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Optimization of the laboratory diagnosis of allergies with regard to regional peculiarities

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Children, allergy, laboratory diagnosis

Allergic pathology is one of the pressing issues in contemporary medicine. The urgency of the problem is primarily due to the prevalence of allergic diseases – in particular, according to the data provided by the European Association of allergologists and clinical immunologists, 150 million Europeans suffer from allergy, and in the following decade this number will increase up to 300 million. In the Western countries the prevalence of allergic rhinitis reaches up to 30 %, of bronchial asthma – up to 20%, of allergic dermatitis – up to 15% and of food allergies – up to 8% [2]. Allergic diseases significantly reduce the patient's quality of life and are often the cause of disability [3, 4]. These diseases are a heavy economic burden to both families and the society. It is estimated that only direct expenses for the treatment of asthma in Europe make up €3.6 billion on medicine and €4.3 billion on medical care [5].

The most important task during the treatment of allergic diseases is the determination of cause-significant allergens. The foregoing is necessary in case of food allergy for prescribing elimination diets as well as in the event of respiratory forms of allergies for conducting both elimination measures and allergen-specific immunotherapy.

Food allergy is the first temporal development form of sensitization and has significant influence on the formation and subsequent development of all allergic diseases of children. Different countries have their own regional food allergens, which depend on the climate and geographical location of the country and characteristics of the population’s diet. Pursuant to the data provided by the World Organization of Allergists, different countries have different patterns of food sensitation: that is, in the USA and Switzerland, apart from egg and milk allergy, peanut allergy is also a common one, while in Germany and Japan the most prominent allergen is wheat, in Spain it is fish, and in Israel - sesame [6].

Allergens that play a part in the development of respiratory allergic diseases (bronchial asthma, allergic rhinitis) also have substantial regional distinctions due to the diversity of climate, flora, periods of plant pollination, properties of pollen (in particular, the change of its allergenic qualities depending on the ecological state of the environment). Significant differences in the spectrum of pollen sensitization, the time of the onset and the duration of clinical symptoms of pollinosis may also be observed even within the territory of one country.

Nowadays the identification of specific IgE by means of ELISA is widely practiced in Ukraine for the diagnostics of food and respiratory allergies. Most laboratories offer identification of specific IgE in the form of panels, the composition of which does not entirely correspond with our regional peculiarities. For instance, a pediatric panel includes: milk, chicken egg protein, home dust, a mixture of alder and birch pollen, oak pollen, wormwood pollen, mites, dog and cat epidermis, crabs, shrimp mixture, fungus, ambrosia, timothy, soya beans and rye. Nevertheless, it is known that food allergy prevails at an early age (children under 3 year old), and therefore the determination of sensitization to pollen does not make sense. On the other hand, it is also not necessary to determine sensitization to shrimps, cancroids, mushrooms and soya, because these products are not included in the diet of young children. Some food panels include products (peanuts, sesame, cocoa, shellfish, spinach, and others), the determination of sensitization to which is also irrelevant due to the fact that they are not typical for our population's diet.

A broad spectrum for pollen allergens is marked depending on the geographical zones – in particular, the main reason for polinosis in the central regions of the European part of Russia is the pollen of meadow grasses and trees (birch, alder, walnut, maple, oak); in Belarus it is the pollen of wild and cultivated cereals; in Kazakhstan - wormwood pollen, hemp and cereals, in Italy it is cereals, nettle, birch and olive; in India – eucalyptus and acacia [1,7,8]. The composition of the panels of pollen allergens should also be reviewed with regard to the data of regional airplane research.

Research objective: determining the relevant food and pollen allergens in the Kharkiv region for the optimization of laboratory diagnosis of allergic diseases among children.

Materials and methods: a retrospective analysis of 790 medical histories of children aged 3-17 years with allergic diseases has been conducted; the children were examined during 2010-2013 in the Regional children's allergy centre of Hospital №1. The identification of food and pollen sensitization was carried out by means skin prick-testing and the identification of

specific IgE in the serum through ELISA. The results were processed by methods of variation statistics using "Microsoft Excel" and "BIOSTAT" (2006) on a Pentium IV PC.

Results and their discussion. 54 (51.4%) of the patients had their causative food allergens determined by skin prick-tests, and 51 (48.6%) of the patient had their specific IgE determined. The total number of identified allergens was 47. We have combined all the allergens in groups according to the generality of the antigenic structure: cow protein (milk, beef), chicken protein (albumen, yolk, meat), fish (carp, hake, pollack), gluten cereals (wheat, rye, oats, barley), gluten-free cereals (rice, buckwheat, millet, maize), Rosaceae (strawberry, wild strawberry, apricot, peach, raspberry, cherry, sweet cherry, plum, apple, pear), citrus fruits (orange, lemon, mandarin), Solanaceous (tomato, potato), carrot, legumes (beans, peas, cocoa), pork, Cucurbitaceae (watermelon, pumpkin, melon, cucumber), as well as cabbage, beetroot, onions, banana, currants, black tea, grapes (Fig.1).

As seen in Fig.1, it was fish, legumes, berries and fruits of the Rosaceae family, citrus fruits, Solanaceous, chicken protein, cow's milk protein and cereals that most frequently caused sensitization among examined children; vegetables and fruits (banana, pumpkin, onion, beetroot, cabbage, currants) caused sensitization a little bit less frequently. The received data differs from the one presented in medical literature, according to which sensitization to peanuts, seafood, eggs is the most common one.

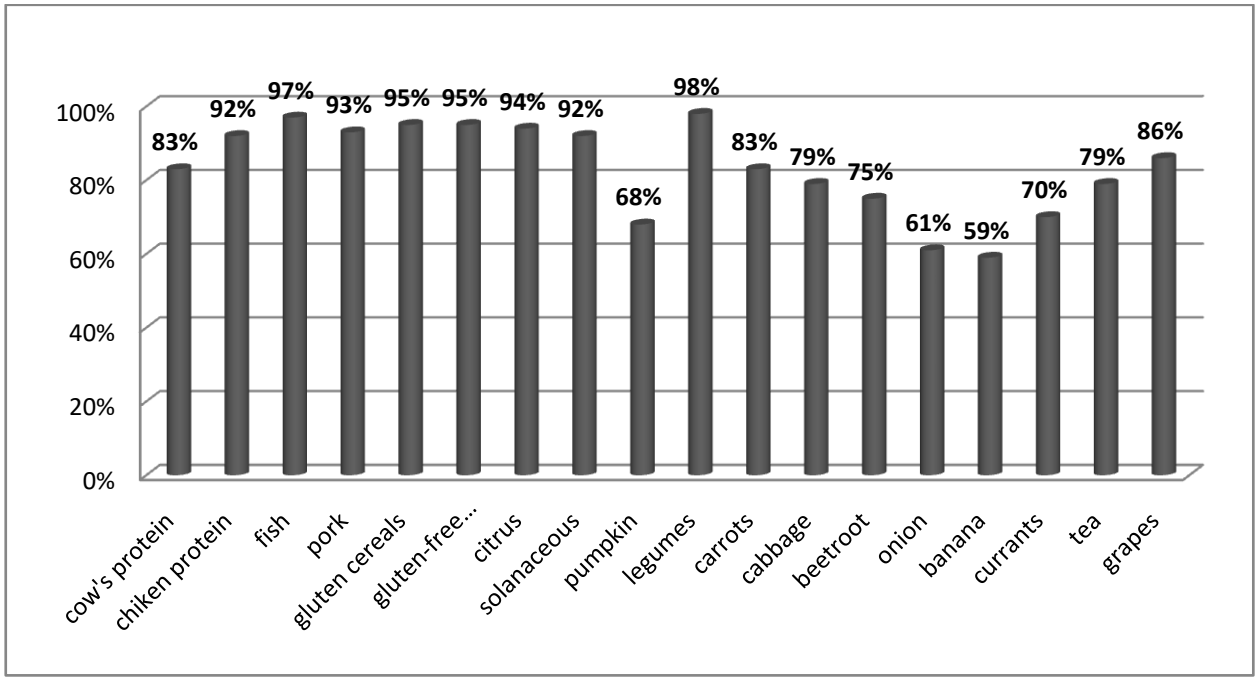

Fig.1.Distribution of food allergen sensitization in the main group

685 children were subjected to allergy testing with pollen allergens. Consequently, it was found that 311 children (45.04%) had high sensitization to pollen allergens. The obtained results are presented in table 1, with plants ranked in descending order of their allergic properties:

Table 1

Characteristic of pollen sensitization among children of the Kharkiv region.

№	Name of allergens	Number of detections	Presence of sensitization	
			n	%
1.	Ambrosia artemisiifolia	305	168	55,08
2.	Dandelion	306	140	45,75
3.	Artemisia absinthium	306	122	39,87
4.	Populous	397	118	39,73
5.	Cyclachaena xantifolia	228	90	39,47
6.	Helianthus annuus	305	120	39,34
7.	Buckwheat satio	215	81	37,67
8.	Lignorum setthim ante	215	80	37,21
9.	Rumex	215	78	36,28
10.	Festuca pratensis	306	111	36,27
11.	Poa pratensis	301	100	33,22
12.	Acer	248	82	33,06
13.	Alnus aglutinosa	305	99	32,46
14.	Lolium perenne	229	73	31,88
15.	Plantago	291	92	31,62
16.	Avis-cerasis lignum	215	67	31,16
17.	Quercus	244	74	30,33
18.	Salix	215	65	30,23
19.	Tilia	292	85	29,11
20.	Dactylis glomerata	285	79	27,72
21.	Betula	306	84	27,45
22.	Seniorem	291	79	27,15
23.	Triticum	285	77	27,02
24.	Chenopodiaceae	306	80	26,14

25.	Juglans	292	73	25
26.	Cinis	215	52	24,19
27.	Alopecurus pratensis	301	72	23,92
28.	Urtica diodica	288	65	22,57
29.	Festuca pratensis	306	69	22,55
30.	Aesculus hippocastanu	292	65	22,26
31.	Corylus avellana	304	67	22,04
32.	Item carpinus	215	42	19,53
33.	Zea mays	306	58	18,95
34.	Pinus silvestris	241	41	17,01
35.	Picea	214	36	16,82
36.	Phleum pratense	259	40	15,44
37.	Agropyrum repens	241	26	10,79

Most of the children (276 patients, which constitutes 88.7 %) demonstrated polyvalent sensitization.

The analysis of pollen sensitization helped identify the most representative allergenic taxa for the Kharkiv region – weeds (ambrosia, artemisia absinthium, cyclachaena xantifolia). Among trees the populus, lignorum setthim ante, acer, alnus aglutinosa and quercus were ranked first by allergic properties. Betula pollen is a common cause of allergic rhinitis in many areas. In the Kharkiv region, it ranks 21st and is the cause of sensitization among 28% of patients with allergic diseases. In addition, an unusually high sensitization to pollen, dandelion (46 %) and rumex (36 %) is observed.

Conclusions

1. The identified relevant regional food allergens include: fish, legumes, berries and fruits of the Rosaceae family (strawberry, wild strawberry, apricot, peach, raspberry, cherry, sweet cherry, plum, apple, pear, citrus, chicken protein, cow's milk protein.
2. The regional differences in the spectrum of pollen sensitization were defined. In particular, the most representative allergenic taxa in the Kharkiv region are weeds (ambrosia, artemisia absinthium, cyclachaena xantifolia), dandelion, buckwheat satio, rumex and trees such as populus, lignorum setthim ante, acer, alnus aglutinosa, quercus.

3. During the preparation of test panels manufacturers are recommended to determine food and pollen allergens separately, because they have different significance for children depending on the nosological form and the period of childhood.
4. During the preparation of test panels manufacturers or specialists should arrange the allergens with regard to the relevant regional factors which have specific climatic and geographical distinctions.

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Оптимизация лабораторной диагностики аллергии с учетом региональных особенностей

Клименко В.А., Карпушенко Ю.В., Серветник А.В.

Резюме. Аллергическая патология является одной из наиболее актуальных проблем современной медицины. При лечении аллергических заболеваний наиболее важным является определение причинно – значимых аллергенов. Для диагностики пищевой и респираторной аллергии в настоящее время в Украине широко используют определение специфических IgE в сыворотке крови. Большинство лабораторий предлагают определение специфических IgE в виде панелей, состав которых не вполне соответствует нашим региональным особенностям. В статье представлены результаты анализа 790 историй болезней детей 3-17 лет с аллергопатологией. Сенсибилизация к аллергенам выявлялась путем определения специфических IgE в сыворотке крови и кожными прик-тестами. В результате выявлены релевантные пищевые аллергены: рыба, бобовые, клубника, земляника, абрикос, персик, малина, вишня, черешня, слива, яблоко, груша, цитрусовые, куриный белок, белок коровьего молока. Репрезентативные пыльцевые аллергены Харьковского региона: амброзия, полынь, циклахена, одуванчик, гречка посевная, щавель конский, тополь, акация, клен, ольха, дуб. Для оптимизации лабораторной диагностики в Харьковском регионе при составленнии тест-панелей рекомендовано отдельно определять пищевые и пыльцевые аллергены с учетом их релевантности . Состав панелей пыльцевых аллергенов следует пересматривать, учитывая данные региональных аэропалинологических исследований.

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Оптимізація лабораторної діагностики алергії з урахуванням регіональних особливостей

Клименко В.А., Карпушенко Ю.В., Серветник А.В.

Резюме. Алергічна патологія є однією з найбільш актуальних проблем сучасної медицини. При лікуванні алергічних захворювань найбільш важливим є визначення чинно-значущих алергенів. Для діагностики харчової та респіраторної алергії в теперішній час в Україні широко використовують визначення специфічних IgE у сироватці крові. Більшість лабораторій пропонують визначення специфічних IgE у вигляді панелей, склад яких не

зовсім відповідає нашим регіональним особливостям. В статті наведені результати аналізу 790 історій хвороб дітей 3-17 років з алергопатологією. Сенсибілізація до алергенів виявлялась шкірними тестами та визначенням специфічних IgE в сироватці крові. Виявлені релевантні харчові алергени: риба, бобові, полуниця, суниця, абрикос, персик, малина, вишня, черешня, слива, яблуко, груша, цитрусові, курячий білок, білок коров'ячого молока. Репрезентативні пилкові алергени Харківського регіону: амброзія, полин, цикламена, кульбаба, гречка посівна, щавель кінський, тополя, акація, клен, вільха, дуб. Для оптимізації лабораторної діагностики в Харківському регіоні при складанні тест-панелей рекомендовано окремо визначати харчові та пилкові алергени з урахуванням їх релевантності . Склад панелей пилкових алергенів слід переглядати, враховуючи дані регіональних аеропалінологічних досліджень.

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Optimization of the laboratory diagnosis of allergies with regard to regional peculiarities

V.A. Klymenko, J.V. Karpushenko, A.V. Servetnik

Summary. Allergic pathology is one of the pressing issues in contemporary medicine. The most important task during the treatment of allergic diseases is the determination of cause-significant allergens. Nowadays the identification of specific IgE is widely practiced in Ukraine for the diagnostics of food and respiratory allergies. The majority of the laboratories offer the identification of specific IgE in the form of panels, the composition of which is not exactly in conformity with our regional peculiarities. This article presents the results of the analysis of 790 medical histories of children aged 3-17 years with allergic pathology. The identification of food and pollen sensitization was carried out by means skin prick-testing and the identification of specific IgE in the serum. The following relevant food allergens were detected: rice, legumes, strawberry, wild strawberry, apricot, peach, raspberry, cherry, sweet cherry, plum, apple, pear, citrus, chicken protein, cow's milk protein. Moreover, the representative pollen allergens of the Kharkiv region were identified: ambrosia, wormwood, cyclamen, dandelion, buckwheat sowing, sorrel horse, poplar, acacia, maple, alder, oak. In order to optimize the laboratory diagnostics in the Kharkiv region, it is recommended to identify food and pollen allergens separately with regard to their relevance when preparing test panels. The composition of the panels of pollen allergens should also be reviewed with regard to the data obtained from regional airplane research.