

Publication

Acute changes in DNA methylation in relation to 24/h personal air pollution exposure measurements : a panel study in four European countries

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One of the potential mechanisms linking air pollution to health effects is through changes in DNA-methylation, which so far has mainly been analyzed globally or at candidate sites.; We investigated the association of personal and ambient air pollution exposure measures with genome-wide DNA-methylation changes.; We collected repeated 24-hour personal and ambient exposure measurements of particulate matter (PM_{2.5}), PM_{2.5} absorbance, and ultrafine particles (UFP) and peripheral blood samples from a panel of 157 healthy non-smoking adults living in four European countries. We applied univariate mixed-effects models to investigate the association between air pollution and genome-wide DNA-methylation perturbations at single CpG (cytosine-guanine dinucleotide) sites and in Differentially Methylated Regions (DMRs). Subsequently, we explored the association of air pollution-induced methylation alterations with gene expression and serum immune marker levels measured in the same subjects.; Personal exposure to PM_{2.5} was associated with methylation changes at 13 CpG sites and 69 DMRs. Two of the 13 identified CpG sites (mapped to genes *KNDC1* and *FAM50B*) were located within these DMRs. In addition, 42 DMRs were associated with personal PM_{2.5} absorbance exposure, 16 DMRs with personal exposure to UFP, 4 DMRs with ambient exposure to PM_{2.5}, 16 DMRs with ambient PM_{2.5} absorbance exposure, and 15 DMRs with ambient UFP exposure. Correlation between methylation levels at identified CpG sites and gene expression and immune markers was generally moderate.; This study provides evidence for an association between 24-hour exposure to air pollution and DNA-methylation at single sites and regional clusters of CpGs. Analysis of differentially methylated regions provides a promising avenue to further explore the subtle impact of environmental exposures on DNA-methylation.

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