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## ORIGINAL ARTICLE

# Epidemiology of Contact Dermatitis in Spain. Results of the Spanish Surveillance System on Contact Allergies for the Year 2008

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Skin patch tests;  
Spanish standard series

### Abstract

**Background:** The epidemiology of contact dermatitis can be analyzed using clinical data from skin allergy units.

**Objectives:** The aims of this study were to define the profile of patients attending a skin allergy unit and to determine the prevalence of the most common sensitizations in this population.

**Material and methods:** Throughout 2008, a retrospective observational study was carried out in the 5 hospitals of the Spanish Surveillance System on Contact Allergies. All patients underwent skin patch tests with the Spanish standard series. The frequencies of sensitization were normalized for age and gender.

**Results:** Data were gathered on 1161 patients. The 5 allergens that gave the most frequent positive reactions were nickel sulfate (25.88%), potassium dichromate (5.31%), cobalt chloride (5.10%), fragrance blends (4.64%), and balsam of Peru (4.44%). The least frequently

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**PALABRAS CLAVE**

Eczema de contacto;  
Epidemiología;  
Dermatitis de contacto;  
Dermatitis alérgica  
de contacto;  
Investigación clínica;  
Prueba epicutánea;  
Serie estándar española

detected reactions were to quinolone-cloiquinol mix and sesquiterpene lactone mix. There was a 35% prevalence of sensitization to nickel among women.

*Conclusions:* The profile of sensitizations in Spain is similar to that of other Southern European countries. Nickel sulfate continues to be the most prevalent allergen, particularly in women. The low prevalence of sensitization to quinolone-cloiquinol mix and sesquiterpene lactone mix supports their exclusion of the Spanish series.

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## Epidemiología del eczema de contacto en España. Resultados de la Red Española de Vigilancia en Alergia de Contacto (REVAC) durante el año 2008

### Resumen

*Introducción:* El estudio epidemiológico del eczema de contacto puede realizarse mediante el análisis de los datos obtenidos a partir de la experiencia clínica de las unidades de alergia cutánea.

*Objetivo:* Determinar el perfil de los pacientes que acuden a una unidad de alergia cutánea y determinar la prevalencia de sensibilizaciones más frecuente en esta población.

*Material y métodos:* Estudio observacional retrospectivo de los 5 hospitales pertenecientes a la Red Española de Vigilancia de Alergia de Contacto (REVAC) durante el año 2008. Todos los pacientes fueron estudiados mediante pruebas epicutáneas con la serie estándar española. Las frecuencias de sensibilización se han estandarizado por sexo y edad.

*Resultados:* Se recogieron datos de 1.161 pacientes. Los 5 alérgenos que presentaron positividad más frecuentemente fueron sulfato de níquel (25,88%), dicromato potásico (5,31%), cloruro de cobalto (5,10%), mezcla de fragancias (4,64%) y bálsamo del Perú (4,44%). Los alérgenos menos frecuentes fueron la mezcla de quinoleínas/cloiquinol y la mezcla de lactonas sesquiterpénicas. En las mujeres la prevalencia de sensibilización al níquel fue del 35%.

*Conclusiones:* El perfil de sensibilizaciones de España es el esperado para un país del Sur de Europa. El sulfato de níquel sigue siendo el alérgeno más prevalente, siendo especialmente importante en mujeres. La mezcla de quinoleínas/cloiquinol y la mezcla de lactonas sesquiterpénicas no han mostrado rentabilidad suficiente para su permanencia en la serie española.

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## Introduction

Allergic contact dermatitis is a common and important medical condition. According to some estimates, 20% of the population is sensitized to at least 1 allergen.<sup>1</sup> Therefore, resource usage for medical diagnoses and treatments, and for the implementation of primary and secondary prevention strategies, generates substantial cost. Allergic contact dermatitis is a challenge for dermatologists as it accounts for a large proportion of their caseload. The efforts made to study this problem are therefore necessary and beneficial.

The aim of epidemiological research into allergic contact dermatitis is to accurately determine the current situation of the disease and support the implementation of measures to tackle it. Currently, analysis of data derived from the clinical experience of skin allergy units is considered a valid scientific approach for epidemiological study of allergic contact dermatitis.<sup>2</sup> Multicenter studies have greater statistical power because a more detailed analysis of the data is possible and common characteristics and differences can be identified for each center.

The objective of the European Surveillance System on Contact Allergies (ESSCA), a working group of the European Society of Contact Dermatitis, is to conduct epidemiological studies of allergic contact dermatitis in Europe. The ESSCA is

represented in Spain by the Spanish Surveillance System on Contact Allergies (*Red Española de Vigilancia de Alergia de Contacto* [REVAC]), whose remit is to collect and analyze data from the national centers that collaborate with the European system. The rationale behind these 2 bodies and their objectives have been described previously.<sup>3</sup> In this article, we present the preliminary results of the REVAC in its first year in operation (2008). The profile of the patients referred to a skin allergy unit with suspected allergic contact dermatitis was defined, and the frequency of sensitization to allergens in the standard series of the Spanish Contact Dermatitis Research Group (GEIDAC in Spanish) was determined.

## Materials and Methods

Between January 1 and December 31, 2008, 1161 patients from 5 Spanish skin allergy units were studied. The clinical approach was similar in all centers: a full medical history was taken and a general physical examination was performed. Patch testing was undertaken according to the guidelines of the International Contact Dermatitis Research Group (ICDRG). The reactions were assessed using the international scale, where + indicates light nonvesicular erythema, ++ notable papule formation with discrete vesicles, and +++

**Table 1** Standard Spanish Series Proposed by the Spanish Contact Dermatitis Research Group (GEIDAC)

Allergen	Concentration	Vehicle
Nickel sulfate	5%	PJ
Potassium dichromate	0.5%	PJ
Cobalt chloride	1%	PJ
Mercury	0.5%	PJ/Aq
Formaldehyde 1%	1%	Aq
Thiomersal	0.1%	PJ
MCI/MI	0.01%	Aq
Euxyl K-400	1.5%	PJ
Quaternium 15	1%	PJ
Paraben mix	16%	PJ
Fragrance mix	8%	PJ
Balsam of Peru	25%	PJ
Caine/benzocaine mix	1%/5%	PJ
Quinoline/clioquinol mix	6%/5%	PJ
Black rubber/IPPD mix	0.6%/0.1%	PJ
Mercapto mix	1%/2%	PJ
Mercaptobenziothiazole	2%	PJ
Carba mix	3%	PJ
Thiuram mix	1%	PJ
Epoxy resin	1%	PJ
Lanolin alcohol	30%	PJ
Colophony	20%	PJ
PTBF-formaldehyde resin	1%	PJ
Neomycin sulfate	20%	PJ
Ethylenediamine	1%	PJ
Budesonide	0.1%/0.01%	PJ
Tixocortol pivalate	1%/0.1%	PJ
Sesquiterpene lactone mix	0.1%	PJ
PPDA	1%	PJ

Abbreviations: Aq, aqueous; IPPD, N-isopropyl-N-phenyl-4-phenyldiamine; MCI/MI, methylchloroisothiazolinone/methylisothiazolinone; PPDA, 4-phenyldiamine base; PJ, petroleum jelly; PTBF, p-ter-butylphenolformaldehyde.

strong vesiculation and blistering.<sup>4</sup> For the purposes of the present study, only reactions occurring within 96 hours of patch application were considered as positive.

All patients were studied with the Spanish standard series of the GEIDAC (Tables 1 and 2). Each center entered its own data using the Winallat software system.<sup>5</sup> Subsequently, the information was anonymized, exported, and transferred to the ESSCA central offices in the Institute of Medical Informatics, Biometrics, and Epidemiology of the University of Erlangen, Germany. For statistical analysis of the data, the SAS software package (version 9.1, SAS Institute, Cary, NC, USA) and the SPSS software package version 8.0 for Macintosh were used.

The statistical analysis was performed according to international recommendations for presentation and analysis of contact allergy data.<sup>6</sup> Descriptive statistics were calculated for the main sociodemographic and clinical variables, with focus on the so-called MOAHLFA index as the reference instrument for comparison between centers (Table 3). The definition of atopy included only personal history of atopic dermatitis.<sup>6</sup> Possible differences due to use of allergens from different suppliers were ignored,<sup>2</sup> even though some studies suggest low concordance and risks of false positives when using different systems.<sup>7</sup> In the study of

allergen sensitization rates, direct sex and age adjustment was performed,<sup>8</sup> using the ESSCA reference population (65% women, 35% men; 50%<40 years, 50%>40 years).<sup>2</sup> For the proportions obtained, 95% confidence intervals (CI) were also calculated. The significance of the results was assessed using the  $\chi^2$  test, comparing the proportion of patients with a positive reaction and those with a negative reaction. The  $\chi^2$  test and the Fisher exact test were used for comparing mixes with the primary allergen of the mix.

## Results

Of the 1161 patients included, 740 (63.7%) were women and 421 (36.3%) were men. The ratio of men to women was 1.76 and the mean age was 44.5 years (range, 1-91 years). At the time of inclusion, 65.46% of the patients were over 40 years of age and 14.61% of the cases had occupational relevance. The most common occupation was domestic worker/home maker (16.04%), 34.21% of the patients worked in a humid environment, and 10.4% had atopic disease. Lesions occurred on the hands in 28.67% of the patients, on the face in 15.24%, and on the legs in 9.3%. The MOAHLFA index condenses these variables, thereby

**Table 2** Materials and Methods in the Different Centers

	Hospital del Mar IMAS	HU de la Princesa	HGU Alicante	CHUS	HU de Puerto Real
Unit director	Dr Giménez Arnau	Dr Javier Sánchez	Dr Juanfran Silvestre	Dr Fernández Redondo	Dr José Carlos Armario
No. patients	461	116	216	303	65
Standard	Yes <sup>a</sup>	Yes	Yes	Yes	Yes <sup>a</sup>
GEIDAC Series					
Allergen mix	Clioquinol IPPD Benzocaine	Quinoline mix Black rubber mix Caine mix	Clioquinol IPPD Benzocaine	Quinoline mix Black rubber mix Caine mix	Clioquinol IPPD Benzocaine
Steroids	Budesonide 0.1% Tixocortol pivalate 1%	Budesonide 0.01% Tixocortol pivalate 0.1%	Budesonide 0.1% Tixocortol pivalate 0.1%	Budesonide 0.1% Tixocortol pivalate 0.1%	Budesonide 0.1% Tixocortol pivalate 1%
Mercapto Mix	MOR, CBS, MBTS 1%	MBT, MOR, CBS, MBTS 2%	MBT, MOR, CBS, MBTS 2%	MBT, MOR, CBS, MBTS 2%	MOR, CBS, MBTS 1%
Suppliers	Trolab, Martitor, Chemotechnique	True Test, Chemotechnique	Chemotechnique	True Test, Chemotechnique	Trolab, Chemotechnique, Aristegui
Chambers <sup>b</sup>	Finn Chamber	Chemotechnique Finn Chamber	Finn Chamber	True Test, Finn Chamber, Curatest	Finn Chamber
Readings <sup>c</sup>	Day 2 and day 5	Day 2 and day 4	Day 2 and day 4	Day 2 and day 4	Day 2 and day 4

Abbreviations: CBS, N-cyclohexyl benzothiazyl sulfonamide; GEIDAC, Spanish Contact Dermatitis Research Group; MBT, mercaptobenzothiazole; MBTS, dibenzothiazyl disulfide; MOR, morpholinyl mercaptobenzothiazole.

<sup>a</sup>Neither mercury nor ethylenediamine were patch tested.

<sup>b</sup>Occlusion for 2 days with Micropore hypoallergenic tape and/or Mefix

<sup>c</sup>All centers took late readings on day 7 if needed.

allowing comparison of samples from different centers (Table 3). In total, 545 patients had at least 1 positive reaction (46.9%). The relevance for these cases was present for 49%, past for 32%, and unknown for 19%.

The diagnosis was allergic contact dermatitis in 50.05% of the patients, irritant contact dermatitis in 25.15%, other allergic forms in 24.37%, and contact urticaria in 0.51%. Other dermatoses were diagnosed in 49.95% of the cases.

The sensitization rates to allergens present in the GEIDAC standard series are shown in Table 4. The 5 most common allergens, according to the sex- and age-adjusted results, were nickel sulfate (25.88%), potassium dichromate (5.31%), cobalt chloride (5.10%), fragrance mix (4.64%), and balsam of Peru (4.44%). Table 5 shows the MOAHLFA index for patients sensitized to each of these substances in our sample. The least common allergens were quinoline mix, paraben mix,

mercapto mix (not including 1% mercaptobenzothiazole), tixocortol pivalate, sesquiterpene lactones, and clioquinol. In all cases, the lower limit of the 95% CI was 0. In the comparison of the patch test results for quinoline vs clioquinol mix, caine vs benzocaine mix, and black rubber vs IPPD mix, no statistically significant differences were found. Likewise, for mercapto mix and steroids, there were no significant differences for mercapto mix with mercaptobenzothiazole 2% vs mercapto mix 1%, budesonide 0.1% vs budesonide 0.01%, and tixocortol pivalate 1% vs tixocortol pivalate 0.1%.

The sex-adjusted sensitization rates of the 8 most common allergens revealed substantial differences between men and women (Table 6). The main allergen was nickel sulfate in both groups, but the percentage of sensitized patients was much higher in women (35.01%). Cobalt chloride

**Table 3** MOAHLFA Index Overall and By Center

	Total	Hospital del Mar IMAS	HU de la Princesa	HGU Alicante	CHUS	HU de Puerto Real
Male	36.3%	34.05%	39.65%	39.35%	37%	40%
Occupational	14.61%	6.94%	1.62%	12.50%	31%	26.1%
Atopic	10.85%	8.02%	6.03%	12.50%	15.2%	13.9%
Hand	28.68%	20.17%	16.37%	27.31%	35.6%	83.1%
Leg	9.30%	8.67%	6%	11.10%	8.6%	0%
Face	15.24%	12.79%	25%	16.20%	12.2%	0%
Age > 40 y	65.46%	65.07%	76.72%	68.50%	62.7%	50.7%

**Table 4** Prevalence of Allergens in the Standard Spanish Series Recommended by the Spanish Contact Dermatitis Research Group (GEIDAC)

Allergen	Conc	Patients Tested	Patients With Positive Reaction		
			Number	Percentage	Sex- and Age-Adjusted Percentage; 95% CI
Nickel sulfate	5.00	1.161	295	25.41%	25.88% (23.35%-28.41%)
Potassium dichromate	0.50	1.161	67	5.77%	5.31% (4.00%-6.62%)
Cobalt chloride	1.00	1.161	60	5.17%	5.10% (3.79%-6.42%)
Fragrance mix	8.00	1.161	58	4.99%	4.64% (3.42%-5.86%)
Balsam of Peru ( <i>Myroxylon pereirae</i> )	25.00	1.161	59	5.08%	4.44% (3.29%-5.60%)
Thiomersal (thimerosal)	0.10	1.161	44	3.79%	4.32% (3.03%-5.62%)
PPDA (CI 76060)	1.00	1.161	49	4.22%	4.08% (2.92%-5.25%)
MCI/MI	0.01	1.161	33	2.84%	2.90% (1.87%-3.92%)
Mercury	0.50	635	16	2.52%	2.81% (1.38%-4.24%)
Formaldehyde	1.00	1.161	30	2.58%	2.74% (1.73%-3.75%)
Thiuram mix	1.00	1.161	26	2.24%	2.34% (1.40%-3.27%)
Benzocaine	5.00	742	15	2.02%	2.00% (0.96%-3.04%)
Budesonide	0.01	635	9	1.42%	1.66% (0.54%-2.79%)
Carba mix	3.00	1.161	17	1.46%	1.52% (0.76%-2.28%)
Caine mix	1.00	419	7	1.67%	1.47% (0.34%-2.60%)
Quaternium 15	1.00	1.161	15	1.29%	1.42% (0.67%-2.17%)
Colophony (Rosin)	20.00	1.161	14	1.21%	1.38% (0.62%-2.13%)
Mercapto mix (MBT, CBS, MBTS, MOR)	2.00	635	10	1.57%	1.31% (0.47%-2.15%)
IPPD	0.10	742	11	1.48%	1.28% (0.52%-2.04%)
Ethylenediamine	1.00	635	7	1.10%	1.28% (0.28%-2.27%)
Neomycin sulfate	20.00	1.161	14	1.21%	1.15% (0.52%-1.77%)
Black rubber mix	0.60	419	5	1.19%	1.09% (0.09%-2.09%)
Mercaptobenzothiazole	2.00	1.161	10	0.86%	0.82% (0.28%-1.36%)
Euxyl K 400	1.50	1.161	10	0.86%	0.81% (0.29%-1.33%)
Budesonide	0.10	526	5	0.95%	0.75% (0.09%-1.41%)
Lanolin alcohols	30.00	1.161	8	0.69%	0.71% (0.19%-1.24%)
PTBF-formaldehyde resin	1.00	1.161	8	0.69%	0.70% (0.20%-1.20%)
Epoxy resin	1.00	1.161	8	0.69%	0.66% (0.17%-1.15%)
Tixocortol pivalate	0.10	635	4	0.63%	0.60% (0.00%-1.21%)
Quinoline mix	6.00	635	3	0.47%	0.49% (0.00%-1.07%)
Paraben mix	16.00	1.161	4	0.34%	0.38% (0.00%-0.78%)
Mercapto mix (CBS, MBTS, MOR)	1.00	526	2	0.38%	0.30% (0.00%-0.71%)
Tixocortol pivalate	1.00	461	1	0.22%	0.17% (0.00%-0.52%)
Sesquiterpene lactones	0.10	1.161	2	0.17%	0.13% (0.00%-0.31%)
Clioquinol	5.00	526	0	0.00%	0.00% (0.00%-0.00%)

Ranking from higher to lower frequency of sex- and age-adjusted sensitization. Abbreviations: CBS, N-cyclohexyl benzothiazyl sulfonamide; CI, confidence interval; Conc, concentration; IPPD, N-isopropyl-N-phenyl-4-phenylendiamine; MBT, mercaptobenzothiazole; MBTS, dibenzothiazyl disulfide; MOR, morpholinyl mercaptobenzothiazole; PPDA, 4-phenylendiamine base; PTBF, p-ter-butylphenolformaldehyde.

**Table 5** MOAHFLA Index for Patients Sensitized to the 5 Most Common Allergens

	Nickel Sulfate	Cobalt Chloride	Potassium Dichromate	Fragrance Mix	Balsam of Peru
Male	12.9%	25%	61.2%	35.1%	42.4%
Occupational	16%	25%	23.9%	12.3%	10.2%
Atopy	11.2%	10%	16.4%	15.8%	6.8%
Hand	29.5%	21.7%	29.9%	22.8%	23.7%
Leg	4.4%	8.3%	4.5%	22.8%	20.3%
Face	19.3%	13.3%	4.5%	12.3%	11.9%
Age>40 y	61.7%	68.33%	74.6%	75.7%	83%

**Table 6** List of the 8 Most Common Allergens in Men and Women

Allergen	Conc	Patients Tested	Patients With Positive Reaction		
			Number	Percentage	Age-Adjusted Percentage; 95% CI
<i>Men</i>					
Nickel sulfate	5.00	421	38	9.03%	8.94% (5.97%-11.91%)
Potassium dichromate	0.50	421	41	9.74%	8.77% (5.97%-11.56%)
Balsam of Peru ( <i>Myroxylon pereirae</i> )	25.00	421	25	5.94%	4.92% (2.91%-6.93%)
Mercury	0.50	240	9	3.75%	4.58% (1.48%-7.69%)
Fragrance mix	8.00	421	20	4.75%	4.30% (2.29%-6.31%)
Cobalt chloride	1.00	421	15	3.56%	3.68% (1.68%-5.68%)
MCI/MI	0.01	421	14	3.33%	3.28% (1.43%-5.13%)
Thiomersal (thimerosal)	0.10	421	10	2.38%	3.06% (1.08%-5.04%)
<i>Women</i>					
Nickel sulfate	5.00	740	257	34.73%	35.01% (31.46%-38.56%)
Cobalt chloride	1.00	740	45	6.08%	5.87% (4.15%-7.58%)
PPDA	1.00	740	38	5.14%	5.03% (3.43%-6.64%)
Thiomersal (thimerosal)	0.10	740	34	4.59%	5.01% (3.33%-6.68%)
Fragrance mix	8.00	741	38	5.13%	4.82% (3.28%-6.36%)
Balsam of Peru ( <i>Myroxylon pereirae</i> )	25.00	740	34	4.59%	4.19% (2.78%-5.60%)
Potassium dichromate	0.50	740	26	3.51%	3.45% (2.11%-4.80%)
Formaldehyde	1.00	740	20	2.70%	2.93% (1.63%-4.23%)

Abbreviations: CI, confidence interval; Conc, concentration; MCI/MI, methylchloroisothiazolinone/methylisothiazolinone; PPDA, 4-phenylendiamine base.

sensitization was slightly more frequent in women (5.87% vs 3.68%), although the difference was not statistically significant. Potassium dichromate sensitization was more prevalent in men than women (8.77% vs 2.11%,  $P < .01$ ). 4-Phenylendiamine base (PPDA) (5.03%) was the third most frequent allergen in women. Fragrance mix and balsam of Peru showed similar sensitization rates in both sexes.

## Discussion

This article presents the results for 2008 submitted to the ESSCA by the 5 Spanish centers in the REVAC. This was a retrospective, observational, multicenter study based on data from patients with suspected allergic contact dermatitis referred for patch testing. Such a design has recognized methodological and epidemiological limitations.<sup>6</sup>

The primary objective of the study was to establish the profile of patients referred to a skin allergy unit with suspected contact dermatitis. According to our series, such a patient would be a woman working in the service industry, probably in a humid environment, in whom the presenting complaint is hand eczema with no apparent occupational relevance. The MOAHLFA index revealed a clear predominance of nonoccupational (consumer) dermatitis. This is to be expected given that in the Spanish National Health System, most occupational diseases, including dermatoses, are dealt with by the *Mutuas de Accidentes Laborales y Enfermedades Profesionales* (a mutual health

insurance company covering work-related claims). However, occupational cases accounted for 31% and 26.1% of the caseload in the Centro Hospitalario Universitario in Santiago de Compostela and the Hospital Universitario Puerto Real in Cádiz, respectively. This illustrates the heterogeneity among centers. Both hospitals had a higher percentage of patients with hand eczema, as would be expected.<sup>9</sup>

The percentage of patients with atopic disease was also unevenly distributed among the centers, ranging from 6.03% to 15.2%. This variability could be explained both by the sociodemographic and clinical characteristics of the patients seen in each center, as well as by the fact that there are currently no clearly defined criteria for diagnosis of atopic dermatitis.<sup>10</sup> In addition, the MOAHLFA index only includes personal history of atopy, even if the final diagnosis is atopic dermatitis. It is known that atopic patients have a greater tendency to produce reactions of uncertain relevance, which may have a bearing on the results.<sup>9</sup>

The most frequent site for lesions was the hands. In addition to its importance in occupational allergic contact dermatitis, hand eczema has been associated with occupations in humid conditions (34.21% of the patients in our sample), atopic dermatitis, and multiple sensitizations.<sup>11,12</sup> The face was the second most common site. Facial allergic contact dermatitis is associated above all with cosmetics use in women, although it is also a reason for occupational consultation in cases of airborne allergic contact dermatitis.<sup>13</sup> Finally, leg dermatitis accounted for 9.3% of the total. This type of eczema is associated mainly with patients with chronic venous ulcers who normally

have multiple sensitizations and are allergic to perfumes, antiseptics, and steroids.<sup>14</sup>

On comparison of the results obtained in the patch tests for fragrance mixes with those of their most important component, no significant differences were found. However, it is important to clarify that, given the low prevalence of these sensitizations in our series, the analysis had low statistical power, and so these findings should be interpreted with caution and verified in other types of study.

The sensitization rates to allergens are known to depend on age and sex and so were adjusted for these variables.<sup>8</sup> This is an important requisite when working with data from different centers, and such adjustment can lower the influence of confounding factors resulting from populations with differing sociodemographic characteristics. Sex and age adjustment also eliminated the confounding influence arising from changes in frequency with age or sex (for example, the increasing frequency of positivity for fragrance mixes with age<sup>15</sup> and the decreasing frequency for nickel,<sup>16</sup> also observed in our sample).

Nickel was the most prevalent allergen, with an adjusted sensitization rate of 25.88% (95% CI, 23.35%-28.41%). This percentage is similar to that reported in previous studies in Spain.<sup>17-19</sup> The high sensitization rate in women, with a prevalence of 35.01% (95% CI, 31.46%-38.56%), brings into question the success of the implementation of the European directive regulating nickel release in consumer products.<sup>20</sup> Potassium dichromate and cobalt chloride were the second and third most prevalent allergens, in line with the previously documented high rates of sensitization to transition metals in Spain.<sup>21</sup> In our sample, these 2 substances also had an occupational relevance of around 25%. Of note is the high rate of potassium dichromate allergy in men (8.77%), in line with previous studies and probably related to sensitization through use of untreated cement.<sup>17</sup> Cobalt chloride was the second most common allergen in women, more than likely due to sensitization through wearing jewelry by the consumer or, in an occupational setting, sensitization through cleaning and hair products, products used in the textile industry, or leather.<sup>22</sup> Finally, mercury metal appeared as a particularly important contact allergen in men, with a sensitization rate of 4.58%. However, this finding should be treated with caution given the broad 95% CI (1.48%-7.69%).

Fragrance mixes and balsam of Peru were the fourth and fifth most common, with rates around 4.5%, in line with studies published by Spanish hospitals.<sup>17,19,23</sup> Prevalence was similar in men and women, demonstrating the current ubiquity of fragrances, which are present not only in perfumes but also in all types of industrial products such as soaps, detergents, and paints. In our sample, fragrances were also frequent sensitizers in patients over 40 years of age with lesions on the legs. Thiomersal was the sixth most common allergen (4.32%), with a prevalence somewhat higher among women (5.01% vs 3.06% in men). Although this substance is a frequent contact allergen, its inclusion in the standard series is controversial because it is being used less and less, and relevance cannot be established in most cases.<sup>24</sup>

PPDA is the third most common allergen in women, with a frequency of 5.03% (95% CI, 3.43%-6.64%). Its presence in hair dyes and its occupational importance in allergic contact

dermatitis among hairdressers explain this finding.<sup>22,25</sup> The methylchloroisothiazolinone/methylisothiazolinone mix is an important allergen in men, with a prevalence of 3.28% (95% CI, 1.43%-5.13%). This provides evidence for the growing occupational importance of this contact allergen among men, due to its increasing use as a preservative in industrial products. The overall prevalence of allergy to this molecule is likely to increase slightly in the coming years during to increased sensitization to the recently approved preservative methylisothiazolinone, which has been shown to be an important emerging allergen.<sup>25</sup>

The least prevalent allergens were tixocortol pivalate, quinoline/clioquinol mix, paraben mix, and sesquiterpene lactones, in line with prior Spanish experience.<sup>17,19</sup> Sesquiterpene lactones, the only marker of plant allergies in the standard series, was positive in just 2 patients, thereby confirming the limited benefit of testing with this mix in Spain. The low number of positive reactions also highlights its geographic variability, given that it is a more prevalent allergen in other parts of Europe.<sup>9</sup> It would be interesting to assess a mixture of compounds as an alternative for diagnosing allergic contact dermatitis to plants, as is done in other European countries.<sup>26</sup> This substance does not carry any risk of active sensitization,<sup>27</sup> and it is useful for detecting airborne allergic contact dermatitis in children whose lesions resemble atopic dermatitis.<sup>28</sup> In our sample, systematic study of the quinoline/clioquinol mix also had a low yield, as these allergens are becoming increasingly less prevalent in Europe and more and more authors are questioning their presence in standard series.<sup>2,9</sup> The low prevalence of tixocortol pivalate should, however, be interpreted with great care. Today, there is no standard concentration of use for this substance,<sup>29</sup> and there is a substantial risk of false negatives if no reading is taken on day 7.<sup>30</sup>

Comparison of our results with previous European experience of the ESSCA shows that there is greater prevalence of nickel allergy in Spain, while sensitization to colophony and lanolin is lower,<sup>2</sup> in line with the profile of patients in southern Europe.<sup>9</sup>

The relevance for these cases was considered as present for 49% and past for 32%. The figure for past relevance was strongly influenced by the high rates of nickel allergy, with a total of 295 positive reactions, of which 55% were considered of past relevance, 32% of present relevance, and 13% of unknown relevance.

## Conclusions

1. Despite their limitations, multicenter studies are a valid tool for epidemiological study of allergic contact dermatitis.
2. The profile of a patient seen in a Spanish skin allergy unit is one of a woman who works in the service sector, probably in a humid environment, and who has lesions with no occupational relevance on the hands and/or face.
3. The profile of sensitizations in Spain is in line with that expected for a southern European country.
4. Nickel sulfate is the most prevalent allergen. The sensitization rate in Spanish women is among the highest in Europe.

5. Transition metals and mercury are still highly prevalent allergens in Spain.
6. Sesquiterpene lactones and quinoline/clioquinol mix are allergens that have not been shown to have a high yield in systematic patch testing.

In this article, we present the first results of the recently implemented REVAC. Despite considerable effort, there remains much to do. It is necessary to attract new members to the system and improve standardization. REVAC, which is still a new system in its early stages of operation, invites all Spanish dermatologists to contribute epidemiological data on allergic contact dermatitis in Spain.

## Conflict of Interest

The authors declare no conflict of interest.

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