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VALUE OF HOUSE AEROALLERGENS IN THE ETIOLOGICAL SPECTRUM OF BRONCHIAL ASTHMA IN CHILDREN

Makeeva N.I., Shmulych V.K., Chernenko L.N., Staruseva V.V., Shmulych A.V., Parameyeva K.O.

Kharkov National Medical University

The one of the key reasons for the formation of bronchial asthma (BA) in children is a hypersensitivity to home allergens [1]. Numerous studies [2-7] have proved that exposure to various allergens in the house dust is a major factor inducing onset of asthma (85 %). Many authors [8-10] indicate that the aggressiveness of the house dust allergens mainly depends on the number and species composition of mites inhabiting it with mainly belonging to the genus *Dermatophagoides*, family *Pyroglyphida*. The most widespread are *D. pteronyssinus* and *D. farinae* mites which making up to 90 % of home akaroflora. In addition, house allergens include molds, bird's feather, chironomids (water fleas), etc.

We set the problem to make a comparative assessment of the significance of home aeroallergens in etiologic spectrum of asthma in children according to age and gender by prick- test in the period of stable remission of the disease.

Materials and Methods

Skin test with allergens remains a valuable method of allergy testing. Making probes aims to confirm the importance of allergens in the development of the disease, which suggestive of hypersensitivity according to anamnesis. This is a highly sensitive method of determining of specific sensitization by percutaneous injecting of allergen and evaluation of the magnitude and nature of the inflammatory reaction or edema. Testing can be performed by scarification probe, injection test, prick-test, and the intradermal test. We have performed allergy testing by a prick-test.

The reasons to perform the skin tests with allergens were clinical anamnesis, the data of clinical and laboratory examinations.

We used standart allergens containing 10,000 protein nitrogen unit (PNU)in 1 ml, made from house dust, bird's feathers, chironomids, molds:

- Allergen e pulvere domesticum e *Dermatophagoides pteronyssinus*;
- Allergen e pulvere domesticum e *Dermatophagoides farinae* ;
- Allergen e pulvere bibliothecae;
- Allergen e pulvere domesticum ex *Acarus siro*;
- Allergen e pluma pulvini;
- Allergen e *Daphnia magna*;
- *Alternaria alternate*;
- *Aspergillum* (mixt);
- *Cladosporium*;
- *Penicillum* (mixt).

Producer: LRS «Immunolog», 21036, Vinnica, pob 4283, Zbyzhka street, 5

The work is implemented in regional children's allergy center based in Regional children's clinical hospital №1 in Kharkov city.

The principle of making skin test is based on the fact that the allergen applied to the skin comes into contact with the antigen-presenting cells and T-lymphocytes. Skin antigen-presenting cells are macrophages and Langerhans cells. This interaction in the presence of sensitization results in releasing of allergic mediators and in the development of a local allergic reaction.

Technique of the skin test with allergens

Prick-test has no age restrictions. Allergens, test control fluid (negative control), 0.01 % solution of histamine (positive control) were used aseptically. Skin probes were made on the inner surface of the forearm at a distance (30 ± 10 mm) one from another.

We applied one drop (0.10 ml) of a standard water-salt allergen extract for diagnosis, the control test liquid, and 0.01 % solution of histamine on the disinfected with 70 ° ethanol skin, using a sterile plastic dropper. We pricked the skin through a drop of allergen liquid and 0.01 % solution of histamine to hold the stopper of the lancet.

Evaluation of the results of skin tests

Evaluations of the results of skin tests were performed in 15-20 minutes (immediate-type reaction). The reaction should according to the table number 1. The skin reaction to the control test fluid must be negative, if its positive tests with allergens are not counted (**Table 1**).

Table .- 1 The evaluation of skin tests

allergic reactions	Prick-tests	
	The papule size, mm	symbols
Negative	0	-
Slightly positive	1-2	+
Positive	3-7	++
Drastically positive	6-12	+++
Hyperergic	13 and more	++++

To determine the most significant allergens in causing or worsening of asthma in children, we analyzed the results of testing basis of severity of skin reactions to a particular allergen. Allergic reactions ranged from (+ +) to (+ + + +) were considered causally relevant in the etiologic spectrum of the disease.

The results and discussion

We observed 1487 children with asthma aged 4 to 18 years.

The results showed that children with asthma responded with hyperergic reactions at house allergens, especially boys of 4-8 years, and boys of puberty age; hyperergic reactions to a prick- test in girls of 4-8 years old and boys and girls of 9-12 years were detected less frequently. Among the all house allergens a dominant one was enriched with *Dermatophagoides pteronyssinus*

Hyperergic reactions to the birds feather allergens were in boys of 4-8 years old, and girls 13-18 years old; but boys of 13-18, girls and boys of 9-12 years were less sensitive to this allergen. Making a comparative assessment of the sensitization degree with the house allergens from birds feathers and dust in children should be noticed a synchronic appearance of the hyperergic reactions in age and sex aspect, suggesting that bird's epiallergens contain common components to the house dust, allergens.

Allergens of chironomids (*Allergenium e Daphnia magna*) caused hyperergic reactions in boys and girls aged 4-8 and 13-18 years. The degree of the immunopathological reaction to the *Daphnia* allergen has been less pronounced in boys of 9-12 years

A distinctive feature of all fungal allergens in comparison with house allergens was the lack of hyperergic reactions in the prick-tests, and smaller number of positive reactions to the test. (Table 2, 3, 4).

Conclusions

1. Sensitization to home aeroallergens is one of the main causes of bronchial asthma in children.
2. Hypersensitivity to house allergens (*Allergenium e pulvere domesticum e Dermatophagoides pteronyssinus*, *Allergenium e pulvere domesticum e Dermatophagoides farina*, *Allergenium e pluma pulvini*, *Allergenium e Daphnia magna*, *Allergenium e pulvere bibliothecae*) registered in boys 4-8 years old and 13-18 years allows us to consider this group as a triggers which causes an induction of early asthma in children of this age and gender.
3. Hyperergic reactions to the house micro-fungus (*Alternaria alternate*, *Aspergillum*, *Cladosporium*, *Penicillium*) were not found in examined children.
4. Determination of dominating in the etiologic spectrum of asthma in children *Dermatophagoides* allows to create the appropriate vaccines that can be used for specific immunotherapy (SIT) and thus streamline the complex treatment of bronchial asthma in children.

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1487 children with asthma were examined by prick- test method. Were made a comparative assessment of the etiologic significance of house aeroallergens: house dust mites, bird's feathers, chironomids, fungus in the formation of bronchial asthma in children. Defined a dominating allergen from the house dust (*Allergenium e pulvere domesticum e Dermatophagoides pteronyssinus*), which could be used to optimize the specific immunotherapy of asthma in children.

Keywords: asthma, house aeroallergens, etiologic significance, children.

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ЗНАЧЕННЯ АЕРОАЛЕРГЕНІВ ЖИТЛА В
ЕТІОЛОГІЧНОМУ СПЕКТРІ БРОНХІАЛЬНОЇ
АСТМИ У ДІТЕЙ

Макєєва Н.І., Шмуліч В.К., Черненко Л.М.,
Старусева В.В., Шмуліч О.В.,Парамєєва К.О.

Методом prick-тесту обстежено 1487 дітей, хворих на бронхіальну астму. Проведено порівняльна оцінка етіологічної значущості аероалергенів житла: кліщів побутового пилу, пера птахів, хірономідій, плісняових грибів у формуванні бронхіальної астми у дітей. Визначений домінуючий алерген з побутового пилу (*Allergenium e pulvere domesticum e Dermatophagoides pteronyssinus*), який може бути використаний з метою оптимізації специфічної імунотерапії бронхіальної астми у дітей.

Ключові слова: бронхіальна астма, аероалергени житла, етіологічна значущість, діти.

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ЗНАЧЕНИЕ АЭРОАЛЛЕРГЕНОВ ЖИЛИЩА В
ЭТИОЛОГИЧЕСКОМ СПЕКТРЕ
БРОНХИАЛЬНОЙ АСТМЫ У ДЕТЕЙ

Макеева Н.И., Шмулич В.К., Черненко Л.Н.,
Старусева В.В., Шмулич О.В., Парамеева Е.О.

Методом prick-теста обследовано 1487 детей, больных бронхиальной астмой. Проведена сравнительная оценка этиологической значимости аэроаллергенов жилища: клещей из домашней пыли, пера птиц, хирономидий, плесневых грибов в формировании бронхиальной астмы у детей. Определен доминирующий аллерген из домашней пыли (*Allergenium e pulvere domesticum e Dermatophagoides pteronyssinus*), который может быть использован с целью оптимизации специфической иммунотерапии бронхиальной астмы у детей.

Ключевые слова: бронхиальная астма, аэроаллергены жилища, этиологическая значимость, дети.

Table 2-Characteristics of the allergic reactions degree with house and fungal allergens in children with asthma, 4-8 years

Number of patients	Boys (n=308)				Girls (n=152)			
	1+	2+	3+	4+	1+	2+	3+	4+
Allergy degree								
Allergens	abs. (p%±s _{p%})				abs. (p%±s _{p%})			
House								
A. Acarus siro	9(2,9±0,9)	41(13,3±1,9)	23(7,5±1,5)	14(4,5±1,2)	5(3,3±1,4)	16(10,5±2,5)	3(2,0±1,1)	13(8,6±2,3)
A.D. pteronyssinus	21(6,8±1,4)	38(12,3±1,8)	27(8,8±1,6)	18(5,8±1,3)	18(11,8±2,6)	15(9,9±2,4)	5(3,3±1,4)	12(7,9±2,2)
A.D. farina	8(2,6±0,9)	42(13,6±1,9)	22(7,1±1,5)	15(4,9±1,2)	5(3,3±1,4)	17(11,2±2,5)	4(2,6±1,3)	11(7,2±2,1)
A. p. bibliothecae	4(1,3±0,6)	37(12,0±1,8)	28(9,1±1,6)	18(5,8±1,3)	3(2,0±1,1)	13(8,6±2,3)	6(3,9±1,6)	15(9,9±2,4)
A. p. pulvini	9(2,9±0,9)	43(14,0±1,9)	23(7,5±1,5)	12(3,9±1,1)	5(3,3±1,4)	16(10,5±2,5)	5(3,3±1,4)	11(7,2±2,1)
A. Daphnia magna	8(2,6±0,9)	26(8,4±1,6)	37(12,0±1,8)	16(5,2±1,3)	4(2,6±1,3)	11(7,2±2,1)	5(3,3±1,4)	17(11,2±2,5)
Fungal								
Alternaria alternate	12(3,9±1,1)	10(3,2±1,0)	2(0,6±0,4)	0	12(7,9±2,2)	9(5,9±1,9)	0	0
Aspergillum	13(4,2±1,1)	11(3,6±1,1)	1(0,3±0,3)	0	12(7,9±2,2)	11(7,2±2,1)	2(1,3±0,9)	0
Cladosporium	14(4,5±1,2)	10(3,2±1,0)	0	0	11(7,2±2,1)	9(5,9±1,9)	0	0
Penicillium	12(3,9±1,1)	10(3,2±1,0)	1(0,3±0,3)	0	13(8,6±2,3)	10(6,6±2,0)	1(0,7±0,7)	0

Notes: abs. – absolute quantity of patients; p%±s_{p%} - frequency of positive reactions degree expressed in percents and permissible variations value

Table 3- Characteristics of the allergic reactions degree with house and fungal allergens in children with asthma, 9-12 years

Number of patients	Boys (n=316)				Girls (n=82)			
	1+	2+	3+	4+	1+	2+	3+	4+
Allergy degree								
Allergens	abs. (p%±s _{p%})				abs. (p%±s _{p%})			
House								
A. Acarus siro	13(4,1±1,1)	68(21,5±2,3)	6(1,9±0,7)	6(1,9±0,7)	5(6,1±2,6)	20(24,4±4,7)	2(2,4±1,6)	4(4,9±2,4)
A.D. pteronyssinus	16(5,1±1,2)	77(24,4±2,4)	29(9,2±1,6)	7(2,2±0,8)	8(9,8±3,3)	19(23,2±4,6)	15(18,3±4,3)	4(4,9±2,4)
A.D. farina	12(3,8±1,1)	62(19,6±2,2)	9(2,8±0,9)	10(3,2±0,9)	8(9,8±3,3)	16(19,4±4,4)	2(2,4±1,7)	5(6,1±2,6)
A. p. bibliothecae	11(3,5±1,0)	63(19,9±2,2)	6(1,9±0,8)	13(4,1±1,1)	6(7,3±2,9)	17(20,7±4,5)	3(3,7±2,1)	5(6,1±2,6)
A. p. pulvini	13(4,1±1,1)	65(20,6±2,3)	8(2,5±0,9)	7(2,2±0,8)	8(9,8±3,3)	16(19,5±4,4)	2(2,4±1,7)	5(6,1±2,6)
A. Daphnia magna	11(3,5±1,0)	64(20,3±2,3)	5(1,6±0,7)	13(4,1±1,1)	6(7,3±2,8)	16(19,5±4,4)	4(4,9±2,4)	5(6,1±2,6)
Fungal								
Alternaria alternate	11(3,5±1,0)	8(2,5±0,9)	1(0,3±0,3)	0	8(9,8±3,3)	12(14,6±3,9)	0	0
Aspergillum	10(3,2±0,9)	9(2,8±0,9)	0	0	9(11,0±3,5)	11(13,4±3,8)	2(2,4±1,7)	0

Cladosporium	9(2,8±0,9)	9(2,8±0,9)	1(0,3±0,3)	0	10(12,2±3,6)	12(14,6±3,9)	0	0
Penicillium	11(3,5±1,0)	8(2,5±0,9)	0	0	8(9,8±3,3)	10(12,2±3,6)	0	0

Notes: abs. – absolute quantity of patients; p%±s_{p%} - frequency of positive reactions degree expressed in percents and permissible variations value

Table4- Characteristics of the allergic reactions degree with house and fungal allergens in children with asthma, 13-18 years.

Number of patients	Boys (n=472)				Girls (n=157)			
	1+	2+	3+	4+	1+	2+	3+	4+
Allergens	abs. (p%±s _{p%})				abs. (p%±s _{p%})			
House								
A. Acarus siro	11(2,3±0,7)	80(16,9±1,7)	25(5,3±1,0)	15(3,2±0,8)	6(3,8±1,5)	19(12,1±2,6)	7(4,5±1,7)	18(11,5±2,5)
A.D.pteronysinus	12(2,5±0,7)	94(19,9±1,8)	26(5,5±1,0)	35(7,4±1,2)	17(10,5±2,5)	18(11,5±2,5)	6(3,8±1,5)	31(19,7±3,2)
A.D. farina	8(1,7±0,6)	63(13,3±1,6)	35(7,4±1,2)	24(5,1±1,1)	8(5,1±1,8)	13(8,3±2,2)	8(5,1±1,8)	20(12,7±2,3)
A. p. bibliothecae	16(3,4±0,8)	55(11,7±1,5)	40(8,5±1,3)	15(3,2±0,8)	15(9,6±2,4)	15(9,6±2,4)	6(3,8±1,5)	13(8,3±2,2)
A. p. pulvini	20(4,2±0,9)	91(19,3±1,8)	13(2,8±0,8)	10(2,1±0,6)	12(7,6±2,1)	17(10,8±2,5)	5(3,2±1,4)	16(10,2±2,4)
A. Daphnia magna	11(2,3±0,7)	78(16,5±1,7)	14(3,0±0,8)	30(6,4±1,1)	5(3,2±1,4)	18(11,5±2,5)	5(3,2±1,4)	17(10,8±2,5)
Fungal								
Alternaria alternate	9(1,9±0,6)	11(2,3±0,7)	1(0,2±0,2)	0	12(7,6±2,1)	12(7,6±2,1)	0	0
Aspergillum	8(1,7±0,6)	11(2,3±0,7)	1(0,2±0,2)	0	11(7,0±2,0)	11(7,0±2,0)	0	0
Cladosporium	9(1,9±0,6)	10(2,1±0,7)	0	0	10(6,4±1,9)	11(7,0±2,0)	0	0
Penicillium	10(2,1±0,7)	8(1,7±0,6)	0	0	10(6,4±1,9)	11(7,0±2,0)	1(0,6±0,6)	0

Notes: abs. – absolute quantity of patients p%±s_{p%} - frequency of positive reactions degree, expressed in percents and permissible variations value