

# Results of Standard Patch Testing in Contact Dermatitis patients with a short review of other diagnostic aids

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## Summary:

Standard patch test is one of the reliable tests to identify the allergen in allergic contact dermatitis (ACD). In the department of Dermatology and Venereology in Rumailah Hospital – Hamad Medical Corporation, Doha – Qatar, 235 patients who were diagnosed to have ACD were patch tested using the European Standard s1000 (chemo technique diagnostic with 25 allergens for patch testing – Sweden).

86.3% of the patients patch tested were in the age groups from 11 – 50 years old. The results showed that 85.5% had positive results while 14.5% were negative.

The total numbers of positive patch testing readings were 590 varying from one to 12 per patients. The percentages of patients with one, two, three or four positive readings were 23.8%, 20%, 17% and 11.5% respectively. The top ten allergens in this group were;

1- Potassium dichromate	18.14%
2- Nickel sulfate hexahydrate	13.05%
3- Cobalt Chloride hexahydrate	12.03%
4- Fragrance mix	7.12%
5- 4-phenylene diamine base	5.60%
6- formaldehyde	4.58%
7- Neomycin sulfate	3.55%
8- Colophony	3.55%
9- Wool Alcohol	3.4%
10- Balsam of Peru	3.4%

The result of patch testing was relevant 100% in potassium dichromate, nickel sulfate, cobalt, fragrance mix, paraphenylene diamine and neomycin sulfate.

## Patient and method:

235 Contact Dermatitis patients were patch tested to the 25 allergens of the European Standard S-1000. The test was done on the back and the patch is removed after 48 hours during which patients avoid washing or exercise. The test is read after 48 – 72

hours from time of application.

Reading of the Patch Test is interpreted as follows:

- (1) negative = no reaction as compared to control PT
- (2) + (plus minus) = erythema which means a questionable reaction
- (3) + (one plus) = erythema plus edema or infiltration and no or few papules
- (4) ++ (2 plus) = erythema + intense edema and many papules and sometimes vesicles
- (5) +++ (3 plus) = densely aggregated papules and vesicles
- (6) ++++ (4 plus) = reaction with bullae and ulceration

## Results:

The total number of patch tested patients according to nationality and sex is shown in table (1) which shows that the total males were 97 (41.28%) and the females were 138 (58.72%). The number of patients according to age group is in table (2) which shows that 86.3% were in age group from 11 to 50 years of age. The number of patients according to the result of patch test readings are shown in table (3). This table shows that 14.5% had negative patch test while 85.5% were positive and had a total of 590 positive reading varying from 1 – 12 positive reading per patient. The total number of 590 positive patch test reading are shown according to the causative allergen in table (4) in a descending frequency. The top five allergens were Potassium dichromate 18.14%, Nickel Sulfate 13.05%, Cobalt Chloride 12.03%, Fragrance mix 7.12% and 4-phenylene diamine base 5.6%.

The degree of positivity of patch test readings that varied from 1 – 4 positive in relation to the two main allergens in the group (Potassium dichromate and nickel sulfate) are shown in table (5).

The 590 positive patch readings were tabulated according to the degree of positive reading from one of 4 plus are shown in table (6) – where 1 and 2 plus readings represented 72.7% of the total.

The results of patch testing in 26 females with ACD of hands are shown in table (7) where the main allergens in these females were Nickel Sulfate 15.11%, Potassium Dichromate 13.95%, Cobalt

Chloride 11.6%, Formaldehyde 10.5%, Fragrance mix 6.97%, Neomycin Sulfate 5.8% and Balsam of Peru 4.65%.

Out of the 26 females with Contact Dermatitis of the hands:

- 5 were housewives
- 4 were nurses
- 3 were students
- 2 were teachers
- 12 were of unknown job.

The 4 nurses had 13 positive patch tests ranging from 1 – 8 per person and the number of +ve patch tests to Potas dichromate and thiurum nix represented 15.4% each while each of the following (Nickel Sulfate, Benzocaine, Cobalt Chloride, Balsam of Peru, Terbutyl formaldehyde, MBT, formaldehyde, fragrance mix and Mercopto mix) represented 7.69% of the positive patch tests.

Table (8) shows the results of patch testing in 17-males with Contact Dermatitis of hands. They had a total of 50 positive patch test ranging from 1 – 6 per person tested. The allergens were related to the total of 50 positive patch tests reading were:

- 1- Potassium dichromate - 22%
- 2- Cobalt Chloride - 20%
- 3- Nickel Sulfate - 14%
- 4- Phenylene diamine base - 4%

Out of the 17 males with Contact Dermatitis of hands:

- 12 were construction laborers representing 70.6% of the group
- 2 Office workers representing 11.8%
- One driver
- 2 with their job not mentioned 11.8%

The 12 construction laborers showed 39 positive Patch Test results ranging between 1 – 6 per laborer. The result of Patch testing of these 12 laborers are shown in table (9) which shows that the four most common causes of contact dermatitis of the laborers were (1) Potas dichromate 23.1%, (2) Cobalt Chloride 17.95%, (3) Phenylene diamine base 12.82% and Nickel Sulfate 10.26% these four allergens represent a total of 64.13% of allergens to which laborers were tested. Table 10 shows the results of Patch Testing to six atopic patients suspected to have allergic contact dermatitis and commonest allergen was nickel sulfate.

Table (11) compares the results of Patch Test in Thailand, Mayo Clinic, USA, Czech, Turkey, Iran

and the current study in Doha, Qatar. It is evident that in USA and Czech, the result published show that allergy to Potas dichromate is not mentioned and the main figure was for nickel sulfate in both countries represented by 14.3% and 13.8% respectively. In Thailand, the highest figures were also for nickel sulfate, cobalt chloride and fragrance mix (18.9%), 17.05%, 14.73% respectively). In Turkey and Iran, the nickel sensitivity figures were the highest (17.6% and 28% respectively) and in Turkey, Cobalt Chloride and potassium dichromate were 5.3% and 4.6% respectively. In Iran, the cobalt chloride figure was 12.8%. In the present series in Doha, where there is a huge construction development the main sensitizers were potassium dichromate (18.14%), Cobalt chloride 12.03% and Nickel sulfate was 13.05%.

#### Discussion:

Contact Dermatitis (irritant and allergic) comprises 6–10% of all dermatology clinic visits. <sup>(1)</sup>

In Hamad Medical Corporation, Department of Dermatology The Contact Dermatitis represented 5.83% of the clinic visits over one year. <sup>(2)</sup> Contact Dermatitis may occur from a wide variety of contactants. Some of the reported contactants are shown in table 12.

It is estimated that over 3,700 allergens have been identified as causing allergic contact dermatitis. <sup>(3)</sup> It has been shown that allergic response to experimental Contact sensitizer as dinitrochlorbenzene (DNCB) is proportionately greater if the sensitizing dose is increased. The concentration of contact sensitizer per unit area is the critical determinant of whether sensitization occurs and if the concentration per unit area is constant there is no effect on sensitizing potency, in other words few Langerhan's cells presenting many antigen molecules per cell is a much more potent sensitizing stimulus than the same number of molecules presented by many Langerhan's cells each presenting few molecules. These observations have important implications in the risk assessment for induction of contact sensitivity. <sup>(4)</sup>

Incidence and prevalence of Contact Dermatitis has increased in recent years. Contact Dermatitis can develop at any age but is rare before puberty. <sup>(5)</sup> In the present study (as in table -2) 1.3% was in age group less than 10 years, 86.3% was in the age group

from 11 till 50 and 65% was in the age group 21 to 50 years and 1.3% was in the age group above 61. In Melbourne, Australia, the incidence of occupational Contact Dermatitis was estimated to be 20.5 per 100,000 workers and one year prevalence was 34.5 per 100,000. <sup>(6)</sup>

Irritant dermatitis and eczema are the most prevalent occupational skin diseases and less common are immediate contact reactions such as contact urticaria and protein contact dermatitis and among those who are at risk are cooks, bakers, butchers, restaurant personnel, veterinarians, hair dressers, florist, gardeners and forestry workers. <sup>(7)</sup>

Phytophoto contact dermatitis affects skin exposed to sunlight after contact with plants containing furocoumrins and consumption of such plants can trigger phytophoto contact dermatitis. <sup>(8)</sup>

Irritant and allergic contact dermatitis comprise the vast majority of occupational contact dermatitis. Differentiation between chronic cumulative irritant contact dermatitis and allergic contact dermatitis is clinically difficult and requires patch testing – The prevalence of contact dermatitis is predisposed to by endogenous and exogenous factors. <sup>(9)</sup>

A study done in Iraq showed that rapid acetylase status might predispose to allergic contact dermatitis. <sup>(10)</sup>

An experimental study concluded that CD8 +ve T-cells have a dominant role as initiators of allergic contact dermatitis to strong and weak experimental haptens and suggest that CD8 +ve T-cells may represent potential target for preventing or treating allergic contact dermatitis. <sup>(11)</sup> Allergic contact dermatitis corresponds to a breakdown of immune tolerance to haptens in contact with the skin. <sup>(12)</sup> Allergic contact dermatitis is mediated by activation of CD8+ve cytotoxic T-cells specific for haptens in contact with the skin. CD4 positive T-cells behave as both regulatory and tolerogenic cells since they regulate the skin inflammation in patients with allergic contact dermatitis (Regulation) and prevent development of eczema (Tolerance) in normal individual. Several regulatory CD4 positive T-cells subsets known as T-regulatory cells especially CD4 + CD25 + natural T-regulatory cells (Treg) are involved in immunologic tolerance and regulation to haptens through the production of immunosuppressive cytokines IL-10 and TGF-beta. <sup>(12)</sup>

Methods to re-induce immune tolerance to haptens

in patients with eczema include:

- 1- oral tolerance
- 2- low dose tolerance
- 3- allergen specific immunotherapy
- 4- U.V. induced tolerance
- 5- New drugs to activate IL-10 producing Treg cells in vivo. This line will open new awareness to treat eczema, autoimmune and allergic diseases resulting from breakdown of tolerance to autoantigens and allergens. <sup>(12)</sup>

Patch Test performed with relevant panel of contact allergens is the ultimate confirmatory test of Allergic Contact Dermatitis. <sup>(13)</sup> With large standard patch test series one can identify commonly encountered and potentially relevant contact allergens. <sup>(14)</sup> Patch Testing is of value in atopic patients who may get allergic contact dermatitis. <sup>(4)</sup>

Routine patch testing may help uncover underlying cause in chronic dermatitis with non-specific or uncommon clinical appearance. <sup>(15,13)</sup>

Patch Test is the standard method to identify allergens in allergic contact dermatitis. It is simple safe and accurate.

#### Other diagnostic aids in ACD include:

- A- using the invitro method of lymphocyte transformation test (LTT). Allergen specific CD8 T lymphocytes central to pathogenesis of type IV allergies can be identified. LTT can help in distinguishing between irritant and allergic contact dermatitis. Currently LTT is not an alternative for patch testing in daily practice. <sup>(16)</sup> LTT is considered a diagnostic test. <sup>(17,18)</sup>
- B- Reflectance confocal microscopy is a non-invasive visualization of human skin patch test site and helps differentiate irritant contact dermatitis (ICD) from ACD after removal of the patch tests (Finn Chambers). At 48 hours superficial epidermal changes primarily involving stratum corneum with increased epidermal thickness were mainly seen ICD. On the other hand, ACD showed micro vesicle formation peaking at 96 hours following patch test removal. Both ICD and ACD showed exocytosis and similar degrees of spongiosis. <sup>(19)</sup> Reflectance confocal microscopy (RCM) in a pilot study has been used in vivo to evaluate the histopathologic features of allergic contact dermatitis. In this pilot study, 16 participants

were patch tested with allergens and control substance and RCM evaluation was done at 72 hours and RCM images were evaluated according to parameters that included stratum corneum disruption, parakeratosis, stratum spongiosum and stratum granulosum for spongiosis and exocytosis. There was a high specificity for RCM features ranging from 95.8% to 100%. RCM is a promising non-invasive technology to evaluate allergic contact dermatitis and may be considered as an adjunctive tool rather than a substitute to clinical evaluation.<sup>(10)</sup>

- C- One of the molecular basis for diagnosing allergic contact dermatitis is gene transcript which is a new in vitro test using microarray technology in the identification of differentially expressed genes in allergen stimulated (for e.g.-Nickel) peripheral mononuclear cells. Using an Affymetrix Gene Chip the gene expression is analyzed, in these antigen stimulated cells that have been cultured on specific media for 24 hours. It was found in a study that such expressed genes may potentially function as diagnostic marker for contact sensitivity.<sup>(21)</sup>
- D- The peripheral blood mononuclear cells of allergic patient were cultured in absence or presence of the allergen and the results demonstrated an increased proliferative capacity and cytokine production by allergen specific Tcells from allergic patients upon stimulation with allergens in combination with type one IL (IL-7 and IL-12) and with type two IL (IL-7 and IL-4) which enhance proliferation of allergen specific Tcells.<sup>(22)</sup>

Performing patch test is still the standard procedure for diagnosing ACD. From the clinical point of view, allergic contact dermatitis diagnosis is suspected from history of exposure and the clinical pattern with particular distribution of the dermatitis. Systemic administration of the allergen may aggravate the ACD and it is reported that oral administration of nickel to a patient who is allergic to it may lead to miscellaneous clinical manifestations which include pompholyx, diffuse exanthema and flexural red dermatitis known as baboon syndrome.<sup>(23)</sup> It is also reported that ACD may be complicated by Kaposi variceliform reaction,<sup>(24)</sup> or Kobnerize Psoriasis.<sup>(25)</sup> Topical steroids may cause contact dermatitis as shown in table 12 and it may cause acute generalized

exanthematous pustular eruption.<sup>(26)</sup> It is advisable in patients who do not show any response to topical steroid to patch test them to topical steroids as such patients may have developed delayed hypersensitivity reaction to the topical steroid used. Such patients are patch tested with corticosteroid series and commercial preparations of corticosteroids and their vehicles<sup>(27)</sup>

Vulvar dermatoses whether irritant or allergic cause itching and burning<sup>(28)</sup> and patch testing is recommended in such cases. Seminal fluid was reported to cause immediate or delayed hypersensitivity of the vulva<sup>(29)</sup> and the hypersensitivity could be discovered by prick and patch test.

The management of contact dermatitis (ICD and ACD) should cover the important item of prevention by avoiding risk factors especially exposure sensitizing material which may include 3, 600 items.<sup>(3)</sup>

In order to prevent ACD to hair dyes, it is recommended in all consumers to do skin allergen test (SAT) which has a predictive value.<sup>(30)</sup> This SAT test is an open application of colorant base before being mixed with the developer in different increasing concentrations to the skin of the hair dye user. Lower concentrations usually give positive reactions in those who are allergic to the hair dye (PPD) and this is the valuable predictive value of SAT.

A measure to avoid ACD from garments containing reactive dyes and their hydrolysis products which are easily washed off. It is advisable to rinse such garments well before using them.<sup>(31)</sup>

The use of creams containing different types of marigold and rosemary extracts may protect against acute irritant dermatitis<sup>(32)</sup> but rosemary itself may cause ACD.<sup>(33)</sup>

Topical formulations containing zinc gel may be used to delay or prevent latex sensitivity especially among healthcare professionals.<sup>(34)</sup>

ACD in children represents 20% of all cases of Dermatitis in children,<sup>(35)</sup> 15 years old or less with a mean age  $10.57 \pm 0.67$  years. The most frequent allergens were thiomersal 21%, mercury 19% and Nickel 18% with increasing age. Nickel takes the place of mercurials as the principal allergen.

Children with atopic dermatitis are at high risk for delayed hyper sensitivity and type I sensitivity to natural rubber latex protein. Exclusion of this

allergen should be strongly advised in atopics because of dual risk of ACD and evolution of severe type I hypersensitivity. <sup>(36)</sup>

Treatment of ACD is as vital as prevention. A wide range of therapeutics is used. Tacrolimus is used to reduce inflammation in ACD and inhibit recurrence<sup>(97)</sup> and it influences as well the migration of dendritic cells into draining lymphnodes in elicitation phase of ACD. <sup>(38)</sup>

Experimentally it was proven that nanocrystalline silver inhibit allergic contact dermatitis similar to steroids and tacrolimus. It suppresses expression of TNF alfa and IL-12 and induces apoptosis of inflammatory cells. <sup>(39)</sup>

Experimentally, it has been shown that vascular endothelial adhesion protein-1 which mediates adhesion of leukocytes to vascular endothelium is upregulated in inflammatory conditions. So vascular adhesion protein-1 is a potential target molecule for inhibition of inflammatory reaction.

Mouse monoclonal antibody to vascular adhesion protein-1 (vepalimomab) in the dose of 0.05 to 0.5 mg/kg single dose as infusion was safe and well tolerated to block the vascular adhesion molecule in patients with nickel induced ACD. 4 out of 9 patients reported mild to moderate adverse effects. <sup>(125)</sup>

#### Conclusion:

Contact dermatitis (ACD and ICD) is a common skin disease caused by a great variety of allergens. Patient occupation, history of exposure, study of the environment, personal factors and the distribution pattern of the dermatitis may help in finding the cause. Patch testing using standard patch test is the corner stone to find out the allergen. The more patch test material is used the more is the chance of success. Other diagnostic tests reviewed include LTT, RCM, genetic transcript and detection of allergen specific T cells are all promising non invasive technology but do not substitute or replace patch testing.

**Table – 1**

Total number of Patch Tested Patients according to nationality and sex

Nationality	No. of Males	% to group	No. of Females	% to group	Total	Percentage to grand total
Qataris	46	35.38	84	64.62	130	55.32%
Other Arabs	19	45.24	23	54.76	42	17.87%
Indian	10	76.90	3	23.1	13	5.53%
Pakistan	5	55.56	4	44.44	9	3.38%
Philippines	2	10.53	17	89.47	19	8.1%
European	0	0	1	100%	1	0.42%
Sri Lanka	4	80	1	20	5	2.13%
Bangladesh	8	100	0	0	8	3.40%
Iran	1	25	3	75	4	1.70%
Nepal	2	100%	0	0	2	0.85%
Indonesia	0	0	1	100	1	0.42%
Nationality unknown	0	0	1	100	1	0.42%
Total	97	41.28	138	58.72	235	100%

Total Male → 97 = 41.28%

Total Female → 138 = 58.72%

Total male & female → 235 = 100%

**Table – 2**

The total number Patch testing according to age group:

Age group in years	Number	Percentage
1 – 10	3	1.3%
11 – 20	50	21.3%
21 – 30	56	23.8%
31 – 40	68	28.9
41 – 50	29	12.3
51 – 60	14	6.0
61 and above	3	1.3
Age not shown	12	5.1
Total	235	100

**Table – 3**

Number of Patients related to result of Patch test and to the number of positive allergens:

Result of Patch Test (PT)		Number of Patients	Percentage
Patch Test	Negative PT	<b>34</b>	<b>14.5</b>
	to one allergen	56	23.8
	to 2 allergens	47	20
	to 3 allergens	40	17
	to 4 allergens	27	11.5
	to 5 allergens	14	6.0
	to 6 allergens	4	1.7
	to 7 allergens	6	2.6
	to 8 allergens	1	0.4
	to 9 allergens	1	0.4
	to 10 allergens	2	0.85
	to 11 allergens	2	0.85
	to 12 allergens	1	0.4
Total	235	100	

The PT positive 201 patients showed a total of 590 positive patch test varying between 1-12 per person as shown above.

**Table – 4**

The 590 positive Patch test (PT) according to specific allergen in a descending frequency:

Allergen code European Standard	Name of Allergen and its sexual number in the European Standard list	No. of +ve PT	Percentage (%)
1	Potas dichromate	107	18.14
7	Nickel sulfate hexahydrate	77	13.05
5	Cobalt chloride hexahydrate	71	12.03
19	Fragrance mix	42	7.12
2	4-phenylene diamine base	33	5.60
18	Formaldehyde	27	4.58
4	Neomycin sulfate	21	3.55
9	Colophony	21	3.55
12	Wool alcohol	20	3.40
15	Balsam of Peru	20	3.40
10	Parabens	16	2.71
14	Epoxy resin	16	2.71
3	Thiurum mix	15	2.54
16	4-Tert Butylphenol formal dehyde resin	11	1.86
13	Mercopto mix	10	1.70
6	Benzocaine	8	1.35
21	Quaternium 15 (Dowicil 200)	8	1.35
23	C1 + Me –isothiazolinone (Kathon CG, 100 ppm)	7	1.18
8	Quinoline mix	6	1.02
20	Sesquiterene lactone mix	6	1.02
22	Primin	5	0.85
17	Mercoptobenzothiazide (MBT)	5	0.85
11	N-Isopropyl – N-phenyl – 4 Phenylidiamine (IPPD)	5	0.85
24	Budesonide	1	0.17
25	Tixocortal – 21 – pivate	1	0.17
-	Cosmetic used by patients (lipstick, eyeshade, rose oil, lip shade, perfumes, deoderants, nail polish, sunblocks, skin whiteners containing eldequin, Henna, anti-wrinkle topical preparation, various chemical peels, face toners	31	5.25
	Total	590	100%

**Table - 5**

Number of positive patch tests to Potassium dichromate and Nickel sulfate according to PT reading range (from 1 – 4 pluses).

Patch Test reading	Potassium dichromate		Nickel Sulfate Allergen	
	No. of Patients	Percentage	No. of Patients	Percentage
One plus	62	57.94	22	28.57
Two plus	18	16.82	25	32.4
Three plus	25	23.37	22	28.57
Four plus	2	1.87	8	10.39
<b>Total</b>	<b>107</b>	<b>100</b>	<b>77</b>	<b>100</b>

**Table – 6**

Total positive Patch Test positive Results (590) according to degree of positivity ranging from one to four plus and their percentages:

	One plus	Two plus	Three plus	Four plus	Total
No.	344	141	87	18	590
%	58.30%	23.90%	14.75%	3.05%	100

The main allergens that cause four plus are:

Nickel Sulfate	8
Para phenylene diamine	4
Formaldehyde	2
Patos, dichromate	2
Henna	1
Epoxyresin	1
<b>Total</b>	<b>18</b>



**Table – 7**

Contact Dermatitis of hands in 26 females according to result of Patch Test

Total number of positive patch tests is 86 ranging from 1 to 9 positive patches per person. Results are arranged from High to Low percentage

Allergen	Code of the allergen in European Standard	No. of positive patch tests	% of total of 86
Nickel Sulfate	7	13	15.11
Potas dichromate	1	12	13.95
Cobalt chloride	5	10	11.60
Formaldehyde	18	9	10.5
Fragrance Mix	19	6	6.97
Neomycin sulfate	4	5	5.80
Balsam of Peru	15	4	4.65
4-phenylene diamine	2	3	3.5
Thiurum mix	3	3	3.5
Para benzene	10	3	3.5
Terbutyl Phenoformaldehyde resin	16	3	3.5
Quaternum	21	3	3.5
Mercopto mix	13	2	2.32
Mercoptobenzothiazide	17	2	2.32
Benzocaine	6	1	1.16
Quinoline mix	8	1	1.16
Colophony	9	1	1.16
N-isoprophyl N phenyl-4-phenyl diamine	11	1	1.16
Wood alcohol	12	1	1.16
Epoxy resin	14	1	1.16
Sesquiterene lactone mix	20	1	1.16
Kathon lactone mix	23	1	1.16
Total		86	100

**Table – 8**

17 males with Contact Dermatitis of hands had a total of 50-positive patch tests ranging from 1 – 6 per person. The frequencies of the positive tests were as follows:

Allergen	Allergen code European Standard	No. of positive Tests	% to total of 50 positive patch tests
Potas dichromate	1	11	22
Cobalt chloride	5	10	20
Nickel sulfate	7	7	14
Phenylene diamine	2	6	12
Neomycin sulfate	4	2	4
Benzocaine	6	2	4
Mercapto mix	13	2	4
Quaternium	21	2	4
Primin	22	2	4
Thricrum mix	3	1	2
Quinoline mix	8	1	2
Colophony	9	1	2
Formaldehyde	18	1	2
Fragrance	19	1	2
Sesquiterene lactone mix	20	1	2
Total		50	100%

**Table – 9**

12 male laborers with Contact Dermatitis of hands had a total of 39 positive Patch test ranging from 1 – 6 per laborer. The frequencies of the positive patch test are as follows:

Allergen	Allergen code European Standard	No. of Positive Tests	% to total of 39 +tests
Potas dichromate	1	9	23.1
Cobalt chloride	5	7	17.95
Phenylene diamine	2	5	12.82
Nickel sulfate	7	4	10.26
Benzocaine	6	2	5.13
Quaternium 15	21	2	5.13
Primin	22	2	5.13
Thiurum mix	3	1	2.56
Neomycin sulfate	4	1	2.56
Quinoline mix	8	1	2.56
Colophony	9	1	2.56
Mercapto mix	13	1	2.56
Fragrance	19	1	2.56
Sesquiterence lactone mix	20	1	2.56
Total		39	100%

**Table – 10**

6 atopic patients were patch tested because they were having contact dermatitis – They have 16 positive patch tests ranging from 1 – 5 positive PT per person and the results are as follows:

Sr. #	Allergen	No. of +ve PT	%
1	Nickel Sulfate	3	18.75%
2	Patos dichromate	2	12.5%
3	Cobalt Chloride	2	12.5%
4	Wool alcohol	2	12.5%
5	Phenylene diamine base	2	12.5%
6	Benzocaine	1	6.255
7	Quinaline mix	1	6.25%
8	Paraliens	1	6.25%
9	Balsam of Peru	1	6.25%
10	Formaldehyde	1	6.25%
	Total	16	100%



Continued...Table 11

Country	Type of Patch Test done	No. of patients Patch tested	M	F	Patients with positive PT	%	Most common allergen revealed by PT	%	Ref.
Iran September	28 allergens recommended by German Contact Dermatitis	250 with Contact Dermatitis and atopic dermatitis	-	-	126 with at least one +ve reaction.	50.4	Nickel Sulfate 70	28	46
2002 - April	Research group. PT was removed after 24 hours and read 24, 48, 72 hours				23 had more than 2 +ve PT	9.2	Cobalt Chloride 32	12.8	
2004							Paratertiary butyl Phenol formaldehyde resen 20	8	
Tehran							Patos dichromate 13	5.2	
							Colophony 13	5.2	
	<ul style="list-style-type: none"> <li>Nickel Sulfate is the most common Contact Allergen in Iran mostly affecting women.</li> <li>189 of 224 positive reaction (84.4%) had past and present relevance to PT result.</li> </ul>								
Doha – Qatar, Hamad Medical Corp.	European Standard 5 – 1000 with 25 allergens chemo technique diagnostics Sweden	235	97	138	201	85.5	Potassium dichromate	18.14	
							Nickel Sulfate	13.05	
							Cobalt Chloride hexahydrate	12.03	
							Fragrance Mix	7.12	
							4 Phenylene diamine base	5.6	
							Formaldehyde	4.58	
							Neomycin Sulfate	3.55	
							Colophony	3.55	
							Wool alcohol	3.4	
							Balsam of Peru	3.4	

**Table – 12**

Some of the reported allergens causing contact dermatitis:

Allergen	Reference	Allergen	Reference
Baby wipes	10	Color developers	47
Mn in aluminum alloy	12	Synthetic rubber	48
Propolis	14, 15	Cobalt in Jewellery	49
Fragrance	17	Azo dyes	50
Silicone	19	Orchid and plants, poison ivy	51,52,8,53,54,55
Topical Steroid	26, 27, 28, 29, 30, 31	Dark dyes in cotton garments	31
Wooden toilet seat	33	Acrylates and acrylic glue	56 , 57
Cyanamide	36	Meat protein	58
Sun screen	38	Minoxidil	59
Tetrazepam	40	Seminal fluid	29
Henna	42	Vit. K in cosmetics	60 , 61
Benzalkonium in shampoo	45	Povidone iodine	62
Rose mary	47, 48, 49	Kojic acid	63
Iodine preparation	51	Simvastatin	64
Epoxy resin	53, 54	Nickel	23 , 65
Chromium	57	Hair dyes	66 , 67
Nail varnish	60	Shellac in mascara	68
Zinc pyrithione in shampoo	62	Triethanolamine polypeptide oleate in shampoo	69
Makeup removal wipes (methyl dibromoglutaronitrile)			70 , 71
Quaternum 15 moisturizing lotion	66	Propylene glycol	72 , 73
Pristinamycin	69	Tetracaine	74
Benzoil peroxide	71	Lindaine	75
Calcipotriol	73	Emla cream	76
Colistin and bacitracin	75	Quinoline	77
Natural rubber latex	76	Adipic polyester in vinyl chloride gloves	78
Naftifine	78	Urologic lubricant	79
Bufexamac	80	Topical pikeloprofen	80
Valde coxib	82	Corals	42
Dipivefrine	83	Triphenyl phosphate	81
		N, N dimethyl cylamine	82
Mentha-puleguin	86	Methyl dibromoglutarate nitrile present in petrolatum 0.5%	83
P. aminophenol	88	Dish washing liquid	84
Protein	91, 92, 93, 94	Sodium stearyl lactate used in food products	85
Paint manufacturer 1, 2 benziso thiazolen-3 5 -chloro-2-methyliso thiazolin-3 2- methyliso thiazolen – 3-	96	Potassium sorbate	86
Buprenorphine	98		

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