

Determination of mercury species in human tissue samples after liquid chromatographic separation – cold vapour generation – and ICPMS detection

Birgit Vallant¹, Monika Denner¹, Andrea Hanus-Ilmar¹, Claudia Gundacker²

¹Department of Inorganic Analysis, Environmental Agency Vienna, Spittelauer Lände 5, A-1090 Vienna, Austria

²Center for Public Health – Lab Ecotoxicology, Medical University of Vienna, Waehringer Strasse 10, A-1090 Vienna, Austria

A powerful procedure for the rapid determination of low levels of inorganic and methyl mercury is described by coupling of liquid chromatography with cold vapour generation inductively coupled plasma mass spectrometry. Baseline separation of mercury species is obtained within 5 minutes by cation-exchange chromatography with Hamilton PRP-X 200 and a mobile phase of 50 mM pyridine, 0.5% w/v L-cysteine, 5% v/v methanol at pH of 2.2. The separated mercury compounds are converted to mercury vapours by the use of HGX-200 vapour generation system for their introduction into the ICPMS.

The concentration of reduction agents (sodiumborohydride/hydrochloric acid) required for vapour generation was optimized for best signal to noise ratios and equal response of both species. The limit of detection for the mercury compounds studied is 0.01 ng Hg/ml and 0.25 ng Hg/g respectively; the limit of quantification is 0.02 ng Hg/ml and 0.5 ng Hg/g which makes the method suitable for speciation of mercury in human tissue samples.

The method was successfully applied for speciation of mercury in human tissue samples namely breast milk and placenta after ultrasonic assisted extraction in mobile phase. Approximately 60 samples originating from Austrian mothers were investigated with the method described, in order to reveal the major modulators of mercury exposures during pregnancy and early infancy. Via questionnaires, the medical history of women, their lifestyle and nutrition and the number of amalgam fillings were surveyed. These data were related to mercury concentrations determined in maternal and infant compartments.