

Allergic contact dermatitis in children; has there been a change in allergens?

G. A. Vongyer and C. Green

Dermatology Department, Ninewells Hospital, Dundee, UK

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Summary

Allergic contact dermatitis (ACD) is now recognized as a common relevant diagnosis in children. We reviewed the results of patch tests in children under 16 years of age over the 3-year period January 2009 to December 2011, comparing the results with those in a similar 3-year retrospective study performed in our unit for the period August 1999 to September 2002. In total, there were 137 children (70 girls and 67 boys) aged 3–15 years enrolled. Of these, 28 girls (40%) and 22 boys (32.8%) had a positive reaction to at least one allergen, with nickel sulfate and potassium dichromate being the most common allergens, each having an incidence of 7.2%, in contrast to the 20% incidence of nickel allergy in 1999–2002. The rate of fragrance allergy was unchanged at 5.8%, and rubber allergy incidence was greatly reduced. These results show that allergens may be changing in children, and that patch testing is still a useful test to consider.

Patch testing is the gold standard for confirming allergic contact dermatitis (ACD), which is a delayed T-cell hypersensitivity reaction (type IV).¹ There seems to be a general trend that rates of positive patch tests in children are increasing. A meta-analysis by Bonitsis *et al.*² in 2011 found that the proportion of positive reactions was higher in studies published after 1995. This could be due to greater exposure to products, better referral for patch testing, or improved quality of patch testing using the appropriate extra series and improved standard series. However, it can be difficult to make comparisons between studies because all the variables are different, so we decided to reproduce a retrospective study carried out 9 years earlier so that we could more accurately pinpoint whether there had been a change in allergens in children within Tayside.

Report

We carried out a retrospective case study of children under 16 years who were patch-tested in the period January 2009 to December 2011, and compared the results with a similar group of children patch-tested in the period August 1999 to September 2002, where test series were selected from a computerized database containing the patch-test results for Tayside. For the 2009–2011 study, there were 137 children (70 girls and 67 boys; mean age 10.3 years, range 3–15) patch-tested within this specified time period, and results were available for all 137 children. In the 1999–2002 study, there were 114 children (66 girls and 48 boys; median age 11.5 years, range 3–15).³

Patients were referred for patch testing if there had been a history of reacting to an allergen, if an existing dermatosis proved difficult to control, or if the patient had dermatitis at a specific site e.g. face or foot.

Each child attended a consultation before patch testing, during which it was determined which series to test for after history-taking and examination of the site and character of the dermatitis. The child's hobbies and the use of make-up and fragrances were also taken into account. The lack of space on the small back of a child restricted the number of patches

Correspondence: Dr Cathy Green, Dermatology Department, Level 8, Ninewells Hospital, Dundee, DD1 9SY, UK
E-mail: cathy.green@nhs.net

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applied. The main reason for selecting the Children's series was to allow for addition of other series. In this study, 81 children (59%) were tested to their own items, 75 (54.7%) to the BSCA (British Society for Cutaneous Allergy) Standard series, 61 (44.5%) to the Children's Dundee series (Table 1), 39 (28.4%) to the BSCA Medicaments series and 33 (24.1%) to the BSCA Corticosteroid series. In total, 136 children were tested to either the Children's Dundee or BSCA Standard series. The number of children tested to the other series is shown in Fig. 1.

Patch testing was performed according to the methodology of the International Contact Dermatitis Research Group using Finn Chambers® (SmartPractice, Phoenix, AZ, USA) on Scanpor® tape (Bard Medical, Covington, GA, USA).⁴ Only positive results (irritants not included) at 96 h were recorded for this study.

Of the 136 children tested, 50 (36.5%) had a positive reaction: 28 girls (40.0%) and 22 boys (32.8%). During the same time period within Tayside, 1468 adults (aged > 16 years; 1009 women and 459 men) were also patch-tested. Of these, 791 had at least one positive reaction: 568 women (56.3%) and 223 men (48.6%).

In the children's group, there was a total of 88 positive reactions, with 29 children having a positive reaction to 1 allergen, 13 children to 2 allergens, 5 children to 3 allergens, and 1 child each to four, six

Table 1 The original 21 allergens tested by the Children's Dundee series.

Reference number	Test material
E8999	Control WSP
E0001	Potassium Dichromate 0.5%
E0010	Neomycin Sulfate 20%
E0023	Thiuram Mix 1%
E0034	Paraphenylenediamine 1%
E0002	Cobalt Chloride 1%
MX19	Caine Mix III 10%
F002B	Formaldehyde 2% aq
E0017	Colophony 20%
E0008	Balsam of Peru 25%
E0020	Wool Alcohols 30%
E0025	Mercapto Mix 1%
E0029	Fragrance Mix I 8%
E0003	Nickel Sulfate 5%
E2504	Budesonide 0.1% 5%
E2459	Sesquiterpene Lactone Mix 0.1%
E0105	Chlorocresol 1%
E1704	Cetyl/Stearyl alcohol 20%
E2454	Fusidic acid 2%
E031A	Tixocortol pivalate 1%
E0027	Ethylenediamine 1%

WSP, white soft paraffin.

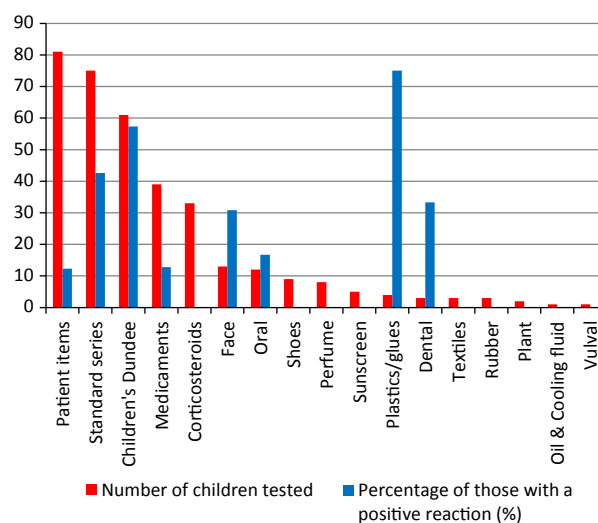


Figure 1 Total number of patients tested by series (red) and the percentage of positive reactions by series (blue).

and eight allergens respectively. Girls tended to have more positive reactions than boys, with no boy having > 3 positive reactions. The mean number of positive reactions in girls was 2.1, compared with 1.4 in boys (the median being 2 in girls and 1 in boys). The range of positive allergens in was 1–8 in girls and 1–3 in boys.

As highlighted by Fig. 2, the highest percentage of positive reactions was seen in children tested to the plastics/glues series, to which three of the four children tested (75%) had a positive reaction. The series with the next highest percentage of positive reactions was the Children's Dundee series, to which 35 of the 61 (57.3%) had a positive reaction. It is interesting to note that this series had a 14.7% higher number of positive reactions than the standard series. The other percentage positives by series are displayed in Fig. 2.

Nickel sulfate and potassium dichromate were the most common allergens, each testing positive in 10 children (7.2%). The incidence of nickel sulfate allergy was equal in girls and boys, but potassium dichromate had a 3 : 2 male : female ratio. Wool alcohols were the third most common allergen, positive in 9 children (6.5%), with a 7 : 2 female : male ratio. Eight children (5.8%) tested positive for fragrance mix I and/or II, and six (4.3%) to cobalt chloride. Of those who tested positive for cobalt chloride, two (33.3%) also tested positive for nickel sulfate (one was of current and the other of unknown relevance).

Depending on the history, some of the patients were also tested to their own items. Ten children had a positive reaction to one of their own items, including

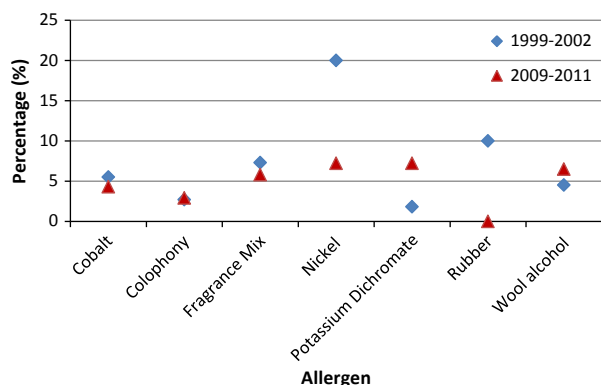


Figure 2 Differences in positive reactions by allergen between the two time periods 1999–2002 (blue) and 2009–2011 (burgundy).

aromatherapy oils and toothpaste. All 10 would have had a reaction of current relevance missed had they only been tested to the BSCA standard series or to the Children's Dundee series.

The importance of using extended series is underlined by the fact that three of children tested to the plastics and glues series had reactions of current relevance. Twelve children (five girls, seven boys) had a positive reaction only to a series (including patient items) other than the Children's Dundee and the Standard series.

The incidence of nickel allergy in children seems to be decreasing.⁵ In this study (2009–2011), only 10 children (7.2%) had a positive reaction, compared with 20% in 1999–2002. Not only that, but there was equal incidence between sexes in this study, compared with an 82% female predilection in the previous study. This is most likely due to a change in European Union legislation, which limits the use of nickel in objects that come into direct and prolonged contact with the skin.⁶ Prior to this legislation, ear piercing had been the main source of nickel allergy in females, but now jewellery such as earrings have to comply with EU legislation, and it seems a reasonable hypothesis that this is the reason why rates of nickel allergy have decreased in females.⁷

Potassium dichromate allergy showed an increase in incidence within Tayside during this time period. However, only one of the six children whose relevance was noted had a reaction of current relevance (four were unknown and one had an active sensitization). Chrome allergy in children has been linked to hobbies such as cycling,⁸ although only 2 of the 10 children who had a positive reaction to potassium dichromate in our study had dermatitis present on their hands.

Although rates of fragrance allergy are still high (5.8% of children tested reacted to fragrance mix I or II), they were not as high as might be expected given the younger age at which children are now exposed to perfumed products.⁹ It may be that we are missing relevant fragrance allergy because of the limited series we are testing. We plan to add the emerging fragrance allergens hydroxyisohexyl cyclohexene carboxaldehyde, hydroperoxide of linalool and hydroperoxide of limonene to our Children's Dundee series. Similarly, decreased rates of rubber allergy may be due to not testing children to the appropriate series or appropriate allergens within the series.

In conclusion, there does appear to have been a change in the allergens to which children are being sensitized within Tayside.

Learning points

- Patch testing is the gold standard for testing for a delayed type hypersensitivity reaction and it is a useful test to do in children.
- Patch testing should be considered in children with uncontrolled or localized eczema or a history of intolerance of/an adverse reaction to products, even in younger children.
- The incidence of sensitization and the allergens which children are exposed to appears to be changing and this is most likely reflecting changes in the environment and the allergens to which children are being exposed.
- Nickel remains one of the most common allergens in children.
- Testing children to their own items is very useful in order not to miss allergens not included in the series.
- A detailed history is needed in order to test the child to the right series to avoid missing a clinically relevant allergy.

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