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MRI Imaging Biomarkers for Diabetic Complications

Katherine Dell / Chris Flask

October 22, 2009

Case Western Reserve University
MetroHealth Medical Center
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SCHOOL OF MEDICINE

- **Motivation**
  - Detection, staging, and understanding of Diabetic complications such as nephropathy and liver disease would benefit from quantitative / non-invasive imaging assessments.

- **Aims**
  1. Optimize MRI techniques for assessments of
     - Adipose tissues and hepatic lipids
     - Renal and hepatic fibrosis
  2. Longitudinal evaluate DN and NAFLD progression in dbdb and other mice.

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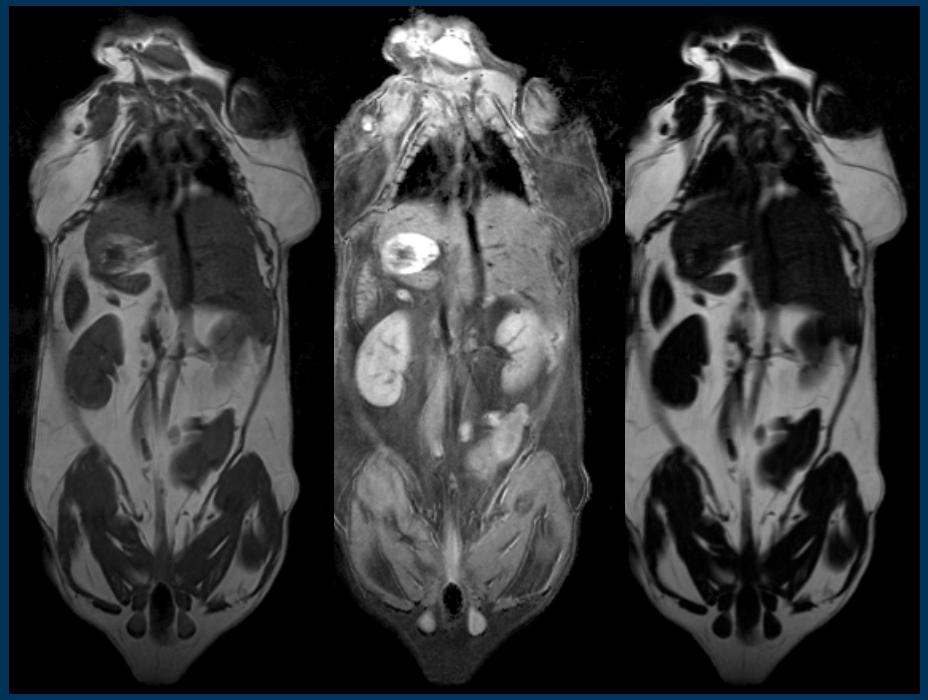
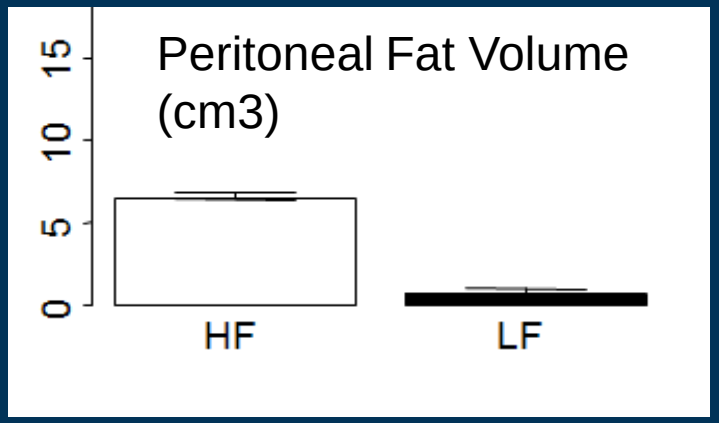
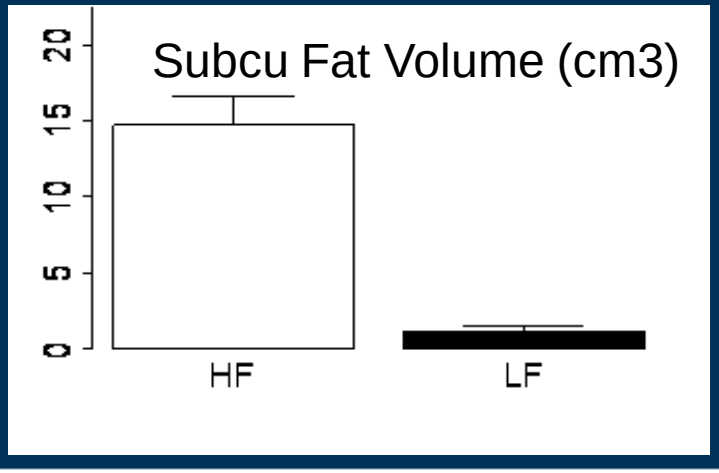
MRI Lipid Assessments

MR Image Water Image Fat Image



Johnson D et. al. JMRI 2009





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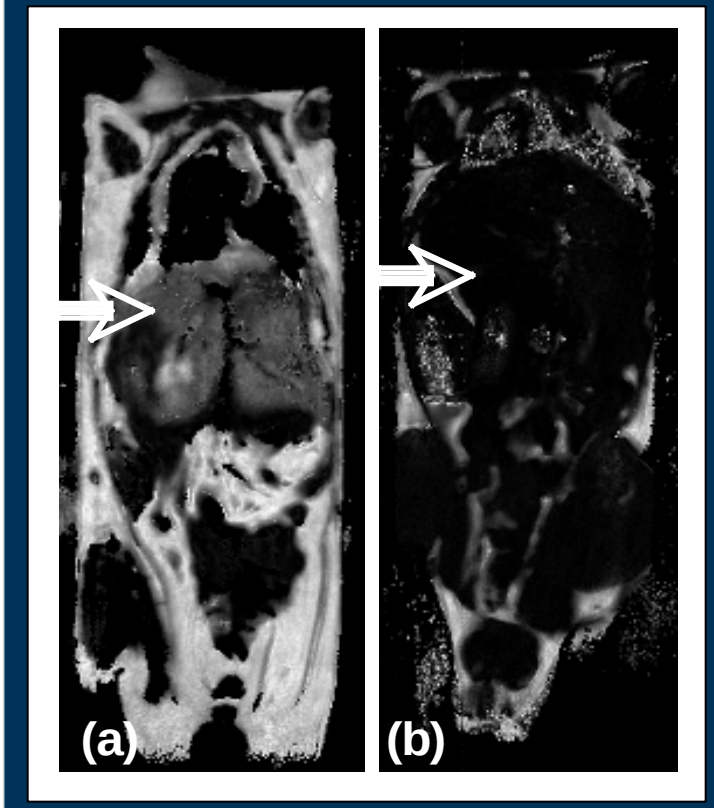
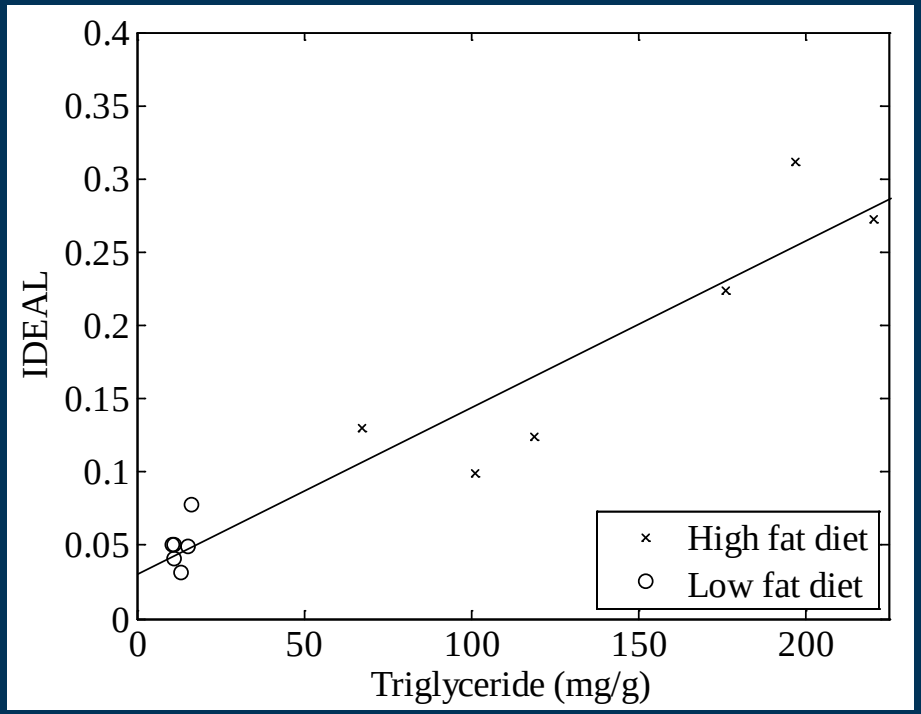
Hepatic Fat Fraction by MRI





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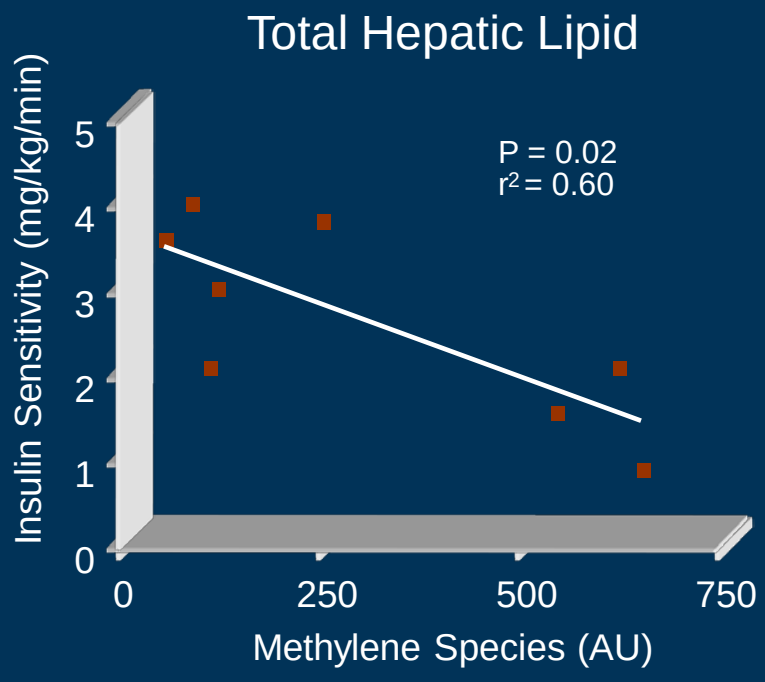
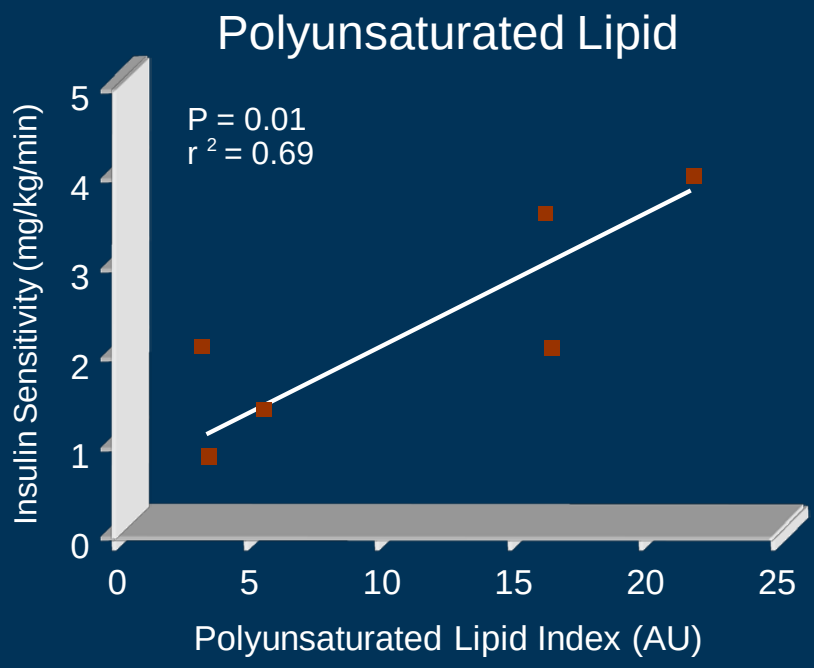
Liver MR Spectroscopy





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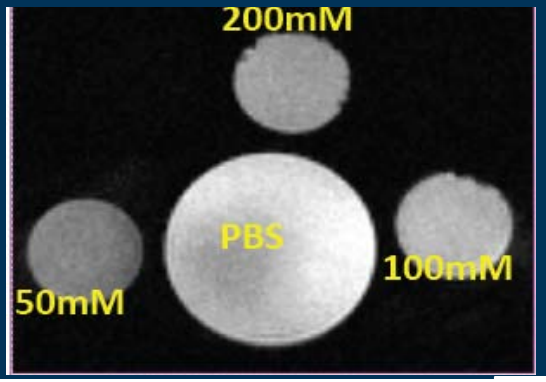
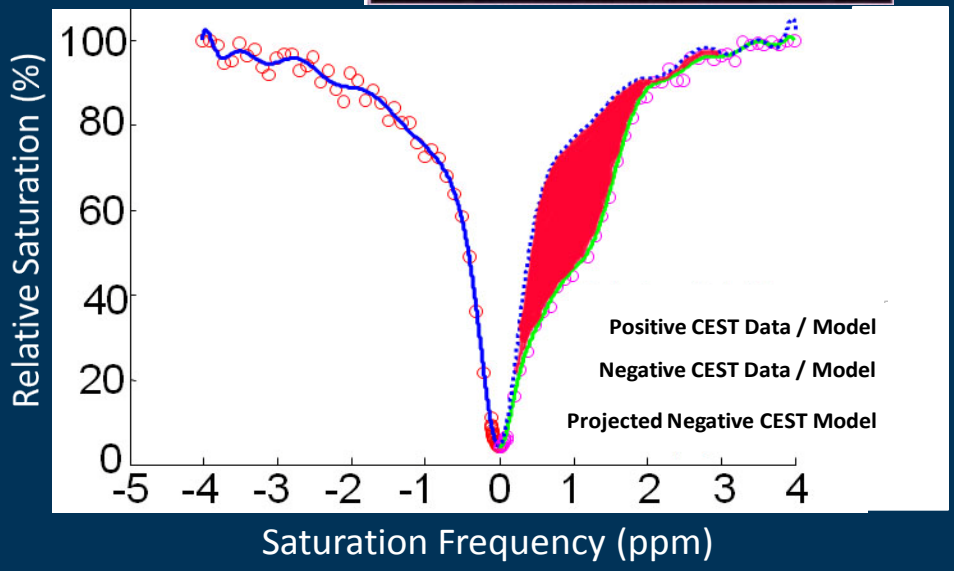
Kidney and Liver Fibrosis

- **Saturation Transfer - MRI**
  - Similar to NMR spectroscopy
  - Measures interaction / ionic exchange
  - Macromolecules (many exchanges sites!)



- **Applications**
  - Glycogen, pH
  - ATP depletion / repletion
  - Collagen
  - Fibrosis
  - Contrast Agents (PARACEST)

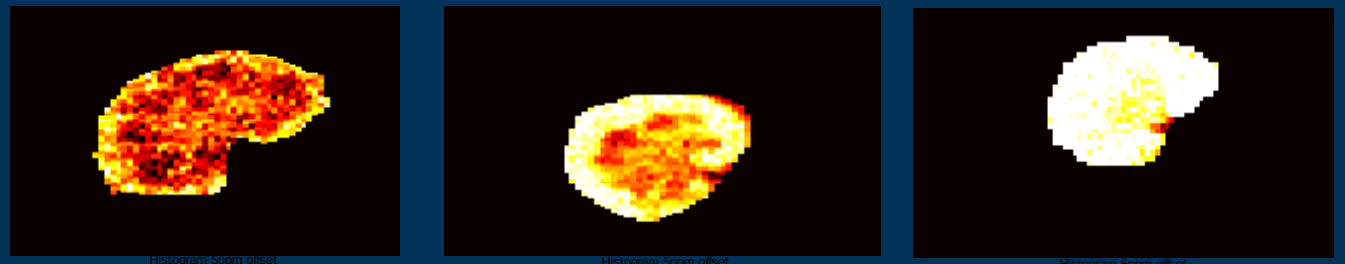


Initial Results with MT MRI (ARPKD Rat Model)

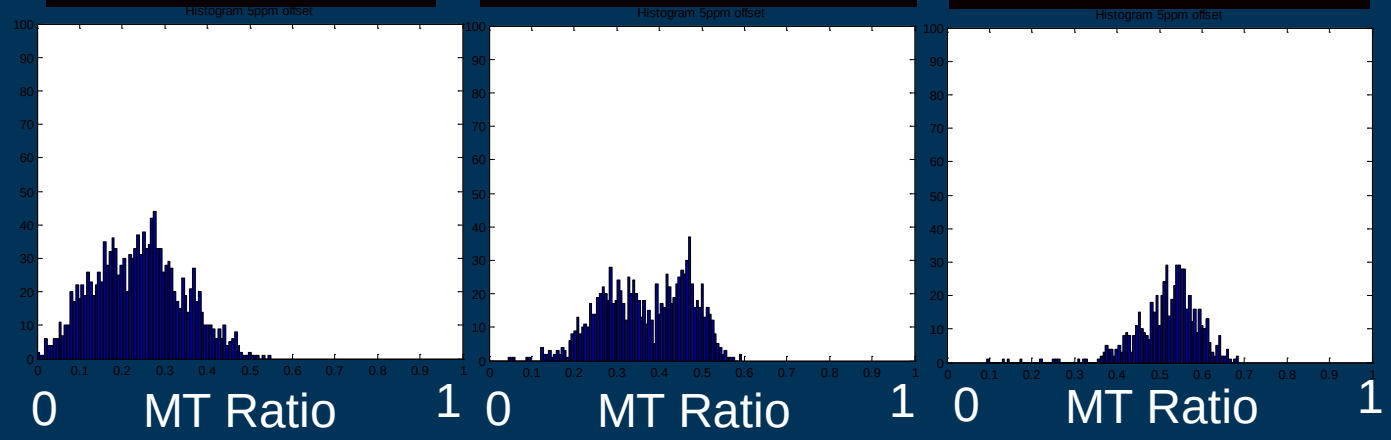
Low MTR = macro/micro cysts

High MTR = normal parenchyma

MTR Maps



Histograms



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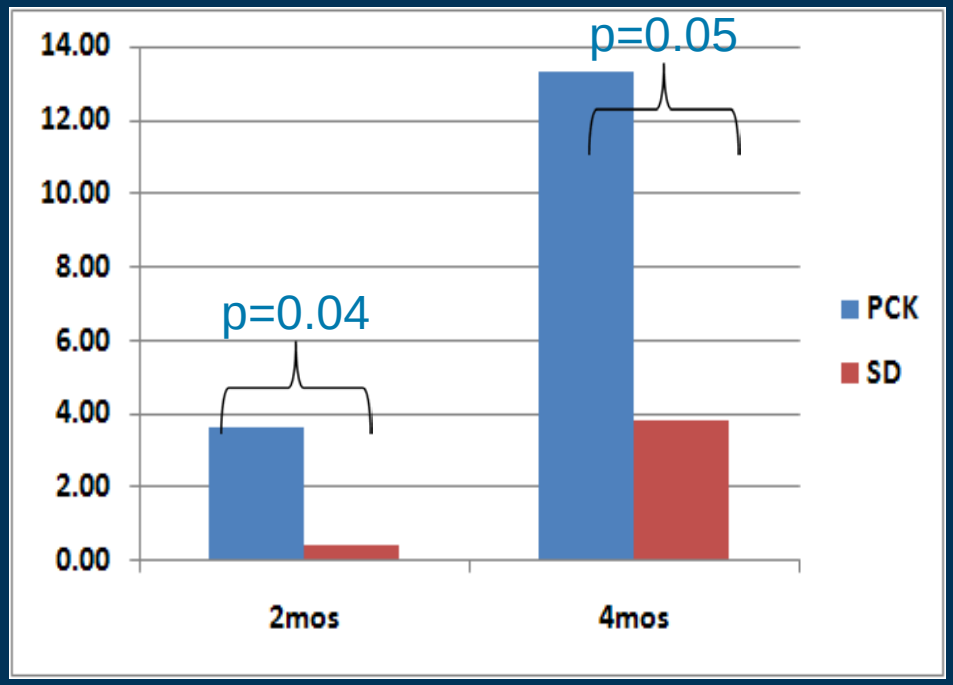

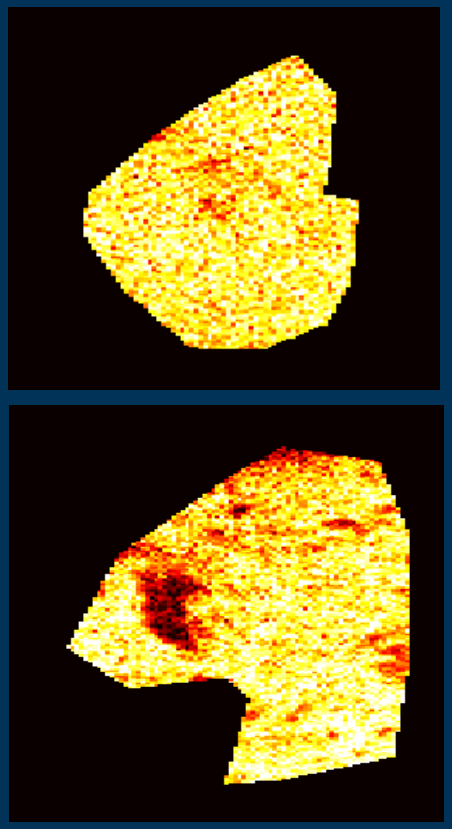

SD

PCK

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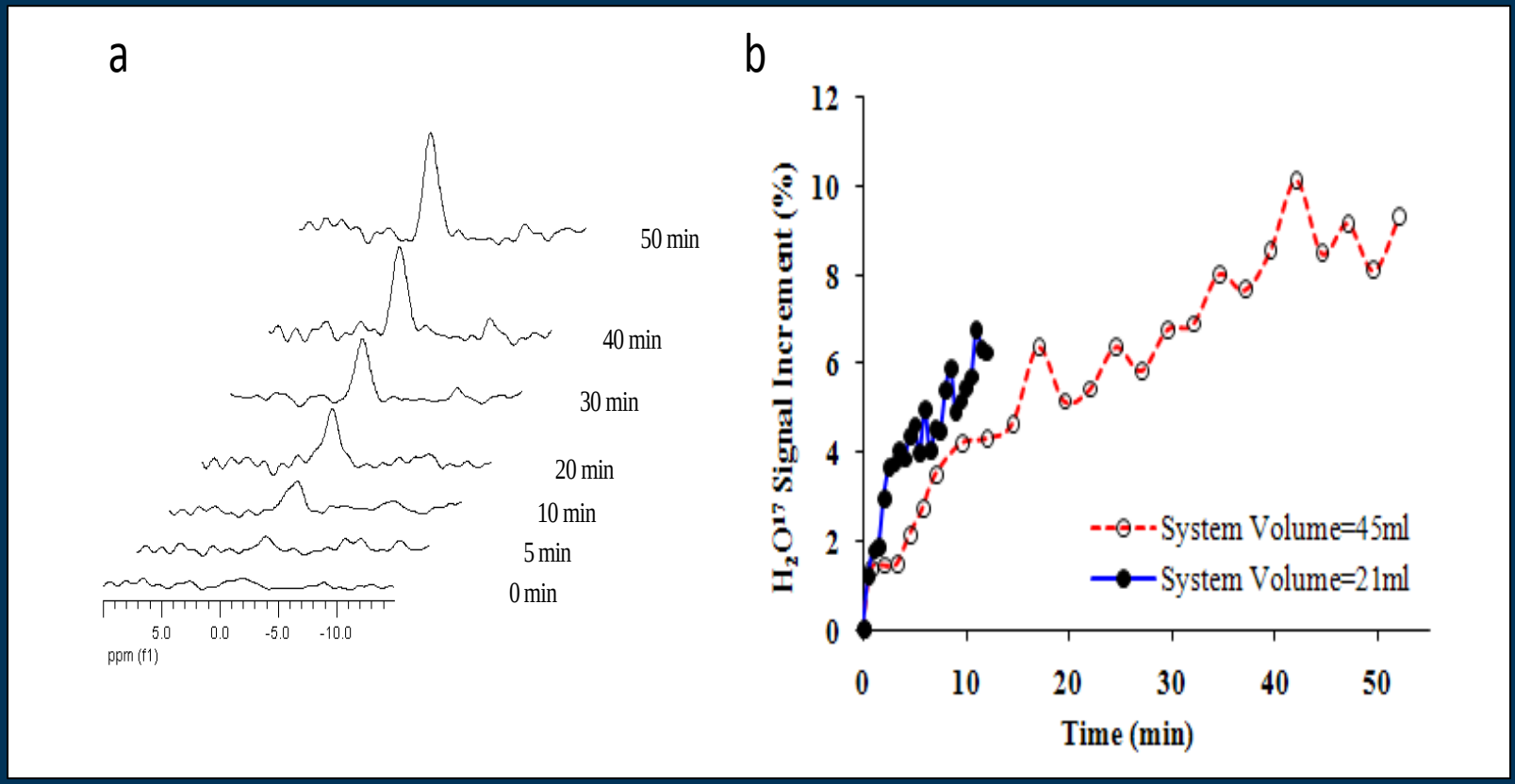
Cardiac Metabolism And Function

Mitochondrial water generation by ^{17}O MRS



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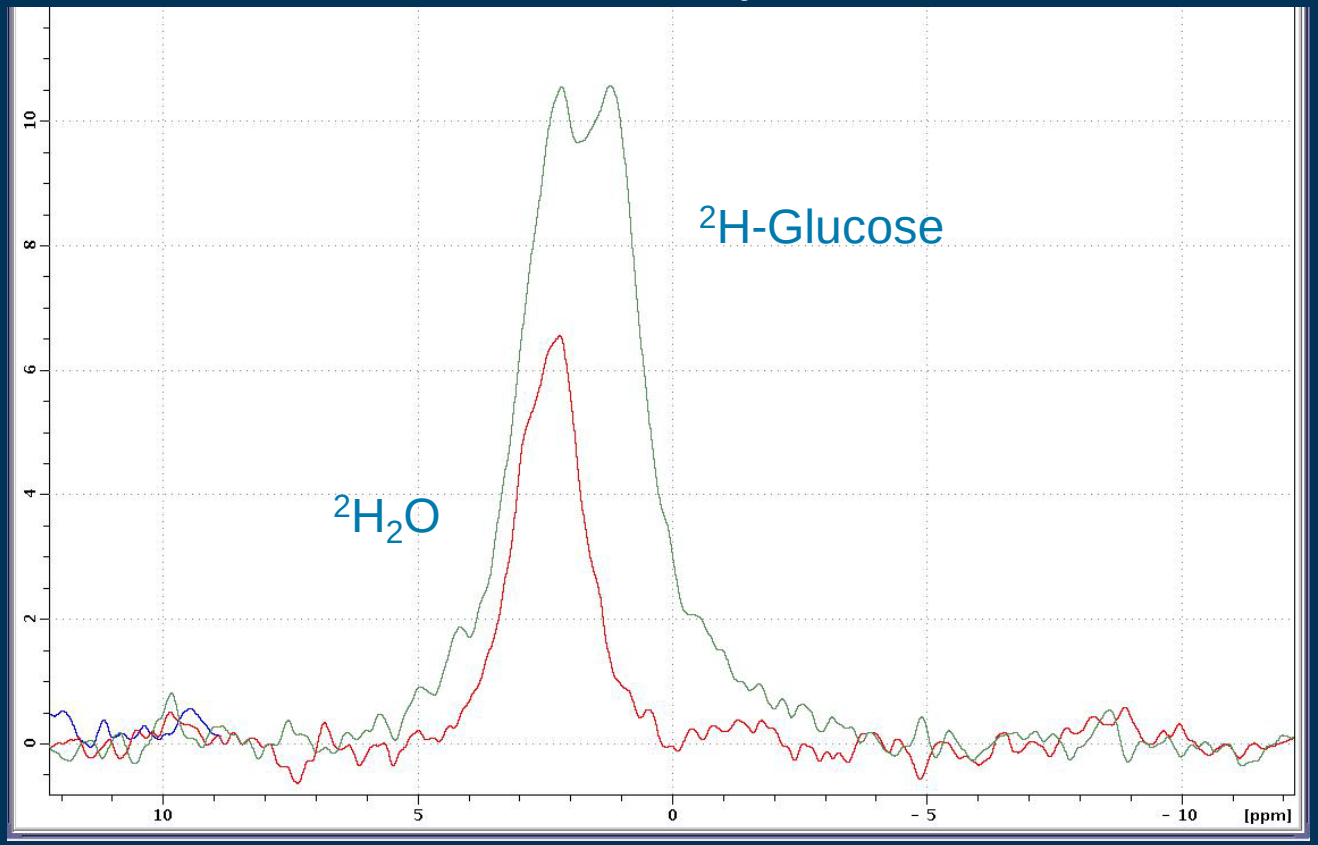
NeuroMetabolism

Glucose Metabolism by ^{2}H MRS



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NeuroMetabolism

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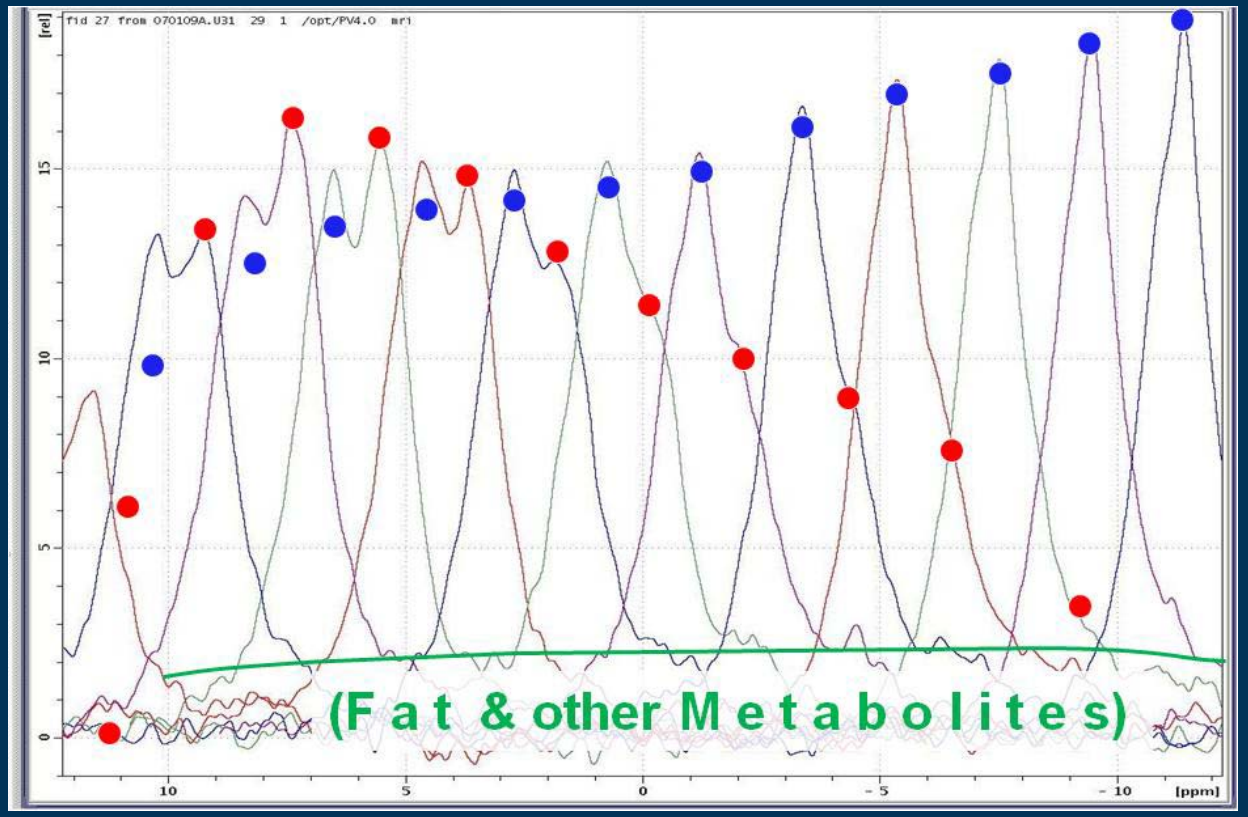

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