NOVEL APPLICATIONS OF TRACE METAL STABLE ISOTOPES IN MEDICAL RESEARCH

Mark Rehkämper

Mass Spectrometry and Isotope Geochemistry at Imperial College London

The application of multiple-collector inductively coupled plasma mass spectrometry (MC-ICP-MS) for trace metal stable isotope analysis is well established within geochemistry since the conception of the technique about 20 years ago. The use of such instruments in medical and life science research has only just begun, however, and the scope of applications is vast, from diagnosis to mechanistic understanding. This project will investigate the use of trace metal isotope analyses, originally developed for geochemical research, within a medical context, in particular for studies in neurosciences, oncology, and toxicology.

The analytical work will be carried out in the clean room and mass spectrometry laboratories of the MAGIC Research Center at the Department of Earth Science & Engineering, Imperial College London (http://www.imperial.ac.uk/earth-science/research/research-groups/magic/). The inter-disciplinary nature of the project implies that the successful candidate will need to communicate effectively with academic professionals from medicine, biology, chemistry and engineering.

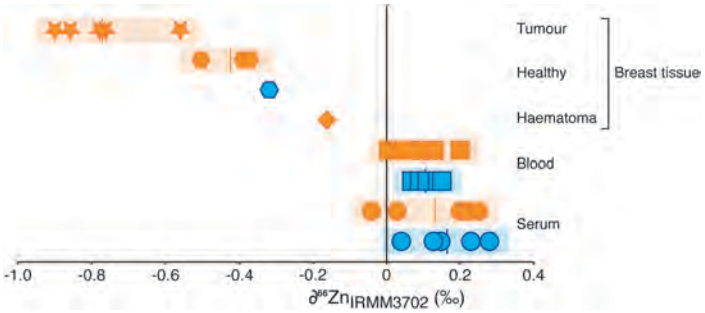

Fig. 1 Variations in zinc isotope composition of breast cancer patients and controls. Zinc isotope composition of blood (squares; *n* = 10), serum (circles, *n* = 10), healthy breast tissue (hexagons, *n* = 4), haematoma (diamond, *n* = 1) and tumour (stars, *n* = 5) samples from breast cancer patients (yellow, dashed outline) and age-matched controls (blue, solid outline). Tumours are significantly isotopically light compared to all other tissues. Mean values are shown by horizontal lines in shaded regions. Uncertainty is ≤±0.2‰ (2SD), and is encompassed by shaded regions.

Data acquired in our lab reveal that breast cancers tumours have a different Zn isotope composition than healthy breast tissue. This difference may enable a new technique for early diagnosis of breast cancer (see Larner et al., 2015).

Applications from students with degrees in Chemistry, Biology, Biochemistry, Earth Science, Geology, Geochemistry or a related discipline are welcome. Please don't hesitate to get in touch via email (markrehk@imperial.ac.uk) if you are interested or have further questions.

Selected literature: Larner, F., Woodley, L.N., Shoush, S., Moyes, A., Humphreys-Williams, E., Strekopytov, S., Halliday, A.N., Rehkämper, M. and Coombes, R.C. (2015) Zinc isotopic compositions of breast cancer tissue. Metallomics 7, 112-117.