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Environmental pollutants and DNA damage in adolescents of the 2nd Flemish Environment and Health Study (FLEHSII)

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A total of 606 adolescents (14-15y) were recruited from the industrial hotspot areas Genk-Zuid and Menen, and from the general population of Flanders as part of the second Flemish Environment and Health Study (FLEHSII, 2007–2011). DNA damage was measured using the alkaline comet assay (with and without formamidopyrimidine DNA glycosylase to detect oxidized bases) in whole blood samples, and by an enzyme-linked immunosorbent assay (ELISA, Gentaur) quantifying 8-hydroxy-2-deoxyguanosine in urine. Exposure-effect associations were analyzed via stepwise multiple regression analyses adjusted for fixed confounders and statistically significant covariates ($p < 0.20$ in single regression models). For this analysis the exposure biomarkers were divided into tertiles, as the relationship with the DNA damage markers possibly might be non-linear.

(Borderline) significant exposure-effect associations with DNA breaks in the comet assay were observed for urinary chromium ($p=0.03$), blood thallium ($p=0.09$), the urinary concentration of the polycyclic aromatic hydrocarbon metabolite 1-hydroxypyrene ($p=0.08$) and the urinary benzene metabolite *t,t'*-muconic acid ($p=0.07$). Additionally, increased urinary concentrations of arsenic ($p=0.002$), toxic relevant arsenic ($p=0.0004$) and thallium ($p < 0.0001$) were significantly associated with decreased concentrations of 8-hydroxy-2-deoxyguanosine.

In conclusion, various environmental pollutants present in the life environment of youngsters were associated with short term DNA damage. Via gene expression analysis, the pathways behind the observed DNA damage will be further explored.

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