



## Cellular Responses and Therapeutic Approaches in Nasal Allergy

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### DESCRIPTION

Nasal allergies, medically referred to as allergic rhinitis, represent one of the most common immunologically mediated conditions affecting the upper respiratory tract. This disorder occurs when the immune system overreacts to environmental allergens such as pollen, dust mites, mold spores or animal dander. The reaction triggers the release of chemical mediators, primarily histamines, from mast cells and basophils, leading to a cascade of inflammatory responses. These responses manifest as symptoms including sneezing, nasal congestion, itching and rhinorrhea, which can significantly affect an individual's quality of life. In recent years, advances in immunology have provided a deeper understanding of the molecular and cellular mechanisms underlying nasal allergies. Research has shown that the condition involves both innate and adaptive immune responses, where antigen-presenting cells process allergens and activate T helper type 2 lymphocytes. This activation promotes B cells to produce immunoglobulin E, which binds to effector cells and triggers the release of inflammatory mediators upon subsequent exposure to the allergen. Understanding these mechanisms has been important in developing therapeutic approaches that go beyond symptomatic treatment to target the underlying immune dysregulation. The prevalence of nasal allergy has been increasing globally, affecting populations across all age groups. Genetic predisposition plays a significant role in susceptibility, with family history of allergic disorders being a major risk factor. Environmental factors, such as air pollution, climate variations and urbanization, also contribute to the rising incidence. Seasonal variations influence the severity of symptoms, with pollen allergies peaking during spring and early summer, whereas perennial allergens such as dust mites and indoor molds can trigger symptoms year-round. Epidemiological studies indicate that nasal allergy is often associated with comorbid conditions, including asthma, sinusitis and atopic dermatitis. This interconnectedness underscores the importance of a multidisciplinary approach in management and highlights the systemic nature of immune-mediated disorders.

Recent advancements in immunology have transformed the diagnostic landscape of nasal allergy. Traditional diagnostic methods, such as skin prick tests and serum specific IgE measurements, remain widely used due to their reliability and cost-effectiveness. However, novel approaches, including component-resolved diagnostics and molecular allergology, allow for more precise identification of allergen sensitivities at a molecular level. These techniques not only improve diagnostic accuracy but also guide personalized treatment strategies. In addition, research in immunotherapy has shown promising results in modifying the natural course of allergic diseases. Allergen-specific immunotherapy involves the administration of gradually increasing doses of allergens to induce immune tolerance. This method has demonstrated long-term efficacy and potential disease-modifying effects, distinguishing it from conventional pharmacological treatments that primarily provide symptomatic relief. Pharmacotherapy continues to play a critical role in managing nasal allergy. Antihistamines, corticosteroids, leukotriene receptor antagonists and decongestants are commonly used to reduce inflammation and alleviate symptoms. Intranasal corticosteroids, in particular, are considered the most effective single-agent therapy for moderate to severe cases. However, the limitations of pharmacological interventions, such as incomplete symptom control and potential side effects with long-term use, have led to increasing interest in alternative and complementary therapies. Nutritional interventions, probiotics and lifestyle modifications are being explored for their immunomodulatory potential. The integration of these strategies with conventional treatments may offer a more holistic approach, addressing both symptom management and immune system regulation.

In conclusion, nasal allergy represents a complex immune-mediated condition with significant clinical and societal impact. Advances in immunology have elucidated the cellular and molecular mechanisms underlying allergic responses, paving the way for targeted therapies and personalized treatment approaches. While pharmacological interventions remain essential for symptom control, immunotherapy and emerging biologics provide promising options for long-term disease

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modification. Continued research, interdisciplinary collaboration and public health strategies are critical to addressing the growing prevalence of nasal allergy and improving the quality of life for affected individuals. The

evolving understanding of nasal allergy and its immunological basis underscores the potential for innovative approaches that not only manage symptoms but also modulate the immune system to achieve lasting relief and prevention.