

# ALLERGEN-SPECIFIC MARKERS OF NASAL SECRET IN CHILDREN WITH COMBINED FORMS OF RESPIRATORY ALLERGOSIS

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## Abstract

The paper presents the results of a study of allergen-specific markers in nasal secretions of children with combined forms of respiratory allergosis, including allergic rhinitis and bronchial asthma. A comprehensive analysis of the content of specific IgE, Th2-type cytokines (IL-4, IL-5, IL-13) in nasal secretions was performed in comparison with the indicators of the control group. A significant increase in the concentrations of these markers was found in patients with combined allergies, which reflects the high activity of local eosinophilic inflammation. The identified correlations between the levels of nasal specific IgE and IL-5 and the severity of clinical symptoms confirm the diagnostic and prognostic significance of these indicators.

**Keywords:** Respiratory allergy, allergic rhinitis, bronchial asthma, nasal secretions, IgE, cytokines; ECP, children.

## Introduction

In recent decades, there has been a steady increase in the prevalence and severity of allergic diseases, which are caused by immune system cells, regulatory molecules (cytokines and chemokines), and their corresponding receptors[3,5]. In allergology, ideas about the molecular and cellular mechanisms of allergic reactions are being updated and expanded at a particularly rapid pace, and new pathogenetically based methods of therapy and disease prevention are being sought[3].

Cytokines regulate the interaction of cells in allergic reactions, ensure the maturation of the main cells involved in allergic inflammation from their precursors, their proliferation, differentiation, activation, and mobilization to the site of the allergic reaction, and participate in the regulation of the form and strength of the specific response to an allergen[1]. Allergic diseases are classified as immune-mediated diseases. They are characterized by impaired immune regulation, chronic inflammation, and tissue damage. Despite the advances in immunology, the cytokine mechanisms





of allergic diseases are still not fully understood, and further research is needed to investigate the role of immunocytes and cytokines in the pathogenesis of allergic inflammation[7,8].

Respiratory allergies, such as allergic rhinitis and bronchial asthma, often occur in combination in children. According to various studies, these conditions have a common pathophysiological basis, including IgE-mediated sensitization, airway hyperreactivity, and mucosal inflammation. However, the diagnosis and monitoring of disease activity are often limited to clinical symptoms and laboratory indicators in the blood, which does not always reflect the local (nasal) condition of the nasal mucosa[2,4]. The study of markers present in nasal secretions (local specific IgE, cytokines, ECP, etc.) allows to assess the degree of inflammation severity directly at the site of allergen exposure. There are studies confirming that specific IgE to house dust mites, pollen allergens, as well as cytokines and inflammatory mediators are found in nasal secretions and correlate with the severity of rhinitis symptoms[6,8].

**The aim of the study:** to study the features of the immune status, local and systemic cytokine profile of nasal secretions in allergic diseases in children.

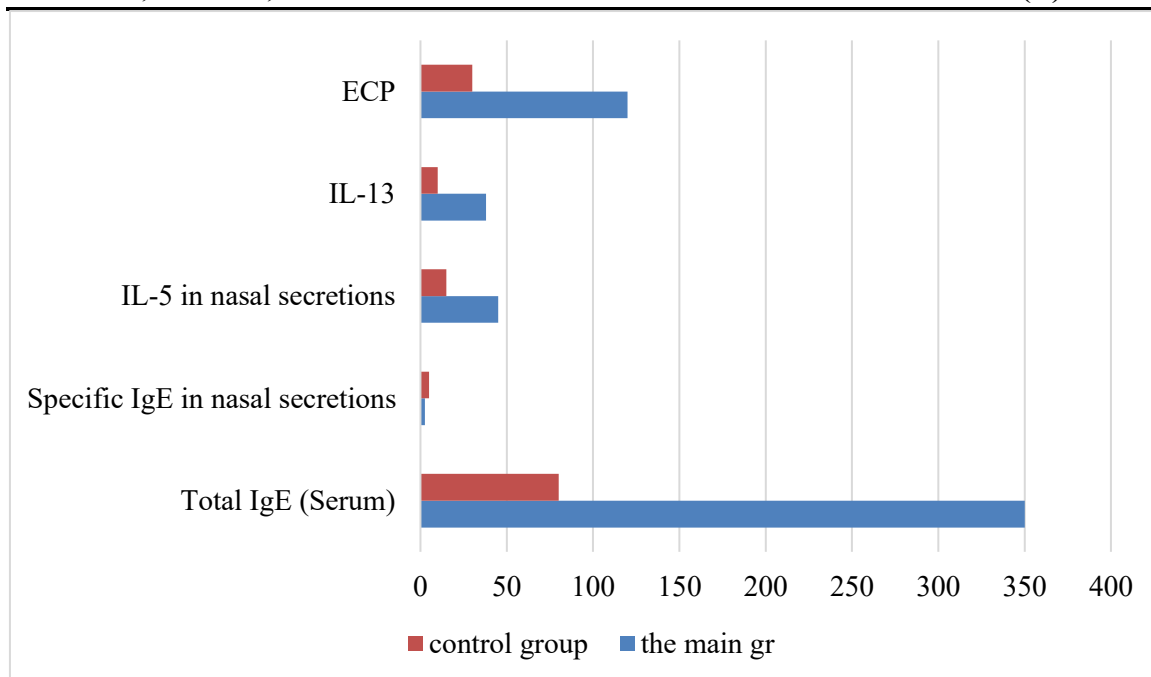
### Materials and Methods

The study involved 44 children aged  $12.6 \pm 0.7$  years with combined forms of hay fever, allergic rhinitis + bronchial asthma, confirmed both clinically and laboratory (serum specific IgE, skin allergy tests or in vitro analysis). The control group consisted of healthy children without manifestations of allergy and atopy. Allergological history was conducted: duration of diseases, seasonality, level of asthma control (according to GINA criteria), severity of rhinitis symptoms (according to ARIA scales), and presence of drug therapy. In nasal secretions, the following were determined: total and specific IgE, IL-5, IL-13, and eosinophil cationic protein (ECP) using enzyme-linked immunosorbent assay methods. Additionally, statistical analysis, correlation analysis between marker levels and the severity of clinical manifestations, and multivariate analysis were performed to identify independent predictors.

### Research results and their discussion

The results of the study confirmed that children with combined forms of allergic rhinitis and bronchial asthma have significantly increased levels of allergen-specific IgE and markers of eosinophilic inflammation (ECP, IL-5, IL-13) in nasal secretions compared to the control group. The level of specific IgE in nasal secretions may be a more sensitive indicator than its concentration in the serum when it comes to local allergic reactions. Studies, for example, have shown the presence of specific IgE and IgA in the secretions of patients with allergic rhinitis, and their correlation with ECP, IL-8, and VEGF.





**Fig.1 Average values of cytokines, IgE, and ECP in the study groups**

Cytokines reflect the shift of the immune response towards an allergic phenotype, which contributes to increased inflammation, mucus secretion, and hyperreactivity. Correlations: the level of IL-5 and ECP was closely correlated with the severity of eosinophilia in nasal mucosal smears ( $r = 0.65$ ,  $p < 0.01$ ). Specific IgE in the secret showed a correlation with the frequency of asthma exacerbations and the degree of nasal congestion ( $r = 0.60$ ,  $p < 0.05$ ). Multivariate regression analysis showed that the levels of nasal specific IgE and IL-5 are independent predictors of poor asthma control in this group of children.

### Conclusion

Children with combined forms of respiratory allergosis showed a significant increase in allergen-specific IgE in nasal secretions, as well as markers of eosinophilic inflammation (IL-5, IL-13, ECP), compared to the control group. Nasal markers, especially specific IgE and IL-5, can serve as independent predictors of disease severity, symptom control, and the likelihood of exacerbations. The introduction of nasal secret analysis into clinical practice (provided that the collection and analysis methods are standardized) can improve the accuracy of diagnosis, monitoring, and personalized therapy in children with allergic rhinitis and asthma.

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