Introduction

This discussion is concerned only with IgE-mediated allergy and natural allergens found in food. It does not take into consideration possible antigenicity of additives used for preservation, flavoring, or food-cosmetic purposes.

Definition of Terms

Scientific as well as clinical work in allergy must satisfy strict criteria as to specificity and precision. It is therefore necessary to be specific and precise with respect to the terms used. Allergy refers to hypersensitivity reactions caused by immune reactions that are harmful to the tissues or disruptive of the physiology of the host. The immune reaction triggers complex biochemical and/or inflammatory sequences which result in clinical symptoms. The symptoms depend on the degree of reactivity of the involved tissue receptors and of the effector cells. An allergen is an antigenic molecule that takes part in the immune reaction which results in allergy. A food allergen, for instance, is an allergen found in food. The allergic source is the substance that contains allergens. And an immunogen is a molecule, or part of it, that is able to initiate the proliferation of immunocompetent lymphocytes or to trigger the synthesis of specific antibodies.

Food Allergens Are (Mostly) Proteins

All natural allergens thus far known to react with IgE antibodies have been shown to be proteins. Many of these are glycoproteins, which...
means that they contain one or more sugar molecules in addition to the amino acids [1–6].

A protein is made up mainly of a number of amino acids bound together in peptide linkages, with or without a few additional carbohydrate residues in the primary structure. Each amino acid is characterized by its side chain – a chemically active site with a certain physiochemical power. Side chains contribute to the final shape and the power field of the molecule, as does any carbohydrate residue present. The chain or sequence of amino acids is twisted and is given its final shape through conformational changes due to the chemical forces between the side chains, which then fold the molecule into its tertiary structure. Chemical forces from outside also influence the final shape and the net chemical power of the molecule.

The amino acids can be said, as it were, to represent letters in a chemical alphabet containing a total of 20 different such letters. Carbohydrate molecules inserted in the amino acid chain act as additional letters. Combinations of these chemical letters in different ways create a multitude of words (peptide fragments) and phrases (proteins) in the language of protein chemistry. Some of the words are made by the amino acid “letters” as found in the original sequence of the chain; these are referred to as sequential denominators. Others are made when amino acid “letters” that are remote in the primary sequence chain are brought close together by folding of the chain. The latter are termed conformational denominators.

The complex mixture of proteins found in allergen sources and in extracts of allergenic foods can be demonstrated by a number of techniques, such as sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE), isoelectrofocusing (IEF), PAGE or starch gel electrophoresis with immunoprinting, and crossed radioimmunoelectrophoresis (CRIE). A wide variety of modifications of these and similar methods have been used, and new methods are being invented. We can rightly speak of “immunoacrobatics” in this connection. Progress in protein separation methods has been an important propagator in this field of immunology, and immunology has propagated progress in protein separation and characterization. Many possibilities have been opened for those interested. This is not to say, however, that this is easy work. On the contrary, it is a demanding, tedious, and time-consuming process full of challenges, problems, and pitfalls.