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New advances in hyperpolarized xenon-129 biosensor MR molecular imaging

Hyperpolarized (HP) agents have the potential to vastly improve MRI sensitivity for the diagnosis and management of many diseases. The hyperpolarization of xenon (^{129}Xe) can result in an enhanced signal by a factor of up to 100,000, which enables direct detection of the HP agent with no background signal. HP ^{129}Xe is a potentially valuable MR tracer for functional imaging due to its high solubility in the blood and brain, and its large chemical shift range. HP ^{129}Xe can also be used withbiosensors for molecular MR imaging using the hyperpolarized xenon chemical exchange saturation transfer (HyperCEST) technique which allows the detection of probes at as low as femtomolar concentrations. HP ^{129}Xe can be delivered to a target by means of dedicated molecular cage systems that can encapsulate xenon and bind to biological sites of interest using a targeting moiety, such as an antibody or a ligand, which enables detection of a specific biomarker. We have obtained the worlds first in vivo HyperCEST image via intravenous injection in a rat, which clearly illustrates the kidneys.

Biography

Mitchell S Albert is a Research Chair at the Thunder Bay Regional Research Institute and a professor at Lakehead University.At the Thunder Bay Regional Research Institute, he is the Director of MRI Research, Director of the Hyperpolarized Gas MRI Laboratory, and a Scientist. At Lakehead University, he is a Professor in Chemistry and an Adjunct Professor in biology, physics, and the health sciences. Prior to this, he was Associate Professor of Radiology at the Harvard Medical School. He is one of the inventors and pioneers of hyperpolarized gas MRI, and holds 9 patents on its development. He received the United States Presidential Award from President Clinton for this invention and received a CAREER award from the National Science Foundation (NSF).

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