

PM2.5, NO2 AND CO2 IN PRIMARY SCHOOLS IN THREE CLIMATIC REGIONS ACROSS EUROPE: THE HITEA STUDY

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and the HITEA study group.

Background and aims: Indoor air quality is essential for human's health. The HITEA-project evaluates health effects of biological and chemical exposures in primary schools. The aim of this study was to characterise exposure to PM2.5, absorbance (soot), NO2 and CO2 in schools in Spain, The Netherlands and Finland.

Methods: Schools with (index) and without (reference) dampness problems were selected based on building questionnaires and on-site inspections. Indoor PM2.5, soot, NO2 and CO2 was measured during 5 consecutive school days. PM2.5, soot and NO2 were measured in the school's central hallway, CO2 was measured in a classroom, and NO2 was additionally sampled in 2-3 classrooms. Measurements were performed twice: during winter/spring 2009 and winter/spring 2010.

Results: 7 Spanish, 10 Dutch and 6 Finnish schools were included. Average soot and NO2 concentrations were highest in Spain (median: soot= $2.27\text{m}^{-1}10^{-5}$, NO2= $30\mu\text{g}/\text{m}^3$), intermediate in the Netherlands (soot= $1.20\text{m}^{-1}10^{-5}$, NO2= $20\mu\text{g}/\text{m}^3$) and lowest in Finland (soot= $0.60\text{m}^{-1}10^{-5}$, NO2= $10\mu\text{g}/\text{m}^3$). PM2.5 was comparable in Spain and the Netherlands (17.51 vs $17.16\mu\text{g}/\text{m}^3$) and lowest in Finland ($5.65\mu\text{g}/\text{m}^3$). PM2.5, soot and NO2 stayed constant over the two assessments, only NO2 in Finland concentrations were higher during the second measurement. CO2 (during school hours) reached highest levels in Spain (median: 1165ppm) vs the Netherlands (median: 844ppm) and Finland (median: 701ppm). CO2 levels were not related with PM2.5, soot and NO2. PM2.5 and soot did not depend on a school's damage status. NO2 was higher in Finnish index schools, while in Spain NO2 was lower in index schools. In Dutch index schools CO2 was higher, while in Spain levels were higher in reference schools.

Conclusions: PM2.5, soot, NO2 and CO2 levels in schools differed considerably between countries, probably because of differences in outdoor air pollution levels, climate and building construction. These agents may, in addition to biological pollutions, play a role in occurrence of potential health effects of occupants.