Project no. FOOD-CT-2005-514000
Project acronym: EUROPREVALL
Project title: *The Prevalence, Cost, and Basis of Food Allergy across Europe*

Instrument: *Integrated Project*

Thematic Priority: *Area 5 – Food Quality and Safety*

FINAL ACTIVITY REPORT

Period covered: from 1/6/2006 to 31/12/2009 Date of Preparation; 15/2/2010

Start Date of project: 1/6/2005 Duration: 4 years 7 months

Project co-ordinator name: Dr Clare Mills

Project co-ordinator organization name: Institute of Food Research

Revision: Version 1

1. Project Execution

1.1 Project aim and objective

The **main objective** of EuroPrevall was to "*examine the complex interactions between food intake and metabolism, immune system, genetic background and socioeconomic factors to identify key risk factors and develop common European databases*". Over the course of 4 years and 7 months it has sought to **deliver the information and tools necessary for policy makers, regulators and the food industry to effectively manage food allergies across Europe and hence deliver an improved quality of life to food allergic consumers**. The outcomes of the project will thus directly provide scientific data to expert committees in DG SANCO and European Food Safety Authority (EFSA) to regularly update the list of most common food allergens to guarantee a reliable protection of allergic consumers in the EU (Mills et al 2007). We have sought to do this by

1. Establishing the prevalence of food allergies in adults and children, and the patterns of reactivity to the five main allergenic foods across the major climatic and cultural regions of Europe
2. Investigating the relationship between genetic and environmental factors, such as allergies to pollen, food consumption patterns, and the development of food allergy.
3. Provision of a platform of highly characterized, authentic food allergens to facilitate the development of novel diagnostic and predictive tools/methods to enable effective management of food allergy.
4. Providing information regarding the effect of the food matrix and the role of food processing in modulating the allergenic properties of foods.
5. Ascertaining the socioeconomic impact and cost of food allergies and their treatments, to the European Community.

This report gives an overview of the projects achievements to date. The project partnership have sought to integrate the information accruing to the project through consensus positions regarding the management of food allergy as far as is possible. However, it has become evident in the latter stages of the project that this activity will extend beyond the end of the project contract. This is because of the unprecedented scale and quantity of data collected in a cohesive fashion which will allow data analysis and modelling to be undertaken in a way not possible to envisage at the outset. Such analysis will be facilitated by the new approaches arising from the integration of systems approaches into research which have the potential to provide predictive models.

1.2 The EuroPrevall Project Partnership

At the outset of the project the EuroPrevall partnership comprised 53 partners from 17 European countries and Ghana. During the second year of the project this partnership was expanded through the addition of partners from three INCO countries, India, China and Russia, through a successful INCO-TP call. Their activity was added to the study already ongoing in EuroPrevall in Ghana, taking tools and know-how developed in EuroPrevall and developing similar studies on food allergies in these countries. An open competitive call was also held to identify new partners to join studies on food consumption habits in relation to food allergies and undertake application of the socioeconomic instruments to assess impact of food allergies on quality of live and their economic cost. This has saw new partners join from Bulgaria, Poland (2), Spain (2) and a new SME partner from Germany. The final project partnership comprised 63 partners from 19 different countries and collaborating centres in North America, Australia and New Zealand.

The activities have been led and co-ordinated by Professor Clare Mills, the project co-ordinator, and Dr Alan Mackie, the deputy co-ordinator, together with the project Executive Committee, Professor Ronald van Ree, Dr Kirsten Beyer, Professor Peter Burney, Professor Lynn Frewer and Dr Charlotte Madsen, together with Rene Crevel, leader of the industrial stakeholder group, and Erna Botjes, leader of the allergic consumer stakeholder group. They were supported by the Scientific Management Board (SMB) which comprised the ExComm and all remaining workpackage leaders namely, Dr Montserrat Fernandez-Rivas, Professor Maria Yazdenbakhsh, Dr Gene Rowe, Dr Karin Hoffman-Sommergruber, Professor Stefan Vieths, Professor Harry Wichers, Professor Carla Bruinzeel-Koomens, Dr Ineke Klinge and Dr Rupert Osborne. Ethical issues in the project were overssen by an Ethical Committee fromed form partners in the Excomm and SMB. The project activities were further supported by an Advisory Board chaired by Professor Lars Poulsen, and including Professors Dick Shepherd, Joachim Sastre, Steve Taylor and Hugh Sampson.

1.3 EuroPrevall Achievements

1.3.1 Patterns and prevalence of food allergies across Europe

EuroPrevall sought to identify how many individuals suffer from food allergy and which are the major problem foods. Since the prevalence of food allergies is age dependent, particularly affecting infants and young children, cohorts were set up in different age groups with a birth cohort covering children from birth to the age of 2½ years with complimentary community surveys in school age children and adults. Studies in unselected populations were complimented by a cross-sectional study in the allergy out-patient clinics. This also provided the project with a cohort of individuals with well characterised food allergies which were necessary for developing and validating new diagnostic tools and led to the development of the EuroPrevall Serum Bank (EPSB) (Vieths et al 2008). The centres were chosen to represent different geographical and climatic regions of Europe (Table 1).

Climate/Country	**Study Type**			**Partners involved**
	Community survey	**Birth Cohort**	**Outpatient Clinics**	
Alpine: Switzerland	Yes	No	Yes	P6
Mediterranean: Spain	Yes	No	Yes	P7
Spain	No	Yes	No	P49
Greece	Yes	Yes	Yes	P17
Italy	No	Yes*	Yes	P45
Central Europe: Germany	No	Yes	No	P5
Poland	Yes	Yes	Yes	P32
Bulgaria	Yes	No	Yes	P37
Lithuania	Yes	No	Yes	P39
Czech Republic	No	No	Yes	P38
Nordic: Iceland	Yes	Yes	Yes	P48
Maritime: UK	No	Yes*	Yes	P33
The Netherlands	Yes	Yes*	Yes	P20
France	No	No	Yes	P47
Sub-tropical: China	No	No	Yes	P60
Tropical India	No	No	Yes	P58
Sub-arctic	No	No	Yes	P59

Russia (W Siberia)				
Total countries	**10**	**6**	**15**	

Table 1: Countries in which clinical cohorts were established in EuroPrevall

All the data collected in the European cohort studies was entered on-line into a suite of customised databases. This involved developing over 154 forms for the birth cohort study, 18 for the community surveys and 8 for the outpatient clinic study. This centralised data collection has helped develop a cohesive set of data at a single point, to which other data (e.g. from serological analysis of patterns of sensitisation) and genetic profiling can be linked.

In all the community surveys and outpatient cohorts food allergies were diagnosed by assessing sensitization to foods by determining serum IgE using a total panel of 24 foods (includes almost all on Annex IIIa of the labelling directive) as follows.
Priority 1: hen's egg, cow's milk, fish, shrimp, peanut, tree nuts (hazelnut), apple, peach, celery
Priority 2: kiwi, mustard, sesame, soy, walnut and wheat.
Other foods, such as peach, which are known to be a problem food in the Mediterranean area, and kiwi, an emerging food allergen were included. Serological analysis was complimented with skin prick testing (SPT).

Birth cohort: Focused on infants and young children the Birth Cohort is co-ordinated by Kirsten Beyer and Doreen McBride at the Charité in Berlin and run in Germany (Berlin), Poland (Łodz), Iceland (Rekjavik), Spain (Madrid) and Greece (Athens) with European Union funding with additional centres in the UK (Southampton), Italy (Milan) and The Netherlands (Amsterdam) funded by third parties. It was designed such that if parents report any symptoms of either an atopic disease (such as eczema in children or recurrent gastrointestinal problems without fever) or immediate reactions after eating a particular food, the child is evaluated by the study centre (Figure 1). If definite criteria (sensitisation to food allergens, reactions to a single food or improvement under an elimination diet) are met, the children are eligible for a double-blind, placebo-controlled food challenge (DBPCFC). For each child eligible for DBPCFC two age-matched controls children were followed with the same evaluations other than SPT and DBPCFC (Keil et al 2009). Serum IgE was assessed using a CAP food mix used in infant food allergy screening (fx5) which includes cow's milk, hen's egg, soy, wheat, peanut and fish. Patients with a positive IgE test to the food mix were subsequently reanalyzed to determine individual food specific IgE. Clinical protocols were developed through consensus with the study centre physicians. Baseline, 12-, 24- and 30-month follow-up questionnaires, as well as questionnaires for children with symptoms, the physician examination form and testing documentation developed, translated into all country languages and back-translated into English before being incorporated into the online database used as the tool for collecting data.

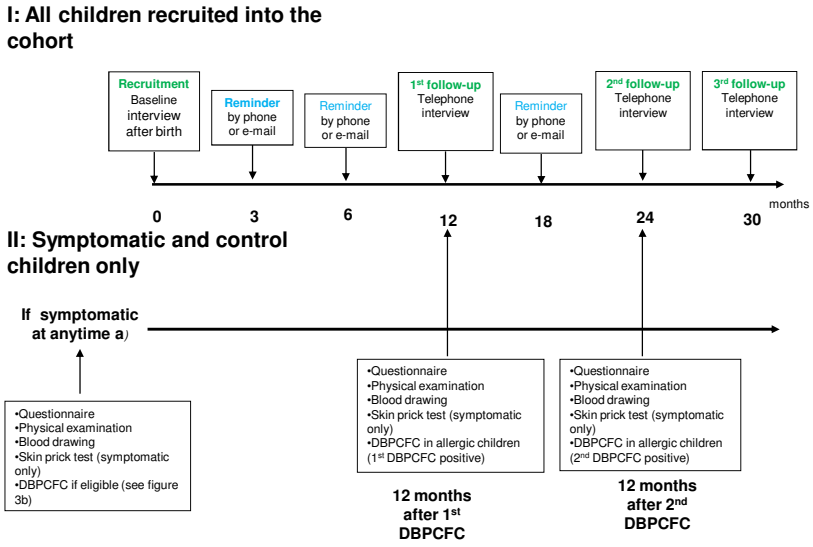

Figure 1: Schematic diagram of Birth Cohort study design (after Keil et al 2009)

Preliminary analysis of the data indicates a considerable heterogeneity in the incidence of food allergy across Europe, with indications being that cows milk and hens egg are the major allergenic foods, followed by peanut, in infants and young children under the age of 21/2 years with less sensitisation to foods such as soya and wheat being evident.

Community surveys: Studies in unselected populations were eventually undertaken in 8 centres from Alpine (Switzerland), Mediterranean (Spain, Greece), Central European (Bulgaria, Poland, Lithuania), Nordic (Iceland) and Maritime (The Netherlands) regions, a ninth centre (UK) dropping out due to changes in principle investigator. The study was coordinated by Professor Peter Burney and Dr Ischa Kummerling at Imperial College, London (UK) and the design involved development of a short screening questionnaire which was used to sample a target population of around 3,000 adults or children in each study centre (Figure 2). Analysis of these questionnaires then allowed putative cases, along with 2 controls, to be followed-up in a case control study. At this stage a much longer questionnaire was administered and a blood sample drawn for either DNA extraction or serological analysis of food specific IgE. A selected number of individuals with food specific IgE were then followed up to confirm their sensitisation to foods using DBPCFC (Kummerling et al 2009).

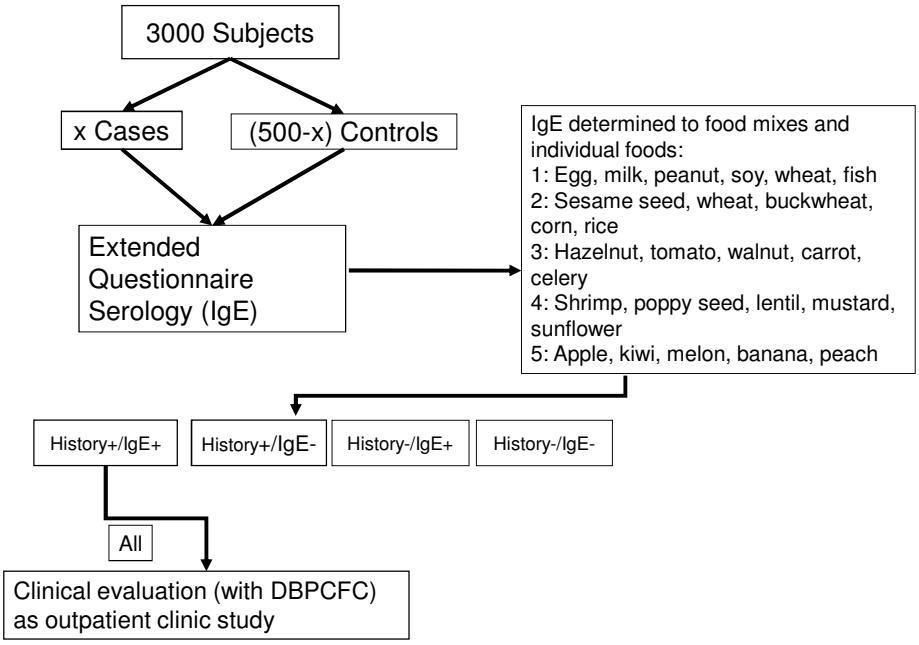

Figure 2: Schematic diagram showing Community Survey study design.

The sampling frame for the child study has used schools, allowing a survey to be conducted into school preparedness for food allergy survey. Around 60% of schools in the survey had at least one child with food allergy, and whilst staff in these schools were aware of the symptoms of food allergy in some schools, was a lack of written school policies to deal with food allergy and only 8.2% of schools reported administering adrenaline via EpiPens in the event of a food allergic reaction. In parallel a survey in the adult community has been finished in the same 8 European centres running the child study, using general practitioner address lists and, in one centre, a telephone survey, for sampling. In the initial screening survey a total of 15,967 adults and 17,884 children were recruited across the centres from a total of 30,422 adults and 28,589 children sampled. The data collected from the screening allowed 1,326 adults and 1,634 children to be identified as eligible for inclusion in as cases in the case-control element of the study. 2,481 adults (777 cases and 1704 controls) and 2,516 children (755 cases and 1761 controls) were evaluated to provide information on reported food allergy and food related symptoms, and a blood sample for serological analysis. As with the birth cohort preliminary data analysis has indicated that the prevalence of self-reported food allergies across Europe is highly heterogeneous, with much lower rates in some regions than others. The serum samples collected as part of the case-control study have been used to investigate patterns of sensitization to foods and relevant inhalant allergens, such as those from pollen and dust. All the data sets are cleaned and linked to the serological data and are now undergoing rigorous statistical analysis.

Out-patient clinic studies: In order to better describe food allergies a large cohort of food allergic individuals was developed through an outpatient clinic study co-ordinated by Dr Montserrat Fernandez-Rivas at Clinico san Carlo in Madrid. In this cross-sectional study 2,123 patients have been studied in Spain (Madrid), Switzerland (Zürich), Greece (Athens), The Netherlands (Utrecht), Poland (Łodz), UK (Manchester), Bulgaria (Sofia), The Czech Republic (Prague), Lithuania (Vilnius), Italy (Milan), France (Strasbourg), the UK (Manchester) and Iceland (Reykjavik). Both children and adults reporting immediate adverse reactions to (any) foods were enrolled. All of them were evaluated by means of a standardised questionnaire, and sensitisation to a panel of 24 foods and 12 inhalants was

assessed by skin prick tests and serum IgE determinations. This included a number of subjects recruited from the Community Surveys in Łodz, Madrid, Utrecht, Zurich, Athens and Reykjavik whose reported food allergy was rigorously evaluated with a total of 30 challenges in children and 88 in adults being performed. The clinical reactivity to 9 foods (milk, egg, fish, shrimp, peanut, hazelnut, apple, peach and celery) was studied by DBPCFC in a total 540 patients, and allergy was confirmed in 309 (Figure 3).

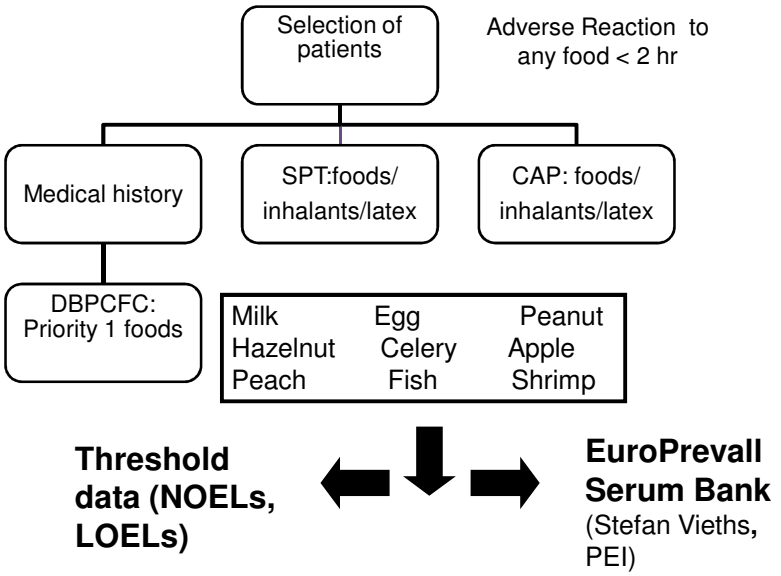

Figure 3: Schematic diagram showing Outpatient clinic study design.

Around 10% of the cohort were children below 3 years of age, thus providing complimentary information to that obtained in the Birth Cohort, and were recruited in three centres also involved in the latter study (Madrid, Athens, Lodz) together with Sofia and Prague. The patterns of allergy were very similar in the outpatient clinic patients with milk and egg dominating, with a range of other foods including fish and peanut being implicated. The older children were aged between 3 and 14 years of age and comprised around 13% of the outpatient clinic cohort were recruited by all centres except Utrecht and Milan. The majority of patients recruited in to the outpatient clinic study was older than 14 years (~ 76 %) and were drawn from all the centres. Foods of plant origin dominated and were mainly to tree nuts, fresh fruits and peanut. As with the studies in unselected populations geographical differences were found in the distribution of food allergies these older patients, varying with climatic region. Around 60% of all referrals were women, raising the question of whether there is an underlying biological difference or whether this is a consequence of gender issues where men access outpatient clinics less frequently than women.

Using this cohort the EuroPrevall Serum Bank (EPSB) has been formed (Vieths et al 2008) which are being analysed for specific IgE against 24 foods, 12 inhalant allergens and latex. Selected sera are used for evaluating CAPs and chips for component-resolved diagnosis. Preliminary indications are that patterns of sensitisation are similar to those observed in the ECRHS sample with sensitisation to food such as hazelnut and apple being prominent.

Extra-European studies: In addition to studies in Europe, the EuroPrevall project has extended its investigations in to Africa (Ghana), Asia (India) and the Far East (China). The

Ghana study was undertaken in rural and urban environments to investigate the role of infections, particularly parasites, in the development of allergies to peanut, a food widely consumed in Ghana. Community surveys have also been run in parallel in both adults and children in India (Mysore, Bangalore), and children only in China (Hong Kong, Beijing) and Russia (Tomsk) (Wong et al 2009). A total of 44,512 responded to the screening survey and 3,378 of these participants took also part in the case-control study in which they provided a blood sample for serological analyses. Skin prick testing and blood sampling continued and were completed in this reporting period in all 3 study sites. As with studies in Europe a preliminary analysis of the data indicate considerable heterogeneity in the prevalence of food allergy with rates in Mysore being much lower than those observed in Hong Kong. Biological samples, including stools, serum and DNA have been banked to facilitate further analysis in the future to mirror that undertaken in the main European-based community surveys; some additional serological analysis, not originally envisaged in the project, has already been undertaken in the final phase of EuroPrevall. Preliminary data analysis is already indicating, that as observed in the European based studies, there are considerable variations in the incidence of food allergy across the extra-European study centres. Further data analysis will be undertaken to confirm these preliminary observations and to identify risk factors associated with these different prevalences.

The Biobanks that have been developed through these cohort studies include

- A serum bank (the EuroPrevall Serum Bank, EPSB) has been set up by the Paul Ehrlich Institute under the leadership of Professor Stefan Veiths to collate serum samples for IgE testing in the cross-sectional survey and facilitate development of novel diagnostic methods. (Vieths et al 2008)
- An additional the Birth Cohort serum bank has been set up by Dr Kirsten Beyer at the Charité to collate serum samples from the birth cohorts for IgE testing.
- Placental biopsies, maternal serum samples, and cord blood samples in the birth cohorts have been collected and are curated by Professor Zsotl Szefalusi, Medical University of Vienna.
- DNA samples for genetic studies and RNA samples in the birth cohorts and extra-European centres have been prepared

The project partnership is now seeking additional funds to exploit this valuable resource.

1.3.2 How much of a food can cause a reaction?

As well as knowledge of how many people are affected by food allergies and the major foods involved, it is also necessary to have data on how much of a problem food can trigger an allergic reaction. This information has been collected when determining the clinical reactivity to foods which has been assessed in the EuroPrevall cohorts wherever possible using standardized DBPCFC. This has been done in those patients who develop adverse reactions to foods in the birth cohorts, in a randomly selected sample of school children and adults from the community-based surveys who report adverse reactions to foods and have specific IgE, and in all the patients included in the cross-sectional survey. It has been a key feature of the EuroPrevall studies with common clinical protocols having been developed for diagnosis together with and training of clinical partners to ensure consistent application of diagnostic criteria across the project as far as practicable. Active ingredients have been used which correspond to commonly available food ingredients. These include the following priority 1 foods:

- Peanut – a lightly roasted defatted peanut meal
- Hazelnut – a ground hazelnut flour preparation
- Celeriac (celery root) – commercial celery spice
- Egg – hens' egg as pasteurized egg white
- Milk – cows' milk as spray-dried skimmed milk powder
- Fish – as freeze-dried cod fish powder

- Shrimp – as pureed whole shrimp

Two food matrices have been prepared for undertaking the challenges, a desert matrix and a dark chocolate matrix which are foods as we eat them and have been through sensory testing to ensure they are truly blinded. These include a chocolate mousse desert formulated by one industrial partner, Unilever, and manufactured by them and Kraft, together with a dark chocolate matrix (peanut and hazelnut only) prepared by Nestlé. The challenge protocols give the active allergenic ingredient in titrated doses which have allowed information on "no observed effect levels" [NOELs] and "lowest observed effect levels" [LOELs] to be obtained for major allergenic foods in individuals suffering from food allergies drawn from across Europe using the same matrices (Crevel et al 2008). These data sets will contribute to the development of hazard management procedures in the food industry in the future.

These matrices proved inappropriate for diagnosis of apple and peach allergy due to instability of the birch-pollen related fruit allergens in the powdered ingredients and hence and alternative drink-based matrix was prepared to confirm allergy although no titrated dose could be obtained. However, since fresh fruits present less of a challenge for the food manufacturing industry to manage in a factory environment, the need for threshold studies is less compelling for these foods. It also proved impossible to blind the shrimp into the desert matrix at the doses required to elicit an allergic reaction. Consequently an alternative matrix recipe adapted from one developed by the University of Nebraska, USA for shrimp challenges which proved effective. Alternative recipes were developed for use with young children and infants – with a pudding type matrix and infant formula being developed for use in young children in the birth cohort.

Additional funding has been secured from the UK Foods Standards Agency for IFR (Clare Mills, Alan Mackie) to analyze the collective EuroPrevall DBPCFC data set to describe the dose response curves and develop a severity scoring system to facilitate data analysis. These studies will be undertaken in close collaboration with the food industry (led by Rene Crevel) and the clinical partners responsible for the clinical aspects of the challenges, led by Dr Barbara Ballmer-Weber with Montserrat Fernandez-Rivas and Kirsten Beyer and will be co-ordinated with other threshold projects, notably that led by Professor Steve Taylor of the University of Nebraska. Whilst precise NOELs and LOELs for the different foods are not yet available it is evident that some foods, such as milk, appear to trigger allergic reactions following exposure to much lower doses than are required of other foods, such as shrimp.

In addition food challenges in have been undertaken using both the dessert matrix and dark chocolate bars in Switzerland (Zurich) and The Netherlands (Utrecht) with comparative challenges undertaken in peanut and hazelnut allergic patients and showed consistent differences in the patterns and minimum eliciting doses required to trigger a food allergic reaction.

1.3.3 Diet, environment and genetic factors in food allergy

Environmental factors, such as exposure to pollen and dusts, food consumption patterns, infections (including parasitic) and genetic background may all play a role in determining why some people and not others develop food allergies (Cochrane et al 2009). In EuroPrevall this was studied by characterizing patterns of sensitization to inhalant allergens in the cohorts with pollen exposure and food consumption patterns, ultimately with a view to linking the resulting data sets to identify potential causal links between exposure to pollen and development of food allergies (known associations as well as possible new ones).

Pollen exposure and sensitization to foods: Historic data from across Europe have been evaluated with regards geographic differences in exposure and to identify local changes over time. In the future these cohorts offer the possibility of follow-up to assess whether rates of

food allergy, along with other types of allergic disease, as increasing. Within the project an assessment of this is being undertaken by retrospective serological analysis of the ECRHS biobank to assess sensitisation to foods in the ECRHS cohorts from 2001. The serological analyses in the EuroPrevall cohort studies have provided further proof for the dominant role of birch pollen sensitization in the induction of tree nut (hazelnut and other) and fruit (peach and other) allergies. In areas with other dominant pollen sensitizations such as grass pollen and/or weed pollen clearly different foods play a role in food allergies. A clear example is the importance of walnut allergy in Athens where pellitory is a dominant source of pollen sensitization. Whether there is indeed a causal relation between the two phenomena still needs to be substantiated by rigorous statistical analyses taking place after termination of the EuroPrevall contract.

Infections (including parasites) and food allergies: Through the extra-European cohorts the initial studies on the role of parasitic infections in determining allergies to peanut in Ghana were expanded to include Russia, China and India comparing rates of food allergies and infections in rural and urban settings. A pilot study was carried out to establish prevalence of three infections that have been linked to protection against the development of allergies: hepatitis A, toxoplasmosis and salmonella. Serological analyses were carried using serum samples from non-allergic controls from Utrecht, Athens, Hong Kong, Tomsk urban and rural (low/high parasite infestation), Mysore and Bangalore showing clear differences in exposure to Hepatitis A and Salmonella across the centres. These differences justify further detailed analyses of the whole cohorts for analysis of protective effects towards the development of allergies exploiting the biobanks created through the EuroPrevall studies after the project contract to support efforts to understand better the role of infections in determining allergies in these countries

Genetic factors: Complimentary studies on the role of genetic factors in food allergy have be undertaken through the analysis of DNA samples from food allergic children and their parents using SNPs using samples from the Birth cohort studies. In addition DNA has been collected from the Community survey subjects, which will facilitate analysis in the future. A list of candidate markers was been identified to undertake this work based on recent developments which was used for the analysis. The large quantities of data generated will require a systems-style approach to mine them and effectively link them to the phenotyping data that has been collected.

Food consumption: Lastly, exposure to the priority foods in EuroPrevall (consumption) was evaluated in four countries, i.e. United Kingdom, Spain, Poland and Bulgaria. Based on the knowledge present amongst the industrial partners of EuroPrevall, a “map” of consumption of at least the priority 1 foods will be drawn. This will allow identification of gaps in the knowledge. Interaction with EU funded projects like EPIC and DAFNE will support this activity. Changes in consumption were analysed in the four countries with peanut as the study focus (the “Peanut Experience”). This evaluation included changes in source (e.g. cultivars, country of origin), food processing practices, types of food containing peanut or peanut derived ingredients, demographic differences in consumption traits, and consumer segmentation data (Boulay et al 2009). Distinct differences in terms of peanut production and consumption patterns were identified. Interviews with key stakeholders (in industry, health, etc.) were followed by focus groups with consumers and parents of young children, to fill out the matrix of information related to the potential influencing factors. This analysis was complemented by qualitative information obtained from stakeholders (retailers, food processors and distributors, and nutritional advisors (Sora et al 2009). Some obvious examples of food allergies that can most likely be linked to higher consumption levels are shrimp and fish in Iceland and celeriac in Switzerland and central Europe. Also here, in-depth statistical analyses will performed to exclude or establish links to sensitization to inhalant allergens sources such as pollen and house dust mite.

1.3.4 Molecules causing allergies and how they are affected by food processing

The components in foods, known as allergens, are protein molecules which are responsible for triggering allergic reactions. An allergen library, representing all the major allergens from all the priority foods identified in the project has been prepared together with novel allergens identified in foods found to be relevant from the outpatient clinic studies, under the leadership of Dr Karin Hoffman-Sommergruber at the Medical University of Vienna. The final library comprised 51 component molecules prepared from allergenic foods of plant (peanut, hazelnut, celery, apple, peach, walnut, soybean, wheat, walnut, sesame, mustard, kiwi fruit, sunflower seed, tomato and carrot) and animal (cow's milk, goats milk, shrimp and fish) origin. Additional panels of "novel" allergens not previously characterised, have been prepared from kiwi fruit and shrimp. All the allergens in the EuroPrevall allergen library have been characterised and authenticated in terms of the structure and conformation, sequence and IgE binding capacity and ability to elicit histamine release in an in vitro cell based assay. This authentication has capitalised on the EuroPrevall serum bank. To-date this has resulted in a suite of publications appearing in a special issue of Molecular Nutrition and Food Research covering the following foods:

Allergens of animal origin: Cows' Milk – Blanc et al 2008; hens' Egg – Jacobsen et al 2008; Fish - Ma et al 2008
Allergens of plant origin: Apple – Oberhuber et al 2008; Celeriac – Bulbin et al (2008); Hazelnut – natural allergens - Rigby et al 2008; Hazelnut - recombinant allergens - Lauer et al 2008. Peach - Gaier et al 2008; Peanut – Marsh et al 2008

Of particular note has been the characterization of a suite of allergens from kiwi fruit (Oberhuber et al 2008) which also involved collaborations with researchers from New Zealand and the shrimp *Crangon crangon* (where inclusion of the full panel of allergens increased *in vitro* diagnostic sensitivity to 96%. The characterization of these allergens has relied on the EuroPrevall Serum Bank has been set up to collate serum samples for IgE testing in the outpatient clinic cross-sectional survey. This forms an important platform to characterize. It has been largely undertaken by seven academic partners (Medical University of Vienna; co-ordinator], IFR, INRA, Paul Ehrlich Institute Rothamsted Research, Technical University of Denmark, Academical Medical Centre Amsterdam and the SME partner Biomay with additional input from ISPA and CNR in Italy on novel allergen preparation and authentication of allergens by NMR.

The EuroPrevall allergen library represents an important landmark in standardization of allergen preparation and authentication (Hoffman-Sommergruber et al 2009) and has facilitated the development of novel diagnostic methods (see below) and will form an important platform from which other methods that rely on purified allergens, notably those determining allergens in foods. The realization of this impact will follow on from the completion of the publications relating to the other allergens in the library and through collaboration with researchers involved in allergen analysis, notably the Allergen Working group of the MoniQA Network of Excellence in the coming years. It has also played a pivotal role in the development of component resolved diagnosis using both the existing ImmunoCAP methodology of Phadia and the novel chip technology of VBC Genomics. The latter technology has also facilitated allergen profiling of the allergic individuals included in all the EuroPrevall cohorts.

Understanding how food processing and the food matrix may affect allergenic potential, of these molecules either in terms of sensitization or elicitation of allergic reactions is important in making effective risk assessments of novel foods as well as managing known defined allergenic risks. This aspect has been taken forward by Professor clare Mills, Dr Alan Macie at the Institute of Food Research, together with Drs Karine Adel-Pateint at INRA, Charlotte Madsen at the Danish Technical University of Denmark and Professor Harry Wichers at

Wageningen University. Protocols were devised to study processing effects on allergen structure, its release from food and stability to digestion, including the effect of modification by sugars, known as Maillard browning. In order to standardize *in vitro* digestion procedures a ring-trial was undertaken to evaluate the utility of the methods (Mandalari et al 2009). A sub-set of allergens from the allergen library drawn from the cupin and prolamin superfamilies of allergens was defined and purified on a large-scale to facilitate the studies, using peanut and peach as model foods. Residual IgE reactivity (including the destruction of IgE epitopes or appearance of neo epitopes) was defined, along an impact on sensitizing potential in animal models. These data were linked to the cohort studies by using the same food matrices as were used for food challenges, and including model processing modified allergens in the protein chip diagnostics to assess the impact of thermal processing on allergen reactivity across the EuroPreval cohorts.

1.3.5 Novel Diagnostic tools

Using this platform of allergens and working closely with the clinical researchers in the project, the concept of component resolved diagnosis will be explored to ascertain whether assessing patterns of sensitization to individual allergens offers additional diagnostic power with regards to food allergies than is currently possible with serological analysis using food extracts. Tools for undertaking this work using Phadia CAP technology and the allergen chip technology of VBC Genomics, one of the SME partners in the project, was undertaken. In addition cellular methods able to assess the biological activity of serum IgE have been developed with a histamine assay using stripped basophils by SME partner Reflab.

Component resolved diagnosis: Using a subset of 31 purified and authenticated allergens from the EuroPrevall Allergen Library was used to prepare allergen specific ImmunoCAPs and allergen chips. These new diagnostic tools underwent a technical validation which proceeded well and subsequently led to a full validation using panels of allergic sera drawn from the EPSB and building on the availability of sera from patients whose allergy has been confirmed by DBPCFC. A workflow for semi-automated processing of samples has been established for the allergen chips in preparation for the screening of ~ 6,000 EuroPrevall serum samples to define patterns of sensitization to different allergens in the cohorts, rather than simply using food extracts. These were used to profile the sera from the cohorts with regards IgE-binding to foods, with over 6,000 sera having been processed in the final phase of the project. Further data analysis will be required to link such molecular profiling to the clinical and epidemiological data on the cohorts to realize the impact of this data.

Single allergen CAPs were prepared for celeriac (Bauermeisteret al 2010) and kiwi (Bulbin et al 2010) allergens and evaluated using pre-existing panels of human allergic sera. The study in celeriac was based on a panel of purified natural and recombinant allergens the performance of which was compared with an extract-based approach using a serum panel from 24 DBPCFC positive patients (Bauermeister et al 2010). It was found that the component-resolved ImmunoCAP analysis increased the sensitivity to detect celeriac-specific IgE by 20%, improving diagnostic sensitivity from 67% to 88%. Sensitization to the glycoprotein Api g 5 was correlated to IgE binding to isolated glycan and inclusion of the basophil mediator release assay showed this IgE binding was of low biological activity. The kiwi study took a similar approach using a panel of sera from thirty DBPC|FC positive patients and comparing the performance of a panel of seven kiwi allergens (five natural and two recombinant) with kiwi extracts. Kiwifruit-monosensitized patients reacted more frequently with actinidin (Act d 1) whereas polysensitized patients reacted more frequently with the Bet v 1 homolog of kiwi, rAct d 8 (Bulbin et al 2010). These studies are contributing to demonstrating the utility of this serological approach to diagnosis of food allergy and have proven to be important in informing partners how to undertake data analysis in the complex study EuroPrevall study populations. The approach will be taken forward in the future using panels of allergens and sera from DBPCFC positive patients arising from the outpatient clinic

studies for other priority 1 foods such as hazelnut. However, the linking of such serological analysis to clinical data to assess the full value of the component resolved approach to diagnosis in the other priority 1 foods will not be realized within the project lifetime.

Cellular assays of biological effectiveness: In addition two different types of cell-based assays are being studied in EuroPrevall which give a measure of the biological effectiveness of IgE which may be more closely related to *in vivo* measures such as skin prick testing. The first involves utilisation of passively sensitised human basophils with one of the SME partners, Reflab which has been used to study the biological activity of the EuroPrevall allergen library. A second method utilises a humanised rat basophil leukaemia (RBL) cell line. In order to improve the humanised RBL assay a strategy to knockdown of the expression epsilon-chain of the rat Fc epsilon receptor by RNAi technology to increase the number of "humanized" heterologous receptors was adopted but the assay proved less effective than one based on stripped basophils. The latter is now being trialed with a panel of hazelnut allergens,

Immunoassays for food analysis: The allergen library has also supported the development of immunoassay kits for determining allergens in foods, notably fish, for which an assay was not available at the outset of Europrevall. This has been commercialized by the SME partner, Tepnel Biosystems, who developed it.

This part of the project has had a significant SME involvement. Further progress has been made by two companies (Tepnel Biosystems and Reflab) with developing and launching new products using information and materials generated by the project. This relates to development of immunoassays for determination of allergens in foods by Tepnel and development of technology to allow wider application of histamine release assays in diagnosis of food allergies by Reflab. The success in these two SMEs has resulted in Reflab being purchased by another European-based SME, RBiopharm, whilst Tepnel was bought initially by another SME, GeneProbe and then the food diagnostic kit business was sold to another food kit company, Neopen Corp, based in the USA but with a significant European base in the UK. In addition, progress with the novel diagnostic chip technology led to a partnership between Phadia and VBC Genomics under which Phadia has initially took a significant equity stake in VBC Genomics and subsequently bought the company in its entirety.

1.3.6 The Socioeconomic impact of food allergy

This activity is focused on assessing the role of food allergen labeling in communicating with food allergic consumers about potential allergenic hazards in particularly pre-packaged foods, together with new studies on impact of food allergies on quality of life and assessing its cost.

Allergen labeling: This aspect of EuroPrevall has been undertaken under the leadership of Sylvia Pfaff of FIS, one of the EuroPrevall SMEs, together with academic partners in Wageningen University, Professor Lynn Frewer and the Agricultural University of Atehns, George Chryssochoides. There is some evidence that food allergic consumers experience stress as result of poor communication and labelling practices. Despite the new labelling legislation (Annex IIIa of Directive 2000/13/EC) allergic consumers are still not completely sure about the safety of products, caused by fear of cross-contamination, unlabelled products, precautionary labelling ("may contain" labels), and difficulties in understanding product labels. An ethnographic study has been undertaken in the Netherlands and Greece which showed that while the respondents did not trust the information given by the retail personnel, they did display high levels of trust in the information given on the labels of the products. However, food-allergic consumers did not like the labels as they are (Voordouw et al 2009). The information provided was overwhelming, and presented in a too small a font size. These needs conflict with the desire for food-allergic consumers to have complete

information about the products they buy. Inclusion of symbols could be useful for excluding a product and speeding-up checking of labels. Higher-priced supermarkets had labelled almost all products according to the new EU-standards, and even produced their own symbols for the most common food allergies. The lower-priced supermarkets in many cases did not have any product labelled according to the EU-standards. In addition consumers spent much more time on shopping than people without a food allergy, because they constantly have to check the labels and have to put more effort into ensuring a varied diet.

Five information scenarios capitalising on ICT approaches to convey information about allergens in foods was also explored. These included a standardised label with symbols (Label), a small electronic personal shopping assistant (SPSA), an Infoterminal (IFT) an Internet shop (Internet) and a booklet with allergy information (Booklet). An initial evaluation showed that the ICT methods showed that differences in stakeholders' reservations about potential technical and social constraints could have led to different emphasis on ICT solutions. Consumer preferences for information delivery have also been subjected to a "reality test" through application of stakeholder analysis. This has been worked up into demonstration information delivery systems (for example, through integrated ingredient traceability and ICT identification systems, and improved labelling strategies), working with SME partner IAL Logistik. In addition, the implications of consumer preferences for information delivery regarding allergens have been examined in the context of the existing European legislation in this regard. The implications for European industry and trade have also been examined.

Impact of food allergy on quality of life: EuroPrevall partners based in Gronginen and Cork, under the leadership of Professors Tony DuBois and Jonathan Hourihane, have pioneered the development of the first disease specific quality of life instruments for food allergy. Prototype instruments (in Dutch and English) were developed to assess the impact of food allergy on quality of life of food allergy following a comprehensive review of relevant instruments (de Blok et al 2007), development of an extended prototype questionnaire which has been refined and reduced. These were cross-sectionally validated, delivering a suite of questionnaires for children (Flokstra-deBlok et al 2009a), teenagers (Flokstra-deBlok et al 2008), adults (Flokstra-deBlok et al 2009b) and parents of allergic children (DunnGalvin et al 2008). These have been shown to have good internal and cross-sectional validity to measure the impact of food allergy on health-related QoL. The questionnaires are self-administered, short and easy to use and therefore useful tools in clinical research as well as clinical practice. The piloting of the instruments has demonstrated that the impact of food allergy is primarily related to issues around food avoidance and the impact for allergy sufferers is not dependent on the severity of any reaction they are likely to experience. However, the impact on parents of having children with food allergies is affected by both severity and number of problem foods the children react to. Longitudinal validation has been undertaken with administration of the questionnaire before and six months after a DBPCFC in the Netherlands and Ireland. This study has shown a benefit to patients quality of life irrespective of outcome – emphasizing the benefits of this diagnostic procedure to those who have a positive AND a negative diagnosis. .

Economic cost of food allergy: Validated questionnaires have also been developed to assess the economic impact of food allergies by Professors Miranda Mugford at the University of East Anglia in the UK with Lynn Frewer and Gerrit Antonides in Wageningen (Fox et al 2009), one relevant to food allergic adults, and a second focused on the parents of food allergic children. The instruments have allowed direct, indirect and intangible costs to be measured, development and initial piloting was conducted in the UK and the Netherlands. Subsequently the study was extended to Spain and Poland with additional data being collected through interaction with the centres involved in the cohort studies; although as

such an extensive survey was not originally envisaged it represents an additional “in-kind” contribution from the Theme 1 centres.

Gender issues in the project have been assessed at two different levels, women’s participation in the project and the gender dimension in research. With regards the former indications are that there is a remarkably equal participation of women and men with women even slightly outnumbering men and women were not underrepresented at the management and research levels. With regards food allergy there are indications that for example allergies to fruits such as peach and apple, appear twice more frequently among females than men. The reason for this is unknown. It is possible that women are more prone to suffering from food allergies than men (sex difference) or - as is with many health-related issues - men do not seek appropriate medical advice and treatment to manage their health (gender difference). There are also Gender issues regarding the burden of care for individuals (particularly regarding young children who may suffer from food allergies)(DunnGalvin et al 2006). Through the studies in socioeconomic impact of food allergies the burden of caring, predominately (but not exclusively) carried by women, will be determined with respect to assessments of the quality life and economic burden to women. Given the diverse social and cultural differences across the continent, this will examine and compare variations in the role of women as careers for sick children.

1.3.7 Food Allergy Management

In order to place the new knowledge produced as a result of the EuroPrevall project activities within the context of advances made elsewhere in the world a series of “State-of-the-Art” papers relating to food allergy management was developed, led by Charlotte Madsen form the Danish Technical University in Denmark. This activity has been undertaken through working groups which have included representatives of three major stakeholder groups, the allergic consumer, the agro-food industry and regulators/regulatory advisor and have spanned the major areas of EuroPrevall activities:

Patterns and Prevalence of Food Allergies: Two systematic reviews of the current knowledge with regards patterns and prevalence of food allergies were published. The first of these (Rona et al 2007) undertook a meta-analysis based on data published in 51 articles. This showed the prevalence of self-reported food allergy was very high compared with objective measures and there was a marked heterogeneity between studies regardless of type of assessment or food item considered, even after stratifying the analysis for age, since prevalence of food allergies in infants is acknowledged to be higher than in adults. This could be a result of differences in study design or methodology, or differences between populations. The second analysis (Zuidmeer et al 2008) focused on allergies to plant-derived foods which showed only six of 36 studies included in the analysis used food challenges to confirm food allergies, showing that population-based prevalence estimates for allergies to plant derived foods determined by DBPCFC are scarce. It also identified prevalences of 0.1% to 4.3% each for fruits and tree nuts, 0.1% to 1.4% for vegetables, and < 1% each for wheat, soy, and sesame. As with the first analysis this meta-analyses showed significant heterogeneity between studies regardless of food item or age group.

Diet, environmental factors in food allergy: Since food allergy is usually associated with other forms of allergic sensitisation it is likely that many risk factors for food allergy are actually common to all forms of allergy. A review of these was undertaken of risk factors specific to food allergy (Cochrane et al 2009). Hypotheses that explain the distribution of food allergy include specific genetic polymorphisms, the nature of the allergens involved and the unique exposure to large quantities of allergen through the gut. In relation to the orle of food consumption in food allergy there was particular interest in different practices and advice given to mothers during the important phase of weaning infants. Thus, a review of the different infant feeding recommendations across Europe was undertaken with particular emphasis on the evidence base for such recommendations (Grimshaw et al 2009).

Thresholds: This paper reviewed the current state-of-the-art with regards the minimum dose that can elicit a reaction, also known as a threshold dose. Such information is important for allergic individuals and health professionals to help inform allergy management and at a population level can help both the food industry and regulatory authorities assess the public health risk and design appropriate food safety objectives to guide risk management. This review describes a low-dose challenge protocol developed as part of EuroPrevall, and strongly recommends its wider use so that data are generated that can readily increase the power of existing studies. (Crevel et al 2008)

Diagnosis: One of the major aims of EuroPrevall is to improve *in vitro* diagnosis of food allergies. A review of current knowledge about the clinical presentation of food allergy and critically reviews available diagnostic tools was undertaken (Asero et al 2007) which identified that a major problem in diagnosis is a relatively poor 'clinical specificity' of such tests. Thus, positive skin tests and *in vitro* tests for specific IgE are frequent observed in individuals who are sensitized but often lack food allergy symptoms. This review sets out the approach taken in EuroPrevall to improve the predictive value of such tests by taking a component resolved approach based on purified allergen molecules, taking into account the affinity of the IgE-allergen interaction, and evaluating the potential of biological in vitro tests such as histamine release tests or basophil activation tests.

Socioeconomic cost of food allergy: This paper set out the landscape with regards assessing the impact of food allergy on quality of life, and the lack of disease specific instruments to collect such data. It describes how the EuroPrevall project was developing new instruments to address this lack with the ultimate goal of combining the information from studies on health-related quality of life (HRQoL) with epidemiological data on prevalence to ultimately give some indication of the magnitude of the social impact of food allergy in Europe (deBlok et al 2007).

In addition to bringing the project partnership together through the state-of-the-art papers, EuroPrevall has undertaken two workshops in collaboration with the UK Food Standards Agency and ILSI-Europe. The first of these on ‘Approaches to risk assessment in food allergy’ was held in May 2007 and brought together 49 invited attendees from within EuroPrevall (clinicians, patients, industry, food researchers) and from EFSA, JECFA, risk assessment institutes, food industry and regulators, including the US FDA and Food Health Canada. It discussed the possibilities of applying toxicological methodologies to clinical data in order to assess the public health risk from food allergens (Madsen et al 2009). The workshop concluded that all three approaches discussed (deterministic [based on NOAEL], benchmark dose and probabilistic modelling) were valid depending on the question to be answered and the type and quality of data available. It is apparent that there are important data missing to allow for advanced risk assessment methods to be used. The data from EuroPrevall on prevalence and thresholds across Europe will be of particular importance. The workshop also contributed to the understanding of how to make best use of EuroPrevall data n the risk assessment process.

A second workshop, organized in collaboration with the NoE MoniQA and the UK Food Standards Agency was run in conjunction with the EuroPrevall Congress in Vienna in May 2009 addressing the sensitive topic of what constitutes acceptable risk. This took a stakeholder approach, spanning the allergic consumers, clinical community, food industry and risk managers. It highlighted the diversity of opinions and approaches, spanning population-based approaches to the person-centred approach. The findings of the workshop are currently being prepared for publication. A second aspect of the workshop related to analysis of allergens in foods and resulted in a joint publication led by the MoniQA allergen working group with relevant input from EuroPrevall partners relating to consumer issues (Kerbach et al 2009).

Dissemination to different stakeholders has been undertaken though collaboration with other projects, notable the networks of excellence Ga^{2}len and MoniQA. Thus, EuroPrevall, through the patient group partners in the project has worked with the NoE Ga^{2}len to produce prototype web-based tools focussed on the consumer which was hosted by the Ga^{2}len website. The content of this website will be transferred to the European Academy of Allergy and Clinical Immunology website during 2010. The main EuroPrevall activity has been focussed on the food industry making use of a previously developed web-based platform, www.foodallergens.info , to disseminate tools and information it has a 'home page' of the website was translated to Bulgarian, Danish, Dutch, Finnish, French, German, Greek, Hungarian, Italian, Lithuanian, Portuguese, Russian, Spanish, and Swedish in order to be easily searchable. It has links to the InformAll database and is linked to the MoniQA Food allergens working group website. It will be hosted by the Institute of Food Research for the foreseeable future.

1.3.8 Training and Industrial Interactions

Training in EuroPrevall: An important aspect of the project has been the training element. In general has been undertaken under the leadership of Professor Harry Wichers at Wageningen University through the activities of the 33 PhD students integrated across the project activities coupled with specific training in the study and clinical protocols of the multicentre studies, notably in DBPCFC. This has been especially important in spreading best practice to centres, such as Poland, Lithuania, Czech Republic and Bulgaria, as well as the extra-European centres in Ghana, India, China and Russia, where studies, such as those undertaken in EuroPrevall, had not previously been performed. This has resulted in there being a significant increase in the numbers of credible clinical research centres able to undertake effective diagnosis of food allergy, including DBPCFC. Furthermore exchanges of researchers, especially students and early-stage postdoctoral researchers involved in many aspects of the project, spanning allergen purification to social science, has expanded the horizons of these young people and contributed significantly to the development of the European research community.

A second aspect has been the site-wide visits involved in monitoring good clinical practice across almost all the study centres in EuroPrevall. The site visits were aimed to identify any problems within the documentation and associated study practices e.g. non-adherence to protocols, and to review study paperwork at each centre; and if appropriate to gain understanding of the local regulations which may affect (1) the future use and storage of samples, and (2) the storage and potential destruction of personal and clinical data obtained from study participants. A total of 26 Site Visits to 14 Partners were performed utilising site visit checklists to identify genuine problems within the documentation and associated study practices and suggest actions to address any problems or short comings encountered. In this way the partnership have sought to ensure the clinical and human studies undertaken in the project adhere to the best possible practice and ethical approvals that might affect future use of data and biological samples collected through the EuroPrevall project. Related to this a collaborative workshop involving members of the EuroPrevall Ethics Committee and facilitators from the Ethox Centre, University of Oxford was undertaken to further support the development of plans for use of samples after completion of the EC contract and ensure that they were consistent with the ethical approvals obtained in the centres.

Industrial interactions: The project has had industrial interactions integrated into its heart, and is a stakeholder group led in the project by Rene Crevel from Unilever. This has included active involvement of food manufacturers through the participation of Unilever, Nestle and Kraft in many aspects, but particularly the development of realistic food challenge materials and development of tools and approaches to help the food industry manage allergens in foods. Related to this has been the input of a SME partner, Tepnel Biosystems,

involved in the development of immunoassays to determine allergens in foods and whilst the company changed hands twice during the project lifetime its input into dose-verification of the challenge meals was essential, it also drew on the project partnership, particularly in relation to purified allergens, to develop methods of analysis for foods for which none were available, plugging an important gap in the analytical tools required by the food industry to manage allergens in foods. A second community has been that involved in development of improved clinical diagnostics, notable the world-leading clinical diagnostics company Phadia (based in Sweden) together with a group of SMEs involved in preparation of purified allergens for diagnosis (Biomay), allergen chip diagnostics (VBC Genomics) and histamine release assays (Reflab). Both VBC and Reflab have changed hands, the success of the component resolved diagnostic approach, in part facilitated by the EuroPrevall allergen library, resulted in VBC Genomics being acquired by Phadia. A third aspect has related to socioeconomic aspects with important contributions being made by the SME FIS in terms of consumer engagement and allergen labelling, and related input from IAL-Logistik. Lastly the project management has depended on SMEs delivering into the business sector – specifically IT-based companies Baigent and Tridan who have supported the web-interface and databases used in the project, HLM who have provided important input in the stakeholder activities representing the catering arena, and IPPL who have provided important advice on exploitation and property issues.

1.4 Conclusions and Next Steps

The main objective of EuroPrevall has been to serve the allergic consumer. This stakeholder group, led in the project by Erna Botjes of the European federation of Asthma and Allergy Associations (EFA) views EuroPrevall as a very important project for allergic consumers (patients) as it is providing insight of all aspects of (IgE mediated) food allergies and address the needed data and gaps.

- From the perspective of the food-allergic patient, food allergy can be difficult and time-consuming to manage because sufferers may react to extremely small amounts of problematic food. The only available treatment for food allergy is avoidance of problematic food and (consequently,) the implementation of effective allergen labelling strategies is essential. It is not possible to protect the allergic consumer from all risks. Further research concerning threshold levels of the different allergens in daily practice is necessary. The identification of thresholds can provide a basis for risk assessment, which can be used for guidance on the need for precautionary labelling, as has been done for gluten, lactose and sulphite. Precautionary labelling, may lead to anxiety and an unnecessarily restricted choice of products. Parents or patients need coaching about how to deal with food allergy in daily life. Preparing meals, shopping and social activities need new strategies. This can be realised by training, often from a specialized allergy dietician in allergen avoidance (whilst maintaining a balanced diet) and also from a specialized nurse or support staff member in managing emergencies and administering emergency medication. This has to be understood by other people in a range of situations

A key contribution of Europrevall is the provision of good quality data to characterise the risk from allergenic foods. Epidemiological data are already providing a clearer picture of the size of the population at risk in Europe and an indication of the relative importance of different foods. Data from the birth cohorts and particularly the clinic surveys are already revealing distinctive patterns of food allergy prevalence. These data indicate that some allergens for which labelling is mandated and for which management measures are therefore instituted (e.g. soy, mustard), appear to have a lower public health impact than some which are not required to be declared (e.g. some fruits). This knowledge, if corroborated by the community surveys, will provide a scientific rationale for re-ordering allergen management priorities to maximise beneficial effects on public health. Significant amounts of data on

thresholds of reactivity to different allergenic foods are now emerging through highly standardised low dose DBPCFCs. These data are now being used to develop and refine dose-distribution models for several foods. Better knowledge of the numbers at risk from defined amounts of allergenic food will not only provide a sounder scientific basis for regulatory and allergen management decisions, but will also inform the wider debate among stakeholders, for instance on issues such as tolerable risk.

- A correct diagnosis is essential for the food-allergic patient. Food allergies can result in uncomfortable, severe or potentially fatal responses. Asthma has been shown to be a risk factor for more severe anaphylaxis and infections, alcohol, medication, stress and exercise may exacerbate food allergy. Today double-blind placebo-controlled food challenges remain the "gold standard" for diagnosis. This is because both the skin prick tests and blood tests, although indicative, are not sufficiently reliable on their own to diagnose food allergy in all cases. The food challenge test is time consuming and more stressful for the patient than the other tests. New tests which are lower in costs and more patient friendly should be developed.

EuroPrevall data and knowledge will have significant impact on diagnostic testing for food allergy at several levels. Firstly, currently available IgE screening tests with mixtures of five to six foods have been compared to three custom-made mixes, followed by testing of 25 individual foods in twelve European and three non-European countries. Together these data will allow design of novel more efficient screening mixes, where needed adapted to national requirements. Secondly, the approach of molecular “component-resolved” diagnosis has been evaluated in depth for 10 foods in well-characterized and challenged patients and has established its potency to improve the clinical relevance of diagnostic tests for food allergy to a level unattainable for food extract-based testing. This will pave the way for increased use of component-based diagnostic tests. Thirdly, EuroPrevall has performed an evaluation of a multiplex approach using a microarray chip with >50 purified food allergens. This new-generation test for food allergy has proven to be an extremely powerful tool to characterize a food allergic patient with only a tiny amount of serum (small children!). Patterns of IgE recognition of a broad panel of major food allergens, complemented with the most relevant cross-reactive inhalant allergens, allow identification of the source of sensitization and help to better inform the patient about the risk of severe reactions. Microarray tests have proven to be a promise for the future that can significantly improve management of food allergy.

EuroPrevall has achieved its overall aims and objectives and has delivered a large amount of data, collected in standardized ways which has been groundbreaking. A crucial activity for the partnership in the coming years will be to realize this potential through effective data analysis. This will be a challenge since the tools for such large scale data analysis spanning population level data, genetics and other phenotyping methods, together with socioeconomic data are only now becoming available. The tools and approaches are already feeding in to studies around the world, notably the quality of life instruments are now being applied in studies in relating to immunotherapy for food allergies as part of a collaboration between the Irish team and clinical researchers in the USA (DunnGalvin 2009), whilst the DBPCFC matrices are being used for oral immunotherapy and has potential both as a standardized challenge material in clinical diagnosis and as a clinically validated reference material for allergen analysis in foods.

In addition to the data and biological resources the EuroPrevall project has formed a network of pan-European (and beyond) researchers spanning disciplines from epidemiology to economics, from molecular genetics to clinical science, risk management to food science. **This is unique and necessary to realize the potential of the data and resources, in particular to ensure its delivery in a form which can be used by risk assessors and risk manager, such as the European Food Safety Authority and DG SANCO.** It is also

important with respect to maintaining competitiveness of European industry – spanning food safety and allergen management issues in the food industry to exploitation of new knowledge in the development of improved diagnostics and treatments for allergic disease. Europe is the envy of the world for having developed such a network. As part of ensuring a cohesive transition and effective use of the resources developed by the project, the partnership has developed and implemented a plan under which the collective value of the EuroPrevall outputs, particularly in terms of shared biological resources and other know-how, can continue to be accessed. A workable management system has been put in place in order that the project's collective resources can be assessed in a way that maximized their value to the allergy scientific community. This has led to the establishment of a EuroPrevall Resource Access Committee (RAC) and agreed mechanisms for partners and third parties to use the RAC to access the projects outputs for further allergy research. An amendment to the Consortium Agreement has been drafted and agreed amongst most of the partnership, which establishes the RAC and how it will operate in the future.

The future realization of these resources can be envisaged under three different topic headings:

Food allergen risk management: The data from EuroPrevall provides a significant advance but still needs to be translated into validated evidence methods for risk management that can be used effectively by the food industry to manage allergens in foods. The data and tools are directly relevant ot assessing the risks posed by novel foods and processes, spanning GMOs and novel technologies such as nano-scale food structures. **Allergenic risk assessment is a significant barrier to approval of such novel technologies and is likely to prove to be a barrier to their implementation In the coming years. This is likely to adversely impact on the ability of the European Community to respond to the challenges facing it regarding food security, sustainability and an aging population. Addressing these issues will require new approaches.** *The lack of effective tools for allergenic risk assessment of GMOs intended for food use has already been highlighted by EFSA GMO Panel draft opinion (2009) which when linked to the lack of know-how and approaches to assess the safety of nanotechnology in the food arena (EFSA Scientific Committee 2009) makes a compelling case for further research in this area.* Any approach needs to take into account the effects of the food matrix and food processing procedures on allergenic potential which is still poorly understood. There is also a clear need to ensure aspects relating to stakeholder and public engagement are incorporated in to this. Given that a significant proportion of food allergies in Europe can be linked to pollen allergies, the effect of global warming will change the pattern found by Europrevall and should be addressed

Preventive and curative strategies; there are clearly gaps relating to the prevention and cure of food allergies which need to be underpinned by a knowledge of mechanisms involved in sensitization/tolerance induction which are currently lacking. There is considerable interest in dietary interventions using pre- and probiotics, and other nutritional interventions such as ω-unsaturated fatty acids where timing of interventions maybe crucial. It is emerging that prenatal rather than postnatal interventions maybe more effective in determining positive outcomes in infants. This also implies epigenetic effects are involved; such an assertion is also emerging from studies using animal models. It is also clear that linking such interventions to improving quality of life and economic functioning and targeting interventions and advice to specific groups, an activity linked to patient stratification. The EuroPrevall know-how and partnership can make an important contribution to the future development of these aspects. The EuroPrevall birth cohort study would provide a good platform from which to explore such issues and will be essential to reliase the potential of the investment (in monetary terms and the commitment of families recruited into the cohorts) in EuroPrevall.

Non-IgE mediated adverse reactions to foods; these are still poorly defined and unexplored and yet are a source of problems to patients. The EuroPrevall birth cohort has documented evidence that such reactions have a prevalence equivalent to IgE-mediated reactions to certain foods and, like IgE-mediated allergies, show a heterogeneous pattern across Europe. They may be related to a failure of serological methods for detecting IgE or actually have a completely distinct pathogenesis. This topic requires further research to explain these differences and either remedy them by improving diagnosis of IgE-mediated allergies OR define a new type of adverse reaction to food.

References

Albrecht M, Kühne Y, Ballmer-Weber BK, Becker WM, Holzhauser T, Lauer I, Reuter A, Randow S, Falk S, Wangorsch A, Lidholm J, Reese G, Vieths S.(2008) High level Expression, Purification and Physico-chemical Characterisation of Recombinant Pen a 1 - a Major Allergen of Shrimp. Mol Nutr Food Res. 52 Suppl 2:S186-95.

Asero R, Ballmer-Weber BK, Beyer K, Conti A, Dubakiene R, Fernandez-Rivas M, Hoffmann-Sommergruber K, Lidholm J, Mustakov T, Oude Elberink JN, Pumphrey RS, Stahl Skov P, van Ree R, Vlieg-Boerstra BJ, Hiller R, Hourihane JO, Kowalski M, Papadopoulos NG, Wal JM, Mills ENC, Vieths S. (2007) IgE-mediated food allergy diagnosis: Current status and new perspectives. Mol Nutr Food Res. 51(1):135-47.

Bauermeister K, Ballmer-Weber BK, Bublin M, Fritsche P, Hanschmann KM, Hoffmann-Sommergruber K, Lidholm J, Oberhuber C, Randow S, Holzhauser T, Vieths S. (2009) Assessment of component resolved in vitro diagnosis of 1 celeriac allergy J Allergy Clin Immunol. 124:1273-81

Blanc F, Bernard H, Alessandri S, Bublin M, Paty E, Leung SA, Patient KA, Wal JM. (2008) Update on optimized purification and characterization of natural milk allergens. Mol Nutr Food Res. 52 Suppl 2:S166-75

Boulay A, Houghton J, Gancheva V, Sterk Y, Strada A, Schlegel-Zawadzka M, Sora B, Sala R, van Ree R, Rowe G. (2008) A EuroPrevall review of factors affecting incidence of peanut allergy: priorities for research and policy. Allergy. 63(7):797-809.

Bublin M, Lauer I, Oberhuber C, Alessandri S, Briza P, Radauer C, Himly M, Breiteneder H, Vieths S, Hoffmann-Sommergruber K. (2008) Purification and characterisation of relevant recombinant and natural celery allergens. Mol Nutr Food Res 52 Suppl 2:S241-50.

Bublin M, Pfister M, Radauer C, Oberhuber C, Bulley S, Dewitt AM, Lidholm J, Reese G, Vieths S, Breiteneder H, Hoffmann-Sommergruber K, Ballmer-Weber BK (2010).Component-resolved diagnosis of peanut allergy with purified natural and recombinant kiwifruit allergens. J Allergy Clin Immunol. Jan 8. [Epub ahead of print]

Cochrane S, Beyer K, Clausen M, Wjst M, Hiller R, Nicoletti C, Szepfalusi Z, Savelkoul H, Breiteneder H, Manios Y, Crittenden R, Burney P. (2009) Factors influencing the Incidence and Prevalence of Food Allergy. Allergy. 2009 Aug 5. Epub

Cornelisse-Vermaat, J.R., Pfaff, S., Voordouw, J., Frewer, L.J., Theodoridis, G. & Woestman, L. (2008). The information needs and preferences of food allergic consumers. The views of stakeholders regarding information scenarios. Trends in Food Science and Technology, 19:669-676.

Crevel RW, Ballmer-Weber BK, Holzhauser T, Hourihane JO, Knulst AC, Mackie AR, Timmermans F, Taylor SL. (2008) Thresholds for food allergens and their value to different stakeholders.Allergy. 63(5):597-609.

de Blok BM, Vlieg-Boerstra BJ, Oude Elberink JN, Duiverman EJ, DunnGalvin A, Hourihane JO, Cornelisse-Vermaat JR, Frewer L, Mills C, Dubois AE. (2007) A framework for measuring the social impact of food allergy across Europe: a EuroPrevall state of the art paper.Allergy. 62(7):733-7.

DunnGalvin, B.M.J. de Blok, A.E.J. Dubois J.O'B. Hourihane. (2008) Development and Validation of the Food Allergy Quality of Life – Parent Administered Questionnaire(FAQLQ-PF) for food allergic children aged 0-12 years. Clinical and Experimental Allergy 38(6)977-988.

DunnGalvin A, Hourihane JO, Frewer L, Knibb RC, Oude Elberink JN, Klinge I.(2006) Incorporating a gender dimension in food allergy research: a review.Allergy. 61(11):1336-43.

Dunngalvin A, Chang WC, Laubach S, Steele PH, Dubois AE, Burks AW, Hourihane JO. Pediatrics. (2009) Profiling Families Enrolled in Food Allergy Immunotherapy Studies. 2009 Aug 24. [Epub ahead of print]

European Food Safety Authority GMO Panel (2009) Draft Scientific Opinion on the assessment of allergenicity of GM plants and microorganisms and derived food and feed. http://www.efsa.europa.eu/en/consultations/call/gmo091201-ax1.pdf.

European Food Safety Authority Scientific Committee (2009) The potential risks arising from nanoscience and nanotechnologies on food and feed safety. The EFSA J 958: 1-39 http://www.efsa.europa.eu/en/scdocs/doc/sc_op_ej958_nano_en,3.pdf

BMJ Flokstra-de Blok, A DunnGalvin, JNG Oude Elberink, BJ Vlieg-Boerstra, EJ Duiverman, JO'B Hourihane, AEJ Dubois. (2008) Development and Validation of a Self-Administered Food Allergy Quality of Life Questionnaire for Teenagers. J Allergy Clin Immunol. 122: 139-144

Flokstra-de Blok BM, DunnGalvin A, Vlieg-Boerstra BJ, Oude Elberink JN, Duiverman EJ, Hourihane JO, Dubois AE.;(2009a) Development and validation of a self-administration Food Allergy Quality of Life Questionnaire for children. Clin Exp Allergy. 39(1):127-37.

Flokstra-de Blok BMJ, Oude Elberink JNG, Vlieg-Boerstra BJ, Duiverman EJ, Dubois AEJ. (2009c) Measuring health-related quality of life: fundamental methodological issues. Clin Exp Allergy 39(11):1774.

Flokstra-de Blok BMJ, Dubois AEJ, Vlieg-Boersta BJ, Oude Elberink JNG, Raat H, DunnGalvin A, Hourihane JO, Duiverman EJ. (2010) Health-related quality of life of food allergic patients: Comparison with the general population and other diseases. Allergy 65(2):238-244.

Flokstra-de Blok BMJ, van der Meulen GN, DunnGalvin A, Vlieg-Boerstra BJ, Oude Elberink JNG, Duiverman EJ, Hourihane JO, Dubois AEJ. (2009b) Development and validation of the Food Allergy Quality of Life Questionnaire-Adult Form (FAQLQ-AF). Allergy 64(8):1209-1217.

Fox M, Mugford M, Voordouw J, Cornelisse J, Antonides G, Frewer L (2009) Social and economic costs of food allergies in Europe: the development of a socioeconomic impact questionnaire. Health Serv Res. 2009 44(5 Pt 1):1662-78.

Gaier S, Marsh J, Oberhuber C, Rigby NM, Lovegrove A, Alessandri S, Briza P, Radauer C, Zuidmeer L, van Ree R, Hemmer W, Sancho AI, Mills C, Hoffmann-Sommergruber K, Shewry PR. (2008) Purification and structural stability of the peach allergens Pru p 1 and Pru p 3. Mol Nutr Food Res. 52 Suppl 2:S220-9.

Grimshaw KE, Allen K, Edwards CA, Beyer K, Boulay A, van der Aa LB, Sprikkelman A, Belohlavkova S, Clausen M, Dubakiene R, Duggan E, Reche M, Marino LV, Nørhede P, Ogorodova L, Schoemaker A, Stanczyk-Przyluska A, Szepfalusi Z, Vassilopoulou E, Veehof SH, Vlieg-Boerstra BJ, Wjst M, Dubois AE. (2009) Infant feeding and allergy prevention: a review of current knowledge and recommendations. A EuroPrevall state of the art paper. Allergy. 64(10):1407-16.

Hoffmann-Sommergruber K, Mills ENC, Vieths S. (2008) Coordinated and standardized production, purification and characterization of natural and recombinant food allergens to establish a food allergen library. Mol Nutr Food Res. 52 Suppl 2:S159-65.

Jacobsen B, Hoffmann-Sommergruber K, Have TT, Foss N, Briza P, Oberhuber C, Radauer C, Alessandri S, Knulst AC, Fernandez-Rivas M, Barkholt V. (2008) Purification and Characterization of Egg Allergens Gal d 1, 2, 3, 4 and 5. Mol Nutr Food Res. 52 Suppl 2:S176-85.

Keil T, McBride D, Grimshaw K, Niggemann B, Xepapadaki P, Zannikos K, Sigurdardottir ST, Clausen M, Reche M, Pascual C, Stanczyk AP, Kowalski ML, Dubakiene R, Drasutiene G, Roberts G, Schoemaker AF, Sprikkelman AB, Fiocchi A, Martelli A, Dufour S, Hourihane J, Kulig M, Wjst M, Yazdanbakhsh M, Szépfalusi Z, van Ree R, Willich SN, Wahn U, Mills EN, Beyer K. (2009) Allergy (in print, DOI 10.1111/j.1398-9995.2009.02171.x) *both authors contributed equally.

Sandra Kerbach, Anton J. Alldrick, Rene W.R. Crevel, Lilla Domotor, Audrey DunnGalvin, E.N. Clare Mills, Sylvia Pfaff, Roland E. Poms, Bert Popping & Sandor Tomoskozi. Managing foodallergens in the food supply chain- viewed from different stakeholder perspectives. Quality Assurance and Safety of Crops & Foods 1:50-60.

Kummeling I, Mills EN, Clausen M, Dubakiene R, Pérez CF, Fernández-Rivas M, Knulst AC, Kowalski ML, Lidholm J, Le TM, Metzler C, Mustakov T, Popov T, Potts J, van Ree R, Sakellariou A, Töndury B, Tzannis K, Burney P. (2009) The EuroPrevall surveys on the prevalence of food allergies in children and adults: background and study methodology. Allergy. 2009 Apr 6. [Epub]

Lauer I, Alessandri S, Pokoj S, Reuter A, Conti A, Vieths S, Scheurer S.(2008) Expression and characterization of three important panallergens from hazelnut. Mol Nutr Food Res. 52 Suppl 2:S262-71.

Ma, Y, Griesmeier, U, Susani, M, Radauer, C, Briza, P, Erler, A, Bublin, M, Alessandri, S, Himly, M, Vàzquez-Cortés, S, Reig Rincon de Arellano, I, Vassilopoulou, E, Saxoni-Papageorgiou, P, Knulst, AC, Fernández-Rivas, M, Hoffmann-Sommergruber, K, Breiteneder, H “Comparison of natural and recombinant forms of the major fish allergen parvalbumin from cod and carp. Mol Nutr Food Res electronically available 2008

Madsen CB, Hattersley S, Buck J, Gendel SM, Houben GF, Hourihane JO, Mackie A, Mills EN, Nørhede P, Taylor SL, Crevel RW. (2009) Approaches to Risk Assessment in Food Allergy: Report from a Workshop “Developing a framework for assessing the risk from allergenic foods”. Food Chem Toxicol. 47(2):480-9.

Mandalari G, Adel-Patient K, Barkholt V, Baro C, Bennett L, Bublin M, Gaier S,Graser G, Ladics GS, Mierzejewska D, Vassilopoulou E, Vissers YM, Zuidmeer L,Rigby NM, Salt LJ,

Defernez M, Mulholland F, Mackie AR, Wickham MS, Mills ENC. (2009)In vitro digestibility of beta-casein and beta-lactoglobulin under simulated humangastric and duodenal conditions: a multi-laboratory evaluation. Regul Toxicol Pharmacol.;55(3):372-81.

Marsh J, Rigby N, Wellner K, Reese G, Knulst A, Akkerdaas J, van Ree R, Radauer C, Lovegrove A, Sancho A, Mills C, Vieths S, Hoffmann-Sommergruber K, Shewry PR. (2008) Purification and characterisation of a panel of peanut allergens suitable for use in allergy diagnosis.Mol Nutr Food Res. 52 Suppl 2:S272-85.

Mills ENC, Mackie AR, Burney P, Beyer K, Frewer L, Madsen C, Botjes E, Crevel RW, van Ree R.(2007) The prevalence, cost and basis of food allergy across Europe. Allergy. 62(7):717-22.

Oberhuber C, Ma Y, Marsh J, Rigby N, Smole U, Radauer C, Alessandri S, Briza P, Zuidmeer L, Maderegger B, Himly M, Sancho AI, van Ree R, Knulst A, Ebner C, Shewry P, Mills EN, Wellner K, Breiteneder H, Hoffmann-Sommergruber K, Bublin M. (2008) Purification and characterisation of relevant natural and recombinant apple allergens. Mol Nutr Food Res.52 Suppl 2:S230-40

Oberhuber C, Bulley SM, Ballmer-Weber BK, Bublin M, Gaier S, DeWitt AM, Briza P, Hofstetter G, Lidholm J, Vieths S, Hoffmann-Sommergruber K. (2008) Characterization of Bet v 1 related allergens from kiwifruit relevant for patients with combined kiwifruit and birch pollen allergy. Mol Nutr Food Res. 52 Suppl 2:S208-19

Rigby NM, Marsh J, Sancho AI, Wellner K, Akkerdaas J, van Ree R, Knulst A, Fernández-Rivas M, Brettlova V, Schilte PP, Summer C, Pumphrey R, Shewry PR, Mills ENC. (2008) The purification and characterisation of allergenic hazelnut seed proteins. Mol Nutr Food 52 Suppl 2:S251-61

Rona RJ, Keil T, Summers C, Gislason D, Zuidmeer L, Sodergren E, Sigurdardottir ST, Lindner T, Goldhahn K, Dahlstrom J, McBride D, Madsen C. (2007) The prevalence of food allergy: a meta-analysis. J Allergy Clin Immunol.120(3):638-46.

B. Sora, A. Boulay, R. Sala, J. Houghton, V Gancheva, A. Strada, M. Schlegel-Zawadzka, G. Rowe.: A characterization of peanut consumption in four counties: results from focus groups and their implications for peanut allergy prevalence. International Journal of Consumer Studies early view: published online 19 Aug. 2009, DOI: 10.1111/j.1470-6431.2009.00810.x About DOI

van der Velde JL, Flokstra-de Blok BM, Vlieg-Boerstra BJ, Oude Elberink JN, Schouten JP, Dunngalvin A, Hourihane JO, Duiverman EJ, Dubois AE. (2009) Test-retest reliability of the Food Allergy Quality of Life Questionnaires (FAQLQ) for children, adolescents and adults. Mar;18(2):245-51.

Vieths S, Reese G, Ballmer-Weber BK, Beyer K, Burney P, Fernandez-Rivas M, Summers C, Ree R, Mills C. (2008) The serum bank of EuroPrevall - the prevalence, cost and basis of food allergy across Europe.Food Chem Toxicol.46 Suppl 10:S12-4.

Voordouw, J., Cornelisse-Vermaat, J.R., Yiakoumaki, V., Theodoridis, G. & Frewer, L.J. (2009). Food allergic consumers' preferences for labelling practices in a real shopping environment. International Journal of consumers studies. E-pub.

Wong GW, Mahesh PA, Ogorodova L, Leung TF, Fedorova O, Holla AD, Fernandez-Rivas M, Clare Mills EN, Kummeling I, van Ree R, Yazdanbakhsh M, Burney P. (2009) The

EuroPrevall-INCO surveys on the prevalence of food allergies in children from China, India and Russia: the study methodology. Allergy. Nov 4.

Zuidmeer L, Goldhahn K, Rona RJ, Gislason D, Madsen C, Summers C, Sodergren E, Dahlstrom J, Lindner T, Sigurdardottir ST, McBride D, Keil T. (2008) The prevalence of plant food allergies: a systematic review. J Allergy Clin Immunol. 121(5):1210-1218.

2. Dissemination and use

During the last year of the project a plan has been developed and implemented under which the collective value of the EuroPrevall outputs, particularly in terms of shared biological resources and other know-how, can continue to be accessed. The aim of this plan was to devise a workable management system in order that the project's collective resources can be assessed in a way that maximized their value to the allergy scientific community. This has led to the establishment of a EuroPrevall Resource Access Committee (RAC) and agreed mechanisms for partners and third parties to use the RAC to access the projects outputs for further allergy research. An amendment to the Consortium Agreement has been drafted and agreed amongst most of the partnership, which establishes the RAC and how it will operate in the future. Other opportunities identified across the project activities have been identified under around 12 different topic headings spanning utilisation of food extract mixes and DBPCFC matrices for clinical diagnosis, to the socioeconomic impact of food allergy information much of which is focused around the SMEs in the project partnership. These opportunities are summarized in the Table below.

2.1 Exploitable Knowledge and its use

Exploitable Knowledge (description)	**Exploitable product(s) or measure(s)**	**Sector(s) of application**	**Timetable for commercial use**	**Patents or other IPR protection**	**Owner & Other Partner(s) involved**
1. Food Extract Mixes	Improved allergen diagnostics	1.Diagnostics 2. General healthcare	2010/11	Confidential know-how	P34
2. Allergen Library	1. Allergen database 2. Improved diagnostics 3. Allergen samples 4. Novel allergens	1. Diagnostics 2. General healthcare	2008	Database rights. Patent applications will emerge in the future. Confidential know-how.	P16, P1, P12, P23
3. Socioeconomic impact of food allergy information	1. Workshops and information for SMEs 2. Validated Questionnaires for use by medical practitioners 3. New food labeling and	1. Food manufacture and retail 2. General medical	2008/9	Copyrighted materials in print, electronic or web based formats. Patent applications may emerge in the next 18 months	P21, P9, P4, P30, P61

Exploitable Knowledge (description)	**Exploitable product(s) or measure(s)**	**Sector(s) of application**	**Timetable for commercial use**	**Patents or other IPR protection**	**Owner & Other Partner(s) involved**
	supermarket information terminals for allergic consumers			claiming novel food labeling and monitoring systems for food retailers	
4. Tools for food producers, retailers, caterers and food control authorities	1. Training courses and associated Tool Kit of information for SMEs	1. SME food producers, retailers and caterers	2011/12	Copyrighted materials in print, electronic or web based formats	P52, P42, P36, P19, P13, P9, P14
5. Validation data for novel cell based assays for rapid in vitro allergy detection	1. Validated and novel cell based assays for in vitro allergen diagnostics	1. Clinical diagnostics 2. Food diagnostics 3. Ag and pharma biotechnology		Not likely to now progress due to technical problems	P11, P2, P9, P35
6. Production of pure allergen ImmunoCAPs and component resolved diagnostics know-how	1. Improved ImmunoCAP assays	1. Clinical diagnostics	2009	Know-how and novel reagents	P34, P11
7. Validated protein diagnostic chips	1. Novel allergen protein chip diagnostic kits	1. Clinical diagnostics 2. Food diagnostics	2008/9	Know-how and novel reagents. Patent applications on the protein chips may emerge in the next 18 months	P16, P26
8. New histamine release detection platform and kits	1. Novel histamine release diagnostic platform 2. Novel histamine release test formats	1. Clinical diagnostics	2007	Know-how. Trademarks. Patent applications may be filed on the new assay format in the coming 18 months	P35

Exploitable Knowledge (description)	**Exploitable product(s) or measure(s)**	**Sector(s) of application**	**Timetable for commercial use**	**Patents or other IPR protection**	**Owner & Other Partner(s) involved**
9. Allergen ELISA Kits	Novel ELISA kits sold under BioKit brand	1. Clinical diagnostics 2. Food manufacture diagnostics	2007	Know-how and novel reagents branded under existing trademark.	P22
10. Processing and digestion of allergens in food matrixes	1. Infant gut model	1. Food product development 2. Drug delivery	2009	Patent could still be filed	P1
11. Dissemination of EuroPrevall know-how	1. Workshops 2. Printed information e.g. books	Broad range from consumers through to food industry	2007	Copyrighted material	P9 plus many others
12. Clinical data using new skin prick tests	1. Skin prick tests for apple allergy	Allergy diagnostics	2008	Know-how and trademarked products	P7 plus other clinical partners
13. Practical Training for Schools	Information on managing allergic students for schools	General healthcare	2009	Published Know-how	P56
14. Resources Access Committee	Mechanism to access shared project resources	1. Allergy research 2. Allergy diagnostics and treatment	2011 and beyond	Know-how and proprietary biological materials	All partners

2.2 Dissemination of knowledge – highlights

The Table below summarises the highlights in relation ot the dissemination activity undertaken during the course of the project together with a list of refereed publications from the project.

Planned/actual dates	Type	Short Description	Type of audience	Countries addressed	Size of audience	Partner responsible/ involved
	WEB-SITE					
Ongoing		The EuroPrevall website (www.europrevall.org) has been updated throughout the reporting period.	General public (public pages); project partners (private pages)	English speaking world	World-wide web	1, 40
		European Academy of Allergy and Clinical Immunology (EACCI) (1) web-site entry on EuroPrevall: http://www.eaaci.net/site/content.php?artid=994	Clinical and health-care workers	English speaking world	World-wide web	19, 9/44
		Information on the MoniQA web-site http://www.moniqa.org/?id=120281 and http://www.moniqa.org/node/1197	Food safety (research and industry)	English speaking world	World-wide web	1
		EuroPrevall India http://www.allergynasthma.org/europrevall.htm	General public and Health professionals	English speaking world	World-wide web	P58
Press/Media briefing						
Month 4		EuroPrevall launch at the Docklands Museum with other EU projects (EuroFIR, Trace, REPRO and BioCop)with Mr Patterman (DG Research); press release cascade to media worldwide (see below)	Media, industry	UK	20-30	1 with 2/55, 3, 36
Month 16		EuroPrevall session at the UK British Association for Advancement of Science Annual Meeting, University of East Anglia; press release cascade to media worldwide (see also press release activity above)	Media, industry	UK	20-30	1 with 2/55
Month 35		Press release by UK Institute of Food Science and technology in association with the Annual lecture given by Clare Mills on 30th April 2008http://www.ifst.org/site/cms/contentviewarticle.asp?article=1104	Food industry, research	UK	200	P1

Month 37		Press release at the EACCI XVII Congress, Barcelona	Clinical and health-care workers	Spanish and English speaking world	Spain and the wider Spanish speaking world	1,7, 55
	CONFERENCES					
	Talks					
Month 31		**World Allergy Congress, Bankok** Talks given by Clare Mills, Ronald van Ree Kirsten Beyer	Health Professionals	English	500	P1, 5, 54
Month 31		**2nd Workshop on Food Allergy in ERA-European Research Area ; Brussels 10 -11th Dec 2007**	Health professionals, natural and social scientists	English	60	
Month 34		**Annual meeting of the American Academy of Allergy, Asthma and Immunology (AAAAI), Philadelphia, USA, 14-18 March 2008.**	Health professionals	English	8,000	P29, 54
		Breakfast seminar "US and EU Approaches to Food Allergy Research" Paper on European Initiatives in Food Allergy Research E.N.C Mills[1*], A. R. Mackie[1], P. Burney[2], K. Beyer[3], L. Frewer[4], C. Madsen[5], E. Botjes[6], R.W.R. Crevel[7], Maria Yazdanbakhsh[8] R van Ree[9]Clare Mills	Health professionals	English	25	P1,5,7,55,56, 19,13,43,9/44
Month 35	Workshop	EFA-EuroPrevall -GA²LEN Workshop for Patient representatives 10th April 2008	Patient groups, clinicians	BE, NL, LU, DE, SW, UK	16	P19, P1
Month 35		**3rd International Symposium on Molecular Allergology - ISMA Allergens: From Identification to Therapy April, 18 to April 20, 2008, Salzburg, Austria**	Health professionals and researchers	German/ English	200	

		K. Hoffmann-Sommergruber[1] A Sancho[2], T. Holzhauser[3], J. Lidholm[4], P. Skov[5], S. Gaier[1], S. Alessandri[6], N. Rigby[2], J Marsh[7], P. Briza[8], C. Oberhuber[9], G. Reese[3], M Fernandez-Rivas[10], B. Ballmer-Weber[11], S. Vieths[3], P. Shewry[7], R van Ree[12], C. Mills[2] General concept and aims of the EuroPrevall Food Allergen Library				P16,34,35,23, 12,11,7,6,54
		S. Vieths, K. Bauermeister, M. Albrecht, K. Hoffmann-Sommergruber, C. Oberhuber, H. Breiteneder, M. Bublin, A Sancho3, J. Lidholm, Å. Marknell DeWitt, S. Alessandri, J. Marsh, C. Mills, G. Reese , T. Holzhauser, R. van Ree, M. Fernandez-Rivas, B. K. Ballmer-Weber Component-resolved Diagnosis Using the EuroPrevall Food Allergen Library				P16,34,35,23, 12,11,7,6,54
		A Sancho Digestion of allergens				P1
Month 30		**International Conference on Food Allergies and Consumer Protection at the University of Montreal, Canada.** "Discuss status of food allergen labelling in the EU, enforcement regulations, implications of the new European regulations, responses of non-EU countries and ongoing research in Europe"Clare Mills	Food science, allergic consumers, health professionals	English/French – North Ameerica	200	P1
Month 36		**10th International Symposium On Immunological, Chemical and Clinical Problems of Food Allergy. Parma (ITALY), 26-29th May 2008**	Health professionals and researchers	English	200	
		Component resolved diagnosis in food allergy: potential and limitations Stefan Vieths				P11, P06, P16, P34
		The Impact of Food Allergy in Europe Clare Mills				P1,5,19,4,54, 15,43,55

Month 37		Conference Barcelona (EAACI) 10 June 2008; Sessions included a specific EuroPrevall session with presentations from Clare Mills, Peter Burney and Tony DuBois in addition to presentations within the main sessions from P7,6 and 5 and around 7-10 posters from various EuroPrevall participants	Health professionals, researchers	English speaking	8,000	P1, 5,6,7 56,29
Month 37		**12th EFA Conference, Warsaw 2008:** A session with talks from EuroPrevall partners Jonathan Hourihane (P54) and Harry Wichers (P10) disseminating the project to allergic consumer groups	Allergic consumer groups, health professionals	English speaking	200	P19, 54,10
Month 40		**German Allergy Congress 10-13th September 2008** "EuroPrevall – The development of food allergies" , Kirsten Beyer	Health professionals, researchers	English speaking	300	P5
Month 41		**Czech Republic Allergy Conference#**"Expoziční testy v diagnostice potravinové přecitlivělosti" – Food challenges in diagnosis of food hypersensitivity	Health professionals, researchers	Czech speaking	300	P38
Month 46		**AAAAI Meeting, Washington, March** 2009: Clare Mills have a plenary talk in the Presidential Symposium and various EuroPrevall partner had posters with one, Audrey DunnGalvin (P54), giving an oral poster on the WP4.2 activities	Health professionals, researchers	English speaking	8,000	P1,P29, P54
Month 49		**EAACI Warsaw Congress May 2009;** EuroPrevall had two sessions at this meeting with talks given by Montserrat Fernandez-Rivas (P7), Kirsten Beyer (P5), Barbabra Ballmer-Weber (P6), Ischa Kummerling (P56), Clare Mills (P1), Jonas Lidholm (P34).	Health professionals, researchers	English speaking	5,000	P1, 5,6, 7, 34, 56

		There were a number of poster presentations from the project in addition.				
Month 49		**13th EFA Conference: Future of Patient Organisations** 12-13 June 2009, Rome, Italy. Ronald van Ree (P55) presented an overview of EuroPrevall	Allergic consumer groups, health professionals	English speaking	200	P19, 55
Month 54		**EAACI Paediatric Allergy and Asthma Meeting, Venice 12-14 November, 2009**	Health Professionals	English	500	P1, 54
		European initiatives on food allergy – preliminary results of the EuroPrevall project Clare Mills				
		Parental Expectation of Adverse Outcomes in HRQL as measured by the FAQLQ-PF, Audrey DunnGalvin				
Month 55		**World Allergy Congress, Buenos Aires** Talks given by Clare Mills, Kirsten Bayer	Health Professionals	English	500	P1, 5
Planned		**EuroPrevall-ILSI-FSA-sponsored symposium 20th-22nd October 2010**	Health professionals, risk assessors, food industry	English speaking	150	P1,13,6,7,56, 60,5.
PUBLICATIONS IN INTERNATIONAL REFEREED JOURNALS						
Month 22		Asero R., Ballmer-Weber B.K., Beyer K., Conti A., Dubakiene R., Fernandez-Rivas M., Hoffmann-Sommergruber K., Lidholm J., Mustakov T., Elberink J.N.G.O., Pumphrey R.S.H., Skov P.S., van Ree R., Vlieg-Boerstra B.J., Hiller R., Hourihane J.O., Kowalski M., Papadopoulos N.G., Wal J.M., Mills E.N.C. and Vieths S. (2007) IgE-Mediated food allergy diagnosis: Current status and new perspectives. Molecular Nutrition & Food Research 51, 135-147.	Researchers	Europe	50,000	P45, P6, P5, P31, P39, P7, P16, P34, P37, P29, P33, P35, P2/55, P29, P20, P26, P54, P32, P17, P8 P11
Month 22		de Blok B.M., Vlieg-Boerstra B.J., Oude Elberink J.N., Duiverman E.J., Dunngalvin A., Hourihane J.O., Cornelisse-Vermaat J.R., Frewer L., Mills C. and Dubois A.E. (2007) A framework for measuring the social impact of food allergy across Europe: a	Researchers, Clinicians	Europe	100,000	P29, 54,4,1

		EuroPrevall state of the art paper. Allergy 62, 733-737.				
Month 22		Dunngalvin A., Hourihane J.O., Frewer L., Knibb R.C., Oude Elberink J.N. and Klinge I. (2006) Incorporating a gender dimension in food allergy research: a review. Allergy 61, 1336-1343.	Researchers, clinicians	English speaking world	100,000	P54, P4 P29, P46
Month 22		Mills E.N., Mackie A.R., Burney P., Beyer K., Frewer L., Madsen C., Botjes E., Crevel R.W. and van Ree R. (2007) The prevalence, cost and basis of food allergy across Europe. Allergy 62, 717-722.	Researchers clinicians	Worldwide	100,000	P1, P56 , P5, P4, P9, P19 , P13. & P55
Month 27		Pfaff, S., Frewer, L.J. & Cornelisse-Vermaat, J.R. (2007). Innovative information delivery for food allergic consumers. *Food Science and Technology*, 21: 24-26.	Food Science	English speaking	5,000	P4, 57
Month 25		Rona,R.J., Keil,T., Summers,C., Gislason,D., Zuidmeer,L., Sodergren,E., Sigurdardottir,S.T., Lindner,T., Goldhahn,K., Dahlstrom,J., McBride,D., Madsen,C. The prevalence of food allergy: A meta-analysis J Allergy Clin Immunol 2007;120(3), 638-646	Health Professionals and researchers	English	10,000	P3,5,33,48,55 ,34,9/44
Month 32		R. W. R Crevel, B. K. Ballmer-Weber, T. Holzhauser,J. O_B. Hourihane, A. C. Knulst,A. R. Mackie, F. Timmermans,S. L. Taylor Thresholds for food allergens and their value to different stake holders" Article published in Allergy 2008; 63, 597-609	Health Professionals and researchers	English speaking world	10,000	P13,6,1, 11,20, 54, 42
Month 33		Flinterman AE, Akkerdaas JH, den Hartog Jager CF, Rigby NM, Fernandez-Rivas M, Hoekstra MO, Bruijnzeel-Koomen CA, Knulst AC, van Ree R, Pasmans SG.Lipid transfer protein-linked hazelnut allergy in children from a non-Mediterranean birch-endemic area. J Allergy Clin Immunol. 2008 Feb;121(2):423-428.e2. Epub 2007 Nov 26.	Health Professionals and researchers	English speaking world	10,000	P20,55,1
Month 35		A. DunnGalvin, B.M.J. de	Health	English	10,000	P54, 29

		Blok, A.E.J. Dubois J.O'B. Hourihane. Development and Validation of the Food Allergy Quality of Life – Parent Administered Questionnaire(FAQLQ-PF) for food allergic children aged 0-12 years Clinical and Experimental Allergy 2008; 38(6)977-988.	Professionals and researchers			
Month 35		BMJ Flokstra-de Blok, A DunnGalvin, JNG Oude Elberink, BJ Vlieg-Boerstra, EJ Duiverman, JO'B Hourihane, AEJ Dubois. Development and Validation of a Self-Administered Food Allergy Quality of Life Questionnaire for Teenagers. J Allergy Clin Immunol, 2008. 122 139-144	Health Professionals and researchers	English	10,000	P29, 54
Month 36		Zuidmeer L, Goldhahn K, Rona RJ, Gislason D, Madsen C, Summers C, Sodergren E, Dahlstrom J, Lindner T, Sigurdardottir ST, McBride D, Keil T.The prevalence of plant food allergies: a systematic review. J Allergy Clin Immunol. 2008 May;121(5):1210-1218.e4. Epub 2008 Apr 18.	Health Professionals and researchers	English	10,000	P29, 54
Month 38		BMJ Flokstra-de Blok, A DunnGalvin, JNG Oude Elberink, BJ Vlieg-Boerstra, EJ Duiverman, JO'B Hourihane, AEJ Dubois. Development and Validation of a Self-Administered Food Allergy Quality of Life Questionnaire for Teenagers. J Allergy Clin Immunol, 2008. 122 139-144	Health Professionals and researchers	English	10,000	P29, 54
Month 38		Boulay A, Houghton J, Gancheva V, Sterk Y, Strada A, Schlegel-Zawadzka M, Sora B, Sala R, van Ree R, Rowe G. A EuroPrevall review of factors affecting incidence of peanut allergy: priorities for research and policy. Allergy. 2008 Jul;63(7):797-809. e-pub in May	Health Professionals and researchers	English	10,000	P1, 63,64,66, 54
Month 38		Vieths S, Reese G, Ballmer-Weber BK, Beyer K, Burney P, Fernandez-Rivas M, Summers C, Ree R, Mills C.	Researchers, risk assessors, risk managers	English	10,000	P11,1,55,56,, 5,33,7

		(2008) The serum bank of EuroPrevall - the prevalence, cost and basis of food allergy across Europe. Food Chem Toxicol.46 Suppl 10:S12-4.				
Month 42		Neil M. Rigby, Justin Marsh, Ana I. Sancho , Klaus Wellner, Jaap Akkerdaas, Ronald van Ree, Andre Knulst, Montserrat Fernández-Rivas , Vlasta Brettlova, Piet P. Schilte, Peter R. Shewry, E.N. Clare Mills. The purification and characterisation of allergenic hazelnut seed proteins Mol Nutr Food 2008 Nov;52 Suppl 2:S251-61	Researchers, Food scientists	English	10,000	1,12,55,20,7
Month 42		Christina Oberhuber[1*], Yan Ma[2*], Justin Marsh[3*], Neil Rigby[4], Ursula Smole[2], Christian Radauer[2], Stefano Alessandri[5], Peter Briza[6], Laurian Zuidmeer[7], Bernhard Maderegger[1], Martin Himly[6], Ana I. Sancho[4], Ronald van Ree[7], André Knulst[8], Christof Ebner[9], Peter Shewry[2], E. N. Clare Mills[4], Klaus Wellner[4], Heimo Breiteneder[2], Karin Hoffmann-Sommergruber[2], Merima Bublin[2] "Purification and characterisation of relevant natural and recombinant apple allergens" Mol Nutr Food Res. 2008 Nov;52 Suppl 2:S230-40	Researchers, Food scientists	English	10,000	P23,16,28,1,20,12,
Month 42		Christina Oberhuber, Sean M. Bulley, Barbara K. Ballmer-Weber, Merima Bublin, Sonja Gaier, Åsa Marknell DeWitt, Peter Briza, Gerlinde Hofstetter, Jonas Lidholm, Stefan Vieths, Karin Hoffmann-Sommergruber "Characterization of Bet v 1 related allergens from kiwifruit relevant for patients with combined kiwifruit and birch pollen allergy " Mol Nutr Food Res. 2008 Nov;52 Suppl 2:S208-19	Researchers, Food scientists	English	10,000	P23, 6,16,34,11
Month 42		Justin Marsh, Neil Rigby, Klaus Wellner, Gerald Reese, André Knulst, Jaap Akkerdaas, Christian Radauer, Alison Lovegrove, Ana Sancho, Clare Mills,	Researchers, Food scientists	English	10,000	12,1,11,20,16

		Stefan Vieths, Karin Hoffmann-Sommergruber, Peter Shewry. Purification and characterisation of a panel of peanut allergens suitable for use in allergy diagnosis. Mol Nutr Food Res. 2008 Nov;52 Suppl 2:S272-85				
Month 42		Ma, Y, Griesmeier, U, Susani, M, Radauer, C, Briza, P, Erler, A, Bublin, M, Alessandri, S, Himly, M, Vàzquez-Cortés, S, Reig Rincon de Arellano, I, Vassilopoulou, E, Saxoni-Papageorgiou, P, Knulst, AC, Fernández-Rivas, M, Hoffmann-Sommergruber, K, Breiteneder, H "Comparison of natural and recombinant forms of the major fish allergen parvalbumin from cod and carp" Mol Nutr Food Res electronically available 2008	Researchers, Food scientists	English	10,000	P16,23,28,17, 20, 7
Month 42		Iris Lauer, Stefano Alessandri, Sven Pokoj, Andreas Reuter, Amedeo Conti, Stefan Vieths and Stephan Scheurer Expression and characterization of three important panallergens from hazelnut. Mol Nutr Food Res. 2008 Nov;52 Suppl 2:S262-71	Researchers, Food scientists	English	10,000	11,28
Month 42		Jacobsen B, Karin Hoffmann-Sommergruber, Tilde Thordahl Have, Nicolai Foss, Peter Briza, Christina Oberhuber, Christian Radauer, Stefano Alessandri, Andre C. Knulst, Montserrat Fernandez-Rivas and Vibeke Barkholt „Purification and Characterization of Egg Allergens Gal d 1, 2, 3, 4 and 5" Mol Nutr Food Res. 2008 Nov;52 Suppl 2:S176-85	Researchers, Food scientists	English	10,000	P16,23,7,44,20, 28
Month 42		Hoffmann-Sommergruber K, Mills EN, Vieths S. Coordinated and standardized production, purification and characterization of natural and recombinant food allergens to establish a food allergen library. Mol Nutr	Researchers	English speaking world	10,000	P1,16,11

		Food Res. 2008 Nov;52 Suppl 2:S159-65				
Month 42		Gaier S, Marsh J, Oberhuber C, Rigby NM, Lovegrove A, Alessandri S, Briza P, Radauer C, Zuidmeer L, van Ree R, Hemmer W, Sancho AI, Mills C, Hoffmann-Sommergruber K, Shewry PR. Purification and structural stability of the peach allergens Pru p 1 and Pru p 3. Mol Nutr Food Res. 2008 Nov;52 Suppl 2:S220-9	Researchers, Food scientists	English	10,000	16,12, 1, 55, 23,28
Month 42		Merima Bublin, Iris Lauer , Christina Oberhuber, Stefano Alessandri, Peter Briza, Christian Radauer, Martin Himly, Heimo Breiteneder, Stefan Vieths, Karin Hoffmann-Sommergruber "Purification and characterisation of relevant recombinant and natural celery allergens" Mol Nutr Food Res 2008 Nov;52 Suppl 2:S241-50	Researchers, Food scientists	English	10,000	P16,11,28
Month 42		Blanc F, Bernard H, Alessandri S, Bublin M, Paty E, Leung SA, Patient KA, Wal JM. Update on optimized purification and characterization of natural milk allergens. Mol Nutr Food Res. 2008 Nov;52 Suppl 2:S166-75	Researchers, Food scientists	English	10,000	
Month 42		Melanie Albrecht, Stefano Alessandri, Amedeo Conti, Andreas Reuter, Iris Lauer, Stefan Vieths, Gerald Reese High level Expression, Purification and Physico-chemical Characterisation of Recombinant Pen a 1 - a Major Allergen of Shrimp. Mol Nutr Food Res. 2008 Nov;52 Suppl 2:S186-95	Researchers, Food scientists	English	10,000	11,28,31
Month 43		Cornelisse-Vermaat, J.R., Pfaff, S., Voordouw, J., Frewer, L.J., Theodoridis, G. & Woestman, L. (2008). The information needs and preferences of food allergic consumers. The views of stakeholders regarding information scenarios. *Trends in Food Science and Technology*, 19:669-676.	Food Science	English speaking	10,000	P4,30,57

Month 44		Sandra Kerbach, Anton J. Alldrick, Rene W.R. Crevel, Lilla Domotor, Audrey DunnGalvin, E.N. Clare Mills, Sylvia Pfaff, Roland E. Poms, Bert Popping & Sandor Tomoskozi. Managing foodallergens in the food supply chain- viewed from different stakeholder perspectives. Quality Assurance and Safety of Crops & Foods 1:50-60.	Food Science	English speaking	2,000	P1,51,54
Month 44		Reig Rincón de Arellano IR, Vázquez-Cortés S, Sinaniotis AC, Fernández-Rivas M. Isabel Reig Rincón de Arellano, Sonia Vázquez-Cortés, Athanasios C. Sinaniotis, Montserrat Fernández-Rivas. False Positive Reaction in a Double-Blind Placebo Controlled Food Challenge. J Investig Allergol Clin Immunol. 2009;19(3):241-2.	Health Professionals and researchers	English	10,000	P7
Month 44		Voordouw, J., Cornelisse-Vermaat, J.R., Yiakoumaki, V., Theodoridis, G. & Frewer, L.J. (2009). Food allergic consumers' preferences for labelling practices in a real shopping environment. International Journal of consumers studies	Consumer scientists	English speaking	5,000	P4,30,57
Month 44		Flokstra-de Blok BM, DunnGalvin A, Vlieg-Boerstra BJ, Oude Elberink JN, Duiverman EJ, Hourihane JO, Dubois AE.; Development and validation of a self-administration Food Allergy Quality of Life Questionnaire for children. Clin Exp Allergy. 2009 Jan;39(1):127-37. Epub 2008 Oct 30	Health Professionals and researchers	English	10,000	P29,54
Month 45		Madsen CB, Hattersley S, Buck J, Gendel SM, Houben GF, Hourihane JO, Mackie A, Mills EN, Nørhede P, Taylor SL, Crevel RW.; Approaches to Risk Assessment in Food Allergy: Report from a Workshop "Developing a framework for assessing the risk from allergenic foods". Food Chem	Risk assessors, risk managers, food toxicologists	English	5,000	P9,13,1,54

		Toxicol. 2009 Feb;47(2):480-9. Epub 2008 Dec 7				
Month 46		van der Velde JL, Flokstra-de Blok BM, Vlieg-Boerstra BJ, Oude Elberink JN, Schouten JP, Dunngalvin A, Hourihane JO, Duiverman EJ, Dubois AE.; Test-retest reliability of the Food Allergy Quality of Life Questionnaires (FAQLQ) for children, adolescents and adults. 2009 Mar;18(2):245-51. Epub 2009 Jan 14	Health Professionals and researchers	English	10,000	P29,54
Month 47		Kummeling I, Mills EN, Clausen M, Dubakiene R, Pérez CF, Fernández-Rivas M, Knulst AC, Kowalski ML, Lidholm J, Le TM, Metzler C, Mustakov T, Popov T, Potts J, van Ree R, Sakellariou A, Töndury B, Tzannis K, Burney P.; The EuroPrevall surveys on the prevalence of food allergies in children and adults: background and study methodology. Allergy. 2009 Apr 6. [Epub]	Health Professionals and researchers	English	20,000	P56,1,49,7,20,32, 34, 37, 39, 6, 55,17,
Month 47		Flokstra-de Blok BMJ, Dubois AEJ. Quality of life in food allergy: valid scales for children and adults. Curr Opin Allergy Clin Immunol 2009 Jun;9(3):214-221.	Health Professionals and researchers	English	20,000	P29,54
Month 50		Sonja Gaier, Christina Oberhuber, Wolfgang Hemmer, Christian Radauer, Neil M. Rigby, Justin T. Marsh, Clare E. N. Mills, Peter R. Shewry, Karin Hoffmann-Sommergruber; Pru p 3 as a marker for symptom severity (in a group of peach allergic patients) in a birch pollen environment. J Allergy Clin Immunol. 2009 Jul;124(1):166-7. Epub 2009 Apr 14	Health Professionals and researchers	English	20,000	P16,1,12
Month 50		Fox M, Mugford M, Voordouw J, Cornelisse J, Antonides G, Frewer L Social and economic costs of food allergies in Europe: the development of a socioeconomic impact questionnaire Health Serv Res. 2009 Oct;44(5 Pt 1):1662-78. Epub 2009 Jul 8	Researchers, clinicians, policy makers, patient groups	English speaking world	3000	P4, 27, 62, 65

Month 50		Flokstra-de Blok BMJ, van der Meulen GN, DunnGalvin A, Vlieg-Boerstra BJ, Oude Elberink JNG, Duiverman EJ, Hourihane JO, Dubois AEJ. Development and validation of the Food Allergy Quality of Life Questionnaire-Adult Form (FAQLQ-AF). Allergy 2009 Jul;64(8):1209-1217.	Researchers, clinicians	English speaking world	20000	P29, P54
Month 51		Cochrane S, Beyer K, Clausen M, Wjst M, Hiller R, Nicoletti C, Szepfalusi Z, Savelkoul H, Breiteneder H, Manios Y, Crittenden R, Burney P. Factors influencing the Incidence and Prevalence of Food Allergy Burney et al submitted. Allergy. 2009 Aug 5. Epub	Researchers	English speaking world	20000	P56, 5,13, 26,1,16, 9,17,14, FSA
Month 51		B. Sora, A. Boulay, R. Sala, J. Houghton, V Gancheva, A. Strada, M. Schlegel-Zawadzka, G. Rowe.: A characterization of peanut consumption in four counties: results from focus groups and their implications for peanut allergy prevalence. International Journal of Consumer Studies early view: published online 19 Aug. 2009, DOI: 10.1111/j.1470-6431.2009.00810.x About DOI	Consumer Scientists	English	5,000	P1,63, 64,65
Month 52		Thomas Keil, Doreen McBride, Paraskevi Xepapadaki, Kirikas Zannikos, Sigurveig T. Sigurdardottir, Michael Clausen, Marta Reche, Cristina Pascual, Anna Przyluska Stanczyk, Marek L. Kowalski, Ruta Dubakiene, Grazina Drasutiene, Graham Roberts, Anne-Fleur A. Schoemaker, Aline B. Sprikkelman, Alessandro Fiocchi, Alberto Martelli, Kate Grimshaw, Jonathan Hourihane, Michael Kulig, Matthias Wjst, Maria Yazdanbakhsh, Zsolt Szépfalusi, Ronald van Ree, Stefan N. Willich, Ulrich Wahn, Clare Mills, Kirsten	Researchers, clinicians	English speaking world	20000	P05, P1, P16, P17, P18, P32, P39, P48, P49, P55, CP90

		Beyer. Allergy 2009 (in print, DOI 10.1111/j.1398-9995.2009.02171.x) *both authors contributed equally.				
Month 53		Grimshaw KE, Allen K, Edwards CA, Beyer K, Boulay A, van der Aa LB, Sprikkelman A, Belohlavkova S, Clausen M, Dubakiene R, Duggan E, Reche M, Marino LV, Nørhede P, Ogorodova L, Schoemaker A, Stanczyk-Przyluska A, Szepfalusi Z, Vassilopoulou E, Veehof SH, Vlieg-Boerstra BJ, Wjst M, Dubois AE. Infant feeding and allergy prevention: a review of current knowledge and recommendations. A EuroPrevall state of the art paper. Allergy. 2009 Oct;64(10):1407-16.	Researchers, clinicians	English speaking world	20000	P20,5,1,38,9, 16,50,29,17, 39, 55,59, 48,32
Month 54		Flokstra-de Blok BMJ, Oude Elberink JNG, Vlieg-Boerstra BJ, Duiverman EJ, Dubois AEJ. Measuring health-related quality of life: fundamental methodological issues. Clin Exp Allergy 2009 Nov;39(11):1774.	Researchers, clinicians	English speaking world	15000	P29, 54
Month 54		Wong GW, Mahesh PA, Ogorodova L, Leung TF, Fedorova O, Holla AD, Fernandez-Rivas M, Clare Mills EN, Kummeling I, van Ree R, Yazdanbakhsh M, Burney P. The EuroPrevall-INCO surveys on the prevalence of food allergies in children from China, India and Russia: the study methodology. Allergy. 2009 Nov 4.	Researchers, clinicians	English speaking world	20000	P1, P7, P43, P55, P56, P58,59,60
Month 54		D. Dupont, G. Mandalari, D. Molle, J. Leonil, R. Faulks, M. Wickham,E.N.C. Mills and A. R. Mackie;Comparative resistance of food proteins to adult and infant in vitro digestion models Mol Nutr Food Res. 2009 Nov 20. [Epub ahead of print]	Researchers, Food scientists	English	10,000	P1,8
Month 57		J. Voordouw, J. Cornelisse, V. Viakoumaki, G. Theodoridis, L.J., G.Chryssochoidis, Frewer L.J. Food allergy consumers' preferences for labelling	Food and retail industry, allergic consumers	English	3,000	P4, 30

		practices; a qualitative study in a real shopping environment. International Journal of Consumer studies				
Month 57		Kerstin Bauermeister, Barbara K. Ballmer-Weber, Merima Bublin, Philipp Fritsche, Kay-Martin O. Hanschmann, Karin Hoffmann-Sommergruber, Jonas Lidholm, Christina Oberhuber, Stefanie Randow, Thomas Holzhauser , Stefan Vieths; Assessment of component resolved in vitro diagnosis of 1 celeriac allergy J Allergy Clin Immunol. 124:1273-81	Researchers, clinicians	English speaking world	20000	P11,6, 23. 34
Month 57		Mandalari G, Adel-Patient K, Barkholt V, Baro C, Bennett L, Bublin M, Gaier S, Graser G, Ladics GS, Mierzejewska D, Vassilopoulou E, Vissers YM, Zuidmeer L, Rigby NM, Salt LJ, Defernez M, Mulholland F, Mackie AR, Wickham MS, Mills EN. In vitro digestibility of beta-casein and beta-lactoglobulin under simulated human gastric and duodenal conditions: a multi-laboratory evaluation. Regul Toxicol Pharmacol. 2009 Dec;55(3):372-81. Epub 2009 Aug 31.	Toxicologists, risk assessors	English speaking world	5,000	P1, P8, P10, P16, P17, 44, P24, P55,
Month 57		Flokstra-de Blok BMJ, Dubois AEJ, Vlieg-Boersta BJ, Oude Elberink JNG, Raat H, DunnGalvin A, Hourihane JO, Duiverman EJ. Health-related quality of life of food allergic patients: Comparison with the general population and other diseases. Allergy 2010 Jan;65(2):238-244.	Researchers, clinicians	English speaking world	20000	P29, P54
Month 58		Donkey's milk detailed lipid composition. **Frontiers in Bioscience E2, 537-546, January 1, 2010**	Biochemists, food scientists	English	3,000	P31
Month 58		Detailed proteomic analysis on Donkey's milk: insight into its hypoallergenicity. **Frontiers in Bioscience 14, 2009-2009, January 1, 2009**	Biochemists, food scientists	English	3,000	P31
Month 58		Merima Bublin, Marina	Researchers,	English	20000	P11,16, 34, 6

		Pfister, Christian Radauer, Christina Oberhuber, Sean Bulley, Åsa Marknell DeWitt, Jonas Lidholm, Gerald Reese, Stefan Vieths, Heimo Breiteneder, Karin Hoffmann-Sommergruber, Barbara K. Ballmer-Weber. Component-resolved diagnosis of peanut allergy with purified natural and recombinant kiwifruit allergens J Allergy Clin Immunol. 2010 Jan 8. [Epub ahead of print]	clinicians	speaking world		
	Film-video					
Month 29	**TV Interview**	Clare Mills on food allergy with the BBC	General Public	UK	2Million	P1
Month 35		EuroNews Available in 7 different languages including Spanish: http://www.kewego.co.uk/video/iLyROoafYwqh.html English http://www.euronews.net/en/article/22/05/2008/the-future-for-food-allergy-research/ German, Italian, French, Russian and Portuguese http://ec.europa.eu/research/star/index_en.cfm?p=64_main	General Public	7 different European languages	Europe wide – several million and posted on widely used internet sites such as youtube.	P1,27,16,35
Month 46	**TV Interview**	Fedorova O., Ogorodova L. Food allergy in children of Tomsk Oblast / Short video film for TV news (for wide audience of Tomsk population)	General public	Russia	60,000	P59
	Other					
Month 46		Mills E. N. C. Concern over rise in allergies BBC News online 16/04/09 WWW Address http://news.bbc.co.uk/1/hi/health/7989873.stm	General public	English speaking world	5 million	P1
Month 52		Mills E. N. C. Norwich science café on food allergies 26 Sep 2009 Eastern Daily Press , 26/09/09	General public	English speaking world	200,000	P1
Month 52		Mills E. N. C. Food allergy: myth and reality Norwich Evening News 19/09/09	General public	English speaking world	200,000	P1
Month 55		Mills E. N. C. Food allergies get curioser and curioser Nov/Dec 2009 Stir It Up is the magazine of the Country	General public	English speaking world	20,000	P1

		Range Group http://www.stiritupmagazine.co.uk/				
Month 48		AGM of Anaphylaxis Campaign – informal briefing of Campaign members on the Europrevall project Hazel Gowland	Patient groups	UK	200	P36
Month 46	**Radio interview**	Talk Radio Europe – Live interview on food allergy – Malaga net-based English language station Hazel Gowland	General public	English speaking countries	50,000	P36
Month 47	**Radio interview**	Recorded interviews for the BBC Asian Network on prevalence and also food allergy risks in catering – some material broadcast on May 28th, other material to be broadcast in due course. Hazel Gowland	General public	English speaking countries	250,000	P36
Planned	**Book**	Food Allergy Management (Madsen, Crevel, Mills, Taylor eds) Elsevier with chapters ofmr EuroPrvall partners,. Planned for October 2011	Food research, food industry, risk assessors, risk managers	English speaking countries	20,000	P44,1,13

2.3 Publishable results

During the course of the EuroPrevall project a large amount of data and know-how has been collected. None of the exploitable results listed in section 2.1 are developed to the stage where they can be put into the public domain. All of the results are still at the stage of being evaluated as to the value of protection or exploring other means of exploitation on a confidential basis. This is not surprising given that the project has only been completed for 6 weeks and much activity remains to be undertaken regarding data analysis.