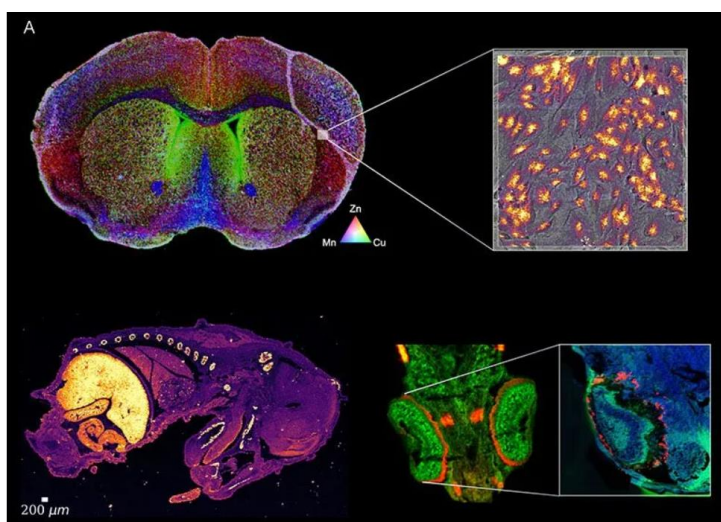


In Situ Metal Concentration Measurements in Medical Research



Rebekah Moore and Mark Rehkämper

The application of laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) for *in situ* elemental concentration measurements is well established within geochemistry. The use of such instruments in medical and life science research has only just begun, however, and the scope of applications is vast and exciting. Metals, such as iron and zinc are essential to humans and need to be kept at specific levels to support bodily processes. Diseases, such as cancer, can induce significant changes in metal balance (homeostasis) and understanding their distribution in affected tissues will improve mechanistic understanding of biological processes and disease characterisation. This project will investigate the use of LA-ICP-MS within a medical context, in particular for studies in neuroscience, oncology, and toxicology.



The images above were generated via LA-ICP-MS and show the in situ concentrations of biologically-important metals zinc, manganese and copper. Source: LMF.

The analytical work will be carried out in collaboration with the London Metallomics Facility (LMF) at King's College London and the student will also work closely with members of the MAGIC Research group at the Department of Earth Science and 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 develop advanced skills in the application of LA-ICP-MS as well as in image analysis and statistics, and learn to communicate effectively with diverse academic professionals from medical, life and natural sciences.

Applications from students with degrees in medical, life or natural sciences are welcome. Please don't hesitate to get in touch via email (r.moore13@imperial.ac.uk, markrehk@imperial.ac.uk) if you are interested or have further questions.

Selected literature:

Doble, P. A., Gonzalez ed Vega, R., Bishop, D. P., Hare, D. J., Clases, D., 2021. Laser Ablation–Inductively Coupled Plasma–Mass Spectrometry Imaging in Biology *Chem. Rev.*, doi.org/10.1021/acs.chemrev.0c01219. *This publication provides a general overview of LA-ICP-MS and the state-of-the-art of the technique in biological research.*

Sullivan, K.V., Moore, R.E.T., Capper, M.S., Schilling, K., Goddard, K., Ion, C., Layton-Matthews, D., Leybourne, M.I., Coles, B., Kreissig, K., Antsygina, O., Coombes, R.C., Lerner, F., Rehkämper, M., 2021. Zinc stable isotope analysis reveals Zn dyshomeostasis in benign tumours, breast cancer, and adjacent histologically normal tissue. *Metallomics*, doi.org/10.1093/mtomcs/mfab027.

This publication, led by the supervisor team, shows how zinc concentration and stable isotope data for whole breast tissue samples suggest that in situ zinc measurements would give a more informative understanding of the biological processes happening during breast cancer and benign breast disease.