Editorial

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EuroPrevall Food Allergen Library

Food allergy represents a health problem of great public concern. It is generally acknowledged that 2–4% of the adult population and 6–8% of children suffer from food allergic symptoms. As an inappropriate immune response of individuals who are genetically predisposed to develop allergic immune responses (so called atopic individuals), the presence of specific IgE antibodies raised against usually harmless and non toxic proteins of plant or animal origin, is a diagnostic criterion of food allergy. By contrast, various food intolerances are due to multiple enzymatic or physiological shortcomings.

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Symptoms of food allergy range from mild local reactions to life threatening generalised symptoms. Although it is well established that inhalant allergies have increased in the last two decades the area of food allergy lacks reliable prevalence data and only a limited number of small sized studies has been performed.

A dozen of food sources are generally thought to account for around 90% of the food allergic cases. These food sources are covered by the new labelling regulations of the European Commission (EC). Irrespective of the concentration in the resulting food, the following ingredients have to be labelled: milk, egg, fish, peanut, tree nuts, celery, mustard, crustacean, soybean, cereals, and sesame seeds. More recently lupine and molluscs have been added to the list. For some of these foods the relevance seems to be restricted to certain geographic regions and dietary habits. This accounts for example for celery being a relevant cause of food allergies in Austria, Germany, France and Switzerland. Mustard has been identified as an important allergen source in Spain, fish is frequently eliciting food allergic symptoms in regions where it is consumed on a regular daily basis, and allergy to sesame seeds is also restricted to areas where it is recommended as a supplement with nutritional value. Other food allergies seem to be on the rise across Europe, as suggested for peanut, milk, egg, and tree nuts. Fruits are missing on the labelling list, albeit the prevalence of fruit allergy appears to be high across Europe. Cereals are listed for patients with celiac disease but are of minor relevance for food allergy.

In the recent past intensive research activities have been undertaken in identifying relevant allergens from various foods, and to isolate these molecules in order to characterise their physico-chemical and immunological properties. Also genes encoding many food allergens have been cloned by various strategies to produce recombinant allergens. Purified allergens rapidly became an important tool in food allergy research.

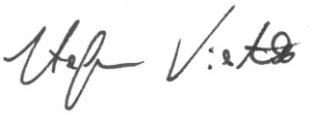
Diagnosis of food allergy is primarily based on a convincing case history and demonstration of allergen-specific sensitization, either by *in vitro* (specific IgE antibodies) or *in vivo* (skin prick) testing. Food challenges under controlled circumstances can provide direct proof of food allergy but cannot always be performed. All *in vitro* and *in vivo* testing with allergen reagents relies on the physical detection or biological reactivity of allergen-specific IgE. The sensitivity of the individual test therefore depends on the quality of the allergen preparation used. Although total protein extracts of the suspected food are routinely used, the concept of component resolved diagnostic assays has gained rising interest in the recent past. Such assay systems utilise well defined and highly purified individual allergens instead of extracts, as there is hope to establish an improved correlation between IgE specific to individual molecules and the clinical situation, *e.g.* the severity of food allergic reactions.

In addition, purified food allergens are used in model studies on the impact of food processing or digestion on the allergenicity of food proteins and to analyse structures and epitopes causing food allergic reactions. Studies have shown that structural features such as folding, posttranslational modification or glycation may be important for allergenicity. However, in many cases the quality of food allergen material used was poorly defined or not fully comparable between different studies so that misleading or divergent results would be possible.

This issue is intended as a first step to fill a gap in the field. It is dedicated to state of the art purification and characterisation methods of food allergens. Within the EC funded integrated project, EuroPrevall, a food allergen library was established, comprising known and newly identified allergens from various foods. The aim of the allergen library is to collect, in an international team effort, purified allergen material with defined and comparable quality to be used in further studies in the field of molecular allergology.

In this context existing allergen purification protocols were improved and expression strategies for producing recombinant allergens were evaluated and optimized. Subsequently, authentication of the highly pure protein batches were performed using state of the art methods including MALDI-TOF mass spectrometry, tandem mass spectromenty and N-terminal amino acid sequencing. Tertiary structures were evaluated by high resolution one-dimensional ^{1}H NMR spectroscopy; secondary structure was evaluated by far-UV circular dichroism spectroscopy. Allergenic activity was studied by IgE ELISA, IgE immunoblotting and cellular basophil activation tests, using selected sera from a panel of food allergic subjects. In the first round, 31 allergens from ten foods including many of the EC labelling list (apple, peach, hazelnut, peanut, celery, cow's milk, goat's milk, hen's egg, fish, and shrimp) were produced and purified by leading scientists in this field and for the first time characterised to a comparable extent. Although the quality of the material was not fully identical for all preparations, the amount of structural and immunological data collected will undoubtedly allow a thorough interpretation of data collected in subsequent studies.

The international team collaborating within EuroPrevall consists of more than 60 partner organisations. The highly interesting panel of allergens described in the present special issue will now be available to this group for molecular studies including diagnostic studies using either a protein chip or the classical ImmunoCAP format in well characterised patient panels recruited across Europe. Allergic immune responses to individual molecules developing in newborns will be studied too, and model studies on the impact of the food matrix and food processing will be performed on the basis of this well defined material. Thus we are confident to read much more about our allergen collection in the near future!



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