



Investigating the Immunological Basis and Emerging Therapeutic Approaches for Food Allergy Worldwide

Meera Raghavan *

Department of Pediatrics and Allergy, All India Institute of Medical Sciences, New Delhi, India

DESCRIPTION

Food allergy is an adverse immune response that occurs when the body mistakenly identifies a harmless dietary protein as a threat, triggering an exaggerated immune reaction. It represents a growing global health concern, affecting millions of children and adults and posing significant medical, nutritional and psychosocial challenges. The prevalence of food allergies has been steadily increasing over recent decades, particularly in industrialized nations, reflecting changes in environmental exposures, dietary habits and immune system development. The most common allergenic foods include cow's milk, eggs, peanuts, tree nuts, soy, wheat, fish and shellfish, although regional dietary patterns influence the types of allergens that predominate.

The immunopathogenesis of food allergy involves complex interactions between genetic predisposition, environmental factors and immune regulation. Upon re-exposure, these IgE antibodies bind to receptors on mast cells and basophils, leading to the rapid release of histamine and other mediators responsible for clinical symptoms. The resulting cascade can produce mild manifestations such as urticaria and gastrointestinal discomfort or severe, life-threatening reactions like anaphylaxis. Non-IgE-mediated food allergies, mediated by T cells, are slower in onset and typically present with gastrointestinal symptoms such as vomiting, diarrhea and malabsorption.

Several risk factors contribute to the development of food allergies, including family history of atopy, early-life exposure to environmental allergens and alterations in the gut microbiota. The "dual allergen exposure hypothesis" proposes that sensitization to food allergens occurs through skin exposure, especially in individuals with disrupted skin barriers, while early oral exposure may promote immune tolerance. This has influenced preventive strategies, leading to revised guidelines recommending the early introduction of allergenic foods

such as peanuts and eggs in infants to reduce allergy risk. The "hygiene hypothesis" also plays a role, suggesting that reduced microbial exposure in modern environments leads to an imbalance in immune regulation and increased allergic susceptibility.

Clinically, food allergies can manifest across a wide spectrum of severity and organ systems. Symptoms may appear within minutes or hours of ingestion and include cutaneous reactions like hives and angioedema, respiratory symptoms such as wheezing and throat tightness, gastrointestinal disturbances and cardiovascular collapse in severe cases. Diagnosis requires a thorough clinical history supported by laboratory investigations. Skin prick testing and serum-specific IgE measurements are commonly used for identifying sensitization, while oral food challenges remain the gold standard for confirming diagnosis under medical supervision. Distinguishing true food allergies from intolerances or other non-immunologic reactions is critical to ensure appropriate management.

Management of food allergies primarily centers on allergen avoidance and emergency preparedness. Patients must be educated on reading food labels, recognizing cross-contamination risks and identifying hidden allergens in processed foods. For individuals at risk of severe reactions, carrying an epinephrine auto-injector at all times is essential, as epinephrine remains the first-line treatment for anaphylaxis. Adjunctive medications, including antihistamines and corticosteroids, can help alleviate mild or delayed symptoms but should never replace epinephrine in emergencies. Nutritional counseling plays a vital role, particularly in children, to ensure balanced diets and prevent nutrient deficiencies associated with food elimination.

Recent advances in research have introduced novel therapeutic strategies aimed at inducing desensitization and long-term tolerance. Oral Immunotherapy (OIT), which involves the gradual administration of increasing amounts of an allergen under medical supervision, has shown significant success in

Correspondence to: Meera Raghavan, Department of Pediatrics and Allergy, All India Institute of Medical Sciences, New Delhi, India, E-mail: meera@aiims.ac.in

Received: 31-Jul-2025, Manuscript No. JAT-25-30276; **Editor assigned:** 04-Aug-2025, Pre QC No. JAT-25-30276 (PQ); **Reviewed:** 18-Aug-2025, QC No JAT-25-30276; **Revised:** 25-Aug-2025, Manuscript No. JAT-25-30276 (R); **Published:** 01-Sep-2025, DOI: 10.35248/2155-6121.25.16.433

Citation: Raghavan M (2025) Investigating the Immunological Basis and Emerging Therapeutic Approaches for Food Allergy Worldwide. J Allergy Ther. 16:433.

Copyright: © 2025 Raghavan M. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

reducing sensitivity to foods such as peanuts and milk. Other approaches, including sublingual and epicutaneous immunotherapy, are being investigated to improve safety and convenience. Biologic therapies targeting key molecules in the allergic cascade, such as omalizumab (anti-IgE) and dupilumab (anti-IL4 receptor), are also demonstrating promising results in enhancing tolerance and reducing reaction severity. These emerging treatments mark a shift from strict avoidance toward proactive immune modulation, offering hope for long-term disease modification.

Environmental and lifestyle factors play a significant role in the global variability of food allergy prevalence. Westernized diets, reduced microbial diversity and urban living have been linked to increased allergic disease rates, while traditional diets and higher microbial exposure in rural settings appear protective. Climate change and global food distribution have also altered allergen exposure patterns, contributing to the emergence of new food allergies in previously unaffected regions. Public health policies focusing on allergen labeling, school safety programs and emergency response training are essential to reduce morbidity and mortality associated with food allergies.

Despite progress, disparities persist in diagnosis and management between developed and developing nations.

Limited access to trained allergists, diagnostic facilities and life-saving medications such as epinephrine auto-injectors remains a major barrier in low-resource settings. International collaboration is needed to establish uniform diagnostic criteria, promote education and ensure equitable access to care. Organizations such as the World Allergy Organization (WAO) and the European Academy of Allergy and Clinical Immunology (EAACI) continue to play vital roles in advancing global standards and awareness.

CONCLUSION

In conclusion, food allergy represents a complex and evolving global health issue rooted in immune dysregulation, genetic susceptibility and environmental influences. While avoidance remains the cornerstone of management, groundbreaking research in immunotherapy and biologic treatments offers renewed optimism for long-term tolerance induction. Greater international cooperation, patient education and healthcare accessibility are essential to improving outcomes and reducing the burden of food allergies worldwide. Through continued innovation and awareness, the global community can move toward safer, more effective and life-enhancing management strategies for individuals affected by food allergies.