

Topic: Epidemiology

Bacterial and fungi exposure in school and allergic sensitization in children

João Cavaleiro Rufo^a, Joana Madureira^a, Inês Paciência^a, Livia Aguiar^{b,c}, Patrícia Padrão^e, Mariana Pinto^d, Luís Delgado^d, Pedro Moreira^e, João Paulo Teixeira^{b,c}, Eduardo Oliveira Fernandes^a, André Moreira^{d,e}

^a INEGI - Institute of Science and Innovation in Mechanical Engineering and Industrial Management, Porto, Portugal

^b National Institute of Health, Porto, Portugal

^c Epidemiology Research Unit, Institute of Public Health (EPIUnit), University of Porto, Porto, Portugal

^d Faculty of Medicine, University of Porto, Porto, Portugal & Centro Hospitalar São João, Porto, Portugal

^e Faculty of Nutrition and Food Sciences, University of Porto, Porto, Portugal

Abstract:

Background: Development of allergic sensitization may be regulated by microbial exposure. Children spend a lot of their time in school, under an extensive diversity of biological aerosols, such as bacteria and fungi. We aimed characterize indoor air microbiological exposure as a predictor of allergic sensitization.

Methods: A total of 858 children, aged 8 to 10 years, attending 71 classrooms in 20 primary schools were submitted to skin-prick tests (SPT) to house-dust mites, mixed weed, mixed grasses, cat, dog and *Alternaria alternata*. Atopy was defined by a positive SPT to at least one of the allergens. Air samples were collected in all the participating classrooms and respective outdoor locations using a single-stage microbiological air impactor through TSA and MEA plates at a 100 L/min rate. Quantification was performed by naked eye count. Endotoxins were collected using a 2L/min flow control pump for 4h and analysed by limulus amoebocyte lysate assay. Mann-Whitney tests and logistic regression models were used to statistically analyse the data.

Results: Prevalence of atopy was 34.1%. The risk of sensitization to inhalant allergens increased with increasing endotoxin exposure in classrooms ($p=0.015$). Similarly, higher concentrations of *Penicillium spp* showed higher risk of having a positive SPT (1.682 [95% CI: 1.180 - 2.398]) while children in classrooms with higher concentrations of *Aspergillus fumigatus*, *Aspergillus niger* and *Chaetomium spp* had lower risk of sensitization (0.64 [95% CI: 0.47 - 0.87], 0.62 [95% CI: 0.45 - 0.87] and 0.61 [95% CI: 0.39 - 0.96], respectively).

Conclusion: Although the cross sectional nature of our study does not allow to establish causal relationships, our results further suggest that current exposure to higher levels of endotoxin is associated with increasing odds of allergic sensitization in children. However, some fungi species, such as *Aspergillus fumigatus*, *Aspergillus niger* and *Chaetomium spp*, but not *Penicillium spp*, may also have effect in protecting from allergic sensitization.