SABRE HYPERPOLARIZATION OF BIOLOGICALLY RELEVANT LIGANDS

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Nuclear magnetic resonance (NMR) spectroscopy is widely used to study molecular structure and dynamics, but its sensitivity is limited by low nuclear spin polarization [1]. To improve sensitivity, stronger magnetic fields or hyperpolarization techniques are applied. One such technique is Signal Amplification by Reversible Exchange (SABRE), which uses parahydrogen as a source of spin order and enables fast signal enhancement without chemical modification of the target molecule. The efficiency of SABRE depends on reversible binding and chemical exchange at the metal catalyst center [1,2].

In this work, SABRE hyperpolarization of imidazole derivatives is studied. Imidazole is an aromatic heterocycle group often found in many antibiotic drugs and pharmaceutical compounds. In addition, the higher affinity to the iridium catalyst makes imidazole derivatives suitable SABRE target as it is demonstrated by the recent high spin-polarization achievements on antibiotic metronidazole [3]. This potentially enables fast NMR studies at millimolar concentrations for nitrogen-containing drugs, allowing single-scan NMR detection [1-3].

However, SABRE efficiency is strongly influenced by reversible ligand binding, exchange rates and by the selected method for polarization transfer from parahydrogen to the target [1–3]. In this work, SABRE was performed on a small variety of imidazole derivatives at room temperature by using a variety of different SABRE polarization protocols operating at low magnetic fields. The chemical dynamics were optimized by adjusting the co-ligand concentration in the solution. The SABRE efficiency was estimated by the achieved 15N signal enhancement compared to conventional NMR. The summarized SABRE performance will potentially serve as an important guide for future studies and lead towards novel pharmaceutical assays using hyperpolarized NMR.

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