Fast and simple high-precision isotopic analysis of Fe in whole blood by MC-ICP-MS for biomedical purposes

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High-precision Fe isotopic analysis of whole blood *via* multi-collector ICP-mass spectrometry (MC-ICP-MS) provides valuable clinical information. A clear link between an individual's whole blood Fe isotopic composition and Fe status has been established and therefore, it is an interesting approach for assessing Fe depletion/overload diseases and for detecting impairments in the regulation of intestinal Fe absorption [1-3]. However, the sample preparation, typically based on anion exchange chromatography, is labor-intensive and time-consuming that, it is a limiting issue in the biomedical research. Thus, simple, fast and reliable methodologies, providing high sample throughput, are highly demanded. The possibility to simplify this methodology by means the direct analysis of the acid-digested whole blood, i.e. without Fe isolation from the sample matrix, was evaluated for Fe isotopic analysis by MC-ICP-MS. The presence of mineral matrix elements and organic matter were evaluated. The Fe isotopic composition was biased low in the presence of matrix elements such as Na and K, while it was biased high for concentrations ≥ 1% (w/v) of glucose. Nevertheless, after dilution of the digested whole blood to 0.75-1.5 mg L^{-1} of Fe followed by the adequate correction for instrumental mass discrimination using a combination of internal (with admixed Ni) and external correction, accurate and precise results were obtained. For actual whole blood samples, Fe isotope data obtained following this appporach was in agreement with those using the reference procedure, based on chromatographic isolation of Fe out of acid-digested blood. The external precision, expressed as standard deviation of 10 measurements of the whole blood sample measured in one measurement session (one day), was 0.02 ‰ for δ^{56}Fe and 0.03 ‰ for δ^{57}Fe.

[1] L. Van Heghe, J. Delanghe, H. Van Vlierberghe & F. Vanhaecke (2013), *Metallomics* 5, 1503-1509; [2] K. Hotz & T. Walczyk (2013), J*ournal of Biological Inorganic Chemistry* 18, 1-7; [3] K. Hotz, P.A. Krayenbuehl & T. Walczyk (2012), J*ournal of Biological Inorganic Chemistry* 17, 301-309.