Faculty: Faculty of Chemistry

Research Group: Laboratory of Basic Aspects of Analytical Chemistry

Title: Optimisation of analytical procedure for elemental composition in animal tissues and assessment of material homogeneity

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Abstract: This project focuses on the optimisation of an ICP-MS method for multielement analysis in animal tissue materials, including both certified reference materials (CRMs) and a homemade reference material. In the initial phase, four biological CRMs were analysed: cod (MODAS-5), cormorant (MODAS-4), bovine muscle (ERM-BB184), and bovine liver (NBS1577). Recovery rates varied substantially across elements and sample types, with notably low values observed for mercury (Hg). To address this, gold (Au) was added as a stabilising agent during sample preparation, which significantly improved Hg recovery and contributed to reliable quantification using small sample masses (5-50 mg) in the CRM phase. Recovery performance for other elements was enhanced through overall method optimisation. In the second phase, a chicken breast sample was processed into a freeze-dried powder as a homemade reference material. Since some elements (Pb, Cd, Hg) were not detected in the raw sample, spike recovery experiments were conducted. The sample was repeatedly ground and subjected to rolling motion to improve material homogeneity. Homogeneity was verified by calculating the relative standard deviations (RSDs) of elemental concentrations and by microscopic observation of particle distribution. The results were compared with those of commercial CRMs, demonstrating comparable or improved material homogeneity. A total of 16 elements were analysed across all samples, including Na, Mg, K, Ca, Mn, Fe, Co, Cu, Zn, Mo, Ag, Cd, Hg, and Pb. These findings support the feasibility of preparing small-scale biological reference materials with trace element accuracy suitable for clinical and environmental applications.