Food Allergy

Molecular and Clinical Practice

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Preface

Allergy-related diseases are today recognized as reaching epidemic proportions, with up to 30% of the general population suffering from clinical symptoms ranging from urticaria, rhinitis and asthma to life-threatening anaphylactic reactions.

The main contributors to the increasing prevalence of allergy seem to be very diverse including increasing immunological predisposition ('atopy'), changing food consumption and well as living conditions. The dramatic increase of allergic diseases is not only seen in the developed world, but increasing evidence indicates that also developing countries are considerably affected. Already over fifty percent of the world population is living in Asia, where not only food consumption, but also food allergies are very different from what is mainly published from Western countries. In the research efforts in the field of food allergy two main questions are often asked: What makes one person allergic to a particular food and not the other? Furthermore, Why are some foods and food proteins more allergenic than others? In addition it is very difficult to predict the severity of clinical reaction and the amount of allergen required to elicit these reactions.

Major food allergens from a small number of sources were identified and purified as early as the 1970s. A boost in the number of newly identified allergens was elicited by the general availability of recombinant DNA technology in the late 1980s. The ever-growing IUIS Allergen Nomenclature Database contains currently over 840 allergens from 252 sources and their isoforms and variants. Currently we know about 290 food allergens from 98 different food sources.

Recent developments into the molecular nature of allergenic proteins enabled us to classify most allergens into few protein families with limited biochemical function. Allergenic proteins can be classified into approximately 130 Pfam protein families, while the most important plant and animal food allergens can be found in 8 protein superfamilies and is discussed in detail in Chapters 1 and 2.

The correct diagnosis of a food allergy can be complex, but includes a convincing clinical history as well as the presence of elevated levels of specific IgE antibody to allergenic proteins in a given food. Therefore, detailed knowledge about the food specific allergenic proteins is central to a specific and sensitive diagnostic approach. The different allergens of peanut, egg, fish, shellfish and food contamination parasites and their diagnostic application are detailed in Chapters 3 to 7.

The food industry is one of the largest employers of workers with about 10% and therefore is the allergic sensitisation to food borne proteins at the workplace not surprising. Workers at increased risk of allergic sensitisation include farmers who grow and harvest crops; factory workers involved in food processing, storage and packing; as well as those involved in food preparation (chefs and waiters) and transport and is detailed in Chapter 8.

Research in food allergies and allergens is much more complex than investigating inhalant allergens since food proteins often undergo extensive modifications during food processing. Furthermore these allergenic proteins are embedded in a complex matrix and may undergo physicochemical changes during digestion and subsequent uptake by the gut mucosal barrier and presentation to the immune system, and have been highlighted in Chapter 9.

Furthermore, food processing results often in water-insoluble proteins, which makes the traditional serological analysis of allergenicity difficult as well as detection and quantification in the food matrix. The approaches and problems of quantifying allergen residues in processed food are detailed in Chapter 10.

To characterize allergens better but also develop better diagnostic and therapeutics, recombinant allergens are increasingly utilized.

Unlike natural allergens or allergen extracts, the production of recombinant proteins is not dependent on biological source material composed of complex mixtures of allergen isoforms. The use of recombinant allergens has revolutionized diagnosis, enabling clinicians to identify disease eliciting allergens as well as cross-reactivity pattern, thereby providing us with the tools necessary for personalized allergy medicine and therapeutics and is detailed in Chapter 11.

Food allergy is a growing problem globally carrying a huge socioeconomic burden for patients, families and the community. Although fatalities are fortunately rare, the fear of death is very real for each patient. Currently, there is no cure for any food allergy available, with management strategies focusing on complete avoidance and utilization of adrenaline as the emergency antidote for anaphylaxis. There is a very strong imperative for safe and effective specific therapeutics for food allergy and one strategy based on T-cell epitopes for peanut allergy is detailed in Chapter 12.

We hope that the joined effort by the authors will not only provide pragmatic information for current food allergy research but also serves as a foundation for significant new research that will advance our current knowledge.

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