Phthalates in indoor dust and their association with building characteristics, DBH-phase II.

Carl-Gustaf Bornehag, PhD
SP Swedish National Testing and Research Institute
Technical University of Denmark
Public Health Sciences, Karlstad University, Sweden
carl-gustaf.bornehag@kau.se

Linda Hägerhed Engman, PhD student,
SP Swedish National Testing and Research Institute
linda.hagerhed@sp.se

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SUMMARY: In the second phase of the DBH study, dust samples from 390 homes were collected from surfaces above the floor level in the child’s room for analyses on phthalates (BBzP and DEHP). Associations were found between the amount of PVC flooring or wall material and higher concentrations of BBzP and DEHP in the dust. However, these phthalates were also found in homes without PVC-flooring due to numerous of other sources. BBzP was associated with buildings with a former water leakage and DEHP was associated with older buildings built before 1960.

Extended abstract

Airborne phthalate esters were first identified in outdoor urban air and have subsequently been recognized as global pollutants and major constituents of indoor air. In a nested case-control study on 198 symptomatic children and 202 healthy controls (“Dampness in Buildings and Health”, DBH-phase II), allergic symptoms and asthma among children were found to be associated with phthalates in dust (n-butyl benzyl (BBzP) phthalate, di(2-ethylhexyl) phthalate, DEHP) from their homes (Bornehag et al., 2005; Bornehag et al., 2004). BBzP was associated with rhinitis and eczema while DEHP was associated with asthma and di-n-butyl (DnBP) phthalate was not associated with symptoms. The aim of the present paper is to examine sources for phthalates in the children’s homes.

The study is a case control study nested within a cohort of 10,852 children. From the cohort, 198 cases with persistent allergic symptoms and 202 controls without allergic symptoms were selected. A technical team investigated each child and her/his environment respectively. Samples of dust from 390 homes were collected from moldings and shelves in the children’s bedrooms and analysed for the content of six different phthalates.

The study focused on BBzP and DEHP, since these were the phthalates associated with health complaints. Associations have been examined using parametric and non-parametric tests as well as multiple logistic regression. Of the 390 homes, 346 valid dust samples with a weight of 25 mg or larger were analyzed for the content of six different phthalates. The highest phthalate concentration was found for DEHP with a median concentration of 0.77 mg/g dust. All other phthalates were detected at a median concentration well below 0.15 mg/g dust. For both BBzP and DEHP, associations were found between their dust concentrations and the amount of PVC used as flooring and wall material in the home. The median concentration for DEHP was higher in 157 homes with PVC as flooring material in the child’s compared with 187 homes without such flooring (0.86 vs. 0.70 mg/g dust: Mann-Whitney U: p=0.001) and the same association was found for BBzP (0.19 vs. 0.09 mg/g dust, p<0.001). However, both BBzP and DEHP were found in buildings with neither PVC flooring nor wall covering, consistent with the numerous additional
plasticized materials that are anticipated to be present in a typical home. Furthermore, high concentrations of BBzP (above median) were associated with self reported water leakage in the home (OR 1.84 (95% CI: 1.05-3.22)) and high concentrations of DEHP were associated to buildings constructed before 1960 (n=144) compared with buildings erected after 1983 (n=49), (OR 2.30 (95% CI: 1.17-4.52)). The building characteristics examined in this study cannot serve as complete proxies for these quite varied sources. However, the associations reported in this study can help to identify homes where phthalate concentrations are likely to be elevated and can aid in developing mitigation strategies (Bornehag et al., 2005).

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References

