Implementation of Alpha Spectrometry for Uranium Isotopes and its Application for Monitoring Purposes

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Body of Abstract: The measurement of radioactivity concentrations in excreta samples is an important tool for the monitoring of possible radionuclides intakes by occupationally exposed workers. The two methods presently operational at IPEN-SP/Brazil for monitoring internal contamination to uranium are urine analysis by fluorimetry and alpha spectrometry. Fluorimetry is the routine monitoring method applied for natural uranium while the alpha spectrometry is limited for few workers according to their new activities in the uranium processing plant. The handing of enriched uranium has resulted in an exposure to different types of uranium compounds identified as Type F, M, S and some of its combination. Therefore, a review of bioassay program applied to uranium workers has shown the need to optimising alpha spectrometry in consequence of handling both natural uranium and uranium compounds with different isotopic composition, which could reach up to 20% in 235U. Moreover, a radiochemical procedure for the determination of uranium isotopes in urine has been optimised, using co-precipitation and ionic exchange resin separation followed by electrodeposition onto stainless steel plates and alpha-spectrometry. The method with chemical recovery of 85% offers good prospects to be applied for the routine monitoring of workers. Additionally, investigation and information provided by radiation protection service about the working conditions as well as the main tasks of the workers were considered valuable to the evaluation of the monitoring results. Assessment of intake of uranium based on urine assay are likely to be appreciable in errors under most condition of occupational exposure. However, urine analysis can be important for assessing intakes after a known event or when monitoring intervals do not exceed about 3 months. Urine measurements from IPEN workers were carried out and the interpretation of uranium data in terms of derived limit and intake were estimated taking into account 19.75% 235U enriched uranium.