

Prevalence of Allergic Contact Dermatitis in Thailand

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Background: Contact dermatitis is a universal condition. Patch testing is an effective diagnostic tool for clinically suspected allergic contact dermatitis. Previous studies have shown that the prevalence of specific allergens varies by geographic area.

Objective: To determine the relative frequency of positive reactions to different sensitizers in Thai patients with clinically suspected contact dermatitis.

Methods: The results of patch tests performed from January 1, 2004, to December 31, 2006, at the Siriraj Hospital Contact Dermatitis Clinic were analyzed. A total of 323 consecutive patients (83% women and 17% men, with mean age of 39 years) were patch-tested with the total number of allergens used from both European standard patch test series and International patch test series was 26.

Results: The most frequent allergen was potassium dichromate (27%), followed by nickel sulfate (26.6%), fragrance mix (20.7%), and cobalt chloride (16.4%).

Conclusions: We compared the results with published findings in Asian-Pacific populations to identify geographic cultural differences in the prevalence of the allergens. The findings of the present study are able to identify the set of prominent local allergens for better revision of the standard patch test to local needs.

CONTACT DERMATITIS (CD) is a universal condition. Patch testing is an effective diagnostic tool to confirm allergic CD.¹ The prevalence of allergic CD ranges from 4 to 10% of all dermatologic disorders depending on the source population.² Previous studies have shown that the prevalence of specific allergens varies by geographic area.^{3–8} Wongpiyabovorn and Puvabanditsin showed that patch-testing with standard test series detected 60% of all contact allergies in Thais.⁹ The objective of the present study was to determine the relative frequency of positive reactions to different sensitizers in Thai patients with clinically suspected CD by using both International and European Standard series in an effort to make patch testing a current and effective tool in diagnosing allergic CD in our region. The findings were also compared with those previously reported in Asian-Pacific countries.

Materials and Methods

Three hundred twenty-three (323) patients suspected of having allergic CD who were referred to the Siriraj Hospital Contact Dermatitis Clinic between January 1, 2004, and December 31, 2006, were patch-tested with the European Standard patch test series and additional allergens from the International patch test series, of 26 allergens, excluding primin (Chemotechnique Diagnostics AB, Malmö, Sweden). The allergens and their concentrations are shown in Table 1. The allergens, in aluminum Finn Chambers (Epitest Ltd Oy, Tuusula, Finland), were placed on unaffected skin on the upper back for 2 days, and the reactions were read on days 2, 3, and 7, according to the guidelines of the International Contact Dermatitis Research Group.¹⁰ Patch-test results and patient data were collected by chart review. The clinical relevance of the patch-test results were determined according to criteria recommended by *Fisher's Contact Dermatitis*.¹⁰ The data were analyzed with descriptive statistics.

Results

Over 3 years (2004–2006), 323 patients (268 [83%] female and 55 [17%] male, for a female-to-male ratio of 5:1) were patch-tested with 26 allergens. The average age of the patients was 39.03 ± 12.9 years (mean $\pm$ standard deviation [SD]; range, 10–74 years). The patch-test results

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Table 1. Patch-Test Results of Both Standard Series (Primin Excluded), Ranked by Frequency of Positive Reactions

Allergen	Concentration (%) and Vehicle	Positive Reactions (%)	% Clinical Relevance (CR)
Potassium dichromate* [†]	0.5 pet	27.0	48.6
Nickel sulfate* [†]	5.0 pet	26.6	81.2
Fragrance mix* [†]	8.0 pet	20.7	46.2
Cobalt chloride [†]	1.0 pet	16.4	36.4
Neomycin sulfate* [†]	20.0 pet	12.6	0.0
Parabens mix [†]	16.0 pet	10.9	32.4
Balsam of Peru* [†]	25.0 pet	10.7	47.1
4-Phenylenediamine base* [†]	1.0 pet	10.3	37.9
Colophony* [†]	20.0 pet	6.8	59.1
Budesonide* [†]	0.01 pet	5.6	15.4
Thiuram mix* [†]	1.0 pet	5.2	83.3
1,2-Dibromo-2,4-dicyanobutane* [†]	0.5 pet	5.0	21.4
Formaldehyde* [†]	1.0 aq	4.5	38.5
4-tert-Butylphenol formaldehyde resin* [†]	1.0 pet	4.5	60.0
Methylchloroisothiazolinone* [†]	0.01 aq	4.3	33.3
Mercapto mix* [†]	2.0 pet	3.6	100
Wool alcohols* [†]	30.0 pet	3.2	0.0
Benzocaine [†]	5.0 pet	3.2	0.0
Mercaptobenzothiazole* [†]	2.0 pet	3.1	100.0
Sesquiterpene lactone mix [†]	0.1 pet	2.8	28.6
Epoxy resin* [†]	1.0 pet	2.7	42.9
Quaternium-15* [†]	1.0 pet	2.5	28.6
Tixocortol-21-pivalate* [†]	0.1 pet	2.2	20.0
Quinoline mix (clioquinol) [†]	5.0 pet	1.8	0.0
Imidazolidinylurea*	2.0 aq	1.4	0.0
N-isopropyl-N-phenyl-4-phenylenediamine [†]	0.1 pet	0.9	0.0

aq = aqueous; pet = petrolatum.

*International Standard Series (20 substances).

[†]European Standard Series (25 substances).

are summarized in Table 1. The most frequent allergen was potassium dichromate (27%), followed by nickel sulfate (26.6%), fragrance mix (20.7%), and cobalt (16.4%). The most frequent allergens as a group were metals (70%), including potassium dichromate, nickel sulfate, and cobalt chloride; 42.9% of patients had a history of metal allergy. Among these metals, nickel sulfate had the highest relevance (81.2%). Current clinical relevance was most frequently seen with mercaptobenzothiazole, mercapto mix (100%), and thiuram mix (83.3%), which are all rubber allergens. However, the relevance rate was 0.0% for neomycin sulfate, wool alcohols, benzocaine, quinoline mix, imidazolidinylurea, and N-isopropyl-N-phenyl-4-phenylenediamine.

About 134 patients (41.5%) were assessed as atopic individuals (ie, having allergic rhinitis, allergic conjunctivitis, asthma, or atopic dermatitis); 36 patients (11.2%) had atopic dermatitis, and 79 patients (24.6%) had a

family history of atopic skin diathesis. The most frequently reported clinical diagnosis was dermatitis (89.57%), especially allergic CD (57.53%), irritant CD (10.42%), and other dermatitis (21.62%). The dermatitis was mainly localized on the hands (37.9%) and on the face (including cheilitis) and neck (31%).

Discussion

We compared our results of tests with the common allergens to those of the Asian-Pacific countries (Table 2). However, we have excluded primin 0.01% in petrolatum from our patch-test series since 1990 because none of the tested patients reacted to primin, which may not be a cause of plant dermatitis in Asian countries.³

Potassium dichromate, the most common allergen in our study, had a frequency (27%, with 48.6% clinical relevance) close to that reported in India (20%).³ It

Table 2. Percentages of Common Allergens in Different Countries

Allergen	Present Study	Thailand ⁹	India ³	China ²⁴	Hong Kong ¹³	NACDG ⁷
Potassium dichromate* [†]	27.01	11.6	20.5	8.9	1.6	4.3
Nickel sulfate* [†]	26.56	18.6	16.5	22.1	16.4	16.7
Fragrance mix* [†]	20.70	14.7	7.5	15.5	19.3	10.4
Cobalt chloride [†]	16.42	17.1	8.0	NT	11.3	7.4
Parabens [†]	10.90	5.4	2.0	3.3	NT	0.6
Balsam of Peru* [†]	10.76	10.8	1.5	NT	8.6	11.6
PPD	10.30	1.5	11.5	12.8	0.4	4.9

NACDG = North American Contact Dermatitis Group; NT = not tested; PPD = para-phenylenediamine.

*International Standard Series (20 substances).

[†]European Standard Series (25 substances).

has always been the most frequent sensitizer in Asia,^{11,12} where the sources of chromium allergy are cement and leather products. In our study, however, allergy to chromium was related more to leather, paint, and detergent than to cement. The frequency of positive reactions to potassium dichromate was decreasing in North American countries (2001–2002), where it ranked as the fifteenth most frequent sensitizer.⁷

Our study found that nickel sulfate was the second most common allergen in Delhi (India) and Hong Kong^{3,11,13} whereas it was usually the most common allergen in Western countries.^{6,7} The patients who had a history of dermatitis caused by wearing cheap metal earrings, bracelets, or necklaces were labeled as having metal allergy. History of metal allergy was significantly correlated with positive patch-test reactions to nickel ($p = .000$) but not with reactions to potassium dichromate or cobalt chloride ($p > .05$). Among allergies to substances in the standard series, allergy to nickel showed the highest clinical relevance (81.2%).

The frequency of contact allergy to fragrance mix (FM) and to balsam of Peru (BOP) was 20.7% and 10.76%, respectively. The frequencies of FM and BOP sensitivity were similar to those found by previous studies in Thailand⁹ and other Asian countries (see Table 2). FM and BOP allergies have become more common in this region of the world because of the increasing popularity of spas and aromatherapy.¹⁴ The high incidence is attributed to the widespread use of perfumes in cosmetics and household products and to aromatic Thai foods containing more spice. Because of changes in lifestyle patterns, consumer products nowadays tend to contain many fragrance ingredients and higher concentrations of such ingredients than they did in the past. Thai foods frequently contain spices such as basil (eugenol, limonene, terpinene, linolool), lemongrass (citronellal, citral, terpenal, linolool) and chili.¹⁵ There are patients who have fingertip dermatitis related with the way they “pinch” such spices.

Fragrance was Allergen of the Year in 2007 and produced the fourth or fifth most frequent patch-test reaction seen by the North American Contact Dermatitis Group.¹⁶

Paraben mix, which was among the top five allergens, caused positive reactions in 10.9% of our patients. Parabens are uncommon cosmetic preservative allergens in North America and Europe. This was confirmed by a meta-analysis of 15 years of published T.R.U.E. Test data and established that paraben mix was one of the least prevalent allergens tested.^{17,18} Most of the cosmetic products and topical medications sold in Thailand contain parabens as preservative. This may be reflected in the high rate of paraben exposure in the Bangkok region and may affect our high rate of positive reaction to paraben mix (10.9%). This high frequency confirms that parabens now are common preservative allergens in Thailand, the opposite of the trend shown in a North American study.⁷ Rudzki and Kleniewska reported that 14% of patients who were sensitive to para-phenylenediamine were allergic to parabens.¹⁹ In addition, the cross-reactivity of parabens and allergens of the “para” group, such as para-phenylenediamine,¹⁸ could explain the high parabens rate.

The rate of positive reactions to para-phenylenediamine (PPD) is 10.3%, which is rather high when compared to that of other regions (see Table 2) and our own data showing that the PPD positive rate in the 1990s was 4.6%.²⁰ The prevalence of allergy to PPD in normal Thai adults was 2.7%, with a 1% incidence of sensitization over a 6-month period.²¹ Our high PPD allergy rate could be caused by many factors, such as the selective group of CD patients in the clinic, increased use in an “anti-aging” era, a broadening array of cross-reacting substances, new patterns of exposure, and reported high levels of sensitization in certain ethnic groups. PPD was chosen to be Allergen of the Year in 2006²² because of a number of recent changes in its clinical aspects. The number of individuals who use hair dyes, the primary route of

exposure to PPD, seems to be increasing in both sexes in an attempt to stave off the appearance of aging. In addition, it is also fashionable to change the color of their hair even among younger individuals. This constitutes a growing population of individuals exposed to all variety of hair coloring agents, the majority of which contain PPD or cross-reacting substances.²² A number of commonly-used, chemically-related compounds has been associated with cross-reactivity to PPD such as a new cyclooxygenase-2 inhibitor and sunscreen agents. Body tattooing is another route of PPD exposure and has been part of Asian culture for a long time (especially tattooing with black pigment). Tattooing has also enjoyed an increased acceptance among youths. The level of PPD in tattoo color, temporary henna tattoos, or black henna tattoos is much higher than that found in hair colorings.²³ Ethnic Asian people show a different pattern of hair dye use. This is because they have naturally black hair and thus tend to use darker shades of hair dyes, which contain higher concentrations of PPD.⁸

Reactions to neomycin sulfate, wool alcohols, benzocaine, quinoline mix, imidazolidinylurea, and N-isopropyl-N-phenyl-4-phenylenediamine showed no relevance in our 3-year study. The relevance of positive patch-test reactions to neomycin cannot be clearly established because the exposure was from the topical combination of corticosteroid and neomycin, which is popularly sold as over-the-counter medication in Thailand. In addition, our studied population contained neither dairy workers nor agricultural workers. The data may reflect the current decline of exposure to these substances. We may need more extensive data to evaluate their presence in the standard series.

Conclusion

Further investigation with extended allergens is necessary to determine the suitable standard series for the Bangkok region of Thailand. Our results are at variance with those of other centers in Asia. The differences in trends of positive reactions to allergens in many reports may result from the differences in culture and exposure to the diverse allergens.

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