Cardiovascular MRI has earned its place in the field of clinical cardiac imaging. Regularly used techniques include anatomical imaging, functional imaging, perfusion, and delayed enhancement (DE). Cardiac magnetic resonance spectroscopy (MRS) uses the same hardware, measuring the abundance of metabolites in the myocardium in vivo non-invasively without the use of radiation or external tracers (Bizino et al. Heart. 2013 10.1136/heartjnl-2012-302546). Its main application is currently scientific to gain insight into metabolic changes in cardiac pathologies. The heart is a metabolically active organ using on average 6 kg of adenosine triphosphate (ATP) each day. As energy is crucial for both systole and diastole, derangements in energy metabolism may be the first step in failure of the heart. By using the gyromagnetic properties of 1H, 31P, 13C, and 23Na, MRS is a powerful tool to relate energy metabolism to (dys)function of the heart. The aim of this lecture is to provide an overview of the current use, opportunities and limitations of MRS in relation to common cardiac disease.

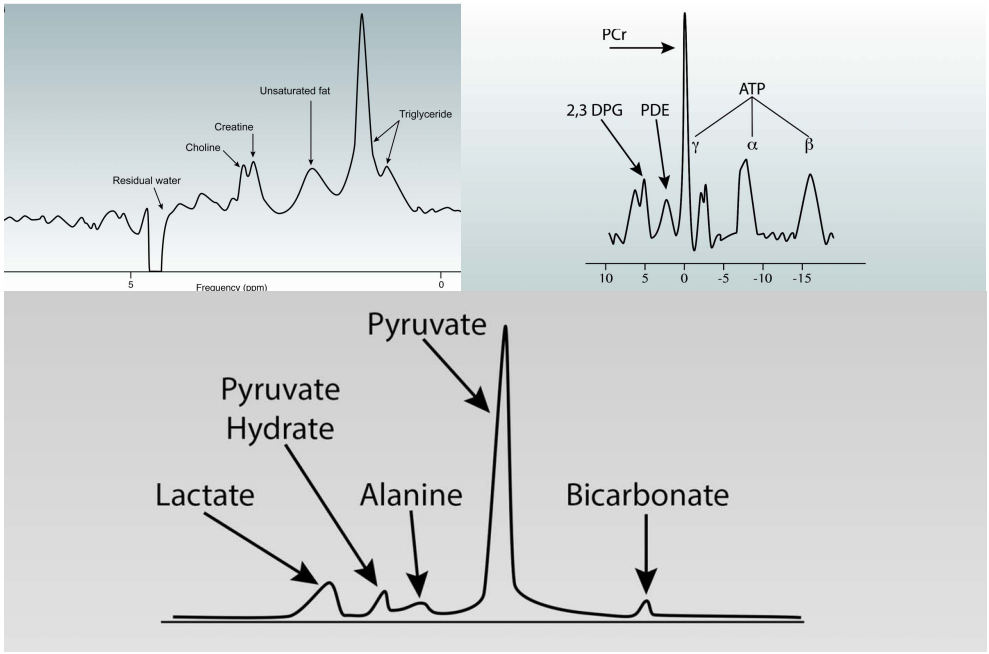

Figure:
Top left panel shows typical 1H-MR spectrum of the human heart. The triglyceride signal can be used to study myocardial lipid metabolism. Top right panel shows a cardiac 31P-MR spectrum, from this data, the PCr/ATP ratio can be quantified to evaluate myocardial high-energy-phosphate metabolism (Bizino et al. Heart. 2013 10.1136/heartjnl-2012-302546). Lower panel shows 13C-MR spectrum of porcine heart, based on hyperpolarized 13C-MRS (Golman K et al. MRM 2008;59:1005–13).