SHORT ABSTRACT OF THESIS

Synthesis and Investigation on Water Soluble Mono(aquated) and Bis(aquated) Gd(III) and Mn(II) Complexes as Potential MRI Contrast Agents

Magnetic resonance imaging (MRI) is the widely used noninvasive clinical diagnosis modality that provides anatomical tissue images of high spatial resolution. The technique is based on ^{1}H-NMR signal recording and thus, limited by low-sensitivity. To deal with the issue, imaging processes are often accompanied by prior administration of a paramagnetic substance, which is known as contrast agents (CA). Gd(III)–based stable and water–soluble complexes are most widely studied as CAs because of its seven unpaired electrons, long electronic relaxation time, and fast water exchange rate. While, the r_1 relaxivity values of the commercially available Gd(III)–based MRI contrast agents are in the range 4.4–5.2 $mM^{-1}s^{-1}$, with comparable thermodynamic and kinetic stability to that of commercially available Gd(III)–based CAs, the water soluble, aquated Gd(III) complexes of ligand H_4peada **(2A)** and H_4bedik **(3A)** provided higher r_1 relaxivity values of 6.08 $mM^{-1}s^{-1}$ and 7.30 $mM^{-1}s^{-1}$ at 1.41 T, 25 °C and pH ~ 7.4, respectively. Moreover, in contrast to the current trend of low r_1 relaxivity values of the commercially available Gd(III)–based MRI contrast agents at higher field strength, the complex **3A** provided higher r_1 relaxivity value even at higher magnetic field strength, holding promise regarding the development of MRI imaging probes that can be even used at higher magnetic fields. In the search of safer MRI contrast agent for patients having severe renal diseases, Mn(II) complexes of ligand H_4bedik **(4A)** and H_2pmpa **(5B)** with one and two inner sphere water molecules showed higher r_1 relaxivity values of 3.11 $mM^{-1}s^{-1}$ and 5.88 $mM^{-1}s^{-1}$ at 1.41 T, 25 °C and pH ~ 7.4 respectively. These higher relaxivity values along with their higher thermodynamic stability make them promising candidates for the development of effective MRI contrast agents for safer and emerging applications in MRI.