HEALTH IMPACTS OF AIRBORNE ALERGEN INFORMATION NETWORK
(HIALINE)

The objective of the project is to evaluate the effects of climate diversity and change on airborne allergen exposure, and to implement an outdoor allergen early warning network. Climatic factors that influence allergen exposure will be extracted and will be used to calculate the effect of climate and climate change on local airborne allergen exposure. Current users of national pollen information services like atopic individuals, physicians

and health authorities will benefit. All methods and instruments for pollen and allergen measurements are equally distributed between the partners. For continuation after the project the local partner only needs to supply consumables (filters, 96-well plates and commercially available antibodies). The instruments are sturdy.

The Commission published in OJL56/46, 3.2.1.6. "Adaptation to climate change, and the consequences on human health" and in particular stated "airborne allergens". We focus on airborne allergens, climate change and climate diversity, and an early warning system (allergen forecast). 3 major airborne allergens in Europe (grasses, birch and olive) will be sampled on filters, extracted and analyzed by allergen specific ELISA´s. Pollen counts will be measured by standard pollen traps. Weather data are freely available. Allergen forecast will be calculated by incorporating our measurements and climatic factors in the SILAM pollen forecast program. Expected outcomes are the implementation of a network of European outdoor allergen measurements to better predict airborne allergen exposure. Also the climatic factors that govern allergen exposure in outdoor air will be established. These can be used to calculate the effect of climate change on exposure to airborne allergens.

2. OBJECTIVES

To assess the effects of climate change and diversity on the allergenicity of airborne pollen in Europe. Airborne allergens represent a major health issue in all countries of Europe, and the problem of atopic diseases like allergies and asthma is steadily increasing. In young children the rate of sensitizations is up to 40% in some countries and the peak of sensitizations to allergens in the European population is predicted to occur around 2040. Allergen exposure can initiate allergies, and climate influences the exposure to allergens. We demonstrated recently that a three-fold difference occurred in the release of allergens from birch pollen in contrasting biogeographical areas only 600km apart. The release was higher in the warmer, drier region. Routine monitoring of airborne pollen by volumetric methods in many countries of Europe has demonstrated the influence of climate on pollen counts. However, differences in allergen release from the same amount of pollen under different climatic conditions across Europe cannot be detected with the current monitoring technique. Climatic changes will influence the amount of pollen but on top also the allergen release potency from these pollen. Europe is ill prepared for this situation. We propose to assess factors that influence the allergen exposure of European citizens in order to improve forecasting both for the patient and for health care demands. By considering weather, the allergen content of air, and pollen counts we will be able to assess which parameters are important for atopic individuals.

Computer models in WP 3 will assimilate our allergen measurements into the existing pollen forecast and will provide an early warning system on allergen exposure. We will be able to answer if pollen counts are sufficient or whether more novel methods like the ones

we employ are an improvement on forecasting health effects. This will become more important with the climate changes we are currently facing in Europe.

2.2. Specific objectives

1 Pollen measurements in ambient air All partners of WP2 will determine simultaneously for two pollen types (birch and grass in the north, olive and grass in the south) during the season the pollen count in ambient air with a Burkard pollen trap. This will be done in all three years.

2 Allergen measurments in ambient air. All partners of WP2 will collect during the pollen flight season ambient air at 800l/min with a Chemvol cascade impactor equipped with stages >10 µm and 2.5-10 µm. The allergen content of these stages at their

2.3. Indicators chosen

Methods and means incl. target groups specification

The aim of this study is to measure simultaneously the allergen carrier, the pollen, and the allergen itself in ambient air. The allergen release capacity of ambient air will be incorporated into an allergen forecast. The forecast will be made available to the stakeholders. Pollen will me measured with the standard method using a Burkard pollen trap, a pollen quantition device uniformly used across Europe. All partners are experienced in this technology. The allergens will be measured with specific ELISA´s for the major allergens from birch, gras and olive. The ELISA methods were validated during the previous 5 years at one partners location in Munich. The forecast will be provide by

WP3, which will incorporates the allergen information in its already used pollen forecast Program The target groups are the stakeholders (see project sketch i.e. COST 0603 EUPOL, European Asthma, Allergy and Clincal Immunolgy society EAACI (allergologist organization), patient organizations, National Pollen Networks, European Pollen Network EAN, WHO, and National Health Authorities). All these groups are the representatives of patients, allergologist treating these patients, and Health Authorities responsible for public health.

Evaluation strategy

The project has 3 building blocks, each finishing each year. Each year all packages will be evaluated, and the results are discussed with the advisory board and an evaluation is made. Improvements for the coming year can then be implemented for the next pollen season and sampling campaign. This is the elegance of the project, errors are not cumulative and one defaulting partner does not block progress. Lesser optimal running WP parts are identified after each year, and adjustments by the management will be made. Each work package has it own list of milestones and deliverables, which will be evaluated each year. The yearly report will be distributed to the international advisory board (one USA member) for scientific consistency. At the end of the project an overall evaluation will take place, and indicators (see 5.3) will be checked that measure the success of reaching the target groups, the allergic subject and clinicians. This will be reached by informing and asking the stakeholders (Allergologists organizations, national and international, patient organizations etc.).

Indicators choosen

2.4. Rationale and relative merits of the project

Innovative merit of the project

No similar project was or is financed by the Health Program. The project adds to the available networks of European pollen counts EAN (European Aeroallergen Network), who are partners in this project. The first innovation of the project is that the causative agent of atopic disease is measured in ambient air, not only the carrier of this agent, the pollen. Measuring allergen in ambient air is not trivial, but the proposed methods were validated during 5 years at one location. The results from this one location and the international literature led to this proposal, as the difference between pollen count and allergen release became clear. A second innovation is the integration of allergen release in a pollen forecast program, making it an aero-allergen-forecasting program. Most importantly, all methods proposed are validated methods. The innovation is the combination of methods in several locations across Europe, using the differences in climate between the European countries to assess the factors important in pollen and allergen release. Once these factors are known, the impact of climate change on allergen exposure and health can be easily predicted. This project needs the geographic and thus climatic diversity available in Europe. Financing by individual member states is inefficient as the climatic differences within one state are limited. Moreover, individual states might be reluctant to finance research in other member states.

Strategic relevance and outlook

All current users of national pollen information services (allergic patients) will benefit from our allergen measurements, as our measurements improves the existing pollen data sets. Public health knowledge is greatly increased and will have a positive effect on health, as patients are better prepared to cope with the disease they have. On top, medical doctors will be able to improve their treatment strategies, as symptoms correlate with allergens and not only with pollens. Some patient's experience symptoms without pollen or at low pollen counts, but in both situations allergen can be present and provoke symptoms, as was demonstrated before. This eliminates wrong diagnosis and treatment because certain pollen was considered absent, when in fact the allergen was not. Transferability: the project is constructed such, that each partner will benefit maximally from the applied methods. All methods and instruments will be equally distributed, making each partner independent. Sustainability: each partner will be equipped with the Chemvol high volume cascade impactor, high volume air turbine needed to operate the Chemvol impactor, an headover-head rotator needed for allergen extraction, and the needed consumables, supplied by this grant. The partners are also all trained to do the analysis and quality control independently. For sustainability of the project the local partner only needs to supply consumables (filters, 96-well plates and commercially available antibodies) to continue the work. The instruments are sturdy. The continuation of a European wide allergen forecast will depend on the support of local governments, but would need only a little manpower at one location in Europe. Of course, as with any project, some extended funding will be needed afterwards, but this amount is limited. Depending on the results of this application, which will make clear the need for allergen monitoring in ambient air, it will be easier to get the needed limited novel national or European funds to continue the work. Setting up the network costs most; continuation of the network will be cheap. The continuation of an European wide allergen forecast will depend on the support of local governments, but needs only manpower at one location in Europe.

Geographical coverage

Our consortium covers countries in the North (Finland, Lithuania, Poland), Middle (Germany, Austria, France and Great Britain) and South of Europe (Spain, Portugal and Italy), both from wealthier and lesser affluent member states. Because pollen differ between countries in the North and the South, one pollen species is determined by all (grasses) and each country chooses either birch (northern countries) or olive (southern countries). Thus an even geographical spread is obtained. This consortium covers the climatic regions relevant for the study of climate influences on pollen and allergen release. Dissemination

The objective of HIALINE (Health Impact of Airborne ALlergen Information Network is to present allergologists and atopic patients an updated information and forecast on allergen/pollen exposure, The dissemination plan uses 3 ways: scientific dissemination, health authorities dissemination, and public dissemination. Details of dissemination and an extensive list of stakeholders is given in section 5.2

3. Expected results

The Commission published in OJL56/46, point 3.2.1.6. "Adaptation to climate change, and the consequences on human health" and clearly stated "airborne allergens". We focus on airborne allergens, climate change, climate diversity and an early warning system (allergen forecast) out of scientific need, and covers the subjects put forward by the "call for proposals". Our efforts will result in an increased citizens´ health security by implementing an airborne allergen forecast, complementing the existing airborne pollen forecast currently available in most countries of the EU. Other EU programmes like COST ES 0603 EUPOL focus on pollen. We focus on the culprit allergens, released by pollen and aim at implementing a European wide network of outdoor allergen measurements, to better predict aeroallergen exposure. EU added value No continent in the world, not even a country, has a network of outdoor allergen measurements. Recent scientific evidence compels such measurements, but technically nobody was able to set-up such a consortium. Previously individual short term measurements were performed in Australia, USA and some countries of Europe. Recently, in one country in Europe, we performed these measurements for several years and discovered differences in the allergen content of pollen from the same species from different climatic conditions. This topic received a warm reception at international conferences. An EU funded project is much more valuable than the sum of national activities, as the differences in climate across Europe are much greater than within single member states. This is the basis of our proposal: to use larger differences in climate to facilitate the identification of the factors determining the allergen content of pollen. Climatic differences cannot be too large, as plant species grow only within certain temperature ranges, thus no birches flower in Spain or Portugal, nor do olive trees bloom in Finland. Thus the European climate presents the natural extremes for certain species and thus makes the spread of our consortium over several countries an excellent opportunity to implement our ideas. Also, as has been shown by numerous national studies and several European projects (in particular, by Finnish national POLLEN and ESA-PROMOTE initiatives), the long-range transport of pollen plays a very important role in Europe significantly affecting concentrations far from the source areas. Therefore, a coherent effort covering the whole continent is needed to adequately evaluate and predict airborne allergens in outdoor air in Europe. European atopic individuals will receive the

best allergen predictions currently available, thus being better prepared and thus protected compared to other citizens in the world.