RAPID EXTRACTION AND DETERMINATION OF ACRYLAMIDE CONTAMINATION IN WATER SAMPLES USING DISPERSIVE LIQUID-LIQUID MICROEXTRACTION COUPLED TO GAS CHROMATOGRAPHY-ELECTRON CAPTURE DETECTOR

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The International Agency for Research on Cancer (IARC) stated that acrylamide could be classified as "probably carcinogenic to humans" (Group 2A) [1] and the World Health Organization (WHO) guideline value associated with a lifetime cancer risk of $10^{-5}$ is 0.5 μg L$^{-1}$ in drinking water [2]. The main source of acrylamide in drinking water is the release of residual monomer from polyacrylamide coagulants used as a clarifier in the raw water treatment. In general the maximum authorized dose of polymer is 1 mg L$^{-1}$. Polyacrylamides are also used as grouting agents in the construction of drinking water reservoirs and wells, and can be discharged in land and water by plastics and dyes industries. Searching for such sub-ppb levels on a regular basis requires methods that are both highly sensitive and non-time-consuming.

The objective of the present study is to develop and validate a reliable extraction method for determination of acrylamide in water samples. The sample pretreatment steps include the derivatization of acrylamide with KBr, HBr and saturated Br$_2$ solution and dispersive liquid-liquid microextraction (DLLME). Extracted derivative of acrylamide was analyzed by GC-ECD for quantification. Under optimized conditions excellent linearity was obtained with correlation of determination ($R^2$) of 0.9999. The precision of the method, which was determined by calculating the relative standard deviations (RSD) of the three replicate measurements, was 3.7 %. The LOD of 1 ng L$^{-1}$ was obtained. The proposed method is sensitive enough for determination of acrylamide in different real water samples. The mean percentage recoveries exceeded 90% for all spiking levels in real water samples. The results obtained from DLLME method are validated by EPA method 8032A. Validation and quantification results demonstrated that this method should be regarded as a new, low cost, and robust alternative for conventional investigation of acrylamide in drinking water samples.

References