

New applications of solid-state NMR to the extracellular matrix in health and disease Supervisor: Dr. Wing Ying Chow

Solid-state nuclear magnetic resonance (ssNMR) is a versatile spectroscopic technique with broad applications. In particular, it can provide structural information on biomolecules in functionally-relevant states. The application of ssNMR to the extracellular matrix (ECM) is an emerging area of research¹. The ECM is a diverse group of biological materials integral to multicellular life. However, its roles in development and ageing are still poorly understood. We aim to develop a multidisciplinary approach, leveraging the unique advantages of ssNMR spectroscopy to deliver new biological insight into human health² and disease³.

This project will use the world-leading ssNMR facility at the University of Warwick, including the High-field National Research Facility based at Millburn House (go.warwick.ac.uk/850mhz). This project will involve close collaboration with Warwick Medical School and University Hospitals Coventry and Warwickshire to obtain biologically/medically relevant samples (from cell culture and patient biopsies) for analysis. Recent analysis included ECM from cell culture, tissues from animal models of disease, and tissues from patients affected by osteoarthritis and alkaptonuria.

This experimental PhD project will involve ssNMR characterisation of a range of ECM samples, especially exploring new directions enabled by fast magic angle spinning (>60 kHz) techniques. Depending on interest, the student can receive training in the production and isotopic enrichment of one or more different types of ECMs or can play a founding role in establishing a database of ssNMR spectroscopic signals that will be an invaluable resource for ECM biologists.

To discuss this project further, please contact <u>W.Ying.Chow@warwick.ac.uk</u> Recent research projects on using ssNMR for the ECM: <u>wychowlab.org</u> Further information on NMR at Warwick: <u>go.warwick.ac.uk/NMR</u>

¹ Murgoci, A., & Duer, M. (2021). Molecular conformations and dynamics in the extracellular matrix of mammalian structural tissues: Solid-state NMR spectroscopy approaches. *Matrix Biology Plus*. <u>https://doi.org/10.1016/j.mbplus.2021.100086</u>

² Chow, W. Y., Rajan, R., Muller, K. H., Reid, D. G., Skepper, J. N., Wong, W. C., Brooks, R. A., Green, M., Bihan, D., Farndale, R. W., Slatter, D. A., Shanahan, C. M., & Duer, M. J. (2014). NMR Spectroscopy of Native and in Vitro Tissues Implicates PolyADP Ribose in Biomineralization. *Science*. <u>https://doi.org/10.1126/science.1248167</u>

³ Chow, W. Y., Norman, B. P., Roberts, N. B., Ranganath, L. R., Teutloff, C., Bittl, R., Duer, M. J., Gallagher, J. A., & Oschkinat, H. (2020). Pigmentation Chemistry and Radical-Based Collagen Degradation in Alkaptonuria and Osteoarthritic Cartilage. *Angewandte Chemie International Edition*. https://doi.org/10.1002/anie.202000618