ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-3, ISSUE-4

REALITY OF MODERN ALLERGOLOGY, ALLERGY DIAGNOSTICS

Abdurasulova Tajixol Ramazanovna
Termez branch of Tashkent medical academy
Davronova Charos Luqmonovna
Termez branch of Tashkent medical academy
O'razaliyev Sunnat Yusufjon o'g'li.
Termez branch of Tashkent medical academy

Abstract: The article provides a review of the literature on current and promising directious for the identification and treatment of allergic diseases. Furthermore, the component resolved allergy diagnosis and the use of microarray technology – ISAC – are being considered to determine the level of IgE antibodies to various allergenic molecules.

Keywords: allergen extract, cross-reactivity syndrome, molecular component allergy diagnostics, recombinant allergens, IgE antibodies, molecular allergology, molecular allergy diagnostics, immunosorbent allergen chip.

Allergy is a distorted, namely specific increased sensitivity of the immune system to an allergen as a result of an inadequate response of the immune system

IgE and allergic diseases

IgE was discovered in 1967 [1]. Subsequent studies have proven the role of IgE in the development of type I hypersensitivity. Specific antibodies of class E are synthesized by B cells as a result of the first entry of allergens into the body, which is predisposed to the development of allergies. IgE circulates in the blood and binds to high-affrin receptors (Fce RI) on the surface of mast cells in various organs and on blood basophils. This condition is called sensitization. With the development of sensitization, there are no manifestations of allergy. With repeated contact of the sensitized organism with the causative allergen, symptoms of allergic diseases develop. The development of allergy symptoms is based on IgE-dependent activation of mast cells and basophils. As a result of activation of the latter, a cascade of biochemical processes is triggered, leading to degranulation of mast cells and basophils, followed by the release of a number of biologically active substances, in particular histamine, and the secretion of eicosanoids. The biological properties of these bioactive molecules determine clinical manifestations [2–5].

Thus, the significance of the IgE-mediated immune response in the pathogenesis of type I allergic diseases has been established. Subsequently, it was found that the cause of degranulation may be not only the binding of the allergen to the IgE/FceRI complex, but also other influences leading to an increase in the intracellular Ca2+ concentration with subsequent degranulation of mast cells and basophils. For example, the binding of anaphylotoxins to mast cell receptors [3, 6–8].

An allergen (mainly proteins or substances of a polysaccharide nature with low molecular weight) in the immunological sense is an antigen that, upon first entry into an organism predisposed to the development of allergies, is capable of forming specific class E antibodies, and upon subsequent intakes, binding IgE, i.e. . An allergen is a special type of antigen [2].

Cross allergy

In recent years, the area of fundamental allergies - cross-reactivity, cross-sensitization syndrome (CSS) and the concept of panallergens - has been actively studied with special attention [9–10].

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

VOLUME-3, ISSUE-4

Cross allergy (CA) is an allergic reaction resulting from increased sensitivity to several allergens that are similar in structure. The study of PA mechanisms has become possible only in recent decades thanks to the development of molecular biology. PA can occur in plants, both within the same species and among plants of different species. Each species has species-specific allergenic epitopes (parts of the antigen that directly interact with the antibody) and antibodies produced against them bind only to the epitopes of that particular species. Species-specific allergenic components are the primary sensitizing molecules - the main sensitizer. Proteins with similar structures are often present in closely related species and in phylogenetically distant groups of plants and animals. Antibodies against these structures cause cross-reactivity. Most often, patients with food allergies have pollen cosensitization. PA can also be observed in response to plants, cosmetics, medications and other allergens. Thus, an identical complex of amino acids can be detected in stimuli that are completely unexpected for humans. A striking example of PA is an allergy to latex and peanuts, because... they contain an almost identical set of amino acids. This is why PA is very dangerous, because... a person may not even expect the development of allergic reactions. Specially compiled tables of cross allergens can help determine what PA is present for.

According to statistics, patients with monosensitization are much less common than patients with multipositive results [10].

Identifying the spectrum of sensitization, formulating a diagnosis and prescribing allergen-specific immunotherapy (ASIT) become significantly more complicated if the results of traditional methods of allergy-specific examination reveal polysensitization and clinical and anamnestic data are not sufficiently informative [1].

Panallergens are proteins that share highly conserved sequences, structures, and functions. They are responsible for many IgE-mediated cross-reactions between different sources of plant pollen and food allergens [2]. In other words, allergenic proteins that cause cross-reaction are called panallergens [9].

Allergen molecules are classified into protein families depending on their structure and biological function.

Over the past 2 decades, 14 superfamilies (groups) of pathogenic proteins (PR-pathogenesis related proteins) harmful to the human body, which are allergens, representatives of which can be found in a wide range of natural sources, have been described and identified [4].

Thus, proteins of the PR-10 superfamily can be found in birch pollen, hazel pollen, apple, peach, carrot, peanut, soybean, kiwi and celery. Another example is that one of the reasons for cross-reactivity to various vegetables with an allergy to birch pollen is the presence of profilin in both pollen and food of plant origin. Thus, profilins are plant allergens with pronounced cross-reactivity between phylogenetically distant species.

Another important property of protein is its stability. Allergens are divided into 2 groups: resistant to heat and the action of digestive enzymes and unstable. Allergens, which are thermally stable and capable of maintaining their immunogenicity after the action of digestive enzymes, are most likely to cause severe clinical reactions, including the development of anaphylaxis [5].

The main representatives of allergen superfamilies: PR-10, or Bet v 1 homologs of profilins, lipid transfer proteins (LTP), prolamins - storage proteins, polkalcins (Ca-binding proteins), cross-reactive carbonate determinants (SSD) [8].

Allergens of animal origin with pronounced cross-reactivity - tropomyosins, serum albumins, lipocalins, parvalbumins [9].

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

THE MULTIDISCIPLINARY JOURNAL OF SCIENCE AND TECHNOLOGY

VOLUME-3, ISSUE-4

Diagnosis of type I allergic diseases

Discussion of issues of allergy diagnostics, the relevance of this problem in practical medicine: every third person around the world is diagnosed with one or more allergic diseases. This topic is the most relevant because it affects both adults and children. Moreover, it is also known that in recent years the course of allergic diseases has become noticeably more severe [2].

Currently, in the patient examination scheme, the first place is taken by the medical history, on the basis of which the most likely causative allergens are searched, which is confirmed or refuted by methods of specific clinical allergy diagnostics (in vivo) and in serological tests to determine specific IgE (in vitro).

In vivo allergy diagnostics - skin testing, provocative tests with allergens, elimination test. The most widely used skin tests are the prick test and the prick test. Skin testing is a method of identifying specific sensitizations in the body by administering a variety of natural allergen extracts through the skin and assessing the inflammatory response. For more than 130 years, this method has served allergists: the method is considered highly specific, accessible, and extremely rarely causes the development of generalized reactions. As a rule, skin tests are performed during the period of remission of an allergic disease.

Despite its universal use, a number of researchers focus on the limitations of this method, in particular for diagnosing allergies to drugs and lack of information - the possible development of false-negative and false-positive reactions [3].

Laboratory allergy diagnostics (in vitro) is a modern trend in allergology. The object of analysis is blood and its serum. One of the main advantages of these methods is their complete safety for the patient. Laboratory allergy diagnostics determines the level of total IgE and detects specific Ig class E, specific for specific allergens. For the first time, at the end of the 60s of the twentieth century, a radioallergosorbent test was developed that allows the determination of class E antibodies specific to water-salt extracts of allergens [4]. In the next 40 years, to determine the level of specific IgE, laboratory allergy diagnostic methods were based on the following immunological research methods [3]:

- ELISA – enzyme immunoassay;
- CHLA – chemiluminescent immunoassay;
- ICA – immunochromatographic analysis;
- Immunoblotting.

In medical practice, the method of enzyme immunoassay on a nitrocellulose membrane, the “immunoblotting” method, best meets modern requirements. This system is based on the following principle: the most common allergens are applied to the surface of nitrocellulose membranes (immunoblot). For an immune reaction, the patient’s serum is added to the container containing the nitrocellulose membrane. The advantage of the method is the simple and quick analysis of a whole set of allergens (up to 20) in one operation (Rida Allergyscreen, immunoblot R-Biopharm AG, Germany).

Traditionally, tests for detecting IgE antibodies are qualitative or semi-quantitative (by class).

Allergy diagnostic methods are constantly being improved. Today the most effective method is ImmunoCAP. ImmunoCAP is an immunofluorescence method, truly quantitative for measuring total IgE, specific IgE to the whole allergen, as well as its components, in particular recombinant allergens, which open up new opportunities in the diagnosis and treatment of allergic

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

diseases. ImmunoCAP is a tool for detecting ultra-low, minimal concentrations of specific IgE antibodies. The World Health Organization has designated ImmunoCAP technology as the gold standard for allergy diagnostics.

In common practice, tests for the detection of IgE antibodies are based on the use of allergen extracts. Allergen extracts are complex mixtures containing allergenic proteins, non-allergenic protein molecules and other ballast substances. In many substances, allergenic components are represented not by one protein, but by a whole set. For example, 32 different proteins that are part of peanuts and can cause an allergic reaction have been isolated and described; 5 of them are the most significant [5]. Moreover, the spectrum of sensitivity within the same allergen may vary among different people. For example, the main allergenic component of birch pollen causes allergies in 95% of cases where people have an allergic reaction to birch pollen, but there are other components that may cause allergies in some patients and not in others.

In recent literature, an allergen may refer to the source of the allergen (for example, birch pollen), an extract of allergenic proteins, or the only allergenic component of the allergen source.

As allergy diagnostics developed, it turned out that when using an extract, the specificity of this method is somewhat lower than we would like. The reasons are as follows:

• Variability of allergenic extracts. For example, pollen from early flowering trees obtained at different latitudes is different.

• Isolation of extracts may vary from manufacturer to manufacturer.

• The approach to isolating allergenic extracts is aimed at isolating as much total protein as possible rather than isolating the allergenic components that cause allergies.

In the 90s of the twentieth century, instead of allergen extracts, it was proposed to use individual purified or recombinantly obtained allergenic molecules (AM) to diagnose type I allergies. Methods for diagnosing allergic diseases using individual purified or recombinantly obtained AMs in the English-language scientific literature are usually called “component-resolved diagnostics,” which means molecular or component allergy diagnostics [9].

Allergenic components can be obtained either by isolating purified ones from natural sources (natural highly purified allergens) or artificially using molecular cloning technology (recombinant allergens). A recombinant allergen is an artificially produced protein. The essence of the technology for producing recombinant proteins is that a certain section is cut out from the genome of a plant and then inserted into the genome of a bacterium. After which the bacterium begins to produce the desired protein. Most existing recombinant allergens are expressed in Escherichia coli cells. The yeast Kluyveromyces lactis is also used to express recombinant allergens (RAs). But before using RA in allergy diagnostics, it is necessary to test it for immunogenicity and allergenicity [8]. To indicate the method of obtaining a component, the name is preceded by the letter “r” if the protein is recombinant, and the letter “n” if it is natural.

The use of component allergy diagnostics makes it possible to identify sensitization to a specific component (detailed analysis of sensitization) to assess the prognosis of the disease, the risk of developing systemic reactions, the choice of therapeutic tactics, and to predict the effectiveness of ASIT [2].

The next step in allergy diagnostics is the microarray technology, which today is the newest promising method for determining the level of IgE antibodies to allergens - the immunosorbent allergy chip or immuno-solid-phase method or ISAC. The first report on the development of ISAC was published in 2002 [3]. The essence of the method: to determine the level of IgE antibodies,

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

VOLUME-3, ISSUE-4

nanotechnology and the principles of "microarray" are used, exclusively "n" and "R" allergenic components immobilized on the solid phase (biochip technology) are used. Results are determined semi-quantitatively in ISAC standardized units (ISU) using a biochip scanner.

A special advantage of the test: even very low concentrations of IgE antibodies to more than a hundred allergenic components are detected in a minimal amount of blood (venous or capillary blood is used). ImmunoCAP ISAC allows you to detect sensitization to a large number of allergens simultaneously in one study. The ISAC technique is characterized by high accuracy and specificity: it determines true and cross-reactive sensitization in patients with allergic diseases. The applicability, specificity, significance and informativeness of this method both in research and clinical allergology are widely discussed in the literature [5]. However, these data are very ambiguous. Thus, there are reports of the use of microchip technology (ImmunoCAP ISAC) for the accurate diagnosis of a number of allergic diseases and the effective implementation of ASIT [3]. On the contrary, R.G. Hamilton [4], having analyzed in detail the advantages and disadvantages of the method, and also taking into account its high cost and complex scheme for interpreting the results, expressed the opinion that ISAC is a tool for epidemiological population studies, and in clinical allergology it is better to use traditional methods of laboratory allergy diagnostics.

Thus, one of the most modern promising areas in allergology is the development of molecular allergology, molecular allergy diagnostics. The use of recombinant allergens and biochip technology to determine the level of IgE antibodies to various allergenic molecules makes it possible to identify sensitization not only to the allergen in general, but also to establish to which specific allergen specific IgE are synthesized, to differentiate true IgE-mediated sensitization and cross-reactivity in patients with polyvalent sensitization, assess the risk of developing systemic reactions, the effectiveness of allergen-specific immunotherapy, which will clearly lead to a reduction in the growth of allergic diseases.

ISSN: 2582-4686 SJIF 2021-3.261,SJIF 2022-2.889,
2023-5.384 ResearchBib IF: 8.848 / 2023

VOLUME-3, ISSUE-4

Literature:

1. Ishizaka K., Ishizaka T. Physioshemical properties ofreaginic antibody. I Association of reaginic activity with an immunoglobulin other than gamma A or gamma G globulin. J. Allergy. 1967; 37: 169–185.

2. Ярилин А.А. Иммунология. М.: 2010. – С. 609–611. / Yarilin A.A. Immunologiya. M.: 2010; 609–611. [in Russian]

3. Ройт А., Бростофф Дж., Мейл Д. Иммунология. М.: 2000. – С. 418–430. / Royt A., Brostoff Dzh., Meyl D. Immunologiya. M.: 2000; 418–430. [in Russian]

4. Hamilton R.G., Allergic sensitization is a key risk factor for but not synonymous with allergic disease. J. Allergy Clin. Immunol. 2014; 134: 360–361 [Cross Ref].

5. Баранова А.А., Хаитов Р.М. Аллергология и иммунология. М.: 2010. – С. 16– 19. / Baranova A.A., Khaitov R.M. Allergologiya i immunologiya. M.: 2010; 16– 19. [in Russian]

6. Пыцкий В.И., Адрианова Н.В., Артомасова А.В. Аллергические заболевания. М.: 1999. – С. 91–102. / Pytskiy V.I., Adrianova N.V., Artomasova A.V. Allergicheskie zabolevaniya. M.: 1999; 91–102. [in Russian]

7. Хаитов Р.М. Клиническая аллергология. М.: 2002. – С. 138–144. / KhaitovR.M. Klinicheskaya allergologiya. M.: 2002; 138–144. [in Russian]

8. Бережная Н.М., Бобкова Л.П., Петровская И.А., Ялкут С.И. Аллергология, словарь – справочник. Киев., 1986. – 22–23. / Berezhnaya N.M., Bobkova L.P., Petrovskaya I.A., Yalkut S.I. Allergologiya, slovar' – spravochnik. Kiev: 1986; 22– 23. [in Russian]

9. Балаболкин И.И. Пищевая аллергия у детей: современные аспекты патогенеза и подходы к терапии и профилактике. Иммунология, аллергология, инфектология. – 2013. – № 3. – С. 36–46. / Balabolkin I.I. Pishchevaya allergiya u detey: sovremennye aspekty patogeneza i podkhody k terapii i profilaktike. Immunologiya, allergologiya, infektologiya 2013; 3: 36–46. [in Russian]

10. Сновская М.А., Кожевникова О.В., Геворкян А.К., Торшхоева Р.М., Намазова-Баранова Л.С. Факторы риска развития атопических болезней и современные методы диагностики. Педиатрическая фармокология. – 2010. – Т. 7. № 5. – С. 99–103. / Snovskaya M.A., Kozhevnikova O.V., Gevorkyan A.K., Torshkhoeva R.M., Namazova-Baranova L.S. Faktory riska razvitiya atopicheskikh bolezney i sovremennye metody diagnostiki. Pediatricheskaya farmokologiya. 2010; 7: 5: 99–103. [in Russian]