

European Standard Series patch test results from a contact dermatitis clinic in Israel during the 7-year period from 1998 to 2004

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The results of a 7-year retrospective study (1998–2004) from patch testing with the European Standard Series (ESS) establishing the frequency of sensitization in a contact dermatitis clinic in Israel are presented. 23 allergens were patch tested on 2156 patients, 1462 females (67.8%) and 694 males (32.2%). Atopy and asthma were present in 21.9% of the patients. One or more allergic reactions were observed in 937 patients (43.5%). The highest yield of patch test positives from the 1076 positive reactions were obtained from nickel sulfate (13.9%), fragrance mix (7.1%), potassium dichromate (3.8%), Balsam of Peru (3.6%), CL + Me-isothiazolinone (3.4%) and cobalt chloride (3.4%). Allergens which produced the least amount of positive results were primin and clioquinol. Allergic contact dermatitis (ACD) was established in 32.8%, whereas occupationally related allergic (8.0) and irritant contact dermatitis (5.6%) affected a total of 13.6% of the cases studied. The most common clinical forms of dermatitis were chronic dermatitis (47.7%) followed by acute dermatitis (22.8%), and lichenification and hyperkeratosis (7.9%). The hands (30.7%), face and neck (23.9%) and extremities (11.3%) were the most frequently affected areas. Four allergens in our study differed from the top 10 allergens in Europe namely: Cl + Me-isothiazolinone, formaldehyde, 4-tert-butylphenol formaldehyde resin and sesquiterpene lactone mix reflecting an existing difference in environmental exposure. Our study is the first to provide data on the frequency of sensitization and important allergens in the aetiology of ACD in Israel. In spite of the existing differences with Europe, we conclude that ESS is an appropriate screening system for the diagnosis of ACD in Israel.

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Patch testing is a valuable diagnostic method in the investigation of patients with allergic contact dermatitis (ACD), which allows to establish the occurrence of sensitization to a certain agent. The use of different standard series such as the European Standard Series (ESS), British, North American or Chinese Series developed in countries according to the regional needs, reflects differences in allergen exposure.

The aim of this study was to analyse the results from patch testing with ESS in order to establish the frequency of sensitization and to compare our findings with those of other centres, thus gaining insight on the validation of the series in clinical practice in our country and our specific environment.

Patients and Methods

Data from clinical history, features and patch testing results of consecutive patients patch tested

in our contact dermatitis clinic from 1998 to 2004 were compiled and analysed. Patch testing was performed with the European Standard Series (ESS) using the IQ Chambers (Chemotechnique Diagnostics, Malmö, Sweden). Budesonide and Tixocortol 21-pivalate were not included in the series for all patients and therefore, these allergens were omitted from the analysis. Additional series were used when indicated. The methodology of the procedure was in accordance with the ICDRG guidelines (1) with an application time of 2 days and readings performed on the second and third days. Clinical relevance of the positive reactions was evaluated. A positive reaction was considered to have present clinical relevance if the patient was known to have cutaneous exposure to a product known to contain the allergen to which the patient reacted. The exposure

assessment was based on information from packages and safety data sheet when available. Data were recorded on a standardized computer entry form and statistically analysed.

Results

23 allergens were tested on 2156 patients. Of them, 1462 were females (67.8%) and 694 were males (32.2%) with a mean age of 45.4 ± 17.1 years and an age range of 2–89 years.

Of the patients tested, 937 (43.5%) had one or more positive allergic patch test reaction. The frequency of sensitization to ESS allergens is summarized in Table 1. The highest yield of positive reactions from the overall 1076 positive patch tests was obtained from the following: nickel sulfate, fragrance mix, potassium dichromate, Balsam of Peru, CL + Me-isothiazolinone, and cobalt chloride. The final diagnoses, established after clinical examination, patch testing and assessment of clinical relevance are presented in Table 2. Present clinical relevance of the positive patch tests was found in 68.4% of the patients. Atopy and asthma were present in 472 patients (21.9%). Of them, 205 (9.5%) were diagnosed as suffering from atopic dermatitis, 237 (11.0%) had mucosal atopy and/or asthma and 30 (1.4%) were afflicted by both.

The majority of patients in the non-occupational group were represented by unemployed, retired

Table 1. Frequency of sensitization to allergens from the European Standard Series (ESS) with top 11 allergens in Israel

Allergen ESS	Number	Percentage
Nickel sulfate 5.0%	299	13.9
Fragrance mix	154	7.1
Potassium dichromate 0.5%	83	3.8
Balsam of Peru 25.0%	78	3.6
Cobalt chloride 1.0%	74	3.4
Cl + Me-isothiazolinone 0.01%	74	3.4
4-Phenylenediamine base 1.0%	38	1.8
Formaldehyde 1.0%	39	1.8
4-tert-butylphenol	29	1.3
formaldehyde resin 1.0%		
Sesquiterpene lactone mix	26	1.2
Thiuram mix 1.0%	25	1.2
Epoxy resin 1.0%	24	1.1
Neomycin sulfate 20.0%	23	1.1
Benzocaine 5.0%	19	0.9
Colophony 20.0%	18	0.8
Quaternium 15 1.0%	18	0.8
Paraben mix 16.0%	12	0.6
N-Isopropyl-n-phenyl-4-phenylenediamine 0.1%	11	0.5
Wool alcohols 30.0%	11	0.5
Mercapto mix 2.0%	8	0.4
Mercaptobenzothiazole 2.0%	9	0.4
Clioquinol 5.0%	3	0.1
Primin	1	0.0

Number of positive patch test = 1076, number of patients = 937.

Table 2. Clinical diagnoses established after patch testing

Diagnosis	Number of patients	Percentage from all the patients studied (n = 2156)
Allergic contact dermatitis	708	32.8
Occupational allergic contact dermatitis	172	8.0
Atopic dermatitis and allergic contact dermatitis	27	1.2
Irritant contact dermatitis	230	10.7
Occupational irritant contact dermatitis	120	5.6
Atopic dermatitis	235	10.9
Other dermatoses (dyshidrotic eczema, nummular eczema and others)	664	30.8

patients and house makers (40.5%), followed by office workers (10.1%) and individuals engaged in education (17.4%). Occupational contact dermatitis (OCD) was established in 292 patients (13.6%). The most frequently affected patients were those working in factories in jobs such as mechanics and technicians (31.4%), cosmetologist and hairdressers (14.4%), professional cleaners (14.1%), construction workers (13.5%), and hospital workers, dentists and nurses (7.8%).

The most common clinical forms of dermatitis were chronic dermatitis (47.7%) followed by acute dermatitis (22.8%), lichenification and hyperkeratosis (7.9%), chronic dermatitis with erosions and fissures (5.7%). Infrequent clinical manifestations included: pigmented and hypopigmented ACD (2.2%), lichenoid ACD (1.9%), psoriasiform ACD (1.6%), purpuric ACD (1.6%) and granulomatous ACD (0.3%). The areas most frequently affected by the ACD were the hands (30.7%), the face and neck (23.9%) and the extremities (11.3%). Disseminated form of ACD was observed in 8.4% of the cases. Other involved locations included: the trunk (6.8%), feet (5.2%), the anogenital region (4.8%), folds (4.7%), the buccal mucosa (3.0%) and the scalp (1.3%).

Discussion

Comparison of results in different centres and geographical areas is of great importance in the evaluation of relevance of the used series in relation to the differing allergen exposure conditions. Variability between centres may be a first indicator of the impact of certain demographic or clinical characteristics of patients seen in this centre provided that a high level of standardization is met (2, 3).

Environmental exposure to allergens can vary from region to region due to local differences in life style, therapeutic practices and local industries. These variations are also reflected in the most frequent allergens triggering sensitization. As can be seen in Table 3, differences from the European most frequent 10 allergens exist not only in Israel, but also in the UK, Czech Republic, Turkey, the USA and China (4–10).

Recently presented pooled data of patch testing with the ESS from two major studies from Europe 1 from 9 countries (with 10 511 patients) (4) and another from seven countries (with 26 210 patients) (5) are of major importance and provide more power to identify trends. The 10 most frequent sensitizers in the standard series as reported by both groups were identical (Table 3). Our study is the first to provide information on the frequency of sensitization to allergens from the ESS in Israel. The 11 most frequent allergens observed in our study differ in some ways from those in Europe (Tables 1 and 3). However, just like the rest of Europe, nickel sulfate is the most frequent allergen yielding positive results. The high frequency of sensitization is probably related to the high exposure to inexpensive jewellery and early piercing. The sensitization rates of fragrance mix, is similar to those in Europe as well, and lower than in UK, China and USA. Four allergens in our study differed from the 10 most frequent allergens in Europe namely: Cl + Me-isothiazolinone, formaldehyde, 4-tert-butylphenol formaldehyde resin and sesquiterpene lactone mix. The higher frequency of sensitization yielded by Cl + Me-isothiazolinone in our study exceeds the rate in Europe and could be explained by the wide exposure to this allergen which is used as a common preservative in cosmetics and biocide in local industry. Some rare but peculiar forms of

ACD, such as psoriasiform Occupationally induced allergic contact dermatitis (OIACD) related with allergic sensitization to Cl + Me-isothiazolinone was observed in our series. Formaldehyde is another allergen of our 10 most frequent allergens which triggered positive results close to those in Europe and lower than in the USA. In Europe, the incidence of formaldehyde allergy has been lowered since its use in cosmetics was largely abandoned and, as a disinfectant, it has been partly replaced by other compounds (11). It could be speculated that in Israel, formaldehyde could be related not only to the exposure to the mentioned sources in cosmetics and disinfectants but also to the field of textile that are treated with formaldehyde resins. The high incidence of textile dermatitis as reported in Israel (12) could be because of higher exposure to formaldehyde resins in textiles and increased penetration due to profuse sweating related to the hot and humid climate. Increased sweating and barefoot exposure to leather footwear and sandals may also be an additional cause for the increased incidence of sensitization to 4-tert-butylphenol formaldehyde resin. The inclusion of sesquiterpene lactone mix in the top 10 allergens could be explained by the high occupational exposure of flower breeders, which are common in this area of the country.

The allergens, which yielded the least amount of positive results include primin and clioquinol. These two allergens could be candidates for elimination from our local series guided by the suggestion for the inclusion of allergens in standard patch series when more than 0.5–1% of the routinely tested patients react positively (13).

Taking the high incidence of textile dermatitis in Israel into account (12) and the fact that textile dermatitis in general and particularly textile dye dermatitis is not always evident from the

Table 3. Comparison of the frequency of sensitization of top 10 allergens in Europe, Israel and in other countries

Allergens	Europe ⁴	Europe ⁵	Israel	UK ⁶	Czech Republic ⁷	Turkey ⁸	China ⁹	USA ¹⁰
1. Nickel sulfate (5.0%)	17.3	17.9	13.9	18.6	13.7	17.6	22.1	16.7
2. Fragrance mix	6.4	9.7	7.1	10.7	5.8	2.1	15.5	10.4
3. Balsam of Peru	5.8	6.0	3.6	6.7	7.3	2.1	NA	11.6
4. Cobalt chloride (1%)	8.0	5.9	3.4	5.8	5.22	5.3	NA	7.4
5. Potassium dichromate (0.5%)	5.4	4.6	3.8	2.1	4.0	4.6	8.9	4.3
6. Phenylenediamine base (1.0%)	3.1	3.9	1.8	3.0	2.0	1.8	12.8	4.8
7. Thiuram mix	2.0	3.2	1.2	3.5	2.1	2.0	0.6	4.5
8. Colophony (20%)	3.3	4.0	0.8	5.2	2.9	1.0	5.0	2.6
9. Neomycin sulfate (20%)	2.7	3.0	1.1	2.9	1.9	2.4	NA	11.6
10. Lanolin alcohol (30%)	2.7	2.9	0.5	3.3	2.9	0.4	NA	2.2
11. Cl + Me-isothiazolinone (0.01%)	2.3	2.2	3.4	2.4	1.4	0.1	NA	2.3
12. Formaldehyde (1.0%)	2.0	2.3	1.8	2.1	4.2	1.2	3.9	8.4
13. 4-tert-butylphenol formaldehyde resin (1.0%)	1.4	1.3	1.3	1.0	0.5	1.3	NA	1.9
14. Sesquiterpene lactone mix	0.9	1.1	1.2	1.1	0.5	NA	1.7	0.6

NA = information not available. Top 10 allergens for Europe Allergens 1–10. Top 11 allergens for Israel Allergens 1–7 and 11–14.

patient's history or clinical pattern (4), we recommend including the allergens Disperse Blue 106 and 124 in the standard series for our local use.

Our study outlines data on important allergens in the aetiology of ACD in Israel. In spite of existing differences with Europe, we conclude that the ESS is an appropriate screening system for the diagnosis of ACD in Israel.

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