

European Respiratory Society Annual Congress 2012

Abstract Number: 4698

Publication Number: 1370

Abstract Group: 6.1. Epidemiology

Keyword 1: Children **Keyword 2:** Environment **Keyword 3:** Air pollution

Title: Relationships between school indoor toluene and respiratory symptoms in children of five European countries (HESE study)

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Body: Aim: to assess whether indoor toluene may affect respiratory health in schoolchildren. Methods: Health status and related risk factors were assessed through questionnaire in 628 children (mean age 10yrs) of five European countries: Sweden, Norway, Denmark, France, Italy (EU-funded HESE Study, Health Effects of School Environment). Measurements of pollutants were performed in 46 classrooms. Toluene was measured by active sampling using charcoal tubes. Results: The levels of toluene were relatively low: median concentration was 4.57, significantly higher in France (12.12) than in the other four countries (range: 2.82 in Sweden to 5.09 $\mu\text{g}/\text{m}^3$ in Italy). Prevalence rates of dry cough at night and wheeze were respectively 35% (range: 17 in Sweden to 48% in Italy) and 13% (range: 10% in Northern countries to 18% in France). Multiple logistic regression, accounting for centre, gender, age, presence of asthma, passive smoking at home, other indoor pollutants (PM_{10} , CO_2 , viable moulds) indicated toluene to be associated with higher risk of dry cough (OR 4.37, 95%CI 2.19-8.75 per 1 $\mu\text{g}/\text{m}^3$ increment) and wheeze (OR 3.24, 1.25-8.45). These associations were significant after further accounting for the fixed effect of the classroom. Conclusion: Although toluene levels in classrooms were relatively low, long-term exposure seems to be a risk factor for respiratory health of schoolchildren.