

# Assessing the impact of indoor air pollution on Europeans

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The health impact of indoor air pollution is a real environmental health issue, which is believed to have a bearing on respiratory conditions such as asthma. This has prompted a European study to take action. While

outdoor pollution is often cited as the cause of many asthma related issues, indoor threats are also being addressed in the light of World Asthma Day.

The HITEA project ('Health Effects of [Indoor Pollutants](#): Integrating Microbial, Toxicological and Epidemiological Approaches') has studied short-term and long-term respiratory, inflammatory and allergic health impacts on children and adults associated with indoor air exposures, with a focus on microbial agents. As a result, new and innovative approaches have been applied in exposure assessments, leading to developing recommendations for health professionals on how to study indoor microbial contaminants.

The five-year project was led by Professor Aino Nevalainen and Docent Anne Hyvärinen at the National Institute for Health and Welfare in Kuopio, Finland. The project had a consortium representing eight [research institutions](#) in seven member states of the EU, with funding of EUR 2.7 million from the European Commission.

The project first looked at indoor air in schools using identical study set-ups in Finland, the Netherlands and Spain, with in-depth analysis of microbial, immunological, toxicological, and dampness-related properties of indoor environmental samples. An extensive respiratory health questionnaire was used to collect data from more than 9.200 pupils and 645 teachers, coming from a total of 66 schools, all of which were inspected for moisture damage and dampness. In addition, spirometric lung function measurements were conducted in approximately 3.500 pupils in a subsample of 25 schools.

More than 500 pupils with asthma or [asthma symptoms](#) and 180 teachers were followed in a longitudinal, detailed health survey. In parallel, extensive exposure assessments and sample collection campaigns were performed in the study schools focusing on a variety of biological agents,

as well as assessing chemical and physical parameters.

Scientists reported different types of moisture and dampness problems in 24-47% of schools surveyed in Finland, the Netherlands and Spain, with the type, occurrence and severity of these moisture problems varying across geographical areas. Moisture damage in schools was found to have an adverse effect on respiratory health in pupils, especially in the Northern climate. Teachers working in schools with moisture problems had a higher risk of upper and lower respiratory tract symptoms, underlining the public health relevance of damp and mould problems in indoor workplaces.

An extensive set of indoor microbial exposures were measured in the study schools, including fungal and bacterial subtypes, general markers of microbial exposure such as endotoxin, as well as mycotoxins, and inflammatory load in settled dust. Endotoxin levels in schools were found at clearly higher levels compared to homes, indicating that school endotoxin may contribute significantly to total endotoxin exposure in children and teachers.

Several of the microbial exposures measured were linked to moisture damage and dampness in the schools. However, these findings were mostly not consistent between countries. The researchers found large temporal, geographical and spatial variation in microbial exposures between countries, stressing the importance of longitudinal studies and repeated measurements when assessing respiratory health in response to microbial exposures in children and adults.

Their second in-depth study then focused on the long-term impacts of biological contaminants in the home environment on adults' health. Scientists analysed biological agents from 1000 house dust samples from 21 areas in Europe contributed by the European [Respiratory Health Survey](#) (ECRHS II) and identified various factors determining the levels

of microbial contaminants in homes.

The researchers found an enormous geographical variation in microbial exposures in homes across Europe and concluded that incoherent observations of health effects of endotoxin may be partly owing to the geographical heterogeneity of the exposure. Higher exposures to bacterial and fungal genera measured with DNA-based methodology were associated with certain current respiratory and asthmatic symptoms, indicating both adverse as well as protective effects of home microbial exposures.

Finally, a third part of the project integrated several on-going European child cohorts, with an emphasis on the long-term health impacts of biological agents. Exposure data from different time points during life were combined with the comprehensive information on children's health already collected in these cohorts.

An initial analysis revealed variability of levels and determinants of general markers of indoor microbial exposures across Europe, which may play a role in the differences in asthma and allergy prevalence's across countries.

The results of the study will lead to a better understanding of the role of biological agents in both adverse and protective respiratory and allergic health effects and the mechanisms underlying these observations. HITEA has produced new data on the characteristics, determinants and potential health effects of indoor microbial agents and has established novel methods for exposure assessment of these agents.

The project has produced new knowledge on indoor exposure relating to dampness and moisture damage in schools and has highlighted the public health relevance of this issue. These results are expected to impact on the way maintenance is carried out in school buildings.

**More information:** HITEA [www.hitea.eu/](http://www.hitea.eu/)

World Asthma Day [www.ginasthma.org/World-Asthma-Day](http://www.ginasthma.org/World-Asthma-Day)

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