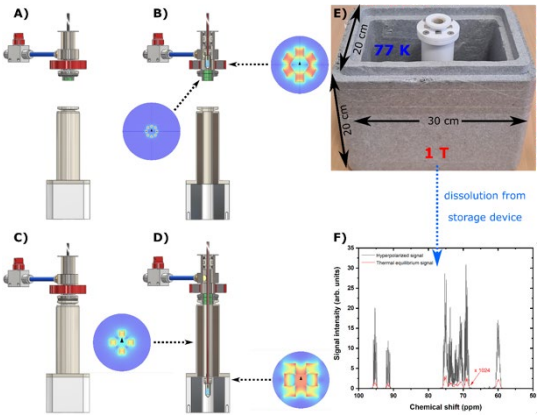
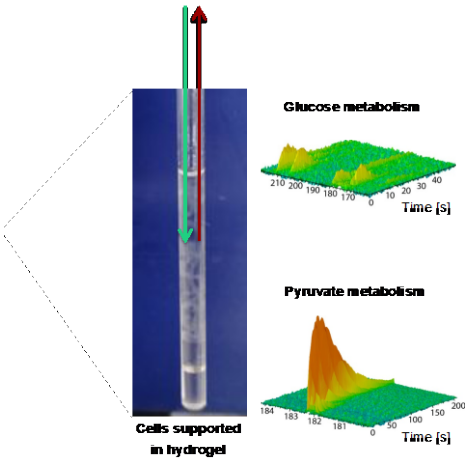
Highlights in 2020

Transport of hyperpolarized glucose sample



To disconnect the hyperpolarization equipment from the clinical environment by enabling storage and transportation of ^{13}C-hyperpolarized metabolic contrast agents (^{13}C-MCA) is a hot topic in the field since technically demanding hardware needed for hyperpolarization hampers a widespread clinical use of this technology. We succeeded, for the first time, in extracting ^{13}C-hyperpolarized MCAs from the hyperpolarization equipment with little loss of polarization and established conditions for transport and remote dissolution of the ^{13}C-MCA. Smart hardware was designed to prove transport at cryogenic conditions and perform remote dissolution of hyperpolarized [U-^{13}C,U–^{2}H]-D-glucose. A "custom designed fluid path" (CFP) allowed us to understand and control the physics in sample extraction. To shelter the MCAs' spin state during extraction of the sample as solid we designed and implemented a permanent magnet bridge inside the DNP probe. In this way, we managed to transform the solid hyperpolarized MCAs into an injectable solution far from the dDNP polarizer, while still obtaining an NMR signal enhancement >10,000. *A. Capozzi et all. 2021, submitted to Comm.Chem.*

New infrastructure at HYPERMAG



During 2020 the NMR infrastructure at HYPERMAG was boosted. Thanks to the DNRF and an infrastructure grant from NNF we have installed a 500 MHz spectrometer with a cryoplatform. This gives us the highest sensitivity that is commercially available on the spectrometer side. This spectrometer is surrounded with three different types of polarizers and thus provides a unique infrastructure for studies of chemical reactions and cell metabolism with hyperpolarization. To improve the biological environment of the cells while studied the system is fitted with a bioreactor that ensures stable pH and oxygen levels. Materials for cell anchoring that are porous enough for fast access of the hyperpolarized MCAs has been implemented. These technical improvements increase the detection limit with a factor of ten for metabolic studies.