

The Role of Atomic Fluorescence Spectrometry in Determining Levels of Mercury and Selenium Species in the Environment

Peter B Stockwell¹, Warren T Corns¹, Bin Chen¹,
Nicholas V C Ralston² and Laura Raymond²

¹P S Analytical Ltd, Arthur House, Crayfields Industrial Park, Main Road, Orpington, Kent
BR5 3HP, UK

²Energy & Environmental Research Center, University of North Dakota, Grand Forks 58202,
ND, USA

Methyl mercury exposures have long been an environmental concern. The major source of human exposure to methyl mercury is from consumption of fish and shellfish. Numerous studies have reported measurements of the levels of mercury in the environment and foods in an effort to assess the risks associated with exposure. However, most of these studies have not recognised the protective effects of the essential trace element selenium. Mercury has a high affinity for selenium and high exposures to methyl mercury inhibit selenium dependent enzyme activities. Inhibition of these enzyme activities appear to be responsible for most if not all of mercury's pathologic effects, but improved dietary selenium intakes preserve their activities, thereby preventing or reversing the progressive debilitation that would otherwise occur. Reliable measurement of both the mercury exposures and selenium intakes and their resulting tissue concentrations are needed to provide meaningful risk evaluations. Atomic fluorescence spectrometry measurements are ideally suited to provide the measurements of the concentrations and molecular speciation of these elements at the levels of interest in a relatively simple and cost effective manner.

The instrumentation developed for these measurements and results from a range of collaborations with industrial and academic partners will be presented.