Acta Dermatovenerol Croat 2007;15(3);130-134 SHORT SCIENTIFIC COMMUNICATION

Most Common Inhalant Allergens in Atopic Dermatitis, Atopic Dermatitis/Allergic Rhinitis, and Atopic Dermatitis/Bronchial Asthma Patients: A Five-Year Retrospective Study

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Received: May 20, 2007
Accepted: June 14, 2007

SUMMARY Atopic dermatitis (AD) is a chronic relapsing inflammatory skin disease with a distinctive clinical appearance and distribution. Around 85% of patients have positive immediate skin reaction or specific IgE to different airborne allergens that are in association with respiratory allergy. The aim of this retrospective, open and uncontrolled study was to identify the most common inhalant allergens in AD patients, AD/allergic rhinitis patients, and AD/bronchial asthma patients by skin prick test *per* year during the 2001-2005 period.

KEY WORDS: atopic dermatitis, inhalant allergens, retrospective study

INTRODUCTION

Atopic dermatitis (AD) is a chronic relapsing inflammatory skin disease with a distinctive clinical appearance and distribution. AD is divided into "intrinsic" type that is non-IgE-associated, and "extrinsic" that is IgE-associated. Around 85% of patients have positive immediate skin reaction or specific IgE to different airborne allergens. AD can be "pure" AD or "mixed AD", i.e. in association with respiratory allergy. Additionally, an important role has been ascribed to cell mediated or delayed hypersensitivity with biphasic cytokine profile, initially Th2 and later on with Th2/Th1 cytokine pattern (1).

The pathogenesis of AD is multifactorial and is the result of complex interaction among genetic, immune and environmental factors in combination with dietary and airborne allergens, infections, stress and decreased skin barrier (1-7). Genetic compound in the development of AD is high. In a cohort of 372 AD patients, 59% had respiratory allergy and in 73% there was a positive family history of atopy (3). The incidence of allergic asthma (79%) and allergic rhinitis (32%) was also high in families with AD but free from respiratory allergy (3).

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Many allergens are considered to be trigger factors in AD patients (3). Food allergens are important in exacerbation of AD, mainly in the subset of young children, usually under age three, e.g., cow's milk, egg, peanuts, soy, and wheat (8). Most food allergic children outgrow their food hypersensitivity in the first few years of life, usually till the age of three, so food allergy is not a common trigger factor in older patients with AD.

Airborne allergens such as house dust mites (HDM), plant pollen allergens, moulds, animal-derived allergens, and bacterial allergens may be responsible for exacerbations of skin inflammation and for atopic involvement of respiratory system (9). Skin lesions can develop after contact and inhalation of aeroallergens. It seems to be of specific importance in both adults and children (5,6,9-11). Reactivity to allergens can be measured as specific serum IgE, positive skin prick test and positive atopy patch test (4).

PATIENTS AND METHODS

Aims

The purposes of this study were to identify the most common inhalant allergens in all three groups of patients by use of skin prick test. AD patients, AD/allergic rhinitis patients, and AD/bronchial asthma patients were examined each year from 2001 to 2005, and allergens were identified with an increased or decreased frequency in each group of patients.

Study design

It was a retrospective, open and uncontrolled study of 5-year duration (2001-2005).

Patients

A positive history of atopy, total IgE and clinical diagnosis of AD, or AD with rhinitis or AD with bronchial asthma were recorded in 1097 patients. Skin prick testing was performed in 1097 patients (373 female and 724 male) at the Outpatient Allergy Clinic, University Department of Dermatology and Venereology, Zagreb University Hospital Center, Zagreb, Croatia, during the 2001-2005 period. The study included patients with clinical diagnoses of AD, AD/allergic rhinitis, and AD/bronchial asthma. The mean patient age was 36, range 3 to 74 years.

Skin prick test (SPT) was performed according to the European Standard (ES) using commercially prepared solutions (supplied by the Institute of Immunology, Zagreb). The test was performed on clinically uninvolved skin on the subjects' forearms (10,11). Early-phase reaction was read after 20-30 minutes as maximum reaction is seen 15-20 minutes after the allergen has been pricked to the epidermis. Positive histamine control was read at 10-15 minutes. A wheal of >3 mm in diameter and/or erythema were considered as positive reaction. Negative control with a buffer was performed in case when the wheals were of the same diameter. Patients were asked not to take drugs for allergy, sleeping, tranquilizers and analgesics for three days before skin prick testing.

Total IgE was performed in all 1097 patients. Values of total IgE were determined by the standardized radioimmunosorbent test (RIST) or enzyme linked immunosorbent assay (ELISA). The upper normal IgE value was set at 150 IU/mL, and was age-adjusted in children (12).

We used Statistica 6.0 (StatSoft Inc., Chicago, USA) software package for Windows to perform statistical data analysis. Microsoft Office Excel 2003 was used on data input and collection. Chi-square test was used to estimate differences between categories of variables, and odds ratio with relative risks was used to calculate the probability of predictors. All statistical values were considered significant at p level of 0.005.

RESULTS

A positive history of atopy and clinical diagnosis of AD, or AD with rhinitis or AD with bronchial asthma were recorded in 1097 patients, mean age 36 (range 3 to 74) years. There were 863 (78.7%) AD patients, mean age 34 (range 3-58) years, all with a mild to moderate disease of variable duration. There were 182 (16.6%) patients with the di-

Table 1. Number of patients with increased values of total IgE by ELISA and RIST in patient groups with atopic dermatitis (AD) and two atopic diseases

Result	AD	%	AD/Rhinitis	%	AD/Bronchial asthma	%
Normal	347	40.2	38	20.9	8	15.4
Very increased	516	59.8	144	79.1	44	84.6
Total	863	100.0	182	100.0	52	100.0

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Table 2. Inhalant allergens in three patient groups 2001-2005

	Total 2001-2005		
Inhalant allergen	Bronchial asthma (n)	AD (n)	Allergic rhinitis (n)
House dust mite	12	139	44
Dermatophagoides pteronyssinus	18	250	78
Feathers	3	28	12
Kermes oak	8	185	55
Timothy grass	9	188	52
Blue grass	0	4	0
Rye	8	166	50
Common hazel	10	88	41
White birch	11	83	45
Black pine	2	28	12
Acacia	4	20	20
Plane-tree	3	14	8
White poplar	1	22	12
Lime-tree	0	37	13
Olive	3	40	21
Elderberry	4	34	12
White willow	0	1	2
Oak	7	72	27
Ragweed	7	152	69
Mugwort	5	104	52
Lichwort	2	38	26
Dandelion	4	67	33

agnosis of AD/allergic rhinitis, mean age 43 (range 5-74) years. There were 52 (4.7%) patients with AD/bronchial asthma, mean age 39 (range 3-68) years.

Increased values of IgE were found in 516 (59.8%) AD, 144 (79.1%) AD/allergic rhinitis, and 44 (84.6%) AD/bronchial asthma patients. In all three groups of patients, *Dermatophagoides pteronyssinus* was the most common allergen, followed by timothy grass and kermes oak in AD group, ragweed and kermes oak in AD/rhinitis group, and house dust and white willow in AD/bronchial asthma group (Table 2). Correlation of study groups with allergens in the 2001-2005 period is shown in Tables 3, 4 and 5.

In AD group, the most common positive prick test was for *Dermatophagoides pteronyssinus* (26.70%, 27.85%, 26.17%, 30.1%, and 26.60%) and grass pollen (22.73%, 20.09%, 22.43%, 24.06%, and 23.40%) (Table 3). In AD/allergic rhinitis group, the most common positive prick test was for *Dermatophagoides pteronyssinus* (20.83%, 27.85%, 23.33%, 25%, and 18.52%) and weed pollen (25%, 23.42%, 16.67%, 25%, and 29.63%) (Table 4). In AD/bronchial asthma group, the most common positive prick test was for *Dermatophagoides pteronyssinus* (35%) in 2001, house dust mite (17.65%) and weed pollen in 2002, grass (50%) and weed pollen (50%) in 2003, and *Dermatophagoides pteronyssinus* (33.33% and 40%, respectively) in 2004 and 2005 (Table 5).

Table 3. Most common inhalant allergens in atopic dermatitis patients 2001-2005

	2001	%	2002	%	2003	%	2004	%	2005	%
House dust mite	38	21.59	42	19.18	9	8.41	30	14.15	20	10.64
Dermatophagoides pteronyssinus	47	26.70	61	27.85	28	26.17	64	30.19	50	26.60
Feathers	5	2.84	14	6.39	3	2.80	3	1.42	7	3.72
Grass pollen	40	22.73	44	20.09	24	22.43	51	24.06	44	23.40
Tree pollen	17	9.66	23	10.50	20	18.69	25	11.79	27	14.36
Weed pollen	29	16.48	35	15.98	23	21.50	39	18.40	40	21.28

Table 4. Atopic dermatitis/allergic rhinitis patients 2001-2005

	2001	%	2002	%	2003	%	2004	%	2005	%
House dust mite	9	18.75	21	13.29	4	13.33	5	8.93	3	11.11
Dermatophagoides pteronyssinus	10	20.83	44	27.85	7	23.33	14	25.00	5	18.52
Feathers	3	6.25	3	1.90	4	13.33	2	3.57	3	11.11
Grass pollen	9	18.75	28	17.72	5	16.67	12	21.43	4	14.81
Tree pollen	5	10.42	25	15.82	5	16.67	9	16.07	4	14.81
Weed pollen	12	25.00	37	23.42	5	16.67	14	25.00	8	29.63

DISCUSSION

Approximately 20% of AD patients have low serum IgE levels and the lack of detectable environmental allergen-specific serum IgE or positive skin prick test reactions (7,9). Johansson *et al.* report a relatively high proportion of AD patients without head and neck dermatitis and patients with low total serum IgE levels but positive atopy patch test for *Malassezia sympodialis*, despite lower proportions of individuals with *Malassezia sympodialis*-specific IgE in these groups of patients (13). Although there is no explanation yet for the occurrence of positive atopy patch test without detectable allergen-specific IgE, one could speculate about minute amounts of allergen-specific IgE not detected by skin prick test that are sufficient for antigen presentation (7). Moreover, Th-2 predominated type IV reaction initiated in the absence of specific IgE, or even a classic Th-1 predominated type IV reaction is thought to be responsible (7).

In our study, concordance between a positive history of atopy, positive skin prick test for inhalation allergens in AD patients with asthma and allergic rhinitis was observed for dust mite, *Dermatophagoides pteronyssinus*, grass pollen and weed pollen.

The prognosis of AD is usually good but the risk of developing asthma or allergic rhinitis is very high. Development of other symptoms or sensitization is associated with a family history of eczema, age at onset of eczema and its severity, early adverse reactions to foods, and proneness to infections (11). Pajno *et al.* conclude that assessment of sensitization to house dust mite by skin prick test is a marker for patients that are more likely to outgrow AD compared with those who will not (7).

Most AD patients have elevated serum IgE (80%-85%) and skin prick test reactions to a wide variety of aeroallergens and food allergens (3,4). In our study, elevated total IgE was recorded in 70% of AD patients. Moreover, the occurrence of IgE antibody to staphylococcal toxins, the yeast *Candida albicans*, opportunistic yeast *Malassezia*, and house dust mite suggest that microbial allergens and house dust mite may be of importance in AD (3,5,6).

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Table 5. Atopic dermatits/bronchial asthma patients 2001-2005

	2001	%	2002	%	2003	%	2004	%	2005	%
House dust mite	2	10.00	3	17.65	0	0.00	5	23.81	1	20.00
Dermatophagoides pteronyssinus	7	35.00	3	17.65	0	0.00	7	33.33	2	40.00
Feathers	2	10.00	2	11.76	0	0.00	0	0.00	0	0.00
Grass pollen	4	20.00	2	11.76	1	50.00	3	14.29	1	20.00
Tree pollen	4	20.00	3	17.65	0	0.00	4	19.05	0	0.00
Weed pollen	1	5.00	4	23.53	1	50.00	2	9.52	1	20.00

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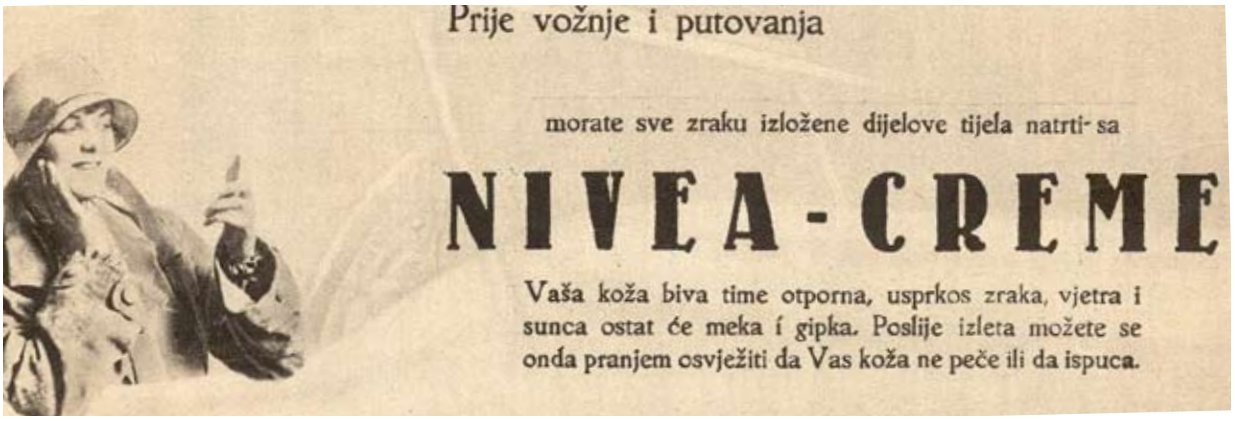

Before driving and travelling use Nivea cream; year 1935.
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