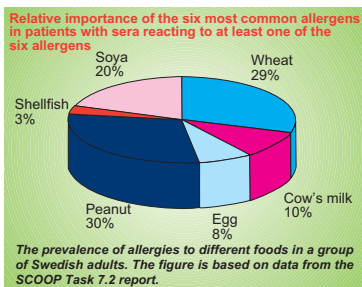


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Background

Whilst only around 3-5% of the European adult population have been diagnosed as suffering from food allergy, the perception amongst consumers is that such food reactions are a common condition. Indeed up to 30% of the population claim to suffer from some form of food allergy; most of this group employs self-diagnosis and consequently implements treatment strategies (usually avoidance of certain foods), which are unsupervised by a medical practitioner. The perception that food allergy is a common condition is heightened by the fact that food allergies, along with other types of allergy, appear to be on the increase. Thus the number of incriminated foods and the frequency of severe reactions appear to be rising rapidly, with peanut allergy being of particular concern.



The discrepancy in perceived and actual IgE-mediated food allergies may partly result from poor diagnosis, in particular due to the inadequacies of *in vitro* test procedures. This may also be compounded by the fact that many of the symptoms experienced by those who perceive themselves to have food allergies may result from non-IgE mediated food allergies. Other than the well-characterised Coeliac disease syndrome, these are generally poorly understood.

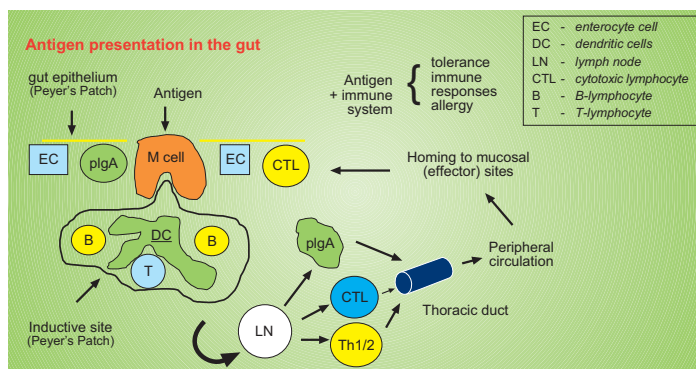
Future research directions within the ERA

Epidemiology

There is a clear need for good epidemiology regarding food allergies across Europe to demonstrate whether rates are rising in the same fashion as inhalant allergies. This is needed for effective health planning in the future and to enable a pan-European food industry to respond adequately to differences in food allergies in different countries and market places. This should also contain an element of studying perceived versus actual allergy rates as no rigorous studies of this nature have been carried out. Such epidemiology needs to be carried out in a European context to ensure sufficient numbers of food allergics are recruited to the studies in order to identify well-defined cohorts of allergic individuals for genomic studies.

Genomics

Genome-based studies would go hand-in-hand with the epidemiology and gives the potential to identify genetic profiles associated with atopy and especially to identify those at risk of developing severe life-threatening allergic reactions, and identify genetic components underlying non-IgE mediated food reactions.



Genomic analysis of the activation and interactions of these different cell-types will lead to new insights into the mechanisms of food allergy and the genetic components involved in determining susceptibility of individuals to developing food allergy.

Improved diagnostics

Improved diagnostics need to be developed for both IgE and non-IgE (so called food intolerances, including Coeliac disease) allergies. These are imperative as currently the only clear way to demonstrate a food allergy or intolerance is through double blind placebo controlled food challenge, a lengthy and expensive process which is performed in only a limited number of centres in each member state. Many IgE-mediated reactions are detected in oral challenges but not with *in vitro* IgE-based tests, probably because of problems with

extract stability and the fact that many people are allergic to cooked foods, but the allergens used for diagnosis are native, unprocessed proteins. Of the non-IgE mediated allergies/intolerances only Coeliac disease has clearly defined diagnostic procedures. New *in vitro* methods need to be developed to help diagnose this group of poorly defined food allergics. It is likely that information from genomic studies and a fuller understanding of the effect of food processing on allergens will play an important part in developing these methods.

Develop more effective therapeutic options

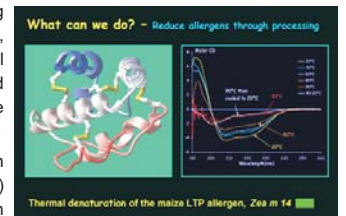
New therapies are required for treating food allergies. Currently the only option offered is food avoidance, provision of low/null allergen foods. This is clearly inadequate, and has severe social consequences for both the allergic sufferer and their family, especially for families with severely allergic children who can suffer life-threatening reactions on exposure, even to a kiss from someone who has eaten an offending food. Immunotherapy to reduce clinical severity using peptides or hypoallergenic allergens, used in combination with ant-IgE therapy, is already showing promise in clinical trials. For this to be effective, knowledge of the nature of food allergens after processing will be required, together with clinical immunology regarding the pathogenesis of food allergy.



One of the current methods used in diagnosis of allergy are skin-prick tests where small amounts of suspected allergens are introduced into the skin and any reaction noted.

Improved food processing and raw material selection

There is also a need to develop knowledge-based strategies to reduce food protein allergenicity without loss of functionality or food quality (texture, flavour etc.) and thus provide consumers with low-allergen foods, which are good to eat. Currently little is known of how processing may alter allergens, and hence there is a need to systematically investigate the relationship between food protein allergenicity and the effect physical processing (temperature, pressure) has on protein modification including glycation products, Maillard adduct formation, protein denaturation and aggregation. As well as potentially increasing the allergenicity of food proteins, such modifications may also reduce allergenicity.



employing physical means (temperature, high pressure) and processing aids (such as enzymes) could be developed to ensure maximum reduction in allergenic load with minimal processing input.

Food Safety Issues

There are also safety issues relating to food allergy and intolerance include the development of effective models/systems to predict the allergenicity of novel foods with greater assurance, methods for analysis of allergens in foods to ensure low/null allergen foods are just that and good quality information provision on food allergies to ensure that allergies are dealt with effectively in the community at large.

Conclusions

Funding of food allergy research at a national level across the European Union is not sufficient to address these problems, and the numbers of severely food allergic subjects are too small to be a significant disease group for pharmaceutical companies to target to improve diagnosis and therapeutic options currently available. Furthermore, the cohorts of food allergic subjects to facilitate appropriate, valid epidemiological and genomic-based studies cannot be found at a national level and require a pan-European consortium. We believe that a European initiative will be required to tackle the problems presented by food allergy and intolerance that embraces a multidisciplinary effort covering both clinical aspects and food production and safety dimensions of the problem.



A selection of food labels with various allergenic ingredient labels and warnings

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If you have any comments, views or wish to be part of the network we are developing please contact Clare Mills at clare.mills@bbsrc.ac.uk