DEVELOPMENT OF ARSENIC ANALYTICAL METHODOLOGIES IN WATER AND URINE BY Hg-AAS FOR ROUTINE DETERMINATIONS IN URUGUAY

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Environmental arsenic (As) levels in water resources have not yet been taken into account to systematically assess population's exposure and health impacts in Uruguay. However, new environmental and occupational regulations have been recently established and there are special needs of developing analytical tools to assess As levels and speciation in water resources, urine and determination of metabolites in exposed populations. Natural low As concentrations require highly sensitive techniques and no ICP-MS is available in this country, so a simple method for routine determinations of total and inorganic arsenic in natural water and urine is proposed and validated. It is based on a flow system with detection by hydride generation (Varian VGA77) - atomic absorption spectrometry (HG-AAS). The sample treatment for total As was optimized for water and urine using sulfuric acid and potassium persulfate for the elimination of organic matter, and potassium iodide and hydrochloric acid for the reduction of As(V) to As(III). For inorganic As determination, only the reduction was carried out. Detection and quantification limits were 0.08 µgL-1 and 0.26 µgL-1 respectively, linear range was up to 10 µgL-1. Accuracy was evaluated as recovery from analysis of a reference material provided by Mexico's Centro Nacional de Metrología (CENAM) for proficiency testing, with recoveries in the range 95% -115% for natural water, and by spiking various urine samples, with recoveries in the range 90-110%. Precision (repeatability, RSD%) was better than 10% for both water and urine samples. Arsenic recommended limits are: for drinking water < 10 µgL-1 for total arsenic (WHO, Guidelines for Drinking-Water Quality) and for urine, < 35 µgL-1 on occupational exposed workers (ACGIH-BEI®) and 10-20 µgL-1 on general population (ATSDR, As Tox-Profile). If those levels are considered as reference, the proposed methods are suitable for this purpose. In conclusion, the figures of merit of these methodologies, are appropriate for routine monitoring of total and inorganic As in water and urine, according to international recommendations and Uruguayan regulations.

Keywords: arsenic in water and urine, hydride generation, Uruguay