

Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Real-time tracking of dissociation of hyperpolarized ^{89}Y -DTPA: a model for degradation of open-chain Gd^{3+} MRI contrast agents¹
SARAH FERGUSON, PETER NIEDBALSKI, CHRISTOPHER PARISH, ANDHIKA KISWANDHI, University of Texas at Dallas, ZOLTAN KOVACS, University of Texas Southwestern Medical Center, LLOYD LUMATA, University of Texas at Dallas — Gadolinium (Gd) complexes are widely used relaxation-based clinical contrast agents in magnetic resonance imaging (MRI). Gd-based MRI contrast agents with open-chain ligand such as Gd-DTPA, commercially known as magnevist, are less stable compared to Gd complexes with macrocyclic ligands such as GdDOTA (Dotarem). The dissociation of Gd-DTPA into Gd ion and DTPA ligand under certain biological conditions such as high zinc levels can potentially cause kidney damage. Since Gd is paramagnetic, direct NMR detection of the Gd-DTPA dissociation is quite challenging due to ultra-short relaxation times. In this work, we have investigated Y-DTPA as a model for Gd-DTPA dissociation under high zinc content solutions. Using dissolution dynamic nuclear polarization (DNP), the ^{89}Y NMR signal is amplified by several thousand-fold. Due to the relatively long T_1 relaxation time of ^{89}Y which translates to hyperpolarization lifetime of several minutes, the dissociation of Y-DTPA can be tracked in real-time by hyperpolarized ^{89}Y NMR spectroscopy. Dissociation kinetic rates and implications on the degradation of open-chain Gd^{3+} MRI contrast agents will be discussed.

¹This work was supported by the U.S. Department of Defense award number W81XWH-14-1-0048 and by the Robert A. Welch Foundation research grant number AT-1877.

Sarah Ferguson
University of Texas at Dallas

Date submitted: 05 Nov 2015

Electronic form version 1.4