
Prevalence of Contact Allergens in a Hispanic Population

MICHELLE H. COLLAZO, MD*; LUZ D. FIGUEROA, MD†; JORGE L. SÁNCHEZ, MD‡

Background: Patch testing has been used as a screening tool to identify those allergens responsible for the development of allergic contact dermatitis. The objectives of this study were to identify the most common allergens found at the Patch Testing Clinic (PTC) of the Department of Dermatology, Medical Sciences Campus (MSC) University of Puerto Rico (UPR), to correlate patch testing results with demographics and clinical data, and to compare the results with similar studies in other institutions.

Methods: A retrospective analysis of the records of patients who underwent patch testing for suspected acute allergic contact dermatitis at the Department of Dermatology of the Medical Sciences Campus of the UPR, from March 31, 2001 to May 31, 2005.

Information regarding demographics, medical history, occupation, and test results was retrieved.

Results: The most common allergens identified were: carba mix, nickel sulphate, thiuram mix, parateritary butylphenol formaldehyde resin, paraphenylenediamine, and neomycin sulphate. The most commonly affected area was the hands. A correlation was observed between parateritary butylphenol and involvement of the feet, paraphenylenediamine and generalized dermatitis, and potassium dichromate and occupational exposure.

Conclusions: Patch testing remains a worthwhile and quick diagnostic tool for the evaluation of patients with suspected allergic contact dermatitis.

Key words: Patch test, Allergens, Allergic contact dermatitis, Hispanic population

Allergic contact dermatitis (ACD) is a delayed-type (type IV) immune reaction that is elicited when the skin comes in contact with a chemical to which an individual has been previously sensitized (1). It is characterized by a pruritic, well-demarcated erythematous, weeping eruption, often with vesicles that, upon progression to a chronic state, develop a lichenified appearance. It comprises 6-10% of all dermatologic clinic visits (2), and is a condition with considerable morbidity and economic impact. Over 3700 allergens have been implicated (3); the most common allergens being nickel sulphate, bacitracin, neomycin sulphate, fragrance mix, and quaternium-15 (4). Standard patch testing series have been designed to include the most relevant allergens. Patch testing is based upon re-exposing the skin to suspected allergens under controlled conditions (5). It has been determined in previous studies that 68.6% of contact allergies can be detected using standard series in addition to occupational and allergen exposure history (3). This fact makes the standard patch test series a useful,

effective, and economical screening tool for allergic contact hypersensitivity (6-8).

The objectives of the study were to identify the most common allergens found on the Patch Testing Clinic (PTC) of the Department of Dermatology, Medical Sciences Campus, University of Puerto Rico (UPR), to correlate patch testing results with demographics and clinical data, and to compare the results with similar studies.

Methods

A retrospective study was conducted at the PTC of the Department of Dermatology, Medical Sciences Campus, UPR from patients seen between 2001 and 2005. The clinic evaluates patients referred by dermatologists and primary care physicians. A physical examination is performed, and information is gathered regarding occupation, demographics, medical history, and clinical data. The American Academy of Dermatology (AAD) standard series is used as the main source of allergens. The allergens are placed on Finn Chambers and applied on the upper back for 48 hours. Results are then read twice, at 48 hours and 96 hours after application of the patches. The results are evaluated using a standard reading scale adapted from previous reports (9-10).

Eighty-seven (87) patients were evaluated from March 2001 to May 2005. Medical records were reviewed for patch test results, occupational data, demographics, clinical data, and medical history. Unavailable data was

*Third Year Resident; †Associate Professor; ‡Professor, Department of Dermatology, University of Puerto Rico, School of Medicine, San Juan, Puerto Rico

The authors have no aspect of interest to disclose.

Address correspondence to: Jorge L. Sánchez, MD, University of Puerto Rico, School of Medicine, Department of Dermatology, PO Box 365067, San Juan, Puerto Rico 00936-5067. Tel: (787) 765-7950 • Fax: (787) 767-0467 • E-mail: rcndermatol@rcm.upr.edu

obtained through telephone calls. The data for 59 patients was complete and were used for the study. The data was entered on EPI-info program for analysis.

Results

Our population consisted of 59 patients, 37 males and 22 females with a mean age of 47.5. Most of the patients were referred for patch testing 2 to 6 months after the onset of their disease (32.8%); followed by 7 months to 1 year in 27.6% of the patients, 2 to 5 years in 22.4%, 6 to 10 years in 8.6%, more than 10 years in 5.2%, and less than 2 months in 3.4% of the patients. Forty-four percent (26 patients) of the patients had at least one positive patch test. The most common allergens found to be positive in this study were carba mix (18.7%), nickel sulphate (17.0%), thiuram mix (10.2%), paratertiary butylphenol formaldehyde resin (8.5%), paraphenylenediamine (8.5%), and neomycin sulphate (6.8%) (Tables 1, 2). The most common affected areas were the hands (27.1%), followed by generalized distribution (22.0%), trunk (16.9%), feet (13.6%), head and neck (11.9%), flexural areas (5.1%), genitalia (1.7%), and the extremities (1.7%). Among women, the most common occupations were teachers (21.15%) and housewives (15.8%). Other occupations were laboratory technicians, secretaries, public relations, and sales. The most common occupations in men were construction workers (28.6%) and retired

persons (28.6%). Other occupations were exterminators, sales, and secretary work.

An attempt was made to correlate the positive allergens with the affected areas of the body and the occupation of the patient among the 26 patients with positive patch tests. Among patients with dermatitis on the feet, 66.7% had a positive patch test for paratertiary butylphenol formaldehyde (PBF). Fifty percent (50%) of patients with generalized dermatitis had a positive patch test for paraphenylenediamine. All patients who showed positive patch tests to potassium dichromate were construction workers.

Discussion

Patch testing is an important underutilized tool in clinical dermatology. A previous study has shown that 27% of American dermatologists do not carry out patch testing (11). The main reasons for not testing were that the patient history was adequate for a diagnosis, that patch testing is too time consuming, and that reimbursement was not sufficient (12). Additional factors that may discourage a more widespread use of patch testing includes the fact that the clinician must take time to ask about exposures both at home and work, the use of personal care products, and the patient's hobbies in order to direct the allergen selection. If only standard series are used, more than 75% of patients will be incompletely evaluated (4). Specialized patch testing clinics offer physicians an alternative where they can refer their patients for this procedure, making it more cost-effective. Patch testing clinics have access to those casual allergens not found on standard trays, which are important in directing the diagnosis in a patient-oriented basis.

The results of our study show that most patients were women (62.7%) with a mean age of 48 years old, nearly identical to the results of the North American Contact Dermatitis Groups (NACDG) in which 62% were women with a mean age of 47 years old (13). The percentage of positive patch tests was 44.1%, which differs from the 70.1% positive patch tests in the NACDG and the 68.6% positive patch tests at the University of Kansas (4). The lower number of positive patch test in our clinic may be explained by the fact that different standard series are used in each study; ours with the AAD series, NACDG with their own series, and the University of Kansas with the TRUE test plus additional allergens. Another limitation could be the small number of patients in our study. However, other studies have determined that patch testing clinics with more than 60% of positive patch tests may be too selective in choosing which patients are to be tested (12), and probably miss some patients that may benefit from the test.

Table 1. Patch test results at the clinics of the Department of Dermatology, MSC, UPR

Allergens	Frequency (%)
1 Carba Mix	11 (18.7%)
2 Nickel Sulphate	10 (17.0%)
3 Thiuram Mix	6 (10.2%)
4 Paraphenylenediamine	5 (8.5%)
5 Paratertiary Butylphenol Formaldehyde Resin	5 (8.5%)
6 Neomycin Sulphate	4 (6.8%)
7 Benzocaine	3 (5.1%)
8 Quaternium-15	3 (5.1%)
9 Wool Alcohols	2 (3.4%)
10 Formaldehyde	2 (3.4%)
11 Ethylenediamine Dihydrochloride	2 (3.4%)
12 Mercapto Mix	2 (3.4%)
13 Potassium Dichromate	2 (3.4%)
14 N-leopropyl-N-phenyl Paraphenylenediamine	1 (1.7%)
15 Balsam of Peru	1 (1.7%)
16 Mercaptobenzothiazole	1 (1.7%)
17 Imidazolidinyl Urea	1 (1.7%)
18 Cinnamic Aldehyde	0 (0.0%)
19 Epoxy Resin	0 (0.0%)
20 Colophony	0 (0.0%)

Table 2. Most prevalent allergens in four different studies

Study (years)[allergen series]	
PR* (2001-2005)[AAD**series]	Kansas (1995-2001)[TRUE test + additional]4
carba mix (18.7%)	nickel (12.5%)
nickel sulphate (17.0%)	bacitracin (10.2%)
thiuram mix (10.2%)	neomycin (9.7%)
paratertiary butylphenol formaldehyde resin (8.5%)	fragrance mix (9.5%)
paraphenylenediamine (8.5%)	quaternium-15 (9.4%)
neomycin sulphate (6.8%)	formaldehyde (8.9%)
NACDG† (1998-2000)[NACDG series]14	NC‡†Meta-analysis (1983-1998)[TRUE test]16
nickel (16.2%)	nickel (14.7%)
balsam of Peru (12.3%)	thimerosal (5.0%)
neomycin sulphate (11.5%)	cobalt (4.8%)
fragrance mix (10.9%)	fragrance mix (3.4%)
thimerosal (10.8%)	balsam of Peru (3.0%)
sodium gold thiosulfate (10.5%)	colophony (2.9%)

*PR = Puerto Rico

**American Academy of Dermatology

†NACDG = North American Contact Dermatitis Group

‡†NC = North Carolina

The most common allergens found by patch testing in our clinic were carba mix, nickel sulphate, thiuram mix, paratertiary butylphenol formaldehyde resin, paraphenylenediamine, and neomycin sulphate. As shown in Table 2, the differences are probably due to the fact that different standard series are used in each of these studies, as well as to geographical factors which result in exposure to different allergens. Among our patients, the most commonly affected areas of the body were the hands and a generalized dermatitis, similar to the results of the NACDG (13). Nickel was the second most common allergen in our study in contrast to other comparative studies that have identified it as the most common allergen. This difference may be attributed to the fact that allergic contact dermatitis to nickel is usually a straightforward diagnosis for some clinicians, and patch testing may not be performed in those patients. In contrast, the most common allergen in our series was found to be carba mix. Thiuram mix was also found to be a common allergen, while in comparative studies it is less common. These two allergens, carba mix and thiuram mix, are found in most rubber articles. Probably, our population has an increased exposure to such products. In our study, the most common allergen affecting the feet was PBF, found in glues used for shoes. In those patients with generalized dermatitis, the most common allergen was paraphenylenediamine, which is found in black dyes. Potassium dichromate, which can be found in cement powder, was the most common allergen among construction workers. No comparable data for these results was found in previous reports.

Evaluating a positive patch test reaction is the most challenging part of the patch testing procedure. The relevance of a positive patch test is determined by correlating the results with the patient history and skin examination findings (distribution and morphology). Lack of relevance does not mean that the patient is not allergic to the allergen, but rather that it is not responsible for the current dermatitis (11). Previous studies have found that allergens such as paraphenylenediamine, epoxy resin, and chromium are allergens with a high relevance (14). Paraphenylenediamine and potassium dichromate

were found to be clinically pertinent in our population, in addition to paratertiary butylphenol formaldehyde. Once the relevance of an allergen is determined, it is important that the physician advises the patient on the avoidance of those allergens, including their alternate names, components, a list of products where they can be found, how to avoid them, and what products to use. Most dermatologists do not spend enough time keeping up-to-date on information regarding the ingredients contained in every new product (15). The American Contact Dermatitis Society has a database known as the Contact Allergen Replacement Database (CARD) that contains updated information on more than 2000 topical skin care products and their ingredients. CARD allows detection of products that cross-react, relevant allergens, and easy identification of alternate products, making patient care and education much easier (15-16).

In conclusion, the recognition and prevention of allergic contact dermatitis depends on the ability of the physician to identify the cause, thus alleviating the suffering and reducing medical care costs. Patch testing remains a worthwhile and quick diagnostic tool for the evaluation of patients with suspected allergic contact dermatitis by helping to establish an early diagnosis, an adequate therapy, and preventing chronic disease.

Resumen

Las pruebas de contacto (“patch tests”) son de gran utilidad para identificar aquellas sustancias causantes

de dermatitis alérgica por contacto. Los propósitos de este estudio fueron identificar aquellos alérgenos más comunes en una clínica de alergia de la Universidad de Puerto Rico, correlacionar estos resultados con los datos demográficos y la presentación clínica y compararlos con estudios similares de otras instituciones. Se llevó a cabo un análisis retrospectivo utilizando los expedientes de los pacientes evaluados en la Clínica de Alergia del Departamento de Dermatología en el Recinto de Ciencias Médicas de la Universidad de Puerto Rico durante los años 2001 al 2005. Los alérgenos más comunes encontrados en nuestra población fueron “carba-mix”, sulfato de níquel, mezcla de tiuram, resina de formaldehído, parafenilendiamina y sulfato de neomicina. El área más comúnmente afectada fue las manos. Se pudo observar una correlación entre la dermatitis de contacto de los pies y un resultado positivo al butifenol paraterciario, entre la dermatitis generalizada y la parafenilendiamina y la exposición ocupacional y el dicromato de potasio. Se concluye que la prueba de contacto es una herramienta de diagnóstico rápida y confiable en la evaluación de pacientes con dermatitis alérgica por contacto para determinar aquellos alérgenos causantes de ésta y así evitar futuras exposiciones.

References

1. Mowad CM, Marks JG. Allergic Contact Dermatitis. In: Bologna JL, Jorizzo JL, Rapini RP (eds). *Dermatology*. 1st ed. New York: Mosby Elsevier Science, 2003: p. 227-240.
2. Sheretz E. Controversies in contact dermatitis. *Am J Contact Dermat* 1994;5:130-135.
3. Prue C, Martinson ME, McAnally PM, Stagner WC. Post-marketing survey results of T.R.U.E. test, a new allergen patch test. *Am J Contact Dermat* 1998;9:6-10.
4. Saripalli YV, Achen F, Belsito DV. The detection of clinically relevant contact allergens using a standard screening tray of twenty-three allergens. *J Am Acad Dermatol* 2003;49:65-69.
5. Devos SA, Van Der Valk PG. Epicutaneous patch testing. *Eur J Dermatol* 2002;12:506-514.
6. Pieter G, Valk VD, Devos SA, Coenraads PJ. Evidence-based diagnosis in patch testing. *Contact Dermat* 2003;48:121-125.
7. Sheretz E. Is the screening of patch test tray still worth using? *J Am Acad Dermatol* 1993;29:1057-1058.
8. Storrs FJ, Rosenthal LE, Adams RM, et al. Prevalence and relevance of allergic reactions in patients patch tested in North America. *J Am Acad Dermatol* 1989;20:1038-1045.
9. Rietschel RL. Contact dermatitis and diagnostic techniques. *Allergy Proc* 1989;10:403-411.
10. Fischer T, Kihlman I. Patch testing technique. *J Am Acad Dermatol* 1989;21:830-832.
11. Belsito DV. Patch testing with a standard allergens (“screening”) tray: rewards and risks. *Dermat Ther* 2004;17:231-239.
12. James W, Rosenthal LE. American Academy of Dermatology Patch Testing Survey: use and effectiveness of this procedure. *J Am Acad Dermatol* 1992;26:991-994.
13. Marks JG, Belsito DV, DeLeo VA, et al. North American Contact Dermatitis Group patch-test results, 1998-2000. *Am J Contact Dermat* 2003;14:59-62.
14. Krob HA, Fleischer AB, D’Agostino R Jr, et al. Prevalence and relevance of contact dermatitis allergens: a meta-analysis of 15 years of published TRUE test data. *J Am Acad Dermatol* 2004;51:349-353.
15. Kist JM, el-Azhary RA, Hentz JG, Yiannias JA. The Contact Allergen Replacement Database and treatment of allergic contact dermatitis. *Arch Dermatol* 2004;140:1448-1450.
16. Scheman A. Patch testing: an underutilized modality. *Arch Dermatol* 2004;140:1529-1530.