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NOVEL QUADRUPOLAR PEAKS BASED CONTRAST AGENTS

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The present study aims at developing an innovative class of MRI contrast agents for Fast Field Cycling-MRI applications. They represent a completely new class of contrast agents that display remarkable relaxation effects on tissue water protons. Their detection requires the acquisition of images at variable magnetic field strength as provided by Fast Field Cycling MRI (FFC-MRI) scanners. The peculiar property of the proposed agents relies on the generation of ^{14}N-Quadrupolar Peaks (QPs) that cause a relaxation enhancement of water protons at the proton NMR frequency corresponding to the ^{14}N quadrupolar resonance frequency.[1] The QPs from these innovative contrast agents has to fall at frequencies well distinguishable from those associated with the amidic peptide bonds from endogenous proteins. This study relies on an innovative technology, FFC-MRI, which opens new avenues for non-invasive imaging technologies with human applications. The uniqueness of this technology relies on its ability to image how the magnetic relaxation time of materials varies with the magnetic field strength. In particular, FFC allows detecting the quadrupolar cross-relaxation, appearing as peaks (QPs) in the $1/T_1$ dispersion profile completely invisible to conventional (fixed-field) MRI. The QPs are detectable only when the contrast agent is in a gelified or solid-like form, ie at pH>6.6, and above this value their intensity is pH dependent.[2] Thanks to this pH-dependent behaviour, the contrast agents can be used to report on tissue pH changes (that can be associated to the occurrence of a pathologic state or to cellular apoptosis/necrosis). We expect that this technique can be exploited for *in vivo* study of tissue implants. In fact, to date there is an almost complete lack of methods for the rapid, non-invasive and repeated monitoring of tissue implants and new methods are needed to monitor cell status and polymer degradation under physiological conditions (temperature, saline, pH, enzymes etc.) thus allowing the physician to control, in real time, the transplanted scaffold status.

References:
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