

LS19-046 - Tracking Nutrient Metabolism and Cellular Partitioning by Multimodal Molecular Imaging

Abstract

The detailed metabolic fate and partitioning of excess nutrients in the body can be considered as a starting point to many metabolic diseases, but some of the detailed processes are not yet fully understood. This project applied a unique combination of imaging modalities and tracer techniques to investigate especially biochemistry in the liver and sub-cellular partitioning of glucose and lipids in an animal model of metabolic health and disease. Preclinical methods of in vivo positron emission tomography (PET) and magnetic resonance (MR) based deuterium molecular imaging (DMI) were tested and their value to monitor glucose and fatty acid fluxes on the organ-/tissue level was assessed. This organ based approach was complemented with correlative transmission electron microscopy (TEM) and nanometer-scale secondary ion mass spectrometry (NanoSIMS) for visualization of metabolite distribution patterns within single cells. At this point experimental set-up and sample preparation was optimized. We have applied these high-end imaging techniques to study models of metabolic disease (fat vs carbohydrate-rich diet; obesity) and found subtle differences in the organ specific fate of lipids. The project shows the potential of combination of our multimodal imaging-setup with in the combination with metabolic experiments can bring more comprehensive understanding of the physiology and pathophysiology of fuel metabolism and shows great potential for broader application in preclinical and translational research.

Scientific disciplines:

Magnetic resonance imaging [MRI] (40%) | Nuclear medicine (30%) | Analytical chemistry (30%)

Keywords:

positron emission tomography, magnetic resonance, NanoSIMS, deuterium molecular imaging, glucose, fatty acids, metabolism

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Further links to the persons involved and to the project can be found under

<https://www.gmbh.wwtf.at/funding/programmes/ls/LS19-046/>