**17O MRI of Rat Head at 21.1 T**

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**Introduction**

 The importance and potential of ultra-high magnetic field MRI for humans (up to 20 T) is under investigation across-the-board [1]. Detecting 17O is an attractive and promising goal of utilizing MRI at ultra-high magnetic fields and is expanding our capability to conduct non-invasive *in vivo* MR imaging. The power of the ultra-high magnetic field of 21.1 T is demonstrated below by performing 3D 17O MRI at natural abundance of oxygen (0.037%) in 25 min. Thus, a variety of labeled 17O substances can be monitored with high resolution 3D MR imaging.

**Experimental**

 The MR experiments were performed using the 21.1 T magnet and Bruker MRI Avance III console. The *in vivo* RF probe has a double tuned 17O/1H volume RF coil with an internal diameter of 33 mm, covering a rat head. The MR frequency for 17O was 121.65 MHz. 3D MR imaging of a rat head was accomplished using a modified Bruker UTE pulse sequence with radial sampling having a matrix size =80x112x56, using FOV=64x64x64 mm, TR = 15 ms, TE = 0.2 ms, NA= 16, Scan time = 25 min. The effect of labeled 17O-water was observed using an injection of PBS solution with a final 17O enrichment of 17%. All animal experiments were conducted according to the protocol approved by the Florida State University ACUC.

**Results and Discussion**

 The ultra-short echo time MR images of rat head using 17O demonstrate many anatomical features and the background level of MR signal intensity, which can be successfully used for calibration of 17O MR signals (**Fig. 1**).

The 17O labeling expands our capability to perform *in vivo* research using non-invasive MR imaging.

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**Fig.1** 17O 3D MRI of rat head (left, natural abundance) and 1.5 hours after 1 mL bolus injection of 17O-water (right). Scan time was 25 min in both cases and resolution of 1x1x1 mm.

**Conclusions**

The 17O MR 3D imaging with resolution of 1x1x1 mm is feasible in a rat head for natural abundance of oxygen and labeled 17O compounds. The higher voltage capability of the RF probe allowed for minimizing the loss of 17O MR signal during *in vivo* experiments by achieving a 90 º RF pulse of 120 µs for 17O.

**Acknowledgements**

 A portion of this work was performed at the National High Magnetic Field Laboratory, which is supported by the National Science Foundation Cooperative Agreement No. DMR-1157490 and the State of Florida, as well as, funding from Heidelberg University. Many thanks to Jason Kitchen for his prompt help with RF coils during arcing.

**References**

 [1] Budinger, T.F., *et al*., MAGMA, **29(3),** 617-639 (2016), Review.