Abstract qui sera donné, à quelques détails près (pas encore demandé par les organisateurs)

^{129}Xe NMR-based sensors

P. Berthault

Although MRI is a powerful modality combining high spatial resolution and penetration capabilities, owing to its intrinsic low sensitivity it is rarely used for early diagnosis of pathologies and follow-up of treatment efficacy. Among the recently proposed hyperpolarized species which NMR signal is multiplied by several orders of magnitude, xenon has a special place, not only because it is a non toxic free diffusive tracer, but also because it exhibits a large variation of its NMR parameters (T_1, chemical shift for instance) according to the local environment. This is the reason why for several years we produce laser-polarized ^{129}Xe and use it as a biological probe. In our applications, xenon is used alone, or functionalized by dedicated molecular systems for which it has a high affinity.[1]

In the first approach, using xenon in cell suspensions, we have shown that on the ^{129}Xe NMR spectrum the presence of a signal specific of the inner cell compartment is not reserved to the peculiar case of red blood cells, but can be extended to various eukaryotic and prokaryotic cell types.[2] The monitoring of its NMR parameters and of the exchange between the two populations opens up promising perspectives for the study of intracellular properties, applied, for instance, to cell toxicology or cancer research.

In the second approach where xenon is reversibly encapsulated in molecular hosts decorated with biological ligands or reactive groups,[3] several types of such ^{129}Xe NMR-based biosensors have been conceived and studied. In this field the cell uptake of such a transferrin biosensor could be demonstrated.[4] Bimodal (fluorescence-NMR) and/or smart sensors have also been proposed.[5-7]

The handling of the intense and out-of-equilibrium xenon magnetization requires the understanding of the induced non-linear effects[7] and the development of fast NMR/MRI sequences.[8]

1. C. Boutin et al. , NMR Biomed. **24** (2011) 1264-1269
2. P. Berthault et al., Prog. NMR Spectrosc. **55** (2009) 35-60
3. C. Boutin et al., Bioorg. Med. Chem. **19** (2011) 4135-4143
4. N. Kotera et al., Angew. Chem. **51** (2012) 4100-4103; N. Tassali et al., Anal. Chem. **86** (2014) 1783-1788.
5. E. Dubost et al., Angew. Chem. **53** (2014) 9837-9840
6. N. Kotera et al., Chem. Comm. **51** (2015) 11482-11484
7. H. Desvaux, Prog. NMR Spectrosc. **70** (2013) 50-71
8. C. Boutin et al., J. Phys. Chem. Lett. **4** (2013) 4172-4176