of the top allergens in every category (Table 1) and would have missed emerging top allergens such as the hydroperoxides of linalool and limonene as well as methylisothiazolinone⁵.

In an era of pediatric patch testing where a variety of standardized and customized expanded series tests exist, choosing the appropriate panel (or allergens) for a patient is important in ensuring the greatest coverage of likely allergens. While there is no clear “best” patch series, providers should consider the age of the patient, available space to apply patches, and frequencies of relevant allergens in determining which patch series to utilize.

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	Pediatric Baseline Series	TRUE Test	ACDS - 80	NACDG - 70	NAC-80 WashU	ACDS-80 WashU	NAC-80 Dormer	Custom Pediatric Core 60 (MGH)
Overall*								
Top 10	7 (70%)	5 (50%)	8 (80%)	7 (70%)	8 (80%)	8 (80%)	10 (100%)	7 (70%)
Top 20	14 (70%)	11 (55%)	16 (80%)	15 (75%)	18 (90%)	16 (80%)	19 (95%)	16 (80%)
Top 50	24 (48%)	19 (38%)	41 (82%)	36 (72%)	38 (76%)	38 (76%)	40 (80%)	33 (66%)
Ages 1-5								
Top 10	6 (60%)	3 (30%)	4 (40%)	7 (70%)	5 (50%)	4 (40%)	6 (60%)	7 (70%)
Top 20	10 (50%)	8 (40%)	14 (70%)	15 (75%)	12 (60%)	13 (65%)	13 (65%)	14 (70%)
Top 49†	25 (51%)	20 (41%)	42 (86%)	38 (78%)	35 (71%)	41 (84%)	35 (71%)	39 (80%)
Ages 6-12								
Top 10	8 (80%)	6 (60%)	8 (80%)	8 (80%)	8 (80%)	8 (80%)	10 (100%)	8 (80%)
Top 20	16 (80%)	11 (55%)	16 (80%)	17 (85%)	18 (90%)	16 (80%)	20 (100%)	17 (85%)
Top 50	24 (48%)	19 (38%)	41 (82%)	34 (68%)	39 (78%)	39 (78%)	41 (82%)	30 (60%)
Ages 13-17								
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Top 50	27 (54%)	21 (42%)	41 (82%)	37 (74%)	44 (88%)	41 (82%)	46 (92%)	34 (68%)

107 *Bolded numbers indicate the highest number in each row. Italicized numbers indicate the lowest number in each row. Given as “n
 108 (%)”

109 †There were only 49 allergens with positive reactions in the age 1-5 cohort
 110
 111
 112

113 Table 2: Top 20 Allergens by Percentage of Positive Patch Tests in Children Ages 1-17 and Inclusion in Expanded Patch Series

Top 20 Allergens*†	No. of Positive Patch Tests	Total number of patients tested	Positive Patch Test Percentage	Pediatric Baseline Series – 38	TRUE Test – 35	ACDS – 80	NACDG – 70	NAC-80 WashU	ACDS 80-WashU	NAC – 80 – Dormer	Custom Pediatric Core 60 (MGH)
Hydroperoxides of linalool	21	84	25.0							√	
Methylisothiazolinone	43	240	17.9	√		√	√	√	√	√	√
Nickel sulfate	47	281	16.7	√	√	√	√	√	√	√	√
Cobalt chloride	36	276	13.0	√	√	√	√	√	√	√	√
Fragrance Mix I	31	286	10.8	√	√	√	√	√	√	√	√
Hydroperoxides of limonene	8	84	9.5							√	
Cocamidopropyl betaine	22	237	9.3	√		√	√	√	√	√	√
Balsam of Peru	24	287	8.4	√	√	√	√	√	√	√	√
Gold sodium thiosulfate	20	242	8.3		√	√		√	√	√	
Amerchol L101	19	234	8.1	√		√	√	√	√	√	√
Benzoyl peroxide	9	114	7.9					√		√	
Formaldehyde	22	286	7.7	√	√	√	√	√	√	√	√
MCI/MI‡	22	286	7.7	√	√	√	√	√	√	√	√
Neomycin	21	278	7.6	√	√	√	√	√	√	√	√
Amidoamine	11	155	7.1	√			√	√		√	√
Quaternium-15	20	283	7.1	√	√	√	√	√	√	√	√
Benzalkonium chloride	9	128	7.0			√		√	√		√
Iodopropynyl butylcarbamate	15	229	6.6	√		√	√	√	√	√	√
Bronopol	18	281	6.4	√	√	√	√	√	√	√	√
MDBGN‡	17	270	6.3		√	√	√	√	√	√	√
Total				14	11	16	15	18	16	19	16

114 *Excludes allergens tested in less than 10% of patients

115 †Allergen concentrations may be found in supplementary table 1

116 ‡MCI/MI – methylchloroisothiazolinone/methylisothiazolinone; MDBGN – methyldibromo glutaronitrile

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