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**DEFINITION OF THE ETIOLOGIC SPECTRUM
OF ACUTE ALLERGOSIS, URTICARIA IN
CHILDREN, ACCORDING TO AGE AND SEX
USING NOMOGRAPHIC METHOD**

**Shmulich V., Prokhorenko O., Ischenko T., Uryvaeva
M., Samsonenko V., Dzinkevich L., Shmulich O.,
Staruseva V., Ascheulov O.,
Reunova N., Zaporozhets I.
Kharkov National Medical University**

Widespread occurrence and steady increase in allergic diseases, which stand in the first place among all non-infectious diseases in children, require careful attention of pediatricians. Importance of the problem of allergic diseases is determined not only by their significant diffusion, but also by the early onset, with serious relapsing course, with transition of the disease to chronic process, that leads to depression of social adaptation and an early invalidism in children. But official statistics, based on indication of requests for a medical care, as a rule, does not give truthful representation of diffusion of allergic diseases [1, 2, 3, 4].

In this regard the use of available highly sensitive specific methods of detection of allergic pathology, reduction of invasive methods of research in children and simultaneous search for techniques prior in social and economic aspects for the purpose of well-timed correction and prevention of these conditions are having good prospects. We offered a non-invasive, high-economic nomographic method of an etiological decoding of allergic diseases in children, which parameters are the nosological form of illness, age and sex of a child. It allows

determining the most likely significant allergen or group of allergens for this child by studying the sensitivity of a skin to different allergens using scarification method in a large age population.

Materials and Methods

One of the methods of determining the most likely significant allergen is the scarification test. Dermal tests are highly sensitive method for determination of an organism specific sensitization by allergen injection through skin and evaluation of size character of puffiness or inflammatory reaction.

In dermal tests we used standard serial allergens, that contain 10 000 units of albuminous nitrogen in 1 ml, made of plant pollen, wood, fluff, epidermic tissue of animals and birds, food etc. The principle of dermal test is that significant allergen when put on skin, interacts with antigen-presenting cells and T-lymphocytes. Antigen-presenting cells are presented in a derma by Langerhans cells and macrophages. The result of such interaction in case of sensitization is the release of allergy mediators.

The technique of dermal tests, indications and contraindications for their use, and assessment of results, were made according to the standard procedure, which was offered by A. Ado [3]. We used a scarification test with standard allergens (alimentary, household, epidermal, pollen allergens) in 181 children with urticaria in the period of stable remission of a disease according to sex and age to specify the significant allergen or group of allergens responsible for acute allergosis, urticaria. Separation of patients on sex and age is presented in the table 1.

Table 1 –Patient distribution by sex and age

Nosological form	Age(years)						Number of patients
	4-8		9-12		13-18		
	girls	boys	girls	boys	girls	boys	total
Acute allergosis	21	21	28	34	35	42	181

As the table 1 testifies, number of children with an acute allergosis, urticarial increases before adolescence.

For the purpose of optimization of the conducted research the coefficient of importance of data testing α_i , ($i = \overline{1, n}$), is used, where i – is the number of an

allergy implication degree. Thus $\sum_{i=1}^n \alpha_i = 1$.

Recalculation of testing data with coefficient α_i for each of allergen groups was carried out on formulas:

$$b_{ij} = \alpha_i * a_{ij}; S_j = \sum_{i=1}^n \alpha_i a_{ij},$$

where a_{ij} – is a test value for each of allergen groups; b_{ij} – is a recalculated with the coefficient α_i test value; j – is a number of the age period ($j = \overline{1, m}$); S_j – is

the degree of allergic reaction of an organism for j – the age period.

The research results were generalized in nomograms given below (1, 2) for practical use so that it is possible to define significant allergen groups depending on sex and age.

Results and discussion

The dermal and allergic tests performed during stable remission from acute allergosis gave the following results: boys of preschool age had hyperergical reaction (+++) after the illness to all types of allergens, except pollen; at the age of 9 – 12 the rage of etiologic factors of the acute allergosis extended to alimentary component.

By 13 – 18 years the sensitivity to pollen allergens increases (+++), to the alimentary allergens decreases (+), and remains without dynamics to the household and epidermal allergens (++) (table 2, figure 1).

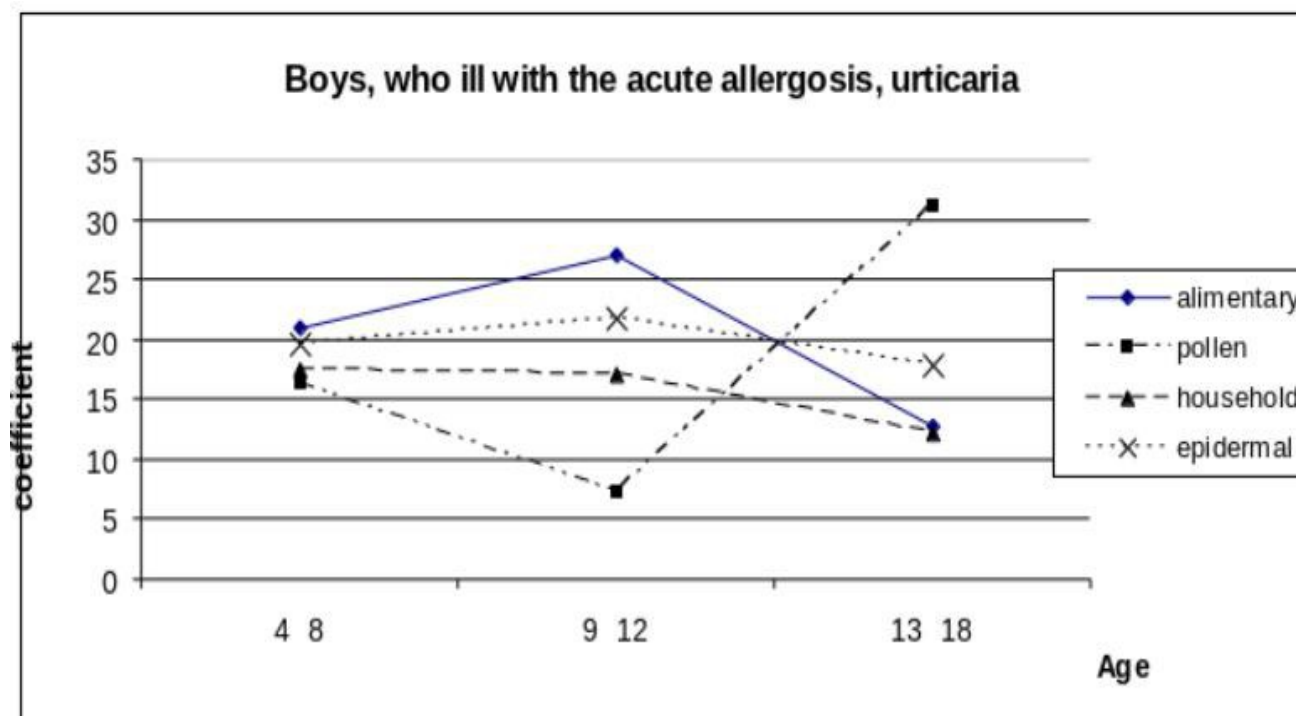


Figure 1 - The nomogram for determination of significant allergen in an acute allergosis in boys according to age

Table 2 – The acute allergosis, urticaria (boys). Quantitative and qualitative characteristic of allergic reactions to main groups of allergens according to age

Number of children	Age (years)	Group of allergens	+	++	+++	++++	Σ (total)
21	4-8	alimentary	15,75	0	5,1	0	20,85
28	9-12		1,8	6,75	0	18,4	26,95
35	13-18		12,75	-	0	0	12,75
21	4-8	pollen	7,5	8,55	0,2	0	16,25
28	9-12		4	3,15	0	0	7,15
35	13-18		13,75	17,1	0,2	0,1	31,15
21	4-8	household	1,3	12,2	0	4	17,5
28	9-12		6,5	8,2	0	2,4	17,1
35	13-18		8,5	0,6	3	0	12,1
21	4-8	epidermal	0	14	0	5,6	19,6
28	9-12		2,1	16,4	0	3,2	21,7
35	13-18		11,8	1,4	4,5	-	17,7

Verifying significant acute allergosis (urticaria) triggers, it is necessary to define following: in boys of 4 – 8 years with the acute allergosis, the urticaria often was caused by strawberry and orange; in boys of 9 – 12 years it was caused by orange, strawberry, chocolate, tomatoes, plums, fish, cucumber, buckwheat, chicken eggs; in boys of 13 – 18 years the significant allergen for the Quincke’s edema was cucumber, strawberry, lemon, orange, peach, chocolate, chicken eggs, fish.

In girls of 4 – 8 years food to which they had the distorted sensitivity more often led to the Quincke’s edema, less expressed was the reaction to household and alimentary allergens (++) and poorly expressed to pollen

allergens (+). In girls of 9 – 12 years the etiological domination of alimentary factors remained, but decreased (+++), the reaction to household allergens had the same level, the reaction to the pollen allergens decreased (+), patients had more often acutely positive reactions to epidermal allergens (+++). In the older age group alimentary allergens also dominated (+++), sensitivity to pollen allergens somewhat increased (++), sensitivity to epidermal allergens decreased (++), without dynamics was a reaction to household allergens (++) (table 3, figure 2).

Table 3 - The acute allergosis, urticaria in girls. Quantitative and qualitative characteristic of allergic reactionsto main allergen groups according to age.

Number of children	Age (years)	Group of allergens	+	++	+++	++++	Σ (total)
21	4-8	alimentary	2,5	0,2	26,7	4,8	34,2
34	9-12		0	20,8	0,6	0	21,4
42	13-18		2,3	20,8	0	7,2	30,3
21	4-8	pollen	8,8	3,6	0	0	12,4
34	9-12		4,4	0,6	0	0	5
42	13-18		33,6	26,4	0	0	60
21	4-8	household	16	0	1,2	0	17,2
34	9-12		4	1,4	0	1,8	7,2
42	13-18		9,8	0	2,1	0	11,9
21	4-8	epidermal	15,2	0	2,4	0	17,6
34	9-12		7,2	3,2	0	3,6	14
42	13-18		10	0	2,1	0	12,1

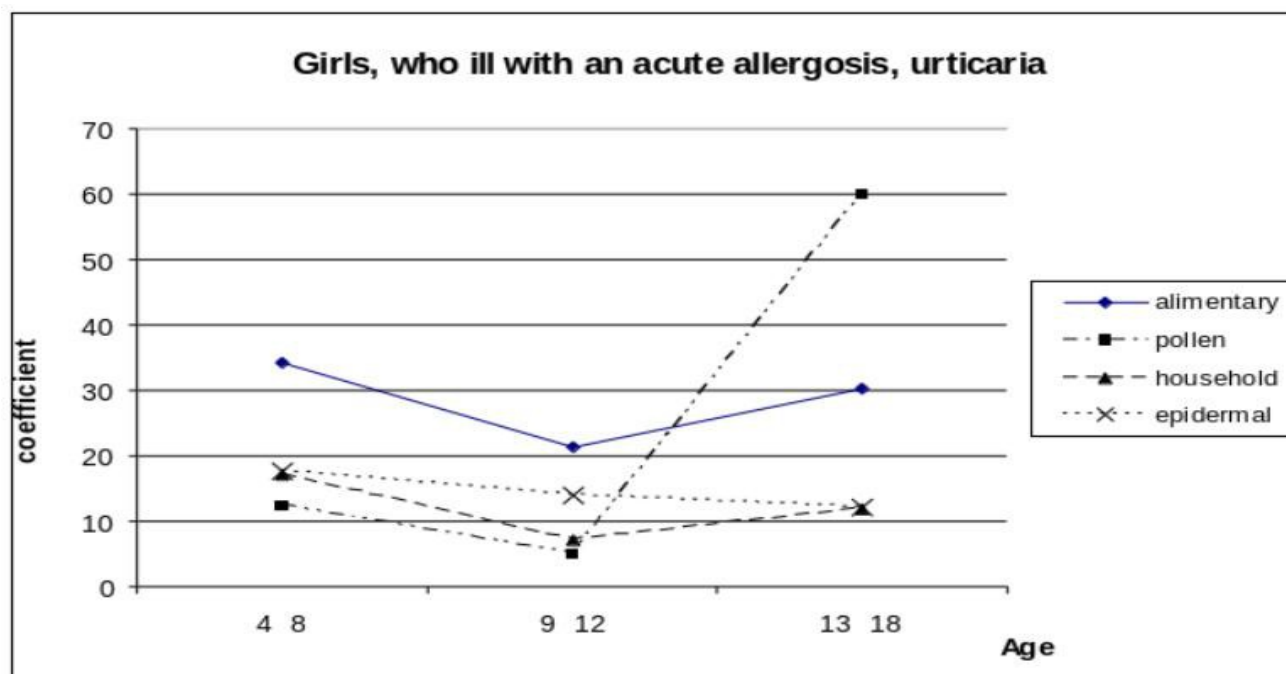


Figure 2 - The nomogram for determination of significant allergen in an acute allergosis in girls according to age.

In girls of 8 – 12 years an acute allergosis (an urticaria) was a reply to the consume of oranges, strawberry, chicken eggs; at the age of 9 – 12 years the significant allergens were strawberry, chocolate, fish, oranges; at the age of 13 – 18 years significant was the consume of oranges, strawberry, chocolate, grapes, apricots, sweet cherries, plums, fishes, chicken eggs, buckwheat, wheat flour, potatoes, milk, tomatoes, cucumbers.

From pollen allergens, the urticaria was caused in boys at the age 4 – 8 years by pollen of maple, linden, sagebrush, sunflower, rye, hazel, ambrosia, oak, chestnut, acacia; at the age of 9 – 12 years by pollen of sage-brush, willow, walnut, ambrosia, nettle, chestnut, acacia, linden, sunflower, rye, dandelion, hazel, oak, birch, plantain; at

the age of 13 – 18 years by pollen of linden, acacia, ambrosia, poplar, oak, walnut, rye, timothy grass, sunflower, sage-brush. In girls of 4 – 8 years the significant allergen of the Quincke's edema was the pollen of ambrosia, oak, poplar, hazel, rye, fescue; at the age of 9 -12 years was the pollen of sagebrush, poplar, ambrosia, elder, acacia, linden, walnut, rye, timothy grass, brome grasses, orache; in girls of 13 – 18 years was the pollen of sagebrush, corn, hazel, poplar, ambrosia, maple, chestnut, acacia, linden, sunflower, wheatgrass, ryegrass, walnut, elder, plantain, rye.

Thus, the conducted research testifies that the acute allergosis at children is polyetiologic. Exceptions are children with acute allergosis or urticaria at the age of 4 – 8 years, when illness is caused by only 2 – 3

alimentary triggers. In all other age groups of children significant allergens are more numerous and various.

Attracts attention the increase with age in the number of alimentary and pollen etiologic factors in girls with the maximum level in the adolescence and stable high sensitivity in all age groups to household and epidermal allergens [5, 6].

Possibly the increase of allergy in the adolescence is a consequence of hormonal reorganization

of an organism, that is associated with dysfunction of corticosteroids formation.

The verified allergens that cause positive reactions above the specified degree in patients with an acute allergosis of urticaria are shown in the table 4, which significantly differs from the previous publication, in which certain groups of significant allergens without specification are represented.

Allergens	Age (years)					
	4-8 years		9-12 years		13-18 years	
	boys	girls	boys	girls	boys	girls
Pollen	Ambrosia Maple Linden Sagebrush Sunflower Rye Hazel Oak Chestnut Acacia	Oak Poplar Hazel Fescue Rye Ambrosia	Ambrosia Willow Sage-brush Walnut Nettle Chestnut Acacia Linden Sunflower Rye Alder Dandelion Hazel Oak Birch Plantain	Ambrosia Sagebrush Poplar Elder Acacia Linden Walnut Rye Timothy grass Orach Brome grass	Ambrosia Linden Acacia Poplar Oak Walnut Rye Sagebrush Sunflower Elder Chestnut	Ambrosia Sagebrush Corn Hazel Poplar Maple Chestnut Acacia Linden Sunflower Rye Wheat grass Plantain Ryegrass Walnut Elder
Household	House dust	Tests doubtful or negative	House dust	House dust	House dust	House dust
Epidermal	Hair of a dog cat rabbit	Hair of a dog cat sheep	Hair of a dog cat rabbit sheep	Hair of a dog sheep	Hair of a dog cat rabbit	Hair of a dog cat rabbit
Alimentary	Strawberry orange fish chicken eggs potatoes cucumber	orange strawberry chicken eggs cucumber	Chocolate orange strawberry tomatoes plum cucumber fish chicken eggs buckwheat	Strawberry chocolate fish orange peach sweet cherries raspberry grapes plum lemon chicken eggs potatoes rice cereal	Strawberry orange lemon chocolate peach cucumber chicken eggs fish cherry raspberry milk potatoes	Chocolate orange strawberry grapes apricot sweet cherry plum chicken eggs fish buckwheat wheat groats rice cereal potatoes milk tomatoes cucumber

Conclusions

1. Studying characteristics of dermal sensitivity in urticaria in different age groups, we came to a conclusion, that there is no need in wide use of invasive research methods (definition of antibodies in blood, dermal and allergic tests), and the preliminary use of a nomographic method of definition of significant allergen or allergen group is more reasonable according to our research.
2. The technique offered by us (on condition of careful studying of the allergic anamnesis) allows, using the nomogram, in 70 – 80 % of cases to define the significant allergen without using of invasive research methods. It is a sparing diagnostic method for the majority of children and it can have an appreciable economic effect.
3. We offer to use invasive methods in doubtful cases and in absence of effect from elimination of estimated group of allergens.
4. Implementation of this method in practice of health care can be realized by providing allergy cabinets in outpatient hospitals, children's hospitals, and local pediatricians according to the scheme offered by us of etiological interpretation of allergic diseases in children.
5. Thus, using the determined consistent patterns, taking into account the diagnosis, sex, age of a child by means of the nomogram it is possible to define specific value of certain allergens in a disease exacerbation, and consequently, to provide their timely elimination, which has fundamental value in prevention of allergic diseases of children.

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ОПРЕДЕЛЕНИЕ ЭТИОЛОГИЧЕСКОГО СПЕКТРА ОСТРОГО АЛЛЕРГОЗА, КРАПИВНИЦЫ У ДЕТЕЙ В ЗАВИСИМОСТИ ОТ ПОЛА И ВОЗРАСТА НОМОГРАФИЧЕСКИМ МЕТОДОМ

Шмулич В.К., Прохоренко А.А., Ищенко Т.Б., Урываева М.К., Самсоненко В.И., Дзикович Л.А., Шмулич О.В., Старусева В.В., Ащеулов А.М., Реунова Н.М., Запорожец И.А.

В работе представлены результаты аллергического тестирования 181 ребенка, больных острым аллергозом, крапивницей. Целью исследования явилось уточнение причинно-значимого аллергена в зависимости от пола и возраста. Результаты тестирования обработаны методом математического анализа, возведены в номограммы, в соответствии с которыми, учитывая нозологическую форму заболевания, пол и возраст пациента, определен причинно-значимый аллерген.

Ключевые слова: номографический метод, дети, этиология, острый аллергоз, крапивница, скарификация.

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ВИЗНАЧЕННЯ ЕТИОЛОГІЧНОГО СПЕКТРУ ГОСТРОГО АЛЕРГОЗУ, КРОПИВ'ЯНКИ У ДІТЕЙ ЗАЛЕЖНО ВІД СТАТІ ТА ВІКУ НОМОГРАФІЧНИМ МЕТОДОМ

Шмулич В.К., Прохоренко О.А., Ищенко Т.Б., Урываева М.К., Самсоненко В.И., Дзикович Л.О., Шмулич О.В., Старусева В.В., Ащеулов О.М., Реунова Н.М., Запорожець І.О.

У роботі подано результати алергічного тестування 181 дітей, хворих на гострий алергоз, кропив'янку. Метою дослідження стало уточнення причинно-значущого алергену залежно від статі та віку. Результати тестування оброблені з використанням математичного аналізу, приведені в номограми, відповідно до яких, враховуючи нозологічну форму хвороби, стать та вік пацієнта, визначено причинно-значущий алерген.

Ключові слова: номографічний метод, діти, етіологія, гострий алергоз, кропив'янка, скарифікація.

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FEATURES OF ETIOLOGIC SPECTRUM OF ACUTE ALLERGY, URTICARIA FOR CHILDREN DEPENDING ON SEX AND AGE BY NOMOGRAPHIC METHOD

Shmulich V.K., Prohorenko A.A., Ishenko T.B., Uryvaeva M.K., Samsonenko V.I., Dzikevich L.A., Shmulich O.V., Staruseva V.V., Aschelov A.M., Reunova N.M., Zaporozets I.A.

In this work there are presented the results of allergy testings of 186 children suffering from acute allergy, urticaria. The aim of this study was the specification of casually significant allergen depending on sex and age. Results of testing are processed by a method of the mathematical analysis, raised in nomograms according to

which, considering the nosological entity of disease, sex and age of a patient, it's defined causally significant allergen.

Keywords: nomographic method, children, etiology, acute allergy, urticaria, scarification.

Table 4 - The acute allergosis, urticaria, (significant allergens)

Allergens	Age (years)					
	4-8 years		9-12 years		13-18 years	
	boys	girls	boys	girls	boys	girls
Pollen	Ambrosia Maple Linden Sagebrush Sunflower Rye Hazel Oak Chestnut Acacia	Oak Poplar Hazel Fescue Rye Ambrosia	Ambrosia Willow Sage-brush Walnut Nettle Chestnut Acacia Linden Sunflower Rye Alder Dandelion Hazel Oak Birch Plantain	Ambrosia Sagebrush Poplar Elder Acacia Linden Walnut Rye Timothy grass Orach Brome grass	Ambrosia Linden Acacia Poplar Oak Walnut Rye Sagebrush Sunflower Elder Chestnut	Ambrosia Sagebrush Corn Hazel Poplar Maple Chestnut Acacia Linden Sunflower Rye Wheat grass Plantain Ryegrass Walnut Elder
Household	House dust	Tests doubtful or negative	House dust	House dust	House dust	House dust
Epidermal	Hair of a dog cat rabbit	Hair of a dog cat sheep	Hair of a dog cat rabbit sheep	Hair of a dog sheep	Hair of a dog cat rabbit	Hair of a dog cat rabbit
Alimentary	Strawberry orange fish chicken eggs potatoes cucumber	orange strawberry chicken eggs cucumber	Chocolate orange strawberry tomatoes plum cucumber fish chicken eggs buckwheat	Strawberry chocolate fish orange peach sweet cherries raspberry grapes plum lemon chicken eggs potatoes rice cereal	Strawberry orange lemon chocolate peach cucumber chicken eggs fish cherry raspberry milk potatoes	Chocolate orange strawberry grapes apricot sweet cherry plum chicken eggs fish buckwheat wheat groats rice cereal potatoes milk tomatoes cucumber