

Analysis of arsenic compounds by CE/ESI-ToF-MS and CE/ICP-MS

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In recent years, arsenic speciation has gained more and more importance. It is well known that the toxicity of arsenic compounds strongly depends on the chemical form, in which they are present in a sample. Organo-arsenic compounds are less toxic than inorganic compounds are. However, organo-arsenicals are the species predominantly present in marine organisms. Arsenic is abundant in seafood at concentration as high as several hundred microgram per gram. Therefore, in countries where food from marine sources is an important part of the daily diet, it is essential to know the concentrations of individual arsenic species in order to estimate possible negative health effects. Thus, a selective and sensitive analytical method for the identification and quantification of arsenic compounds in food samples is required.

The coupling of highly efficient separation techniques such as capillary electrophoresis (CE) to sensitive and selective mass spectrometric detection allows the qualitative and quantitative analysis of arsenic compounds. Analytes can be distinguished according to their different migration times. Main advantages of CE over liquid chromatography (LC) are high separation efficiency, short separation times, small sample amounts and the possibility to effectively separate charged analytes. The use of inductively coupled plasma mass spectrometry (ICP-MS) allows obtaining elemental information about the sample and is ideally suited to quantify elements even in very low concentration ranges. The additional coupling of electrospray ionization time-of-flight mass spectrometry (ESI-ToF-MS) yields molecular information allowing to elucidate the structure of arsenic compounds.

In this work, we describe an analytical method for the determination of four arsenic species: Arsenobetaine, dimethyl arsenic acid (DMA), As(III) and As(V) are separated by capillary electrophoresis. Subsequently, the identification and quantification of arsenics are obtained by coupling ESI-ToF-MS and ICP-MS for detection. For the validation of the method, a variety of real samples has been analyzed and results have been compared to those obtained by established methods.