

## Contact Dermatitis in Children: A 16-Year Study of 396 Children

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### Abstract

**Background:** Contact dermatitis is continuing to be increasingly recognized in pediatric populations, especially in those with atopic dispositions. Exposures in children parallel those seen in adult populations. In fact, as post university career jobs are becoming more difficult to acquire, in many countries youngsters are once again entering apprenticeships to obtain immediate economic remuneration. These apprenticeships come with occupational exposures to allergens.

**Objectives:** To review the most common sensitizers in children and to evaluate the changing tendencies of occupational dermatitis in children.

**Patients/Materials/Methods:** For 16 years, we patch tested 12,719 patients. Of these, 396 (3.11%) were children younger than 16 years old. All children were patch tested with the standard GEIDAC (Spanish Contact Dermatitis Group) test series, or with the standard True-test series. In addition, some of them were tested with specific allergens with additional supplemental allergens as warranted by history

**Results:** Among these 396 patch tested children, 119 (30%) were positive to one or more allergens, 73 girls (61%) and 46 boys (39%). The most common allergens were nickel sulfate, cobalt chloride and mercury ammonium chloride. A second group of additional top allergens included the components of rubber accelerators, potassium dichromate, fragrance mix and 4-phenylenediamine base, para-tertiary butylphenol (PTBP) formaldehyde and isothiazolinone, wool alcohols, *Myroxylon pereirae*. colophony, colophonium [if you are going to use INCI names for M.p. would be consistent] formaldehyde and N-isopropylphenyl- paraphenylenediamine (IPPD).

**Conclusions:** There was a significant incidence [20%] of our cases which were related to their job as apprentices. This percentage is much higher than what has been reported in other publications.

**Keywords:** Children; Contact dermatitis; Atopic dermatitis; Topography; Etiology; Occupational; Apprentice; Trainee

## 1. Introduction

Several epidemiological studies have been published regarding contact dermatitis in Spanish children [1-3] including one from our department [4]. All of them refer to school children of up to 14 years old. In our department, we use the same series of allergens and the same concentration in children as in adults. This is in agreement with some authors [5,6] and in disagreement with some others [2,3,7-9], who use shorter series and/or lower concentration allergens.

School age is usually considered up to 14 years old although some authors would include children up to 15 years old [7,10-15] and others up to 18. In our country it is common for pediatricians to continue to visit children up to the age of 16. This is why we have included children up to this age. We believe that a 16 to 18-year-old should be considered as a young adult.

In the present article we show a large series of 16 year follow-ups from January 1992 to December 2007. This includes a 6-year period (1992-1997) already published [4] and a new 10-year period (1998-2007). We decided to also include the results from the first period, although they have already been published, because we widened the pediatric age from 14 up to 16 as we have seen that many children between the ages of 14 to 16 who begin an apprenticeship start to show professional contact dermatitis. In our previous series this situation accounted for 18% of the cases.

## 2. Methods

For 16 years, from January 2002 to December 2017, we patch tested 12.719 patients. Of these, 396 of (3,11%) were children younger than 16 years old. 230 girls (58%) and 166 boys (42%), with a distribution of age groups that can be seen in TABLE 1. Among these 396 patch tested children, 119 (30%) were positive to one or more allergens, 73 girls (61%) and 46 boys (39%).

All children were patch tested with the standard GEIDAC (Spanish Contact Dermatitis Group) test series, or with the standard True-test series, and some of the with specific allergens in accordance to their clinical history (shoes, cosmetics, drugs, hairdressing products etc.).

TABLE 1. Age and gender.

	Boys	Girls	Total
<b>0-4 years</b>	11	10	21
<b>5-8 years</b>	31	49	80
<b>9-12 years</b>	82	69	151
<b>13-16 years</b>	42	102	144
<b>Total</b>	166	230	396

The patch tests were administered with Curatest™ patch-test chambers (Lohmann –Rauscher International GMBH & Co.KG, Germany), applied on the back with Micropore™ (3M Health Care, Borken, Germany). The patch test readings were performed according to the international guidelines by the International Contact Dermatitis Research Group after 2 and 4 days.

In all patients the personal and familial history on atopic constitution, including rhinitis and asthma was recorded (TABLE 2).

**TABLE 2. Presence of atopy in the patient or family.**

	No	Yes	Total
<b>Boys</b>	69	97 (58.4%)	166
<b>Girls</b>	88	142 (61,7%)	230
<b>Total</b>	157	239 (60,35%)	396

### 3. Results

In TABLE 3 we can observe the most common location and the most common clinical findings of all the studied patients, divided by gender.

**TABLE 3. Most common location of the clinical findings that provoked the patch testing.**

	Boys	Girls	Total
<b>Feet</b>	63 (52%)	58 (48%)	121
<b>Hands</b>	20 (36%)	35 (64%)	55
<b>Feet and hands</b>	25 (43%)	33 (57%)	58
<b>Oral region</b>	6 (30%)	14 (70%)	20
<b>Facial region</b>	12 (27%)	32 (73%)	44
<b>Body and/or limbs</b>	20 (36%)	35 (64%)	55
<b>Genitalia</b>	6 (60%)	4 (40%)	10
<b>Scalp</b>	4 (44%)	5 (56%)	9
<b>Generalized</b>	10 (42%)	14 (58%)	24
<b>Total</b>	166 (42%)	230 (58%)	396

The most common consultation complaints for contact dermatitis are listed in TABLE 4.

**TABLE 4. Most common causes of suspicion of contact dermatitis.**

	Boys	Girls	Total
<b>Bijouterie and metallic ornaments</b>	10 (15%)	55 (85%)	65
<b>Shoes</b>	22 (35%)	40 (65%)	62
<b>Topical drugs</b>	18 (44%)	23 (56%)	41
<b>Cosmetics</b>	6 (21%)	22 (79%)	28
<b>Textile</b>	4 (57%)	3 (43%)	7
<b>Other causes</b>	17 (57%)	13 (43%)	30
<b>Without suspicion</b>	89 (55%)	74 (45%)	163
<b>Total</b>	166 (42%)	230 (58%)	396

The positive results in sexes, specifying the degree of relevance i.e. past, present or unknown, of all allergens can be observed in TABLE 5.

The most common allergens nickel sulfate, cobalt chloride and mercury ammonium chloride. A second group followed which included the components of rubber, potassium dichromate, fragrance mix and 4-phenylenediamine base, para-tertiary butylphenol (PTBP) formaldehyde, isothiazolinone, wool alcohols and *Myroxylon pereirae*. There was a third group

comprising colophony, formaldehyde and N-isopropyl-Na-phenyl-paraphenylenediamine, and a final list of allergens with only one positive result.

**TABLE 5. Results of the patch testing specifying relevance.**

	Boys			Girls		
	Past	Present	Unknown	Past	Present	Unknown
<b>Nickel sulfate</b>	0	12	13	37	33	2
<b>Cobalt chloride</b>	0	9	10	4	4	33
<b>Thimerosal</b>	3	8	5	2	5	6
<b>Mercury ammonium chloride</b>	2	13	7	4	11	4
<b>Fragrance mix</b>	0	0	4	1	6	1
<b>Carba mix</b>	0	3	0	0	4	5
<b>Thiuram mix</b>	1	3	0	6	5	3
<b>4-phenylenediamine base</b>	0	1	1	0	7	2
<b>Potassium dichromate</b>	3	7	1	0	3	8
<b>Mercapto mix</b>	0	1	0	4	4	5
<b>Mercaptobenzothiazole</b>	0	1	0	4	4	4
<b>Neomycin</b>	1	3	1	1	2	3
<b>Wool alcohols</b>	0	2	1	1	2	2
<b>4 Tert butylphenol formaldehyde resin</b>	0	3	0	0	5	1
<b>Formaldehyde</b>	0	2	1	0	1	2
<b>Isothiazolinone</b>	0	1	1	1	4	2
<i>M. pereirae</i>	0	2	2	1	2	1
<b>Colophony</b>	0	0	0	0	4	0
<b>N Isopropyl-N-phenyl-4-phenylene diamine (IPPD)</b>	0	0	0	0	2	2
<b>Caine mix</b>	0	0	0	0	1	0
<b>Ethylenediamine</b>	0	0	0	0	1	0
<b>Paraben mix</b>	0	0	0	0	1	0
<b>Clioquinol</b>	0	0	0	0	0	1
<b>Budesonide</b>	0	0	0	0	0	0
<b>Epoxy resin</b>	0	0	0	0	0	0
<b>1,2-dibromo-2,4-dicyanobutane+2phenoxyethanol</b>	0	0	1	0	0	0
<b>Lactone mix</b>	0	0	1	0	0	0
<b>Quaternium 15</b>	0	0	0	0	0	0
<b>Tixocortol 21 pivalate</b>	0	0	0	0	0	0

In TABLE 6 there is a list of the relevant positive results that can be considered professional: 6.3% of the total studied children and 20% of the positives to one or more allergens are listed. In most cases they were apprentices, but some of them had already been working for at least 2 years at the same job. In the girl's group, hairdresser and food workers were the most common jobs and in the boy's group bricklayers and metallurgy workers were the commonest.

The final diagnosis of the total 396 studied children according to the clinical history and the relevance of the positive results were:

**Contact dermatitis: 195** (49%), (allergic contact dermatitis: 107 (27%) and irritant contact dermatitis: 88 (22%).)

**Atopic dermatitis: 95** (24%), **Juvenile plantar dermatitis: 49** (12,5%) **Other diagnosis: 57** (14,5%).

TABLE 6. List of the jobs with relevant positive allergens.

	Boys	Girls	Total
<b>Hairdresser</b>	1	7	8
<b>Metallurgy</b>	4	1	5
<b>Bricklayer</b>	5	0	5
<b>Food industry</b>	1	4	5
<b>Cosmetics</b>	0	1	1
<b>Dental worker (prosthesis)</b>	1	0	1
<b>Total</b>	12	13	25 (20%)

#### 4. Discussion

Only 30% of our patients showed positive results which is slightly inferior to other published series: 31% (1), 35% (2), 35% (8) and 37% (3), clearly inferior: 48% (12), 50% (4), 52%(5) and 56% (13) and superior to others: 13% (14), 23% (15) and 24% (6).

Nickel sulfate is the most common allergen, followed by cobalt chloride, mercurial compounds (mercury ammonium chloride and thimerosal), rubber components (thiuram group, mercapto and carba) and potassium dichromate, followed by fragrance mix, neomycin, 4-phenyldiamine base, paraterbutilphenol formaldehyde resin, isothiazolinone, wool alcohols and *M. pereirae*, which correspond to the most common causes of sensitization which are in order of frequency: bijouterie and metallic ornaments, shoes, topical drugs and cosmetics.

The most common locations were in first place, foot, and then hands and in third place the facial region. Referring to occupational dermatitis, 20% of our cases are much higher than other publications [1,4,16,17]. Some authors [18,19] suggest using predictive patch tests before starting to work at specific jobs. We do not agree with this suggestion, as well as with other authors [20-23], because of the risk of inducing active sensitizations. In most of our PPD positive patients, there was a clear relation with their jobs as hairdresser apprentice. Mercury positive cases were not easily related with any job.

Last but not least, we would like to point out that in our series atopic children have more capacity to be sensitized than non atopic children as in agreement with other authors [4,15,18,24-29]. In fact, more, than 60% of those patch tested had an atopic constitution.”

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