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dissolution Dynamic Nuclear Polarization

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Abstract

Hyperpolarized Magnetic Resonance is a new medical imaging modality that offers exceptional possibilities to follow changes in metabolism. The method is enabled by a more than 10,000 fold enhancement of the nuclear magnetisation from metabolic contrast agents that probe central metabolic pathways. The contrast agent is typically enriched in 13C and polarized by dissolution Dynamic Nuclear Polarization (dDNP). The contrast agent circulates via the vasculature to the tissue of interest, where it is taken up by the tissue cells and metabolized into specific products. MR is unique in several ways: 1) it already provides anatomical and morphological images with high resolution and contrast based on the tissue water protons, 2) it is does not expose the patient to any ionizing radiation, and 3) it is a spectroscopic method that allows quantification of the individual metabolites. The first tracer in clinical development is 13C-pyruvate. Pyruvate is at a pivotal point in glycolysis and allows us to directly probe the Warburg effect through the elevated lactate-to-pyruvate ratio. The hope is that more accurate diagnosis and staging can be made, and that the method will provide an early read-out of response to treatment. The first clinical studies have been performed with encouraging results, e.g. aggressiveness staging of prostate cancer.