Contact Allergy in Eczema Patients in Thammasat University Hospital

Wareeporn Disphanurat MD*

** Dermatology Unit, Department of Medicine, Faculty of Medicine, Thammasat University Rangsit campus, Pathumthani, Thailand*

Many patients with eczematous dermatitis need continued care in case of a recurrent or persistent skin condition and potential adverse effect of medications. Allergic contact dermatitis should be considered in the differential diagnosis of eczematous dermatitis especially in a patient whose dermatitis is persistent despite appropriate therapies. Patch testing is an essential investigation in patients with persistent eczematous eruption when contact allergy cannot be ruled out. The purpose of this study was to determine the frequency of contact allergy in patients with eczematous dermatitis in Thammasat University Hospital, Prathumthani, Thailand from June 1, 2008 to June 30, 2009 and to identify a possible relationship between sex, age, occupational differences and type of eczema that is associated with positive patch test reactions. A total of 157 patients were patch tested with 23 standard allergens. One or more positive responses were noted in 70 patients (44.6%). The most common allergen was nickel sulfate (26.8%), followed by cobalt chloride (7.6%), p-phenylenediamine (7.0%), fragrance mix (7.0%). Patients who were initially diagnosed with allergic contact dermatitis had significant correlation with positive patch test results to nickel sulfate, cobalt chloride and phenylenediamine (p = 0.00, p = 0.03, p = 0.02, respectively). Patients who were initially diagnosed with endogenous eczema had significant correlation with positive patch test results to colophony (p = 0.04). Contact allergy to fragrance mix was significantly more frequent in patients who had personal history of atopy (p = 0.04). There was no significant correlation between the frequency of contact allergy and sex, age, location of lesion and patient's occupation. In conclusion, this study demonstrated the prevalence in contact allergy in eczema patients in Thammasat University Hospital and compared the results with other region from Thailand. Further study involving many hospitals in various areas in Thailand is needed to provide more insight into contact allergy in Thailand.

Keywords: *Eczema, Contact allergy, Allergic contact dermatitis, Patch testting*

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Eczema is a pattern of skin inflammation which in its acute phase is characterized by erythema, vesiculation, and in its chronic phase by lichenification. The etiologies consisting of endogenous, irritation and allergic reaction may coexist in development of certain eczema. Contact allergy is a delayed-type hypersensitivity reaction in response to external allergen by direct skin contact. Allergic contact dermatitis is defined by hapten-specific T cell-mediated skin inflammation. A sensitized individual must be genetically susceptible and have sufficient contact with allergen and then have repeated contact with the allergen later. Allergic contact dermatitis should be considered in the differential diagnosis of eczematous dermatitis especially in patient whose dermatitis is persistent despite appropriate therapies. Patch testing is the gold standard method for diagnosis of allergic contact dermatitis. The frequency of sensitization to contact allergens varies in different countries and regions because of both genetic and allergen exposure. The exposure patterns change and vary over time because of regional traditions, fashion trends and environmental specifications. The Danish contact allergy database reported a 34.5% sensitivity rate of contact allergy in their eczema populations[1]. Previous studies have shown that the prevalence of specific allergens varies by geographic area, population, age and sex[2-4]. This study aimed to determine the prevalence of contact allergy in patients with eczematous dermatitis in Thammasat University Hospital, Pathumthani, Thailand and to identify possible sex, age, occupational difference and type of eczema that are associated with

Correspondence to:
Disphanurat W, Dermatology Unit, Department of Medicine, Faculty of Medicine, Thammasat University Rangsit campus, Pathumthani 12120, Thailand.
Phone: 0-2926-9793-4
E-mail: dwareeporn@gmail.com

positive patch test reactions.

Material and Method

Data were collected from patients who diagnosed eczema in dermatologic outpatient clinic, Thammasat University Hospital, Pathumthani, Thailand from June 1, 2008 to June 30, 2009. All of the patients have symptoms of eczema more than 1 month. Patients were excluded if they had applied topical corticosteroids to the test site within two weeks, taken more than 20 mg per day of systemic corticosteroid or other immnusuppressive drugs within 2 weeks and patients who had widespread uncontrolled or active eczematous dermatitis. One hundred fifty-seven patients were tested with 23 standard allergens from European baseline series exclude budesonide, tixocortal pivalate, methyldibromoglutaronitrile and Lyral®[5] (chemotechnique DiagnosticsAB, Malmo, Sweden). Patch testing were performed using Finn chambers (Epitest Ltd Oy, Tuusula, Finland) on Scanpor tape (Norgesplaster Aksjeselskap, Vennesia, Norway). The allergen were placed on unaffected skin of the upper back for 2 days and readings were taken on days 2 and 4. All reactions were scored by one dermatologist (principle investigator) according to guidelines of the International Contact Dermatitis Research Group[6,7]. A 1+, 2+, or 3+ reading was interpreted as a positive response. An irritative response, doubtful (+?) or negative reading was interpreted as negative response. Initial diagnosis of eczema (by etiologies) were recorded.

Data analysis

Data were coded and analyzed using the Statistical Package for Social Sciences (SPSS version 13). A MOAHLFA index (percentage of Male, Occupation, Atopic dermatitis, Hand dermatitis, Leg dermatitis, Face dermatitis, Age > 40) was calculated[8]. Analysis of association between patients characteristics (gender, age group, history of atopy), type of eczema and positive patch test results were evaluated using Chi-square test or Fisher's exact test when expected value was less than 5. A level $p < 0.05$ was considered as cut-off value for statistical significance.

Results

The total number of one hundred fifty-seven patients were included in this study. The patients consisted of 112 women (71.3%) and 45 men (28.7%) with an age range between 17-79 years (mean $\pm$ SD = 40.6 $\pm$ 15.2years). The patients' occupations were manual laborer (24.8%), industrial worker (14.7%), student (12.7%), merchant (11.5%), office occupation (10.8%), retiree (8.28%), housewives (6.4%) and health-care worker (6.4%). Important demographic characteristics of the patients according to the MOAHLFA index are summarized in Table 1.

At least one positive skin reaction was observed in 70 patients (44.6%) and there were a total of 119 positive reactions in these patients. The positive reactions had present or past relevance in 91 of 119 positive reactions (76.5%). Among these, 83 positive reactions had present relevance in 50 patients (31.9%) who were diagnosed allergic contact dermatitis, 16 patients (10.2%) had occupational related positive patch test results. The most common allergens was nickel sulfate (26.8%), followed by cobalt chloride (7.6%), p-phenylenediamine (7.0%), fragrance mix (7.0%), balsum of peru (4.5%) and Cl + M-isothiazolinone (4.5%). None of the patients had a positive patch test reaction to 6 of 23 allergens including clioquinol, mercapto mix, 4-tert-butylphenol formaldehyde resin, sesquiterpene lactone mix, quaternium15 and primin. Table 2 shows the distribution of positive reactions to the allergens and their clinical relevance.

The rate of positive reactions were 42.2% (19/45) in males and 45.5% (51/112) in females. The positive patch test reactions showed no significance difference between the male and female population. Table 3 shows the distribution of positive reactions to the allergens according to gender.

Stratification of patients was made by dividing the patients according to age (younger or equal to and older than 40 years), history of atopy and type of eczema (endogenous and suspected of having allergic contact dermatitis). 88 patients (56.1%) are younger or equal to 40 years of age and 69 patients (43.9%) are older than 40 years. The positive reactions to fragrance mix were

Table 1. Demographic characteristics of 157 patients according to MOAHLFA index

M (Male)	45 (28.7%)
O (Occupation)	16 (10.2%)
A (Atopic dermatitis)	11 (7.0%)
H (hand dermatitis)	56 (35.7%)
L (Leg involvement)	26 (16.6%)
F (Face involvement)	25 (15.9%)
A (Age > 40)	69 (43.9%)

Table 2. Positive patch test reactions to individual allergens and their clinical relevances

Allergens	Total n = 157 (%)	Clinicalrelevance
Nickel sulfate	42 (26.8)	83.3%
Cobalt chloride	12 (7.6)	91.7%
4-Phenylenediamine base	11 (7.0)	63.6%
Fragrance mix	11 (7.0)	81.8%
Balsam of Peru	7 (4.5)	57.1%
Cl+Me-isothiazolinone (Kathon CG)	7 (4.5)	100%
Thiuram mix	5 (3.2)	80.0%
Colophony	5 (3.2)	60.0%
Neomycin sulfate	4 (2.5)	25.0%
Mercaptobenzothiazole (MBT)	4 (2.5)	100%
Parabens mix	3 (1.9)	33.3%
Potassium Dichromate	2 (1.3)	100%
Wool alcohol	2 (1.3)	50.0%
Benzocaine	1 (0.6)	0%
N-Isopropyl-N-phenylenylenediamine	1 (0.6)	0%
Formaldehyde	1 (0.6)	0%
epoxy resin	1 (0.6)	100%

Table 3. Patch test results for individual allergens according to sex

Allergens	Total n = 157 (%)	Male n = 45 (%)	Female n = 112 (%)	p-value
Nickel sulfate	42 (26.8)	9 (20.0)	33 (29.4)	1.47
Cobalt chloride	12 (7.6)	2 (4.4)	10 (8.9)	0.28
4-Phenylenediamine base	11 (7.0)	5 (11.1)	6 (5.3)	0.94
Fragrance mix	11 (7.0)	3 (6.7)	8 (7.1)	0.61
Balsam of Peru	7 (4.5)	1 (2.2)	6 (5.3)	0.35
Cl+Me-isothiazolinone (KathonCG)	7 (4.5)	1 (2.2)	6 (5.3)	0.35
Thiuram mix	5 (3.2)	0 (0.0)	5 (4.4)	0.18
Colophony	5 (3.2)	3 (6.7)	2 (1.7)	0.14
Neomycin sulfate	4 (2.5)	1 (2.2)	3 (2.6)	0.68
Mercaptobenzothiazole (MBT)	4 (2.5)	0 (0.0)	4 (3.5)	0.25
Parabens mix	3 (1.9)	1 (2.2)	2 (1.7)	0.80
Potassium Dichromate	2 (1.3)	1 (2.2)	1 (0.80)	0.49
Wool alcohol	2 (1.3)	1 (2.2)	1 (0.80)	0.49
Benzocaine	1 (0.6)	0 (0.0)	1 (0.80)	0.71
N-Isopropyl-N-phenylenylenediamine	1 (0.6)	1 (2.2)	0 (0.0)	0.29
Formaldehyde	1 (0.6)	0 (0.0)	1 (0.80)	0.49
epoxy resin	1 (0.6)	1 (2.2)	0 (0.0)	0.29

more common in those aged over 40 years but statistically insignificant (p = 0.05). Atopy was defined as the presence of a personal or family history of asthma, allergic rhinitis, or atopic eczema. A positive history of atopy were found in 42 patients (26.8%). Positive patch test reactions to fragrance mix were significantly more common in patients who had positive history of atopy, than those who had negative history of atopy (p = 0.04). Table 4 summarizes the patch test results for individual allergens according to age and history of

Table 4. Patch test results for individual allergens according to age and history of atopy

Allergens	Total = 157 (%)	Age < 40 n = 88 (%)	Age > 40 n = 69 (%)	p-value	Positive history of atopy n = 42 (%)	Negative history of atopy n = 115 (%)	p-value
Nickel sulfate	42 (26.8)	28 (31.8)	14 (20.2)	2.94	9 (21.4)	33 (28.6)	0.83
Cobalt chloride	12 (7.6)	9 (10.2)	3 (4.3)	0.13	3 (7.1)	9 (7.8)	0.59
4-Phenylenediamine base	11 (7.0)	5 (5.6)	6 (8.6)	0.35	3 (7.1)	8 (6.9)	0.67
Fragrance mix	11 (7.0)	3 (3.4)	8 (11.5)	0.05	6 (14.2)	5 (4.3)	0.04
Balsam of Peru	7 (4.5)	2 (2.2)	5 (7.2)	0.14	2 (4.7)	5 (4.3)	0.72
Cl+Me-isothiazolinone	7 (4.5)	6 (6.8)	1 (1.4)	0.10	1 (2.3)	6 (5.2)	0.39
Thiuram mix	5 (3.2)	3 (3.4)	2 (2.8)	0.60	2 (4.7)	3 (2.6)	0.88
Colophony	5 (3.2)	2 (2.2)	3 (4.3)	0.40	1 (2.3)	4 (3.4)	0.59
Neomycin sulfate	4 (2.5)	1 (1.1)	3 (4.3)	0.23	1 (2.3)	3 (2.6)	0.71
Mercaptobenzothiazole	4 (2.5)	3 (3.4)	1 (1.4)	0.39	1 (2.3)	3 (2.6)	0.71
Parabens mix	3 (1.9)	2 (2.2)	1 (1.4)	0.58	1 (2.3)	2 (1.7)	0.83
Potassium Dichromate	2 (1.3)	1 (1.1)	1 (1.4)	0.80	0 (0.0)	2 (1.7)	0.54
Wool alcohol	2 (1.3)	2 (2.2)	0 (0.0)	0.31	0 (0.0)	2 (1.7)	0.54
Benzocaine	1 (0.6)	0 (0.0)	1 (1.4)	0.45	0 (0.0)	1 (0.8)	0.73
N-Isopropyl-N-phenylenylenediamine	1 (0.6)	1 (1.1)	0 (0.0)	0.55	0 (0.0)	1 (0.8)	0.73
Formaldehyde	1 (0.6)	0 (0.0)	1 (1.4)	0.45	0 (0.0)	1 (0.8)	0.73
epoxy resin	1 (0.6)	1 (1.1)	0 (0.0)	0.55	0 (0.0)	1 (0.8)	0.73

atopy.

We also classified the patients into two groups-endogenous eczema group and suspected allergic contact dermatitis group-according to etiologies of their eczema after history taking and dermatologic examination. There were 73 patients (46.5%) who suspected of having allergic contact dermatitis and 84 patients (53.5%) who diagnosed endogenous eczema. Positive patch test reactions to nickel sulfate, phenylenediamine and cobalt chloride were more common in patients who were suspected of having allergic contact dermatitis than patients who diagnosed endogenous eczema ($p = 0.00$, $p = 0.02$, $p = 0.03$ respectively). On the other hand, positive patch test reactions to colophony are more common in patients diagnosed with endogenous eczema ($p = 0.04$). After patch testing, we found that there were 83 positive reactions had present relevance in 50 patients (31.9%) who were diagnosed allergic contact dermatitis. The most frequent causative allergens in allergic contact dermatitis in our study were nickel sulfate (66%), cobalt chloride (20%), Cl + M-isothiazolinone (Kathon CG) (14%), Phenylenediamine (12%), Fragrance mix (12%). Table 5 summarizes the patch test results for individual allergens according to diagnosis and Table 6 summarizes the distribution of positive patch test reactions according to localization.

Discussion

In this study, 70 patients (44.6%) were found to have one or more positive patch test reactions, but only 50 patients (31.9%) had present relevance and diagnosed allergic contact dermatitis. The most common allergens were nickel sulfate, cobalt chloride, p-phenylenediamine, fragrance mix, balsum of Peru and Cl + M-isothiazolinone. Nickel was the most frequent allergen (26.8%) in this study similar to other studies from Asia, Europe and America[9-12]. It had increased statistical trend in most of the studies[13]. The rise in frequency of contact allergy to nickel might be explained by changing fashion trends such as body piercing, wearing jewelry and nowadays, there are more commercial products that contained nickel sulfate compared to the past.

Cobalt is frequently found along with nickel and chromate; therefore, cobalt sensitivity frequently accompanies with nickel sensitivity but not frequently accompanies with chromate sensitivity. In this study, the rate of positive reaction to potassium dichromate (1.3%) is lower than nickel sulfate (26.8%) and cobalt

Table 5. Patch test results for individual allergens according to diagnosis

Allergen	Total n = 157 (%)	Initial diagnosis		p-value	Diagnosis ACD n = 50
		Suspected ACD n = 73	Endogenous n = -84		
Nickel sulfate	42 (26.8)	32 (43.8%)	10 (11.9)	0.00	33 (66%)
Cobalt chloride	12 (7.6)	9 (12.3%)	3 (3.6%)	0.03	10 (20%)
4-Phenylenediamine base	11 (7.0)	9 (12.3%)	2 (2.4%)	0.02	6 (12%)
Fragrance mix	11 (7.0)	7 (9.6%)	4 (4.8%)	0.19	6 (12%)
Balsam of Peru	7 (4.5)	3 (4.1%)	4 (4.8%)	0.58	4 (8%)
Cl + Me-isothiazolinone (Kathon CG)	7 (4.5)	4 (5.5%)	3 (3.6%)	0.42	7 (14%)
Thiuram mix	5 (3.2)	4 (5.5%)	1 (1.2%)	0.14	4 (8%)
Colophony	5 (3.2)	0 (0%)	5 (6%)	0.04	2 (4%)
Neomycin sulfate	4 (2.5)	2 (2.7%)	2 (2.4%)	0.64	1 (2%)
Mercaptobenzothiazole	4 (2.5)	2 (2.7%)	2 (2.4%)	0.64	4 (8%)
Parabens mix	3 (1.9)	0 (0%)	3 (3.6%)	0.15	1 (2%)
Potassium Dichromate	2 (1.3)	2 (2.7%)	0 (0%)	0.21	2 (4%)
Wool alcohol	2 (1.3)	0 (0%)	2 (2.4%)	0.28	1 (2%)
Benzocaine	1 (0.6)	1 (1.4%)	0 (0%)	0.47	1 (2%)
N-Isopropyl-N-phenylenediamine	1 (0.6)	0 (0%)	1 (1.2%)	0.54	1(2%)
Formaldehyde	1 (0.6)	0 (0%)	1 (1.2%)	0.54	0 (0%)
epoxy resin	1 (0.6)	1 (1.4%)	0 (0%)	0.54	1 (2%)

Table 6. Distribution of positive patch test reactions according to localization

Location	Total = 157		positive = 119		Relevance = 91		Occupation-related = 16	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Face	25	15.92	15	60	14	93.33	3	21.41
Hand and feet	66	42.04	55	83.33	42	76.36	7	16.66
Extremities	36	22.93	24	66.66	11	45.83	2	18.18
Trunk	13	8.28	11	84.61	10	90.90	1	10.00
Scattered generalized	17	10.83	14	82.35	14	100.00	3	21.42

chloride (7.6%) similar to report of the North American Contact Dermatitis Group 2005-2006 showed prevalence of positive reactions for potassium dichromate was 4.8% which ranked as the eleventh most common frequent sensitizer[14]. Nguyen SH et al reported trends in prevalence of patch test positivity from 1970 to 2002 showing that the prevalence of positive reactions to potassium dichromate initially decreased but then increased starting from 1996[13]. In addition, chromate sensitivity was not only from cement but also leather products, paint, and detergent. In our study, all positive reactions to potassium dichromate were related to leather products.

The third most common allergens in our study were fragrance mix and para-phenylenediamine (7.0%). Fragrance mix are usually in the top three most common allergen in most studies worldwide. The rate of positive reaction to fragrance mix in our study were statistically

Table 7. Percentages of common allergens in different areas in Thailand

Allergen	Thammasat Hospital (present study)	Siriraj Hospital[16]	Chulalongkorn Memorial Hospital[4]
Nickel sulphate	26.8%	26.56%	18.60%
Cobalt chloride	7.6%	16.42%	17.05%
4-Phenylenediamine base	7%	10.30%	1.55%
Fragrance mix	7%	20.70%	14.73%
Balsam of Peru	4.5%	10.76%	10.85%
Methylchloroisothiazolinone	4.5%	4.30%	0%
Potassium dichromate	1.3%	27.01%	11.63%

more common in patients who had positive history of atopy ($p = 0.04$). Both fragrance mix and balsum of Peru are markers of fragrance or perfume allergy. Besides preservatives, fragrances are the main culprits in cosmetic products. The patients who had clinically relevance to fragrance allergies but fail to detect positive reaction with fragrance mix and balsum of Peru should undergo patch testing with fragrance mix II (contains six fragrance allergens) which has been developed to supplement the traditional fragrance mix. A multicenter study has shown the fragrance mix II can detect about 30% more fragrance allergic patients, who were missed by traditional fragrance mix[15]. Para-phenylenediamine is the main indicator for hair dye allergy. In our study, most of the patients allergic to hair dye are older than 40 years of age; however, a young patient in our study also had positive reaction that related with popular black henna tattoos which contain PPD in high concentrations. Furthermore, tattoos can cause primary sensitization in younger people and if the person later dyes hair, an eczematous dermatitis can develop.

There were significant correlations between patients who were initially diagnosed with allergic contact dermatitis having positive patch tests to nickel sulfate, cobalt chloride and phenylenediamine ($p = 0.00$, $p = 0.03$, $p = 0.02$, respectively). These data confirmed that nickel sulfate, cobalt chloride and phenylenediamine are the most common allergens in patients with allergic contact dermatitis. The frequency of metal allergy perhaps stimulate more efforts to establish preventive and regulatory measures in both occupational nickel exposure and exposure to nickel releasing items such as coins or cheap jewelry. Patients initially diagnosed with endogenous eczema had significant correlation with positive patch test results to colophony ($p = 0.04$). It was probably caused by widespread use of colophony at home and at work. Identifying a relevant result of positive patch test to colophony may be difficult, because colophony is widely used; however, previous studies consistently reported sensitivity with colophony in wood worker, female administrative workers, and users of cosmetics[16].

Our study compared frequency of contact sensitivity with previous published results from other areas in Thailand. There was a difference in the frequency of positive reaction to potassium dichromate. Boonchai W, Iamtharachai P and Sunthonpalin P showed that potassium dichromate was the most frequent contact sensitizer in 2004-2006 (27%). Wongpiyabovorn J and Puvabanditsin P showed that the frequency of positive reaction to potassium dichromate ranked as the forth most frequent allergen in 2003-2004 (11.6%), whereas the frequency of positive reactions to potassium dichromate in patients who were diagnosed allergic contact dermatitis in our study (Table 5) ranked as the sixth most frequent allergen (1.3%)[4,17]. The frequency of positive reactions to fragrance mix in our study (7%) is rather low when compared with the results in other regions in Thailand. It is possible that there are differences in the study population which includes the patients who were suspected of having allergic contact dermatitis unlike our study which included patients who had eczematous dermatitis. Table 7 summarizes the percentages of common allergens in different area in Thailand.

In conclusion, this study demonstrates data of contact allergy in patients with eczematous dermatitis in Thammasat University Hospital, Pathumthani, Thailand. Differences in the rate of contact sensitivity to each allergen could be attributed to various groups of patients, different exposures in various locations over times. This survey is a cross-sectional study in one local area in Pathumthani Province. The data were

limited by small number of patients. Further study involving many hospitals in various areas in Thailand is needed to provide more insight into contact allergy in Thailand.

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ภาวะแพ้สัมผัสในผู้ป่วยผื่นผิวหนังอักเสบเอกซีมาในโรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติ

วรีพร ดิสภานุรัตน์

ผู้ป่วยผื่นผิวหนังอักเสบเอกซีมามักมีอาการเรื้อรังและกลับเป็นซ้ำบ่อย ผู้ป่วยที่อาการไม่ดีขึ้นหลังได้รับการรักษาตามมาตรฐานอาจเกิดจากโรคผิวหนังอักเสบแพ้สัมผัส การทดสอบโดยการปิดบนผิวหนัง(patch testing) เป็นวิธีมาตรฐานเพื่อใช้หาสารก่อภูมิแพ้ในผู้ป่วยสงสัยผื่นผิวหนังอักเสบแพ้สัมผัส งานวิจัยนี้มีวัตถุประสงค์เพื่อหา ความชุกของภาวะแพ้สัมผัสในประชากรผื่นผิวหนังอักเสบที่มารักษาในโรงพยาบาล ธรรมศาสตร์เฉลิมพระเกียรติระหว่าง 1 มิถุนายน พ.ศ. 2551 ถึง 30 มิถุนายน พ.ศ. 2552 และเพื่อหาความสัมพันธ์ระหว่างข้อมูลประชากรกับผลทดสอบบวกต่อสารมาตรฐาน 23 ชนิด มีผู้ป่วยผื่นผิวหนังอักเสบทั้งหมด 157 คน ได้ทำการทดสอบแปะปิด 70 คน (ร้อยละ 44.6) มีผลบวกต่อสารมาตรฐานอย่างน้อย 1 ชนิด 50 คน (ร้อยละ 31.9) ได้รับการวินิจฉัยว่าเป็นผื่นแพ้สัมผัสสารที่ทำให้เกิดปฏิกิริยาผลทดสอบบวกมากที่สุด ได้แก่ นิกเกิลซัลเฟต ร้อยละ 26.8 โคบอลล์คลอไรด์ ร้อยละ 7.6 พาราฟีนิลีนไดเอมีน ร้อยละ 7 เครื่องหอม ร้อยละ 7 ผู้ป่วยที่ได้รับการวินิจฉัยเบื้องต้นว่าสงสัยผื่นแพ้สัมผัส มีผลทดสอบบวกอย่างมีนัยสำคัญกับสารนิกเกิลซัลเฟต (p = 0.00) โคบอลล์คลอไรด์ (p = 0.03) และพาราฟีนิลีนไดเอมีน (p = 0.02) ผู้ป่วยที่ได้รับการวินิจฉัยเบื้องต้นว่าผื่นเกิดจากการเปลี่ยนแปลง ภายในร่างกาย (endogenous eczema) มีผลทดสอบบวกอย่างมีนัยสำคัญกับสารโคโลโฟนี (p = 0.04) ผู้ป่วยที่มีประวัติโรคภูมิแพ้มีผลทดสอบบวกอย่างมีนัยสำคัญทางสถิติต่อเครื่องหอม (p = 0.04) โดยสรุปงานวิจัยนี้แสดงความชุกของภาวะแพ้สัมผัส และโรคผิวหนังอักเสบแพ้สัมผัสในผู้ป่วยผื่นผิวหนังอักเสบเอกซีมาในโรงพยาบาลธรรมศาสตร์เฉลิมพระเกียรติด้วยการทดสอบโดยการปิดบนผิวหนัง และได้เปรียบเทียบผลการทดสอบแปะปิดของสถาบันอื่นในประเทศไทย เนื่องจากข้อมูลเกี่ยวกับสารต้นเหตุของผื่นแพ้สัมผัสในประเทศไทยยังมีน้อยและส่วนใหญ่มาจากโรงพยาบาลตติยภูมิในกรุงเทพฯ ดังนั้นการตระหนักถึงความสำคัญและเพิ่มการทำทดสอบโดยการปิดบนผิวหนังในผู้ป่วยที่มีผื่นผิวหนังอักเสบให้มากขึ้นในทุกภูมิภาคของประเทศ จะทำให้มีข้อมูลที่แท้จริงของสารต้นเหตุหลักที่ทำให้เกิดผื่นแพ้สัมผัสในประเทศไทยได้มากขึ้น