## ISMRM 2016 $^{17}$O Oral Presentation Abstracts

1. **1997. Assessing Water Influx and Retention in the Brain of AQP4 Knockout Mice by 17O-MRI** *Yifan Zhang1, Bernadette O. Erokwu2, Yuchi Liu1, George W. Farr3, 4, Walter F. Boron4, Chris A. Flask5, 6, Xin Yu, 45* ,1Biomedical Engineering, Case Western Reserve University, Cleveland, OH, United States; 2Radiology, Case Western Reserve University, Cleveland, OH, United States; 3Aeromics, LLC, Cleveland, OH, United States; 4Physiology and Biophysics, Case Western Reserve University, Cleveland, OH, United States; 5Biomedical Engineering and Radiology, Case Western Reserve University, Cleveland, OH, United States; 6Pediatrics, Case Western Reserve University, Cleveland, OH, United States

2. **2450. Proton-Constrained CMRO2 Quantification with Direct 17O-MRI at 3 Tesla,***Dmitry Kurzhunov1, Robert Borowiak, 12, Philipp Wagner1, Marco Reisert1, Michael Bock1,*1Department of Radiology · Medical Physics, University Medical Center Freiburg, Freiburg, Baden-Württemberg, Germany; 2German Cancer Consortium (DKTK), German Cancer Research Center (DKFZ),, Heidelberg, Baden-Württemberg, Germany

3 **4615. *CMRO2* Quantification by Direct 17O MRI at 7 T in the Macaque Brain: Assessment of Energy Metabolism Impairment *In Vivo*** *Chloe Najac1, 2, Brice Tiret1, 2, Julien Flament1, 3, Martine Guillermier1, 2, Diane Houitte1, 2, Romina Aron Badin1, 2, Philippe Hantraye1, 2, Emmanuel Brouillet1, 2, Vincent Lebon1, 2, Julien Valette1, 2*1CEA-MIRCen, Fontenay-aux-Roses, France; 2CEA-CNRS URA 2210, Fontenay-aux-Roses, France; 3Inserm US27, CRC-MIRCen, Fontenay-aux-Roses, France

4 **4633. Dynamic 17O-MRI at 3 Tesla for *In Vivo* CMRO2 Quantification** *Robert Borowiak1, 2, Dmitry Kurzhunov2, Philipp Wagner2, Marco Reisert2, Michael Bock2* 1German Cancer Consortium (DKTK), German Cancer Research Center (DKFZ), Heidelberg, Germany; 2Dept. of Radiology · Medical Physics, University Medical Center Freiburg, Freiburg, Baden-Württemberg, Germany

## ISMRM 2016 $^{17}$O Posters

### E-posters

5 3942 Computer #11 **Sensitivity Comparison of Ultrahigh-high field Oxygen-17 MRS Imaging between 7T and 10.5T using a Human Head Size Phantom and Quadrature Surface Coil** Hannes Michel Wiesner , Xiao-Hong Zhu , Kamil Ugurbil , and Wei Chen CMRR, Radiology, University of Minnesota Medical School, Minneapolis, MN, United States

6 In vivo O MRS imaging provides a valuable tool for quantitatively imaging the cerebral rate of oxygen metabolism, cerebral blood flow and oxygen extraction fraction from a brief inhalation of O-isotope labeled oxygen gas. In this study, we conducted a pilot test to examine the O sensitivity using the human head size water phantom in the world's first 10.5T whole-body human scanner at the CMRR, then compared it with that at 7T. We found approximately doubled 17O sensitivity at 10.5T after careful consideration signal and noise contributions at both fields.

7 3962 Computer #31 **Simultaneous Assessment of Abnormal Glycolysis and Oxidative Metabolisms in Brain Tumor using In Vivo Deuterium MRS Imaging** Ming Lu , Xiao-Hong

Zhu , Yi Zhang , Walter Low , and Wei Chen Center for Magnetic Resonance Research, University of Minnesota, Minneapolis, MN, United States, Neurosurgery, University of Minnesota, Minneapolis, MN, United States

**8** Recently, we developed a novel 3D-Deuterium MR (DMR) approach able to simultaneously image glucose consumption rate and TCA cycle flux in rat brain at ultrahigh field. To evaluate its sensitivity in detecting altered metabolism, in this study, we acquired localized DMR spectra in rat brains with gliosarcoma following a brief infusion of deuterated glucose at 16.4 T. We observed accelerated glucose consumption and lactate accumulation accompany with decreased glutamate/glutamine turnover in brain regions with tumor. This pilot study demonstrates the feasibility of the in vivo DMR imaging approach for investigating abnormal glucose metabolism in brain tumor at ultrahigh field.

**9** 3963 Computer #32 **In Vitro Oxygen-17 NMR Spectroscopy of Cellular Metabolism at Ultra High Field** Ruomin Hu , Andreas Neubauer , Jorge Chacón-Caldera , Javier Uranga Solchaga , Christian Schuch , Tilo Gläser , Cordula Nies , Eric Gottwald , Stefan Giselbrecht , and Lothar R. Schad Computer Assisted Clinical Medicine, Medical Faculty Mannheim, Heidelberg University, Mannheim, Germany, NUKEM Isotopes Imaging GmbH, Alzenau, Germany, Institute for Biological Interfaces 5, Karlsruhe Institute of Technology, Eggenstein-Leopoldshafen, Germany,

**10** 3964 Computer #33 **Initial investigation of glucose metabolism in mouse brain using enriched 17O-glucose and dynamic 17O-MRS** Robert Borowiak , Wilfried Reichardt , Dmitry Kurzhunov , Christian Schuch , Jochen Leupold , Thomas Lange , Marco Reisert , Axel Kraft , Elmar Fischer , and Michael Bock University Medical Center Freiburg, Dept. of Radiology - Medical Physics, Freiburg, Germany, German Cancer Consortium (DKTK), German Cancer Research Center (DKFZ), Heidelberg, Germany, NUKEM Isotopes Imaging GmbH, Alzenau, Germany.

**11** In this work, we demonstrate the feasibility of monitoring glucose uptake in mouse brain using direct O-MRS at 9.4 Tesla for the first time. Time-resolved O-MRS spectra (temporal resolution: 42 s) are acquired in vivo after injection of D-glucose with O-labeled hydroxyl groups. The cerebral rate of glucose metabolism CMR is estimated using a pharmacokinetic model in an anesthetized (1.25% isoflurane) mouse to 0.43 ± 0.21 µmol/g/min, which is of the same order of magnitude as reported by F-FDG PET.

**12** 3965 Computer #34 **Evaluation of High Temporal and Spatial Resolution 17O-MRI** Sebastian C. Niesporek , Reiner Umathum , Thomas M. Fiedler , and Armin M. Nagel Medical Physics in Radiology, German Cancer Research Center (DKFZ), Heidelberg, Germany, Diagnostic and Interventional Radiology, University Medical Center Ulm, Ulm, Germany

**13** 3966 Computer #35 **Iterative Approach for Partial Volume Corrected T2* Determination in 17O-MRI** Sebastian C. Niesporek , Reiner Umathum , Thomas M. Fiedler , and Armin M. Nagel Medical Physics in Radiology, German Cancer Research Center (DKFZ), Heidelberg, Germany, Diagnostic and Interventional Radiology, University Medical Center Ulm, Ulm, Germany.

**14** 3979 Computer #48 Development of translational simple multinuclear MRI system for ultra high-field Chang-Hoon Choi , YongHyun Ha , Pandichelvam Veeraiah , Jörg Felder , Klaus Möllenhoff , and N. Jon Shah Institute of Neuroscience and Medicine-4, Research Centre Juelich,

Juelich, Germany, Faculty of Medicine, Department of Neurology, JARA, RWTH Aachen University, Aachen, Germany

## New $^{17}$O publications since ISMRM 2015

**15** **Oxygen Consumption Deficit In Huntington Disease Mouse Brain Under Metabolic Stress.** Lou S, Lepak T, Eberly LE, Roth B, Cui W, Zhu XH, Öz G, Dubinsky JM. Hum Mol Genet. 2016 May 18. pii: ddw138. [Epub ahead of print]

**16** **(17) O relaxation times in the rat brain at 16.4 tesla,** Wiesner HM[1,2], Balla DZ[1], Shajan G[1], Scheffler K[1,3], Uğurbil K[2], Chen W[2], Uludağ K[4], Pohmann R[1]. Magn Reson Med. 2016 May;75(5):1886-93.

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## ISMRM 2015 Presentations

1 States; 5Biomedical Engineering and Radiology, Case Western Reserve University, Cleveland, OH, United States; 6Pediatrics, Case Western Reserve University, Cleveland, OH, United States

2 Proton-Constrained CMRO2 Quantification with Direct 17O-MRI at 3 Tesla
Dmitry Kurzhunov1, Robert Borowiak, 12, Philipp Wagner1, Marco Reisert1, Michael Bock1
1Department of Radiology · Medical Physics, University Medical Center Freiburg, Freiburg, Baden-Württemberg, Germany; 2German Cancer Consortium (DKTK), German Cancer Research Center (DKFZ),, Heidelberg, Baden-Württemberg, Germany

3 CMRO2 Quantification by Direct 17O MRI at 7 T in the Macaque Brain: Assessment of Energy Metabolism Impairment In Vivo, Chloe Najac1, 2, Brice Tiret1, 2, Julien Flament1, 3, Martine Guillermier1, 2, Diane Houitte1, 2, Romina Aron Badin1, 2, Philippe Hantraye1, 2, Emmanuel Brouillet1, 2, Vincent Lebon1, 2, Julien Valette1, 2

4 1CEA-MIRCen, Fontenay-aux-Roses, France; 2CEA-CNRS URA 2210, Fontenay-aux-Roses, France; 3Inserm US27, CRC-MIRCen, Fontenay-aux-Roses, France

5 Dynamic 17O-MRI at 3 Tesla for In Vivo CMRO2 Quantification, Robert Borowiak1, 2, Dmitry Kurzhunov2, Philipp Wagner2, Marco Reisert2, Michael Bock2, 1German Cancer Consortium (DKTK), German Cancer Research Center (DKFZ), Heidelberg, Germany; 2Dept. of Radiology · Medical Physics, University Medical Center Freiburg, Freiburg, Baden-Württemberg, Germany

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## ISMRM 2014 Presentations

2. In vivo measurement of CBF using 17O NMR signal of metabolically produced H217O as a perfusion tracer , Xiao-Hong Zhu, Yi Zhang, Hannes Wiesner, Kamil Ugurbil, Wei Chen Magn Reson Med. 2013 August; 70(2): 309–314

2 In Vitro and In Vivo Studies of 17O NMR Sensitivity at 9.4 and 16.4 Tesla
Ming Lu, Yi Zhang, Kamil Ugurbil, Wei Chen, Xiao-Hong Zhu, Magn Reson Med. 2013 June; 69(6):

3 Development of 17O NMR approach for fast imaging of cerebral metabolic rate of oxygen in rat brain at high field, Xiao-Hong Zhu, Yi Zhang, Run-Xia Tian, Hao Lei, Nanyin Zhang, Xiaoliang Zhang, Hellmut Merkle, Kamil Ugurbil, Wei Chen, Proc Natl Acad Sci U S A. 2002 October 1; 99(20): 13194–13199 Correction in: Proc Natl Acad Sci U S A. 2003 April 1; 100(7): 4352.

4 Direct Cerebral 17O-MRI at a Clinical Field Strenght of 3 Tesla Using a Tx/Rx Head Coil
Author: Borowiak, R; Groebner, J; Kurzhunov, D; Fischer, E; Dragonu, I; Bock, M Subject: Molecular Imaging: New Mechanisms & Techniques, Program Number: 0687.

5 In Vivo 17O MR Imaging and Quantification of CMRO2, CBF and OEF in Human Visual Cortex at Rest and During Activation, Author: Zhu, X-H; Liu, X; Lu, M; Wiesner, H M; Ugurbil, K; Chen, W
Subject: MRS & ESR, Program Number: 3763.

6 Increase in Sensitivity and Signal Stability in 17O MRI Using a Cryogenic RF Probe
Author: Augath, M A; Seuwen, A; Zwick, S; Rudin, M;Subject: MRS Animal Models & Isotopic Tracers; Program Number: 2972.

7 Natural Abundance in Vivo 17O Measurements at 9.4T Author: Möllenhoff, K; Felder, J; Romanzetti, S; Gordji-Nejad, A; Shah, N J Subject: Molecular Imaging & Spectroscopy
Program Number: 0475.

8 Mapping Blood Flow & Tissue Oxygenation with MRI: Insights from Other Modalities
Author: Barbier, Emmanuel

Subject: Translational Pathways & Validation:Sorting Cells & MEMRI Validations: Flow Cytometry

9 MR Spectroscopy: The Promise
Author: Cerdán, Sebastián

Subject: Bamboccioni: Powerful, Promising MR Techniques that Have Yet to Leave Home-Challenges to Widespread Clinical Adoption

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3. Groebner, Jens; Borowiak, Robert; Rösler, Manuela; Umathum, Reiner; Fischer, Elmar; Pavlina, John M.; Bock, Michael, In Vivo 17O-MRI at 3 Tesla Using a TxRx Surface Coil
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6. Hoffmann, Stefan H.; Radbruch, Alexander; Semmler, Wolfhard; Nagel, Armin M., Partial Volume Corrected CMRO2 Determination in a Glioblastoma Patient by 17O MRI, Program Number: 0216.
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## ISMRM 2009 Presentations

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## Methods


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2 Zhu XH, Zhang Y, Wiesner HN, Ugurbil K, Chen W, In Vivo Measurement of CBF Using 17O NMR Signal of Metabolically Produced H217O as a Perfusion Tracer, Magn Res Medicine 70:309–314 (2013)

3 Lu M, Zhang Y, Ugurbil K, Chen W, Zhu XH, In Vitro and In Vivo Studies of 17O NMR Sensitivity at 9.4 and 16.4 T, Magnetic Resonance in Medicine 69:1523–1527 (2013)

4 Zhu XH, Chen JM, Tu TW, Chen W, Song SK Simultaneous and noninvasive imaging of cerebral oxygen metabolic rate, blood flow and oxygen extraction fraction in stroke mice, NeuroImage 64:437-447 (2013),

5 Hoffmann SH, Begovatz P, Nagel AM, et al. A measurement setup for direct (17) O MRI at 7 T. Magn Reson Med. 2011;66(4):1109-15.

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