

SHORT-TERM TEMPORAL VARIABILITY IN URINARY BIOMARKERS OF PHOSPHATE FLAME RETARDANTS AND ALTERNATIVE PLASTICIZERS

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Background: Emerging chemicals such as phosphate flame retardants and plasticizers (PFRs) and alternative plasticizers (APs) have recently been introduced as replacements to more persistent chemicals and are therefore increasingly studied in human biomonitoring studies. Many of these chemicals have a shorter half-life than the ones they are replacing, which means that urinary metabolite concentrations likely only reflect short-term exposure. However, it is not clear whether biomarkers levels of these chemicals are stable or fluctuating over time. This is of critical importance for biomonitoring studies that generally use only one spot urine sample per participant. We aimed 1) to investigate the intra- and inter-day variability of PFR and AP metabolite concentrations over a 5-day period and 2) to compare the reliability of spot urine samples versus 24 hours urine to predict general exposure.

Methods: In this study, ten healthy volunteers of at least 18 years old provided every urine sample they produced for 5 consecutive days, followed by one day of 24-hour urine collection. The study protocol was approved by the ethical board of the University Hospital of Antwerp. PFR and AP metabolite concentrations were quantified by validated analytical protocols based on solid-phase extraction (SPE) and liquid-chromatography tandem mass-spectrometry (LC-MS/MS). Urinary metabolite concentrations were adjusted by specific gravity (SG) and creatinine (Cr). Spearman's rank correlation was used to relate metabolite concentrations. Intraclass correlation coefficients were calculated to assess temporal variability.

Results: Of the 14 PFR metabolites measured, eight were found in more than half of the samples. Of the 11 AP metabolites measured, five had a detection frequency above 50%. Median concentrations were comparable to the levels reported in our validation studies. Moderate to strong correlations were observed between metabolites coming from the same parent compound. Intra class coefficients were of moderate strength for the majority of the investigated compounds (i.e. 0.4 – 0.6), however some metabolites had much higher values (>0.6) which showed that these concentrations varied little across time. Correlation strength did not improve significantly after adjustment for SG or Cr.

Short discussion/conclusions: The preliminary results from this study show that urinary PFR and AP concentrations are relatively stable over time and that spot urine samples are reliable to predict general exposure.