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# Applications of arsenic speciation by HPLC-ICP/MS

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**AIMS:** Arsenic exists in a variety of forms which have differing impacts on health and the environment. The trivalent form (AsIII) is the most toxic, followed by the pentavalent form (AsV). Other common forms of arsenic include organically bound monomethylarsenic (MMA), dimethyl arsenic (DMA) and arsenobetaine (AsB). As a result, it is necessary to quantify the individual forms within a specimen, rather than simply the total arsenic content, for an accurate assessment of their impact. To document the interest of arsenic speciation, we have applied the method in 2 applications: 1. the hair of Napoleon and 2. seafood.

**METHODS:**
*1. Hair of Napoleon.* We have tested two strands of hair, referenced as Noverraz and Grand Maréchal Bertrand. Samples were incubated 6 hours in water at 90°C, and arsenic speciation was carried out by HPLC-ICP/MS, using anion-exchange PRP-X100 column and phosphate buffer (12.5 mM, 3% methanol, pH 8.5) as the mobile phase. In this conditions, the inorganic species As(III), As(V) and their metabolites (DMA and MMA) were separated.

*2. Shrimp pastry.* About 1.5 g of specimen was homogenized in ultra-pure water. The residue was injected on a cation-exchange PRP-X200 column that allows the detection of AsB. On that column, the early elution products (1 to 2.30 ml) are collected and submitted to the PRP-X100 column to test for the mineral forms.

**RESULTS:**
*1. Hair of Napoleon.* Analysis of hair samples highlighted massive amounts of total arsenic (42.1 and 37.4 ng/mg). Arsenical species found in the two samples of analyzed hair are distributed in the following: As(III) 31.1 and 44.7 %; As(V) 66.3 and 53.2 %; DMA 0.42 and 0.15 %. Traces of MMA were detected, and 2 % of the species could not be identified. These results prove that more than 97 % of the arsenic found in the hair of Napoleon is in inorganic form, which is consistent with a chronic intoxication to arsenic.

*2. Shrimp pastry.* Total recovery was about 90 %. From the specimens we have tested, more than 85 % were represented by AsB, which is considered as nontoxic because of its rapid unchanged excretion in urine.

**CONCLUSIONS:** It should be noted that a current concern regarding speciation is the pre-analysis preservation of species in a sample. This study demonstrated the feasibility of rapid arsenic speciation in two very different matrices. Based on the results, it is proposed that any potential criminal case involving arsenic has to be documented by speciation.

**KEYWORDS:** *Arsenic, Speciation, Hair, Napoleon, Shrimp*

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