

Member Initiated Symposium (MIS), ISMRM Montreal 2019

**Frontiers in Magnetic Resonance Imaging
Biomarkers of Renal Disease Where Imaging
Sciences, Big Data, Physiology and Medicine Meet**

When: Monday, 13 May 2019; 08:15-10:15

Where: Room 13A-C

Organizers:

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Abstract Renal diseases pose a significant and escalating socio-economic burden on healthcare systems. The development of better diagnostics and prognostics is well-recognised as a key strategy to resolve these challenges. Central to these developments are MRI biomarkers due to their potential for monitoring of early parenchymal changes, renal disease progression or treatment effects. The remarkable surge in renal MRI involves major cross-domain initiatives including a European research network (PARENCHIMA), large clinical studies (BEAt-DKD), the UK Renal Imaging Network (UKRIN) and the launch of a new US initiative (NIDDK). The MIS provides an overview of the state-of-the-art and the clinical relevance of MRI biomarkers of renal diseases. Presentations are devoted to linking renal (patho)physiology with imaging findings, to promoting emerging technologies and its validation, to discussing future directions and health economic aspects of renal MRI biomarkers. In doing so, we hope to convince the communities to throw their weight into the task of solving technical problems, connecting (patho)physiology with (bio)physics and big data analytics, and conceiving new clinical applications. As they are advanced, the MIS will push the boundaries of

MRI science, nephrology, patho(physiology), computational sciences and related fields for enhanced patient outcome and renoprotection. This MIS will convey the seeds of this mission and inspire the ISMRM community to become pioneers of renal MRI.

Learning outcomes Upon completion of this MIS attendees will be able to:

- Provide an overview of the state-of-the-art and the clinical relevance of MRI biomarkers of renal diseases
- Understand the needs for biological validation of renal MR markers to clarify the link to biology and physiology
- Explain technical recommendations for renal MR to ensure accuracy & precision, quality assurance.
- Discuss the added value of renal MR in drug development or patient management.
- Explore the scalability, automation, cost-efficiency, and health economy modelling of renal MRI.
- Outline the role of computational models, machine learning and predictive analysis for enhanced MR diagnostics of renal diseases
- Recognize the opportunities for discovery and challenges of renal MRI.

Target Audience This MIS attracts young scientists and new entrants into the field. It targets basic scientists, engineers, translational researchers and clinicians.

Scientific Program

Presentations (each 14 min + 3 min discussion)

1.) The link to biology and renal physiology: The physiologist's

perspective Erdmann Seeliger (M.D., male speaker)

Institute of Vegetative Physiology, Charité – University Medicine, Berlin, Germany erdmann.seeliger@charite.de

This presentation outlines fundamentals of renal biology and renal physiology.

The focus will be on the links between MRI biomarkers, biochemical markers and the signatures from quantitative physiological measurements and can stages of disease progression and therapy response be characterized by these profiles.

2.) Renal diseases and pathophysiology: The Nephrologist's

Perspective Madhav Menon (M.D., male speaker) Icahn School of Medicine at Mount Sinai Hospital, New York, USA
madhav.menon@mssm.edu

This presentation presents unmet clinical needs in nephrology and demonstrates staggering clinical uses of MRI for the assessment of diseases of the kidney. Future directions into emerging MR imaging applications fueled by the quest for advancing the capabilities of renal diagnostics are explored.

3.) Emerging renal MR imaging biomarkers or measurement

approaches: The MR physics perspective Charlotte Buchanan (Ph.D., female speaker) Sir Peter Mansfield Imaging Centre, Nottingham, UK
charlotte.buchanan@nottingham.ac.uk

This presentation outlines current concepts and the physics of parametric and physiometabolic MRI based biomarkers. The goal is to inspire the community to throw further weight behind the solution of the MR physics and technical obstacles of renal MRI.

4.) Technical validation: Demonstrating accuracy, precision and

quality assurance of renal MR biomarkers. Ilona Dekkers (M.D., trainee, graduate fellow, female speaker) Leiden University Medical Center, Leiden, The Netherlands i.a.dekkers@lumc.nl

This presentation highlights the challenges *en route* to MRI biomarkers of renal disease. It summarizes the main engineering targets and technological challenges, and outlines the solutions to accuracy, precision and quality assurance. Lines of the research to fully exploit the potential of parametric MRI and of MR biomarkers in preclinical research and clinical science are presented.

5.) Computational models, predictive analytics and machine

learning for advancing renal diagnostics and therapies Satish Viswanath (Ph.D., male speaker) Case Western Reserve University, Cleveland, Ohio, USA satish.viswanath@case.edu

This presentation highlights the improvements in computational models, big data and predictive analytics. Important steps and innovations including novel machine learning and predictive analysis approaches and early applications for renal diagnostics and therapies are surveyed to link renal imaging and computational sciences.

6.) Potential added value of novel renal MR biomarkers in drug

development or patient management. Lilach Lerman (M.D., female speaker) Mayo Clinic, Rochester, Minnesota, USA
lerman.lilach@mayo.edu

This presentation discusses the added value of novel renal MRI biomarkers in drug development or patient management with the goal to catalyze clinical explorations that foster prevention of kidney injury, combat renal disease and substantially slow its progression.

7.) Practical challenges and outcome of multi-center studies and

clinical renal MR imaging trials Paul Hockings (Ph.D., male speaker) Chalmers University of Technology, Gothenburg, Sweden Antaros Medical, Gothenburg, Sweden
Paul.Hockings@antarosmedical.com

This presentation highlights the requirements behind the setup of clinical renal MRI trials. It surveys pioneering multi-center studies and major renal MRI initiatives (Europe – PARENCHIMA, USA - NIDDK renal imaging initiative, UK - renal imaging network UKRIN). The presentation will help to accelerate the implementation of clinical MRI trials and to leverage the clinical value of renal MRI.

Diversity

42% of the speakers of this symposium are female scientists or female clinicians. 33% of the organizers and moderators are female scientists. The symposium features four MDs (67%) and three PhDs. 15 % of the speakers are trainees. The symposium targets young scientists, new entrants into the field, clinicians and under-represented groups.