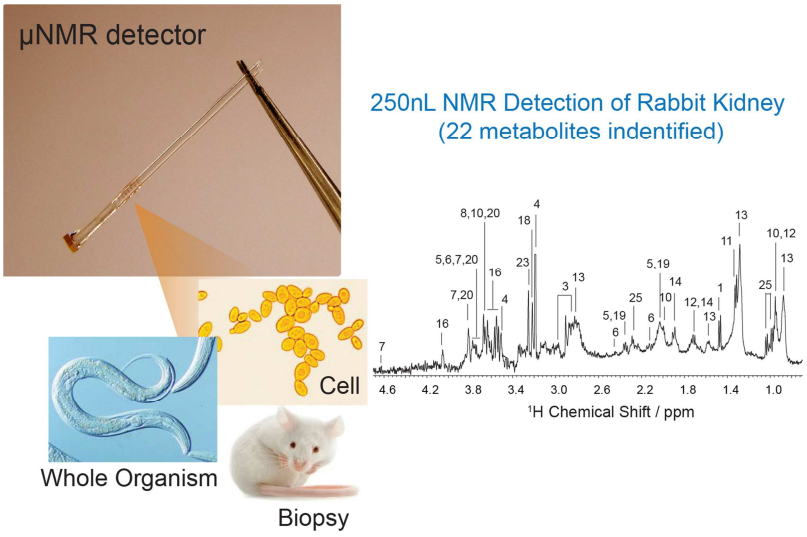
Towards µNMR biopsy

Alan Wong

CEA Saclay/UMR3299 – SIS2M/LSDRM, F-91191, Gif-sur-Yvette Cedex, France



High-Resolution Magic-Angle sample Spinning (HR-MAS) NMR spectroscopy of biopsies combined with chemometric statistical tools has now emerged as a powerful methodology for metabolomics NMR – analysis of small organic molecules in System Biology – of biological tissues, and has led to many important disease diagnosis, therapeutic target discovery and environmental assessment. However, due to the intrinsically poor detection sensitivity, NMR analysis often requires large tissue mass (5 to 10 mg). Such mass could compromise the metabolic evaluation due to the high degree of tissue heterogeneity; and could also prevent high-throughput screening of scarce tissues (such as human tumor), and also hamper the possibility of multi-clinical diagnostic analyses. Unfortunately, today there are no practical means for NMR analysis of small quantities of tissue, or soft-matter, where sample magic-angle spinning is essential for high quality data acquisition. For this reason, we are developing NMR-based analytical tools with good sensitivity and with good metabolic spectral quality for scarce tissue application. Currently, one promising approach is the use of a simple micro-resonator (High-Resolution Magic-Angle Coil Spinning (MACS)), which can wirelessly couple to a MAS probe. Here, we present the evolution of the micro-resonator MACS to metabolomics applications. This work marks a significant leap towards *needle NMR biopsy* – a direct biopsy analysis in real-time clinical and surgical environments.

Sakellariou et al Nature 2007;447:694.
Wong, Beatriz et al Anal Chem 2012;84:3843.
Wong et al Anal Chem 2013;85:2021.