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International Society for Magnetic Resonance in Medicine • www.ismrm.org

ISMRM Workshop on
MR Imaging of X-Nuclei (23Na & Friends):
From Controversies to Potential Clinical Applications, Part II

27-30 March 2023

The Palais du Pharo | Marseille, France

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ORGANIZING COMMITTEE

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OVERVIEW

This workshop will cover the latest technical advances and potential clinical applications in X-nuclei imaging (i.e., there is more to MRI than hydrogen, 1H) using 23Na (sodium) as an example. We expect that such discussions will be informative for imaging of other X-nuclei, as there are often many methodological similarities given low concentrations, complex spin dynamics when spin > 1⁄2, unique relaxation characteristics necessitating different k-space trajectories, need for custom RF coils (usually at high field), and last but not least, issues of absolute quantification. The new biochemical information available from imaging X-nuclei linked to metabolism can address several clinical questions affecting the brain and body in a novel way. The workshop will feature invited presentations to review the technical state of the art and initiate discussion, as well as poster sessions for attendees to present their latest research. There will also be an industry discussion to promote integration of scientific advancements and "best practice" methods for clinical studies across multiple MRI vendors. Note that spectroscopy and hyperpolarization methods are excluded from this workshop as these topics are covered by other ISMRM study groups.

TARGET AUDIENCE

The goal is to bring together our community of experienced researchers and newcomers, both basic scientists and physicians, who are interested or engaged in developing and using non-proton X-nuclei MR imaging. Attendees are members of the X-Nuclei Imaging Study Group, basic scientists and physicians interested or engaged in developing and using non-proton MR imaging, and people from industries involved in X-nuclei imaging.

EDUCATIONAL OBJECTIVES

Upon completion of this activity, participants should be able to:

- Recognize the controversies and challenges of imaging X-nuclei;
- Outline choices in hardware and acquisition methods for imaging X-nuclei;
- Discuss current and potential applications in human disease; and
- Predict future research and clinical needs for human applications of X-nuclei MRI.

SPEAKER UPLOAD INFORMATION (Audiovisual Preview)

The audio-visual staff will be located in the back of the meeting room.

Uploading presentations is available on a first-come, first-served basis. Hours are:

- Monday, 27 March 2023: 15:00-16:00 CEST
- Tuesday, 28 March 2023: 07:15-08:30 CEST
- Wednesday, 29 March 2023: 07:30-08:30 CEST

Please see program for additional times (breaks & lunch).

PROGRAM CREDIT DESIGNATION

The International Society for Magnetic Resonance in Medicine is accredited by the Accreditation Council for Continuing Medical Education to provide continuing medical education for physicians. The International Society for Magnetic Resonance in Medicine designates this live activity for a preliminary maximum of 11.0* *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

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To obtain your credit for the workshop, log in to the ISMRM membership portal at www.ismrm.org, click the "My Meeting Evaluations" menu option, and follow the instructions provided.

DECLARATION OF FINANCIAL RELATIONSHIPS

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Following are the names of all presenters, committee members, and other organizers who had influence upon program content. If individuals have disclosed real or apparent financial interests or relationships, the interests or relationships are described.

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Mohamed Mounir El Mendili, Ph.D.....No relationships to disclose
Lena V. Gast, Ph.D.....No relationships to disclose
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Wafaa Zaaraoui, Ph.D.....No relationships to disclose

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Christine R. Rose, Ph.D.....No relationships to disclose
Robert W. Stobbe, Ph.D.....Grants/Research Support: Heart & Stroke Foundation (Canada); Employment: University of Alberta
Olgica Zaric, Ph.D.....No relationships to disclose

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TORONTO | 03-08 June **2023**

EARLY REGISTRATION DEADLINE: **05 MAY 2023**

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Day 1: MONDAY, 27 MARCH 2023 *(2.0 CME Available)*		
15:00	Registration & Speaker Upload Available	
Session 1: Basic Physics & Physiology		
Moderators: Lothar Schad, Ph.D. & Wafaa Zaaraoui, Ph.D.		
16:00	*Basic Physics: Differences Between 1H & X-Nuclei*	Guillaume N. Madelin, Ph.D. New York University Langone Medical Center New York, NY, USA
17:00	*Imaging Cellular Sodium Signals in Neurons & Astrocytes in Health & Disease*	Christine R. Rose, Ph.D. Heinrich-Heine-Universität Düsseldorf Düsseldorf, Germany
18:00	Welcome Reception	
19:00	Adjourn	

Day 2: TUESDAY, 28 MARCH 2023 *(5.0 CME Available)* Physical/Technical Developments on X-Nuclei Imaging		
07:15	Registration & Speaker Upload Available	
08:30	Welcome & Introductions	
Session 2: Multiquantum Imaging		
Moderators: Lena V. Gast, Ph.D. & Lothar Schad, Ph.D.		
08:45	*Overview of Multiquantum Imaging*	Simon Reichert, M.Sc. Heidelberg University Heidelberg, Germany
Proffered Papers - Oral Session		
09:15	*Spatially Resolved 39K MRSI at 7T in Skeletal Muscles for Characterization of Quadrupolar Splittings*	Hedvika Haindrich Primasová, Ph.D University of Bern Bern, Switzerland
09:25	*Prospectively Undersampled Higher Resolution 23Na Multi-Quantum Coherences MRI*	Christian Licht, M.Sc. Heidelberg University Heidelberg, Germany
09:35	Break & Speaker Upload Available	
Session 3: Acquisition, Reconstruction, Quantification & Contrasts		
Moderators: Christian Licht, M.Sc. & Guillaume Madelin, Ph.D.		
10:15	*Designing k-Space for X-Nuclei Acquisitions & Reconstruction*	Yasmin Blunck, Ph.D. University of Melbourne Parkville, VIC, Australia
10:45	*Image Reconstruction Issues Related to Real Resolution, Partial Volume & B1/B0 Corrections*	Lena V. Gast, Ph.D. University Hospital Erlangen-Nuremberg Erlangen, Germany
11:15	*Quantification & Contrast Mechanisms*	Robert W. Stobbe, Ph.D. University of Alberta Edmonton, AB, Canada

Proffered Papers - Oral Session		
11:45	*Sequence Comparison for Sodium MRI*	Rolf Schulte, Ph.D. GE Healthcare München, Germany
11:55	*Design of a Two-Dimensional Ultrashort Echo Time Simultaneous Multi-Slice Pulse Sequence*	Jason Reich, M.Sc. University of British Columbia Kelowna, BC, Canada
12:05	*Simulated & Measured B1 Maps in Self-Gated Respiratory-Sorted 23Na MRI Obtained with a Pulse Sequence with Alternating Excitation*	Jana Felz, B.Sc. German Cancer Research Center Heidelberg, Germany
12:15	Lunch & Speaker Upload Available	
Session 4: Hardware		
Moderators: Christian Beaulieu, Ph.D. & Simon Reichert, M.Sc.		
14:00	*X-Nuclei Hardware Developments & Requirements*	Tanja Platt, Dr. rer. nat. German Cancer Research Center Heidelberg, Germany
Proffered Papers - Oral Session		
14:30	*End-Ring Stacked Triple-Tuned Birdcage Coil for X-Nuclei Magnetic Resonance Imaging*	Taewoo Nam, Ph.D. Candidate Gachon University Incheon, Republic of Korea
14:40	*A 16-Channel Proton/Sodium Transmit/Receive Array Design for 7 Tesla Head Imaging*	Menglu Wu, Ph.D. Student King's College London London, England, UK
14:50	*Whole-Body Sodium (23Na) & Proton (1H) MRI at 7T Using a Combined 23Na Birdcage/1H Array RF Coil Set-Up*	Sabine Melanie Matuschik, M.Sc. University Hospital Erlangen Erlangen, Germany
15:00	Break & Speaker Upload	
Session 5: Other Friends Beyond 23Na		
Moderators: Mounir El Mendili, Ph.D. & Armin Nagel Dr. rer. nat.		
15:30	*Deuterium Imaging*	Jeanine J. Prompers, Ph.D. University Medical Center Utrecht Utrecht, The Netherlands
Proffered Papers - Oral Session		
16:00	*39K/23Na MRI at 7 T Combined with Fat Quantification/T2 Mapping at 3T for Assessment of Ionic Balance in Patients with Hypokalemic Periodic Paralysis*	Claudius Sebastian Mathy, B.Sc. University Hospital Erlangen Erlangen, Germany
16:10	*Variability by Region & Method in Human Brain Sodium Concentrations Estimated by 23Na Magnetic Resonance Imaging: A Meta-Analysis*	Ben Ridley, Ph.D. IRCCS Istituto delle Scienze Neurologiche di Bologna Bologna, Italy
16:20	*Time-Resolved Abdominal 23Na MRI During Uptake of Saline Solution at 7 Tesla*	Laurent Ruck, M.Sc. University Hospital Erlangen Erlangen, Germany
16:30	*A Quadruple-Tuned Extremity Coil Enabling Multinuclear Metabolic MR Imaging at 7 Tesla*	Jiying Dai, M.Sc. University Medical Center Utrecht Utrecht, The Netherlands

16:40	*Anatomically-Guided Sodium Image Reconstructions: Effects of Readout Length*	Georg Schramm, Ph.D. Stanford University Stanford, CA, USA
16:50	*Quantitative Brain-Regional Sodium MRI in the Healthy Human Brain: Beware of Image Artifacts*	Samuel Rot, M.Sc. University College London London, England, UK
17:00	Adjourn	

Day 3: WEDNESDAY, 29 MARCH 2023 *(4.0 CME Available)*
X-Nuclei Applications

07:30	Registration & Speaker Upload Available	
08:30	*Consensus Topics: Pros & Cons*	Armin Michael Nagel, Dr. rer. nat. Lothar Schad, Ph.D. Wafaa Zaaraoui, Ph.D.
	Session 6: Brain Applications	
	Moderators: Anne Adlung & Jean-Philippe Ranjeva, Ph.D.	
09:30	*Sodium MRI in Stroke & Brain Tumours*	Christian Beaulieu, Ph.D. University of Alberta Edmonton, AB, Canada
10:00	Break & Speaker Upload Available	
10:30	*Sodium MRI in Multiple Sclerosis & Neurodegenerative Diseases*	Adil Maarouf, M.D. Aix Marseille University Marseille, France
Proffered Papers - Oral Session		
11:00	*Quantitative High-Resolution Sodium MR Imaging can be a Clinical Reality at 3 Tesla*	Keith Thulborn, M.D., Ph.D. University of Illinois Chicago, Illinois, USA
11:10	*Study of Homeostasis Alterations of Hubs in Focal Epilepsy Using 7T Sodium & Diffusion MRI*	Lucas Gauer, M.D. Aix-Marseille University Marseille, France
11:20	*Skin Sodium Concentration is Elevated with Aging but Relative Change Depends on Spatial Resolution of 23Na MRI*	Jingxuan Zhu, B.Sc. University of Alberta Edmonton, AB, Canada
11:30	*High Resolution Sodium Imaging of the Skin*	Theodora Slater, M.Sc. University of Nottingham Nottingham, England, UK
11:40	*Widespread Alterations in Fast Amyotrophic Lateral Sclerosis Progressors: A Brain DTI & Sodium MRI Study*	Mohamed Mounir El Mendili, Ph.D. Aix Marseille University & Hopital de la Timone Marseille, France
11:50	*Characterizing Thalamic Sodium Homeostasis Changes in Focal Epilepsy*	Roy Haast, Ph.D. Aix-Marseille University Marseille, France
12:00	Poster Session *(No CME available)* Lunch & Speaker Upload Available	

Session 7: Musculoskeletal & Whole-Body Applications		
Moderators: Teresa Gerhalter, Dr. rer. nat. & Jeanine J. Prompers, Ph.D.		
14:00	*X-Nuclei in Muscles & Cartilage*	Teresa Gerhalter, Ph.D. University Hospital Erlangen Erlangen, Germany
14:30	*Sodium MRI in Breast*	Olgica Zaric, Ph.D. Medical University of Vienna Vienna, Austria
15:00	Break & Speaker Upload Available	
15:30	*Sodium MRI in Nephrology*	Christoph Kopp, M.D. Friedrich-Alexander-University, Erlangen-Nürnberg Erlangen, Germany
Proffered Papers - Oral Session		
16:00	*Compressed Sensing Applied to 2D Sodium MRI of the Calf Using Half-Sinc Excitation Pulses*	Rebecca Baker, Ph.D. University College London London, England, UK
16:10	*Magnetic Resonance Imaging Assessment of Skin & Muscle Sodium in Haemodialysis*	Ben Prestwich, Ph.D. University of Nottingham Nottingham, England, UK
16:20	*Tissue Sodium Is High in Fat & Fibrosis of Human Unilateral Lymphedema*	Shannon L. Taylor, B.Sc. Vanderbilt University Nashville, TN, USA
16:30	Adjourn	
16:30	Social Event	

Day 4: THURSDAY, 30 MARCH 2023 *(No CME Available)*

Session 8: Perspectives & Vendor Points of View		
Moderators: Armin Nagel Dr. rer. nat & Wafaa Zaaraoui, Ph.D.		
07:30	Registration & Speaker Upload Available	
08:30	Vendor Presentation	
09:15	Round Table with Vendors: State of the Art, Needs & Support	
10:00	Break	
11:00	General Discussion	
11:30	Summary & Closing Remarks	Claudia A. Gandini Wheeler-Kingshott, Ph.D. University College London London, England, UK
12:00	Closing Statements, Boxed Lunches & Adjournment	

Posters

POSTER	TITLE	AUTHOR
1	*Initial 23Na Signal Decay Rate Is Not Different Between Lesion & Contralateral Tissue in Acute Stroke*	Robert W. Stobbe, Ph.D. University of Alberta Edmonton, AB, Canada
2	*Flip-Angle & Signal Dependence on RF Pulse Duration Yield Measurement of Very Rapid T2f for 23Na in Skin*	Robert W. Stobbe, Ph.D. University of Alberta Edmonton, AB, Canada
3	*Simultaneous 23Na Triple Quantum (TQ) Signal Estimation from Single-Pulse Sequence with Single Quantum (SQ) Time Efficiency*	Simon Reichert, M.Sc. Heidelberg University Heidelberg, Germany
4	*A Study to Understand the Relationship Between Electric Properties & Sodium Concentration with Proton T1*	Daniel Hernandez, Ph.D. Gachon University Incheon, Republic of Korea
5	*Detection of Renal Oxygen Consumption Using 17O-MRI in an Ex-Vivo Model: A Feasibility Study*	Johannes Castelein, M.Sc. University Medical Center Groningen Groningen, The Netherlands
6	*Performance Comparison of Two RF Coils for Abdominal Sodium MRI at 7T*	Anna K. Scheipers, M.Sc. German Cancer Research Center Heidelberg, Germany
7	*Comparison of Double & Triple-Quantum Signals of 23Na in the Presence of TmDOTP & Bovine Hemoglobin*	Dominik Zehender, M.Sc. University of Heidelberg Heidelberg, Germay
8	*Low-Rank Image Reconstruction Improves 23Na Multi-Quantum Coherences Imaging*	Christian Licht, M.Sc. Heidelberg University Heidelberg, Germany
9	*Quantification of Tissue Sodium Concentration in the Skin Using 23Na MRI at 3T*	Jonathan Birchall, Ph.D. University of Cambridge Cambridge, England, UK
10	*Noise Reduction in 23Na-MRI: A Comparison Between Non-Local-Mean Methods*	Irene Egidi, Ph.D. Student Enrico Fermi Research Centre Rome, Italy

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See the registration desk for questions.

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Irene Egidi, Ph.D. Student

Alex Ensworth, M.Sc.

Jana Felz, B.Sc.

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Sabine Melanie Matuschik, B.Sc.

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Menglu Wu, Ph.D. Student

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