Method and System to Detect a Solute in a Solvent using Nuclear Magnetic Resonance

Reference No: B77091

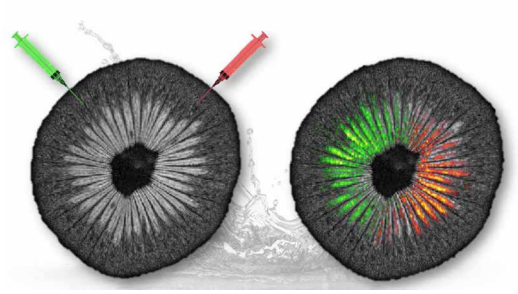
CHALLENGE

The most common contrast agents for clinical Magnetic Resonance Imaging (MRI) are Gadolinium-based but they lack tissue specificity, typically do not respond to their chemical environment, and there are serious safety concerns over gadolinium deposition.
The CEST (Chemical Exchange Saturation Transfer) method, which is well established in the MRI practice, has opened the door for the discovery of new classes of responsive or physiological agent molecules that sense their tissue environment (e.g. *in vivo* pH-imaging), respond to biological events or allow for e.g. cell-tracking and inflammation imaging. However, the standard CEST method requires several independent imaging experiments and results in a loss of signal magnitude and a darkening of the image, or negative contrast.

INNOVATION

New MRI method with outstanding performance and unrivalled image quality due to the direct imaging of the exchanging protons of e.g. endogenous amide or hydroxyl protons or from exchangeable sites on exogenous CEST agents.

- Detection of low-concentrated chemical-exchange-active substances in a single imaging experiment.
- S/N increased by several orders of magnitude.
- No need for additional reference images.
- Exploitation of signal magnitude and signal phase facilitates parallel detection of several different chemical compounds (see figure below).
- Highly efficient chemical exchange detection schemes possible.



✔ Detection of low concentrated chemical compounds (approx. 100 mM).
✔ Left half: Anatomical MRI image is not affected.
✔ Right half: Overlay of anatomical MRI (grey scale) with obtained chemical compound selective MRI (in colours).
✔ Parallel detection and high sensitivity with the invented MRI method.

Figure: Kiwi as a test phantom for chemical compound selective MRI. Green injection needle: salicylic acid, red injection needle: Iopamidol.

COMMERCIAL OPPORTUNITIES

- Possible use in human and small animal size MR scanners.
- Shorter examination time for patient.
- Harmless chemical compounds such as NSAIDS, barbituric acid or e.g. Iopamidol, Iohexol, Iodixanol as contrast agents.

DEVELOPMENT STATUS

First positive experimental results on high-field animal MRI scanners at 7T and 17.5T; the methodology will be implemented on 3T and 7T human size MRI scanners.

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