PRIMEVIEW

FOOD ALLERGY

nature REVIEWS DISEASE PRIMERS

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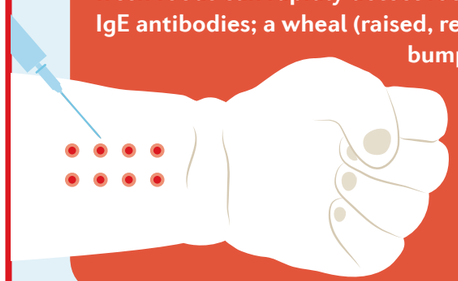
Food allergy is an umbrella term that describes many clinical entities. However, the common mechanism of food allergy is the breakdown of clinical and immunological tolerance against ingested foods. Its most-severe form — anaphylaxis — is immediate, can involve several organ systems and can induce life-threatening hypovolaemic shock and respiratory compromise.

EPIDEMIOLOGY

Epidemiological evaluations of food allergy are lacking and tend to focus on anaphylaxis as a proxy for all allergy. Accordingly, prevalence is difficult to determine but available data on peanut allergy suggest increasing prevalence in developed countries such as the United Kingdom and the United States.

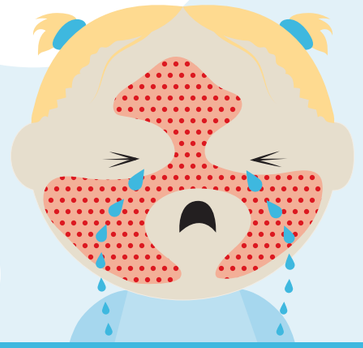
DIAGNOSIS

Double-blind placebo-controlled food challenge is the gold standard for diagnosis, but many protocols are available and it is costly to implement. Typically, a medical history is used to identify the food and quantity suspected of eliciting the reaction, to characterize symptoms and to note other factors associated with the reaction (such as NSAID use). Additionally, a skin prick test with commercial extracts or fresh foods can rapidly detect food-specific IgE antibodies; a wheal (raised, red, itchy bump) >10 mm in diameter indicates a high likelihood of an allergic reaction.



PREVENTION

Over the past decade, the risk factors of developing food allergy have become increasingly understood. In turn, hypotheses that explain increased risk have developed, which have implications for potential preventive strategies.

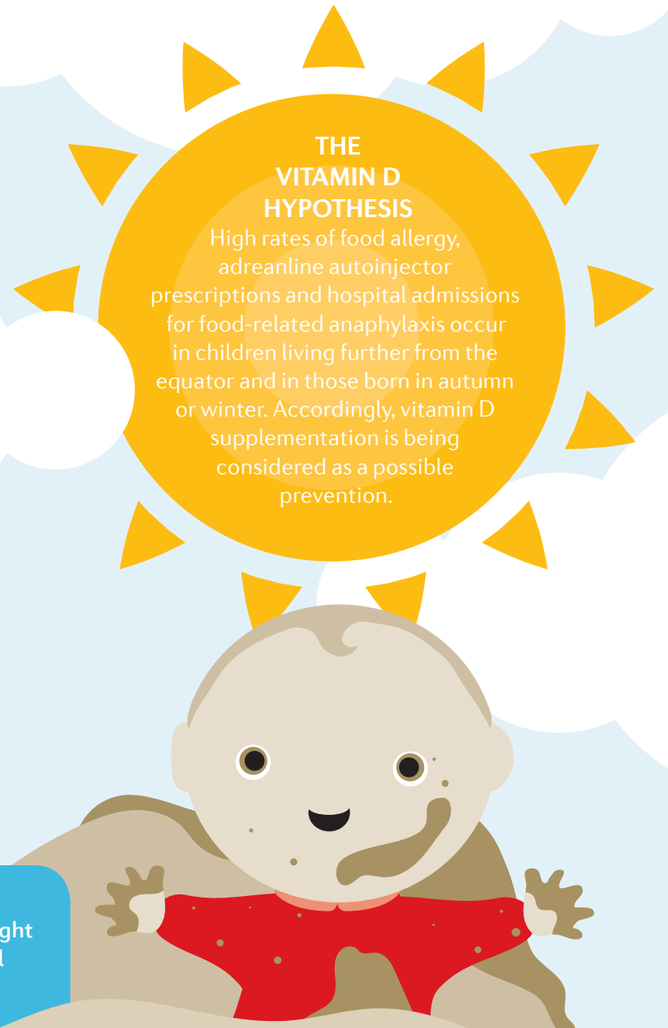


THE DUAL-ALLERGEN HYPOTHESIS

Disrupted skin barrier function in infant eczema might cause allergen sensitization through environmental exposure via the skin (rather than orally), but given the trend to avoid allergenic solid foods, the induction of oral tolerance fails and food allergy develops. The concept of early introduction of allergenic foods as a prevention measure is increasingly being tested in clinical trials.

THE VITAMIN D HYPOTHESIS

High rates of food allergy, adreanline autoinjector prescriptions and hospital admissions for food-related anaphylaxis occur in children living further from the equator and in those born in autumn or winter. Accordingly, vitamin D supplementation is being considered as a possible prevention.



THE HYGIENE HYPOTHESIS

A lack of exposure to microbes and infections in early childhood might increase susceptibility to allergic disease by altering the development of the immune system. Factors associated with increased microbial exposure, such as exposure to pets, childcare attendance and the presence of older siblings, might have protective effects against developing food allergy.

OUTLOOK

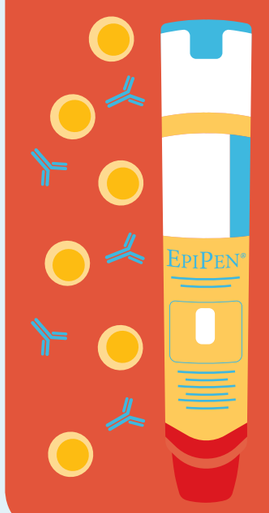
Early life events play a critical part in the development of food allergies, but how they shape immune and metabolic response patterns is not yet clear. Furthermore, many individuals with food allergy will naturally outgrow it over time. Research to better understand these phenomena will provide the foundation for definitive preventive measures in the future.

MECHANISMS

In people with immediate hypersensitivity food allergy, food-specific IgE antibodies develop that trigger intestinal mast cell activation and expansion — a process that is under the control of allergen-specific $CD4^+$ effector T (T_{eff}) cells. Mast cells elicit a range of physiological responses such as vasodilation, increased vascular permeability and the activation of nerves that mediate itch. These IgE-mediated reactions are suppressed by the activity of regulatory T (T_{reg}) cells, a tolerant state that is dominant in non-allergic individuals. The factors that influence the breakdown of tolerance (that is, the balance of T_{eff} and T_{reg} cell activity) are only somewhat understood, but probably include the products of commensal and pathogenic microorganisms, injury to the intestinal epithelium and the effects of antigen exposure at other sites, particularly the skin.

Non-IgE-mediated food allergy can also occur, but the reactions are typically slower, involve eosinophils and can cause gastro-oesophageal reflux and dysphagia (difficulty swallowing).

MANAGEMENT



Strict allergen avoidance is the only causal 'therapy' for food allergy, although immunotherapies are under investigation. Patients who are at risk for severe allergic reactions must carry medication for immediate self-treatment following unintentional ingestion at all times, such as an adrenaline autoinjector.

Written by Mina Razzak; designed by Laura Marshall

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