Determination of primary aromatic amines in cold water extract of coloured paper napkin samples by liquid chromatography-tandem mass spectrometry

Abstract:
The aim of this study was the optimization of a multi-analyte method for the analysis of primary aromatic amines (PAAs) from napkins in order to support official controls and food safety. We developed an UHPLC/MS/MS method for the simultaneous determination of 36 toxicologically relevant PAAs for paper and board. Good regression coefficients of the calibration curves in a range of 0.992-0.999 and reproducibilities in a range of 2.3-15% were obtained. LODs were in the range of 0.03-1.4 µg/L and recoveries were in a range of 21-110% for all the amines. A total of 93 coloured paper napkin samples from different European countries were bought and extracted with water to determine the PAAs. The results showed that, 42 out of 93 samples contained at least one PAA. More than half of the detected PAAs are considered as toxic, carcinogenic or probably carcinogenic to humans by the IARC, or are classified as such in the European Union legislation on chemicals. Summed concentrations of PAAs in 7 samples were higher than 10 µg/L, the limit of summed PAA in the EU plastic food contact material Regulation. Also, 8 PAAs classified as Category 1A and 1B carcinogen in the EU legislation of chemicals, were detected at concentrations higher than 2 µg/L, exceeding the limit proposed by the Federal Institute for Risk Assessment in Germany. Aniline (n=14) was most frequently present in higher concentrations followed by o-Toluidine, o-Anisidine, 2,4-Dimethylaniline and 4-Aminoazobenzene. Red, orange, yellow and multi-coloured paper napkins contained the highest concentrations of total PAAs (>10 µg/L). Although the European Union has not harmonized the legislation of paper and board materials and thus there is no specific migration limit for PAAs from paper napkins, the present study showed that coloured paper napkins can contain toxic and carcinogenic PAAs at concentrations that are relevant for monitoring.

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