UDC 616-056.3-053.2-02-072
DEFINITION OF THE ETIOLOGIC SPECTRUM
OF ACUTE ALLERGOSIS, URTICARIA IN
CHILDREN, ACCORDING TO AGE AND SEX
USING NOMOGRAPHIC METHOD
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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
of these conditions are having good prospects. We offered a non-invasive, high-economic
and prevention of these conditions are having good
economic aspects for the purpose of well-timed correction
simultaneous search for techniques prior in social and
reduction of invasive methods of research in children and
specific methods of detection of allergic pathology,
diffusion of allergic diseases [1, 2, 3, 4].

As the table 1 testifies, number of children with an acute
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 sensibilization 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 sensibilization 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

<table>
<thead>
<tr>
<th>Nosological form</th>
<th>Age(years)</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4–8</td>
<td>9–12</td>
</tr>
<tr>
<td></td>
<td>girls</td>
<td>boys</td>
</tr>
<tr>
<td>Acute allergosis</td>
<td>21</td>
<td>21</td>
</tr>
</tbody>
</table>

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 \( \alpha \),
\((i = \overline{1, n})\), 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 \( \alpha \) for each
of allergen groups was carried out on formulas:

\[ b_j = \alpha \ast a_j; \quad S_j = \sum_{i=1}^{n} \alpha_i a_j, \]

where \( a_j \) – is a test value for each of allergen groups;
\( b_j \) – is a recalculated with the coefficient \( \alpha \) 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 hyperergic 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).
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.

<table>
<thead>
<tr>
<th>Number of children</th>
<th>Age (years)</th>
<th>Group of allergens</th>
<th>+</th>
<th>++</th>
<th>+++</th>
<th>++++</th>
<th>∑ (total)</th>
</tr>
</thead>
<tbody>
<tr>
<td>21</td>
<td>4-8</td>
<td>alimentary</td>
<td>2.5</td>
<td>0</td>
<td>26.7</td>
<td>4.8</td>
<td>34.2</td>
</tr>
<tr>
<td>34</td>
<td>9-12</td>
<td></td>
<td>0</td>
<td>20.8</td>
<td>0.6</td>
<td>0</td>
<td>21.4</td>
</tr>
<tr>
<td>42</td>
<td>13-18</td>
<td></td>
<td>2.3</td>
<td>20.8</td>
<td>0</td>
<td>7.2</td>
<td>30.3</td>
</tr>
<tr>
<td>21</td>
<td>4-8</td>
<td>pollen</td>
<td>8.8</td>
<td>3.6</td>
<td>0</td>
<td>0</td>
<td>12.4</td>
</tr>
<tr>
<td>34</td>
<td>9-12</td>
<td></td>
<td>4.4</td>
<td>0.6</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>42</td>
<td>13-18</td>
<td></td>
<td>33.6</td>
<td>26.4</td>
<td>0</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>21</td>
<td>4-8</td>
<td>household</td>
<td>16</td>
<td>0</td>
<td>1.2</td>
<td>0</td>
<td>17.2</td>
</tr>
<tr>
<td>34</td>
<td>9-12</td>
<td></td>
<td>4</td>
<td>1.4</td>
<td>0</td>
<td>1.8</td>
<td>7.2</td>
</tr>
<tr>
<td>42</td>
<td>13-18</td>
<td>epidermal</td>
<td>9.8</td>
<td>0</td>
<td>2.1</td>
<td>0</td>
<td>11.9</td>
</tr>
<tr>
<td>21</td>
<td>4-8</td>
<td></td>
<td>15.2</td>
<td>3.2</td>
<td>0</td>
<td>3.6</td>
<td>14</td>
</tr>
<tr>
<td>34</td>
<td>9-12</td>
<td></td>
<td>7.2</td>
<td>0</td>
<td>2.1</td>
<td>0</td>
<td>12.1</td>
</tr>
<tr>
<td>42</td>
<td>13-18</td>
<td></td>
<td>10</td>
<td>0</td>
<td>2.1</td>
<td>0</td>
<td>12.1</td>
</tr>
</tbody>
</table>

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 sagebrush, 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, sagebrush. 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.

<table>
<thead>
<tr>
<th>Allergens</th>
<th>Age (years)</th>
<th>4-8 years</th>
<th>9-12 years</th>
<th>13-18 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>boys</td>
<td>girls</td>
<td>boys</td>
</tr>
<tr>
<td><strong>Pollen</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Ambrosia</td>
<td>Oak</td>
<td>Ambrosia</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Maple</td>
<td>Poplar</td>
<td>Willow</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Linden</td>
<td>Hazel</td>
<td>Sage-brush</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sagebrush</td>
<td>Fescue</td>
<td>Walnut</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sunflower</td>
<td>Rye</td>
<td>Nettle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rye</td>
<td>Ambrosia</td>
<td>Chestnut</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hazel</td>
<td>Linden</td>
<td>Acacia</td>
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<td></td>
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<td>Oak</td>
<td>Sunflower</td>
<td>Sunflower</td>
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<td></td>
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<td>Chestnut</td>
<td>Rye</td>
<td>Rye</td>
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<td></td>
<td></td>
<td>Acacia</td>
<td>Alder</td>
<td>Timothy</td>
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<td></td>
<td></td>
<td>Poplar</td>
<td>Dandelion</td>
<td>grass</td>
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<td></td>
<td></td>
<td>Oak</td>
<td>Hazel</td>
<td>Orach</td>
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<td></td>
<td></td>
<td>Birch</td>
<td>Sunflower</td>
<td>Brome grass</td>
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<tr>
<td></td>
<td></td>
<td>Plantain</td>
<td>Plantain</td>
<td>Plantain</td>
</tr>
<tr>
<td><strong>Household</strong></td>
<td></td>
<td>House dust</td>
<td>Tests doubtful or negative</td>
<td>House dust</td>
</tr>
<tr>
<td><strong>Epidermal</strong></td>
<td></td>
<td>Hair of a dog</td>
<td>Hair of a dog</td>
<td>Hair of a dog</td>
</tr>
<tr>
<td></td>
<td></td>
<td>cat rabbit</td>
<td>cat rabbit</td>
<td>cat rabbit</td>
</tr>
<tr>
<td><strong>Alimentary</strong></td>
<td></td>
<td>Strawberry orange fish chicken eggs potatoes cucumber</td>
<td>Strawberry chocolate fish orange peach sweet cherries chicken eggs plum lemon chicken eggs potatoes rice cereal</td>
<td>Strawberry chocolate fish orange peach sweet cherries chicken eggs plum lemon chicken eggs potatoes rice cereal</td>
</tr>
</tbody>
</table>
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.

References
4. Miasoedov V.V. Scientific work № 27506 "Supplement to the allergic diseases in children examination protocols. (The order of Ministry of Health of Ukraine, 12.27.2005, № 767 About affirmation of the allergic diseases in children examination and treatment protocols"). "Alignment chart for causative allergens determination".

ОПРЕДЕЛЕНИЕ ЭТИОЛОГИЧЕСКОГО СПЕКТРА ОСТРОГО АЛЕРГОЗА, КРАПИВНИЦЫ У ДЕТЕЙ В ЗАВИСИМОСТИ ОТ ПОЛА И ВОЗРАСТА НОМОГРАФИЧЕСКИМ МЕТОМ

Шмулич В.К., Прохоренко А.А., Ішенко Т.Б., Урывачева М.К., Самоноченко В.І., Дзикевич Л.А., Шмулич О.В., Старусева В.В., Ашеулов А.М., Реунова Н.М., Запороць І.А.

В работе представлены результаты аллергического тестирования 181 ребенка, больных острым аллергозом, крапивницей. Целью исследования явилось уточнение причинно-значимого allergена 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 allergen.

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

УДК 616-056.3-053.2-02-072

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

Шмулич О.В., Запороць І.А.

У роботі подано результати алергічного тестування 181 дітей, хворих на гострий алергоз, крапив’янку. Метою дослідження стало уточнення причинно-значимого allergена залежно від статі та віку.

Результати тестування оброблені використанням математичного аналізу, приведені в номограми, відповідно до яких, враховуючи нозологічну форму хвороби, стать та вік пацієнта, визначено причинно-значимий allergen.

Ключові слова: номографічний метод, діти, етиологія, гострий алергоз, крапив’янка, скарификація.

УДК 616-056.3-053.2-02-072

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


In this work there are presented the results of allergy tests 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)**

<table>
<thead>
<tr>
<th>Allergens</th>
<th>Age (years)</th>
<th>4-8 years</th>
<th>9-12 years</th>
<th>13-18 years</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>boys</td>
<td>girls</td>
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<td>Pollen</td>
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<td>Ambrosia</td>
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<td>Orach</td>
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<td>Brome grass</td>
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<tr>
<td>Household</td>
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<tr>
<td>House dust</td>
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<td>Tests</td>
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<td>doubtful</td>
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<td></td>
<td>or negative</td>
<td></td>
<td></td>
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<tr>
<td>Epidermal</td>
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<td></td>
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<tr>
<td>Hair of a dog</td>
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</tr>
<tr>
<td>cat</td>
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</tr>
<tr>
<td>rabbit</td>
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<td></td>
</tr>
<tr>
<td>Alimentary</td>
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<td></td>
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</tr>
<tr>
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