

AIRALLERG

EC PROGRAMME	Quality of Life and Management of Living Resources (QoL), Key Action 4 - Environment and Health
PROJECT TITLE & ACRONYM	Effects of outdoor and indoor air pollution on the development of allergic disease in children AIRALLERG
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Executive summary

a) Original research objectives

The objectives of the study were:

1. To establish the *association* between early childhood exposure to outdoor, traffic-related air pollution and indoor combustion products and biological contaminants on the one hand, and the prevalence of allergic sensitisation and disease in 4 year old children on the other hand.
2. To establish the *interaction* between exposure to specific outdoor air pollution components (notably diesel exhaust and NO₂) and specific indoor contaminants (notably common allergens and mould and bacterial products such as endotoxin, environmental tobacco smoke, NO₂ and nitrous acid) in explaining the prevalence of allergic sensitisation and disease in 4 year old children.

The AIRALLERG project has investigated the relationship between indoor and outdoor contamination, and the development of allergic sensitisation in three populations of children, living in Sweden, The Netherlands and Germany. The three population studies which form the core of the AIRALLERG study were initiated in the mid to late 1990s with local funding. All three studies were started to investigate the development of allergy and asthma in children from birth. The studies have very similar designs, and use similar or comparable instruments for data collection. In a previous, EU funded collaboration (TRAPCA), data were collected on exposure to traffic-related air pollution in all three cohorts. AIRALLERG is a continuation of this collaboration, now adding measurements of exposure to indoor contaminants. Specifically, measurements were made of biological contaminants in mattress and floor dust (mite and cat allergen, bacterial endotoxin, mould glucans and extracellular polysaccharides. Also, measurements were made of nitrogen dioxide (NO₂), nitrous acid (HONO) and nicotine in indoor air.

The measurements were conducted in the homes of a selection of the children participating in the studies. Children were selected on the basis of assessment of allergic sensitisation at age 4. Children sensitised to inhalant allergens were compared to a control group of unsensitised children. In each country, the aim was to select 180 sensitised and 180 non-sensitised children, for a total study population of 1080 children. The environmental measurements were made some time after the measurement of sensitisation, and children were only allowed to participate when they had not moved for at least 6 months prior to the measurement of sensitisation.

b) Expected deliverables

The main expected deliverables were the study brochure, the study manual and the study report. Each of these has been delivered

c) Project's actual outcome

In the AIRALLERG study, successful measurements of various indoor pollutants were made in 1069 homes of children participating in three different birth cohort studies in The Netherlands, Sweden and Germany. We found that:

- 1 NO₂ and HONO concentrations differed markedly between countries, with much higher concentrations in the Netherlands than in either Sweden or Germany. This was related to a much higher proportion of families using gas for cooking in the Netherlands. In addition to gas cooking, levels were also influenced by tobacco smoking in the home. Despite the fact that NO₂ concentrations were elevated in homes using gas for cooking, the levels were lower than in previous studies in the Netherlands. This likely reflects that the study, being focused on young families, largely took place in modern single family homes, often with open plan kitchens and mechanical ventilation so that combustion products were rapidly dispersed and removed from the indoors.
- 2 Exposure to environmental tobacco smoke was higher in Germany and the Netherlands than in Sweden, where only a few of the participating families had smokers in the home. There was a close correlation between nicotine in air, and the amount of cigarettes smoked in the home. Questionnaires were shown to be a highly accurate tool in all three populations to establish exposure to environmental tobacco smoke (ETS). In the German cohort, measurements were also made of cotinine in urine, a biomarker for exposure to environmental tobacco smoke. Again, the correlation between questionnaire reported exposure to ETS and cotinine was very high. The importance of these findings is high. It has sometimes been argued that smoking is underreported by parents of young children, but in this large population, we found essentially no evidence that questionnaire reported smoking habits were not accurate.
- 3 In a number of homes, duplicate dust samples were taken to investigate the variation within homes of the biocontaminant measurements. The aim was to compare the within-home variation to the between-home variation; if the within-home variation is large compared to the between-home variation, it becomes difficult to conclude with confidence that some participants are more highly exposed than others. Given the nature of the assays used to measure biocontaminant levels, the coefficient of variation of the assays themselves is usually fairly high, in the order of 15-30%. Despite this, for the large majority of the measurements that were made, within-home variation was much smaller than between-home variation. Again, this is an important finding, because it means that measurements of biocontaminant levels in house dust effectively distinguish homes from each other, which is a prerequisite for any epidemiological study on health effects associated with biocontaminant levels.
- 4 Exposure to biocontaminants in house dust was again different between countries, with low levels of mite allergens in Sweden, high levels of the mite allergen Der f1 in Germany, and high levels of the mite allergen Der p 1 in the Netherlands. This is related to climatic differences. A detailed analysis was made of the major determinants of biocontaminant levels in all three countries in order to identify potential measures to reduce exposure to these contaminants. We found clear and consistent associations between the presence of a cat in the child's home and Fel d 1 levels in mattress and living room floor dust. No other factor was consistently and significantly associated with biocontaminant levels in the child's mattress dust. Besides the presence of a cat for Fel d 1, floor type was the most important determinant of the amount of floor dust sampled and biocontaminant levels in floor dust.
- 5 Assessment of exposure to traffic-related air pollution was updated for the home addresses of the four-year olds in the AIRALLERG study, from the previous TRAPCA assessments which pertained to the one year olds. Traffic counts and assessment of street characteristics were made at the homes of the study participants to

d) Broad dissemination and use intentions for the expected outputs (*such as industrial development, standards, regulations and norms, improvement of environment, health, working conditions, employment, net economic benefits, etc*)

The results of the AIRALLERG project are in the process of being submitted for publication in international, peer reviewed journals. Primarily, the AIRALLERG study has contributed to our understanding of the joint effects of various indoor and outdoor contaminants on the development of allergy and asthma. These results are being taken up by the GA2LEN network of Excellence on allergy and asthma, in which the AIRALLERG study teams officially and unofficially participate. In GA2LEN excellent opportunities exist for incorporating the study results in guidance to be developed by the EACI for practioners working the field of allergy and asthma.