

HelmholtzZentrum münchen

German Research Center for Environmental Health

MRI and MRS in Metabolic diseases

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The Scanner

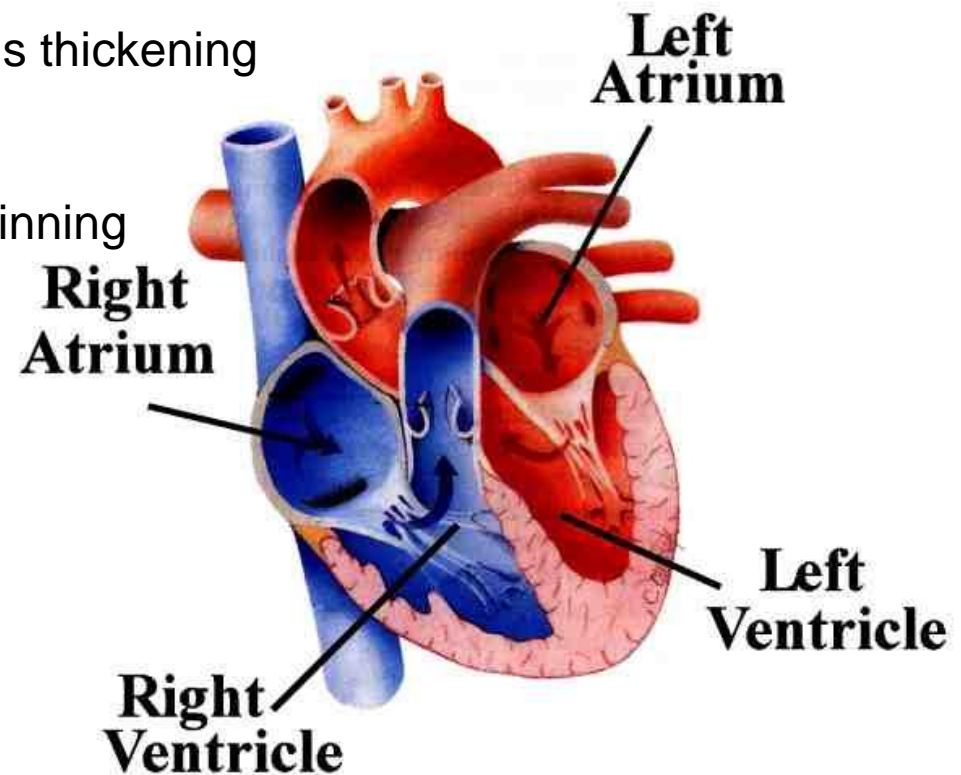
@GMC: **BioSpec 94/20 USR** (9.4 Tesla)



- Superconductor solenoid
 - à Static magnetic field
- Gradients
 - à time-dependent magnetic fields
- Radio frequency coils + amplifiers
 - à high frequency electromagnetic fields
 - à cryprobe

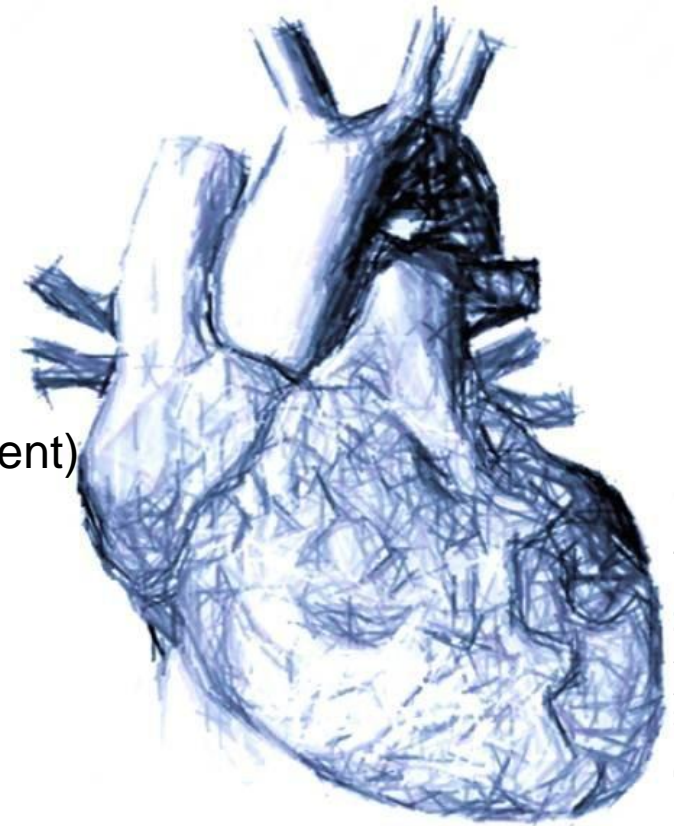
Cardiomyopathies

- Dilated cardiomyopathy: enlarged chambers
- Hypertrophic cardiomyopathy: walls thickening
- Ischemic cardiomyopathy: walls thinning
- Valve defect: regurgitation
- Etc...



Cardiac MRI

- Safety
- Clarity of anatomical visualization
- Inter-observer consistency
- Quantitative accuracy
- Variable tissue contrast (also with contrast agent)
- Standard tool in reference medical centers
- versatile and powerful tool for CV imaging



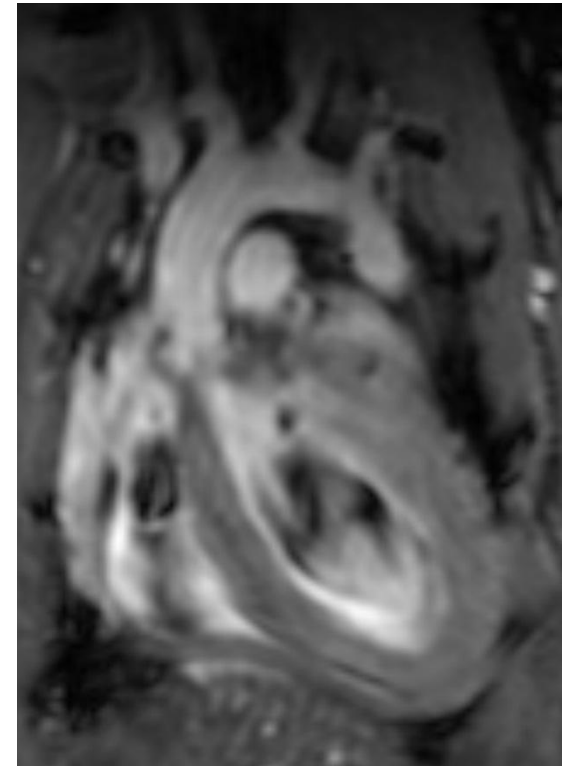
Dr. Kristin Moreth

Cardiac MRI



Cardiac MRI

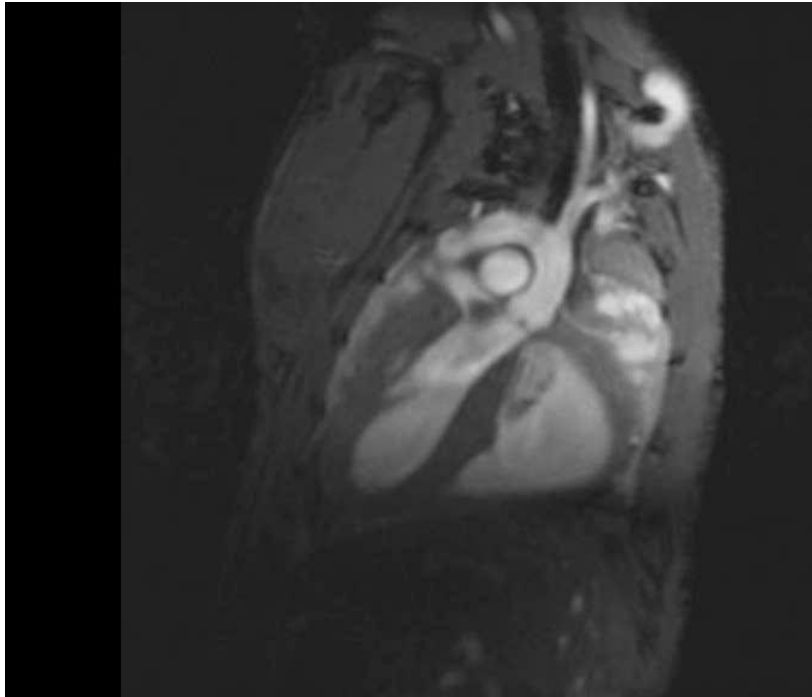
- Dimensions of ventricles (left and right): systole and diastole
- Walls dimensions: systole and diastole
- Visualization of aortic arch
- Calculation of heart performance: EF and FS
- Myocardial contraction
- Atria shape
- Further analysis à special softwares



Cardiac MRI

- Examples

Dilated heart (R)



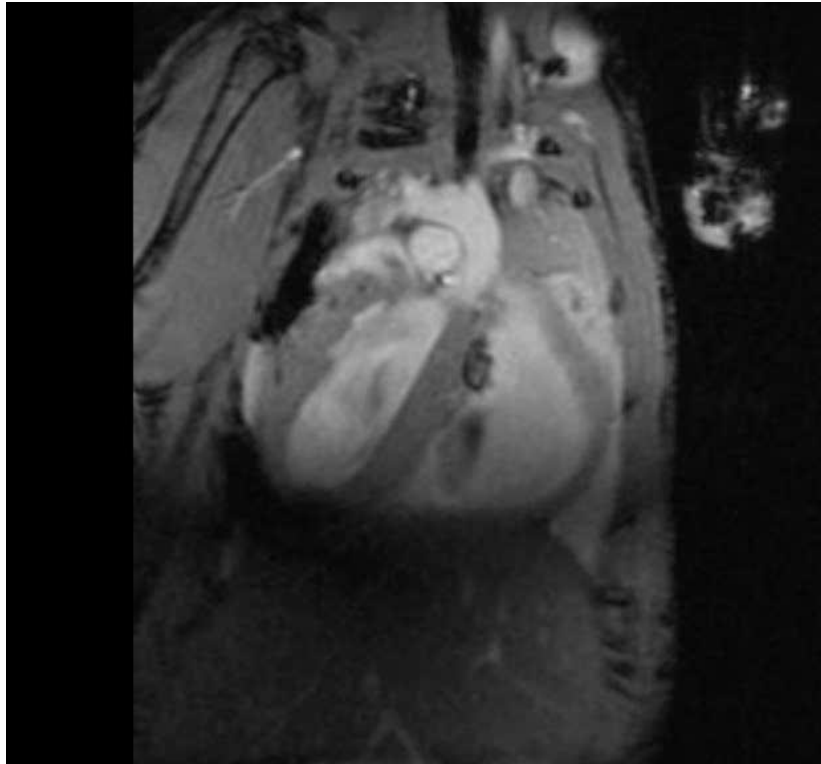
Healthy heart



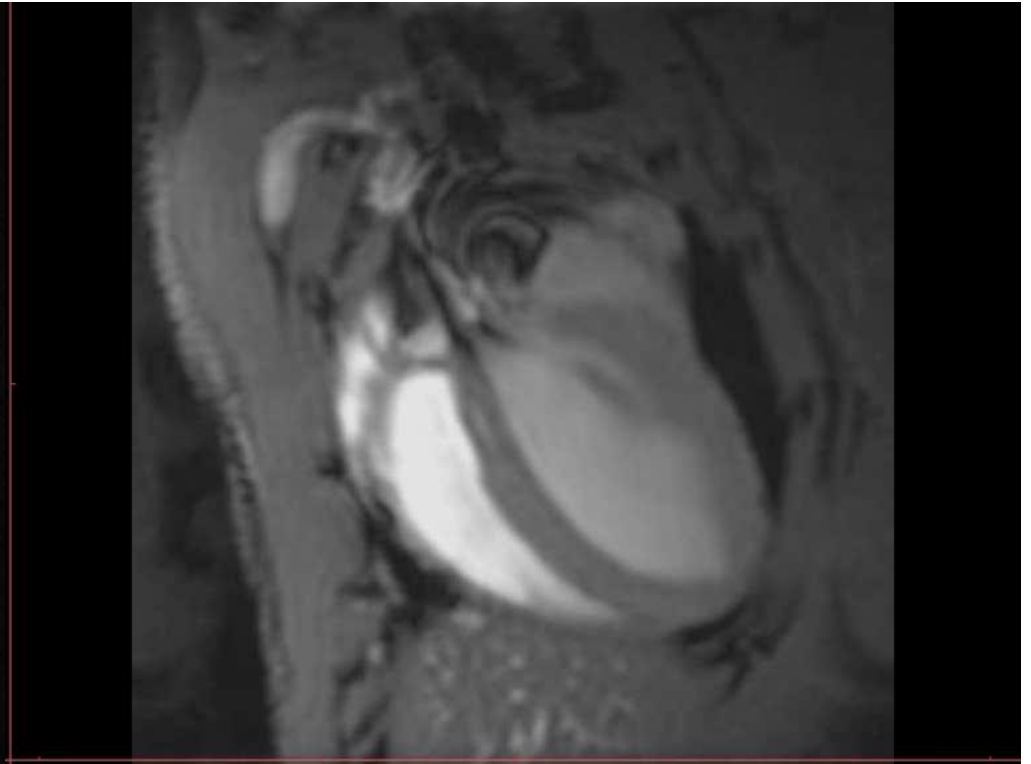
Cardiac MRI

- Examples

Dilated heart (R)



Healthy heart



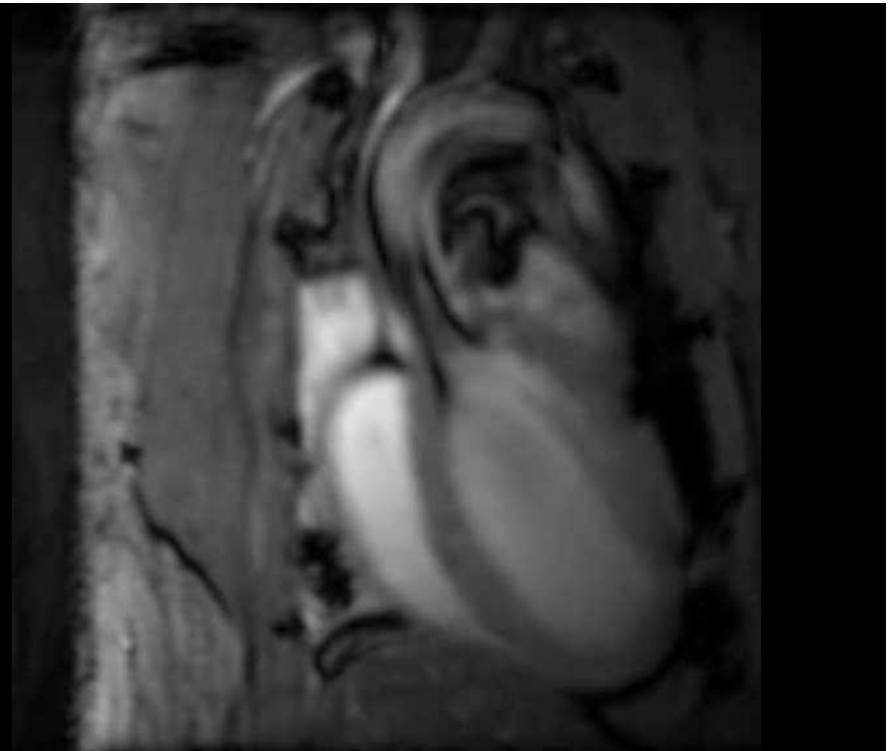
Cardiac MRI

- Examples

Dilated heart (R)



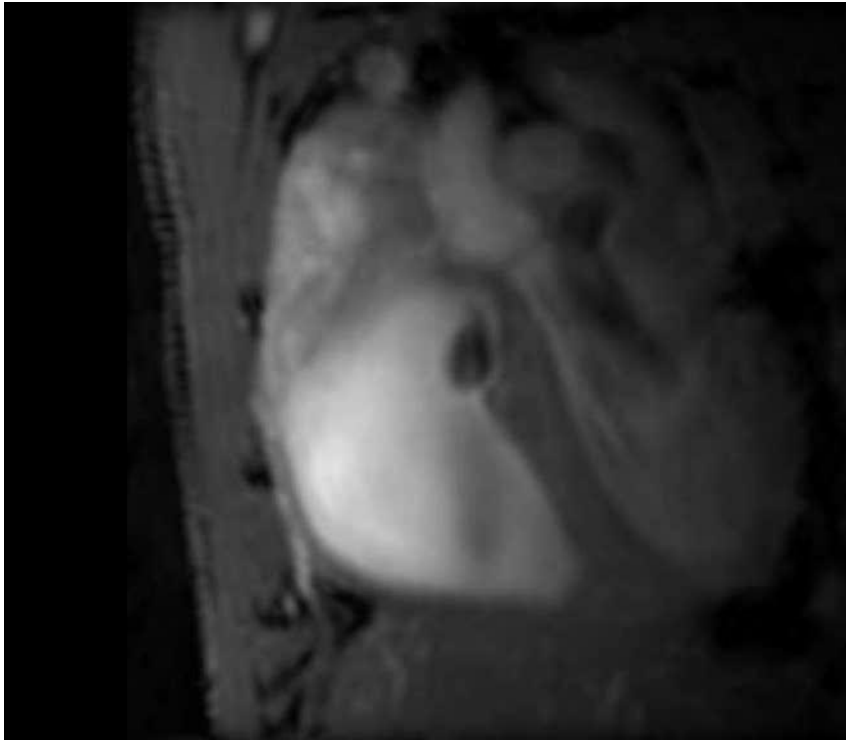
Healthy heart



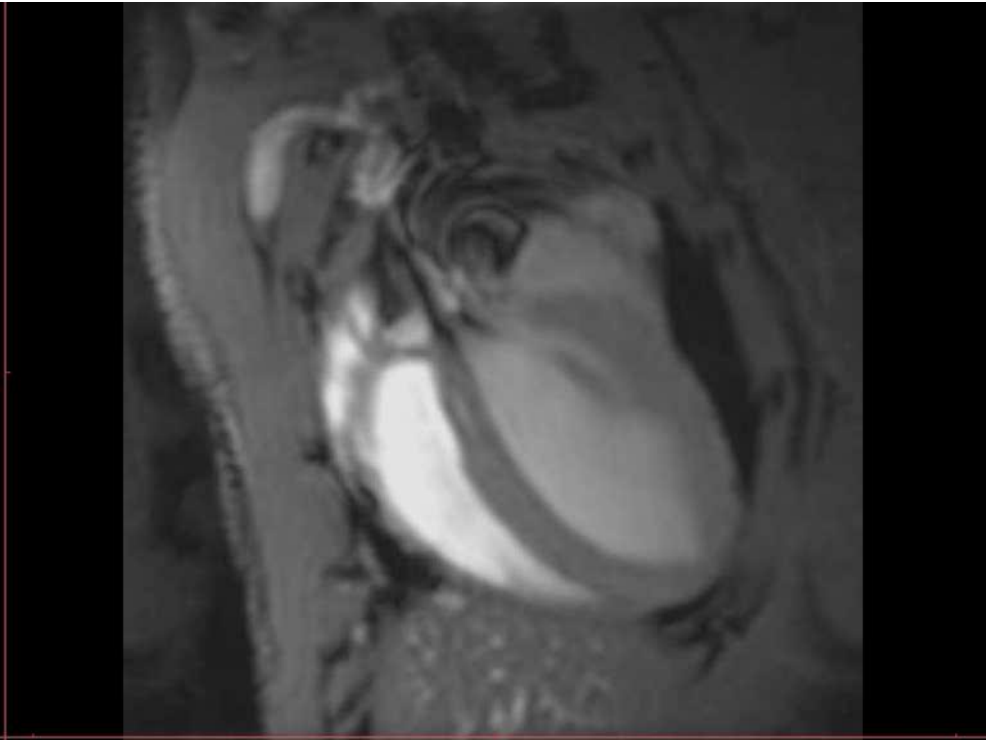
Cardiac MRI

- Examples

Dilated heart (R)

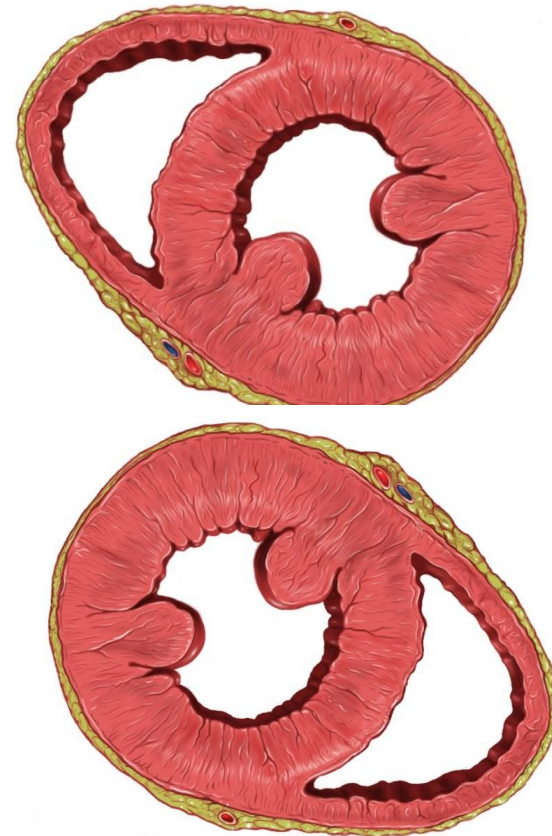
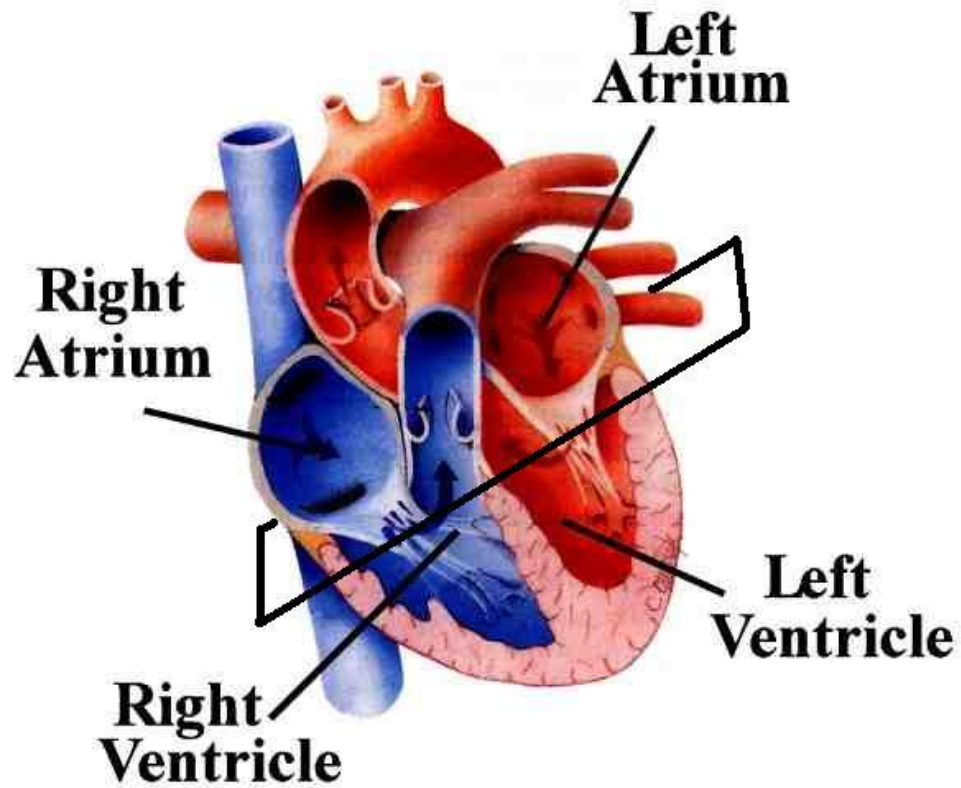


Healthy heart



Cardiac MRI

- Short axis: measuring walls thicknesses, chambers diameters...

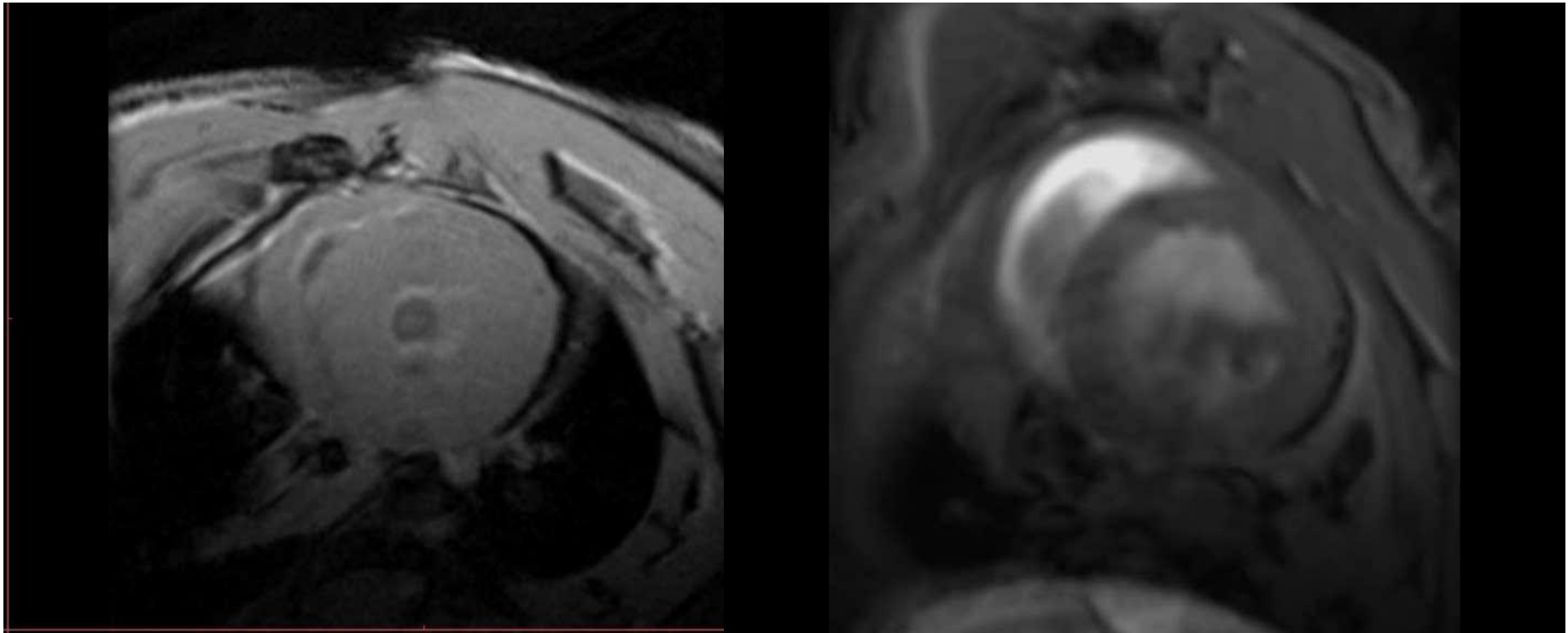


Cardiac MRI

- Examples

Hypertrophic heart (L & R)

Healthy heart

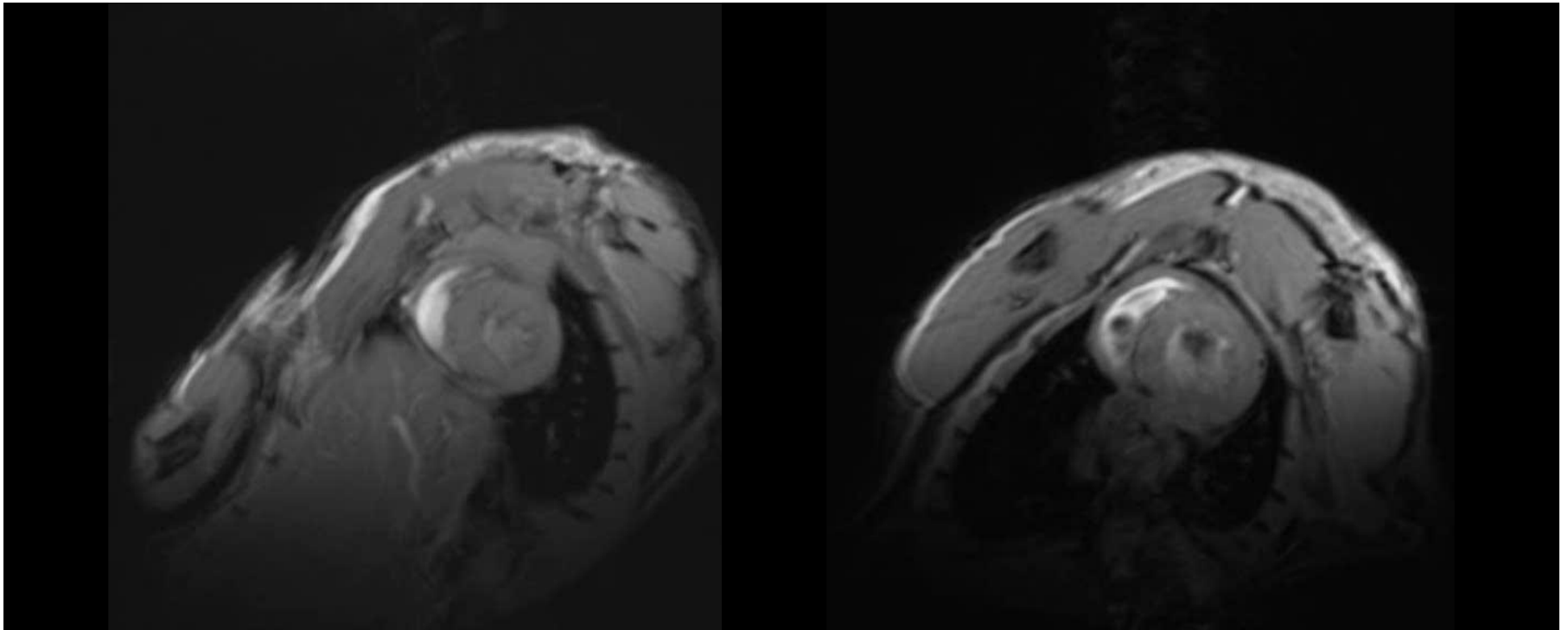


Cardiac MRI

- Examples

Hypertrophic heart (L & R)

Hypertrophic heart (L & R)

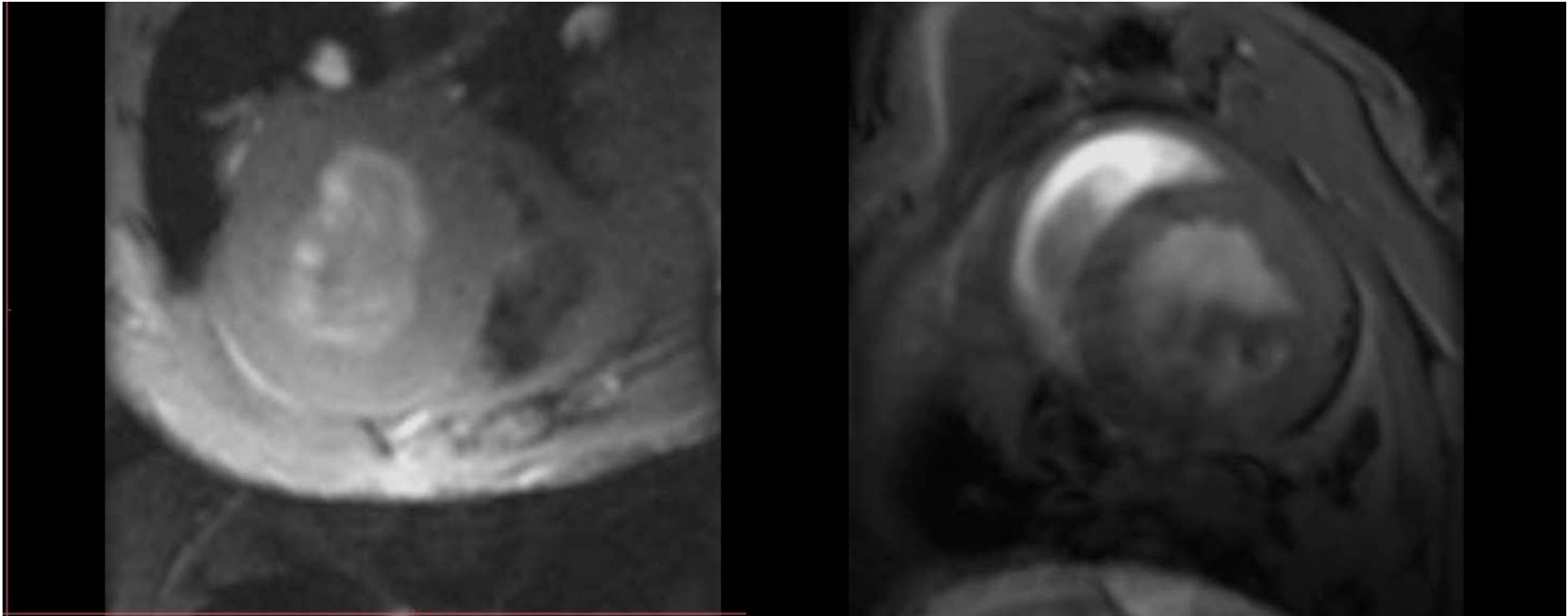


Cardiac MRI

- Examples

Dilated heart (L)

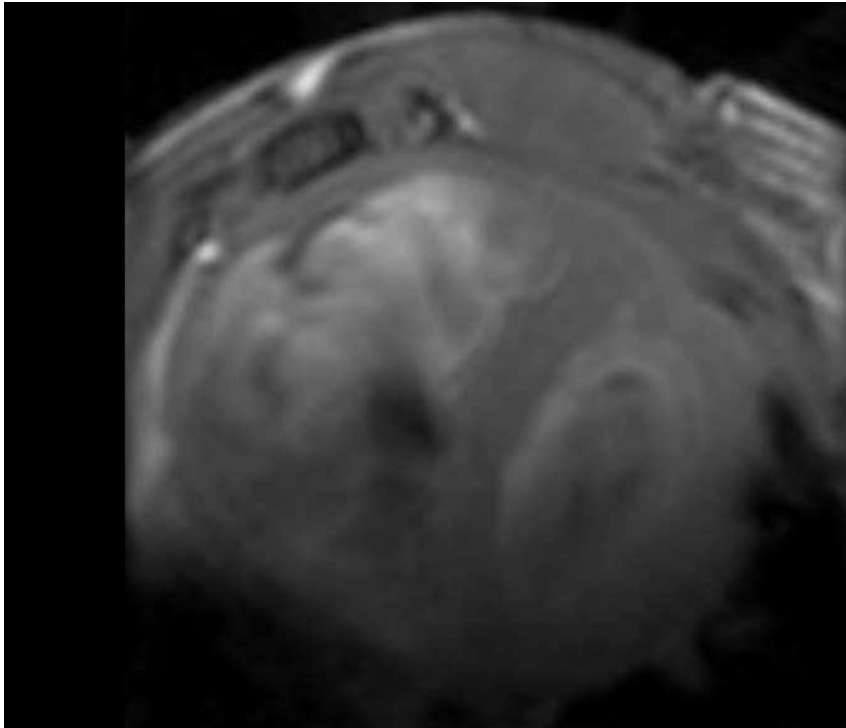
Healthy heart



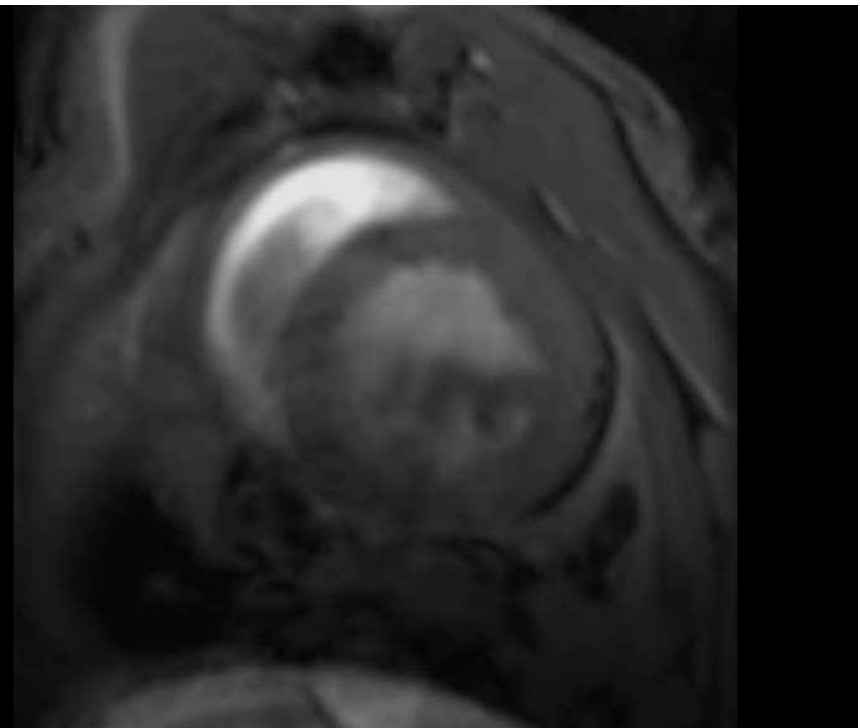
Cardiac MRI

- Examples

Dilated heart (R)



Healthy heart

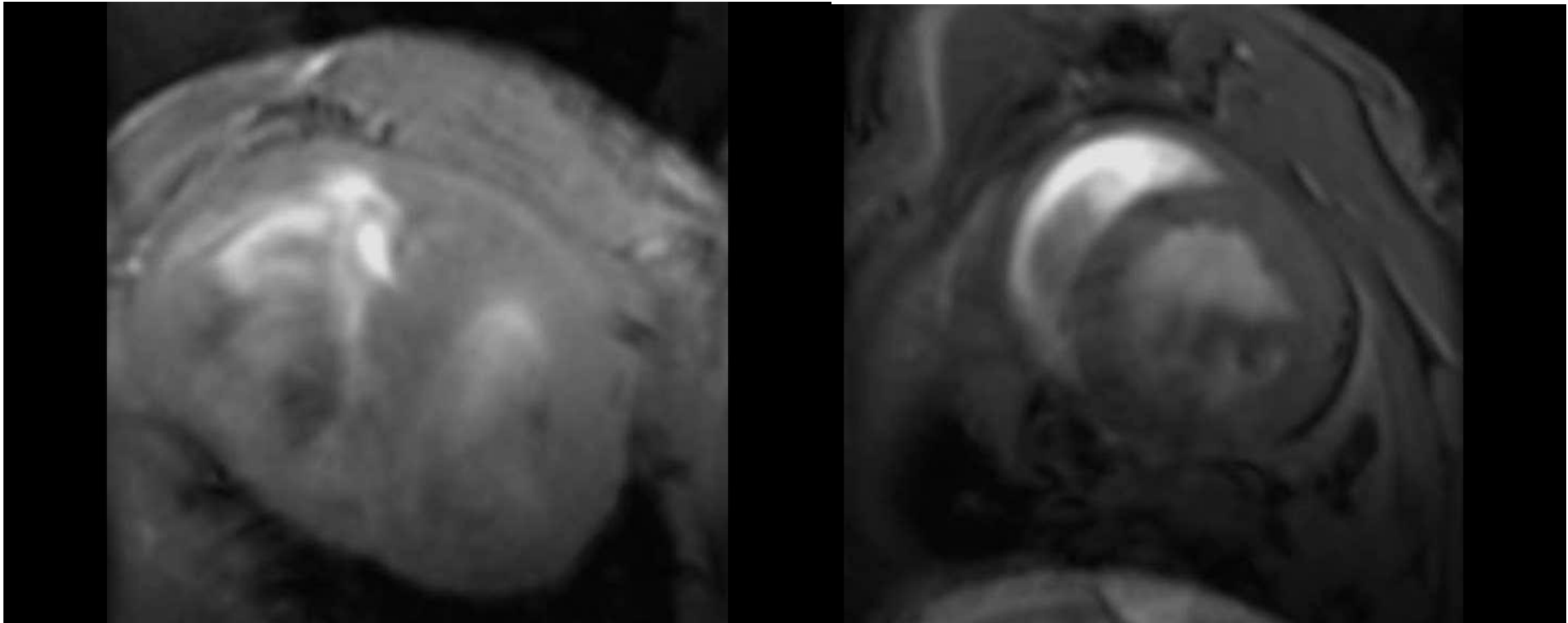


Cardiac MRI

- Examples

Dilated heart (R)

Healthy heart

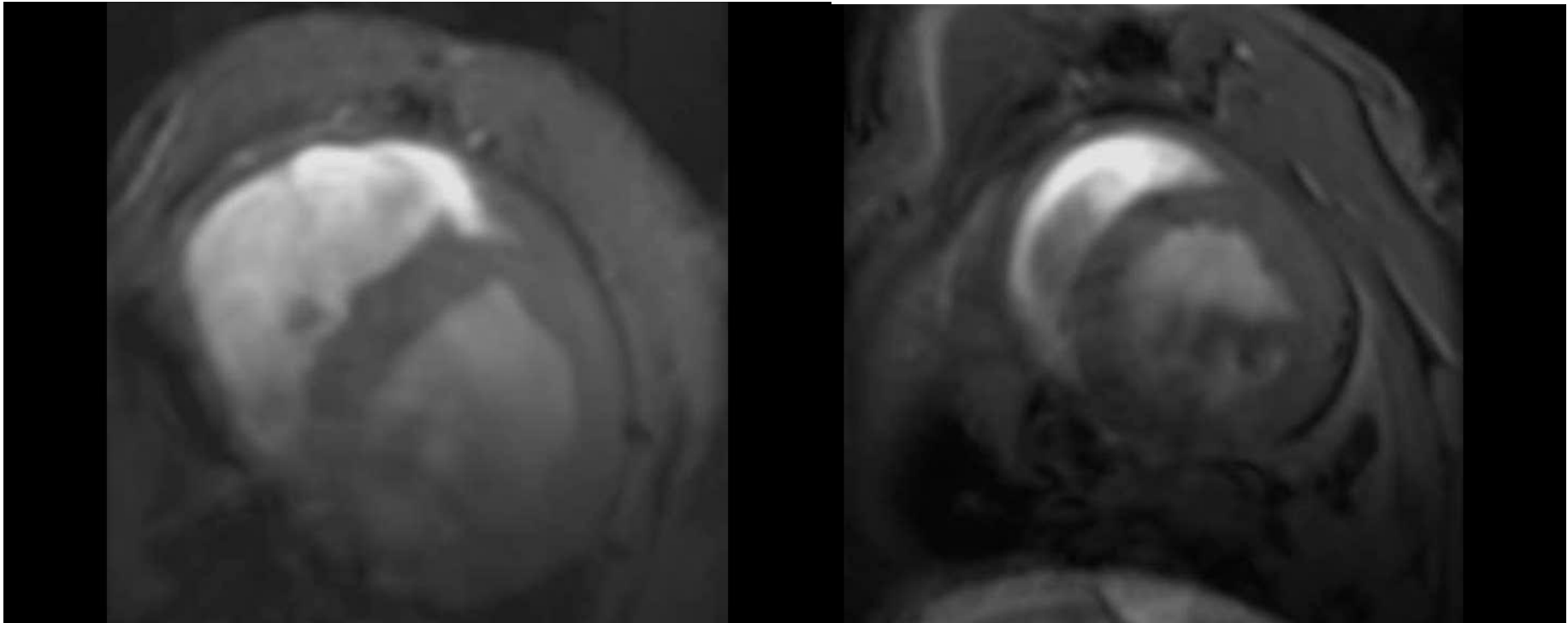


Cardiac MRI

- Examples

Dilated heart (L & R)

Healthy heart

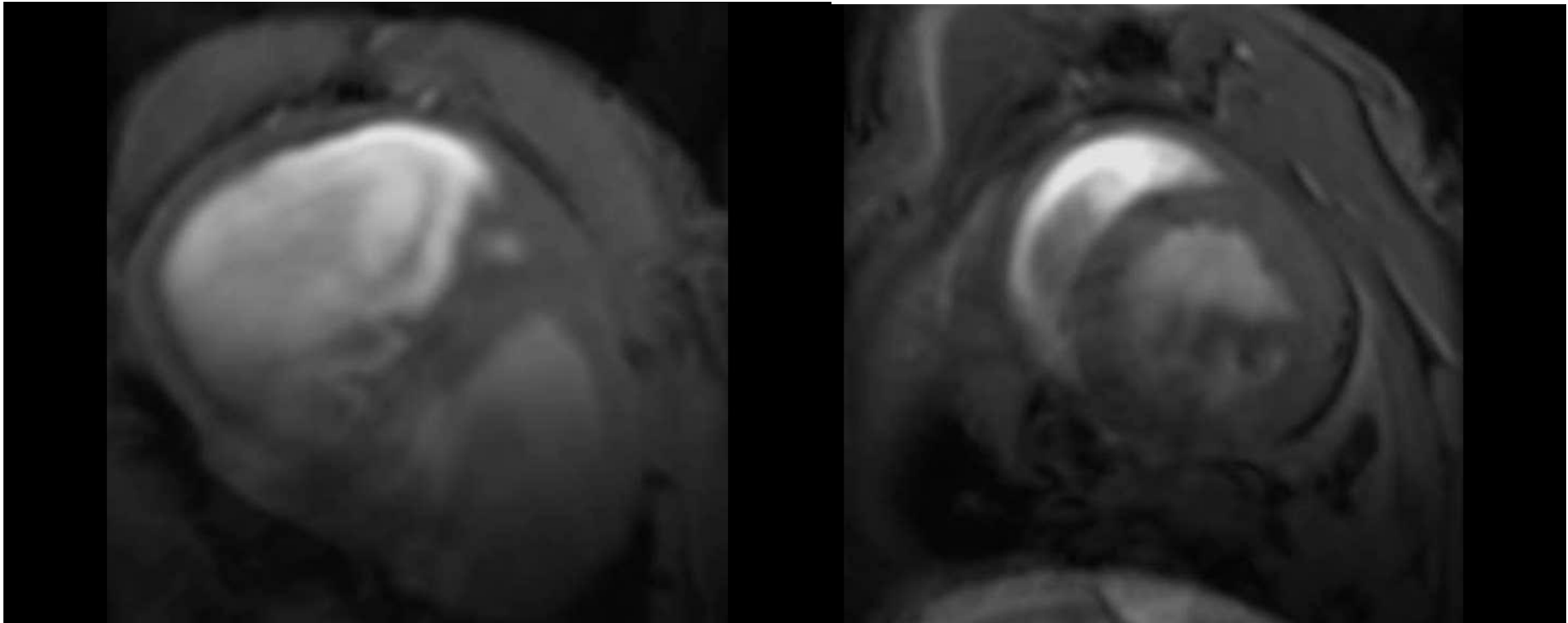


Cardiac MRI

- Examples

Dilated heart (R)

Healthy heart



Cardiac MRI

... and much more...

Hepatic diseases: Liver MRI and MRS

Liver MR Imaging and Spectroscopy for obesity/diabetes research

- Ingestion of high amounts of fat

à obesity

à fatty liver

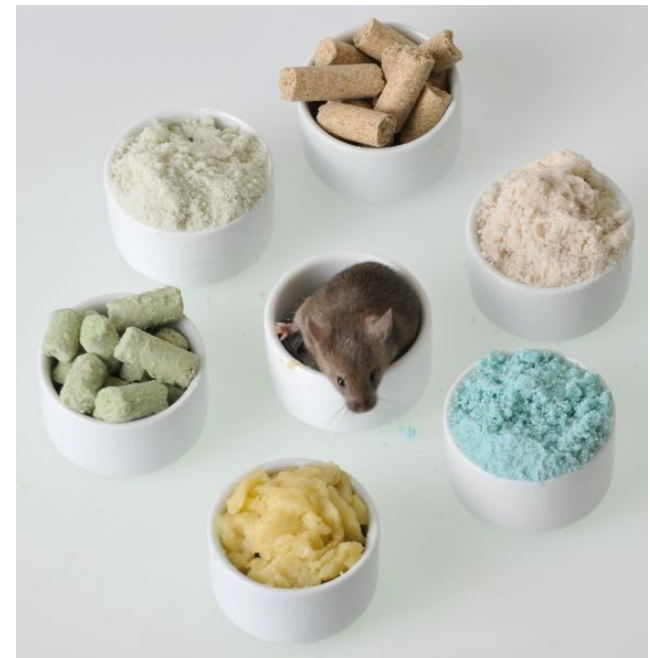
à diabetes

Fat content	Steatosis
< 5 %	none
5 - 33 %	NAFLD
33 - 66 %	NASH
> 66 %	Fibrosis, cirrhosis, etc

Hepatic diseases: Liver MRI and MRS

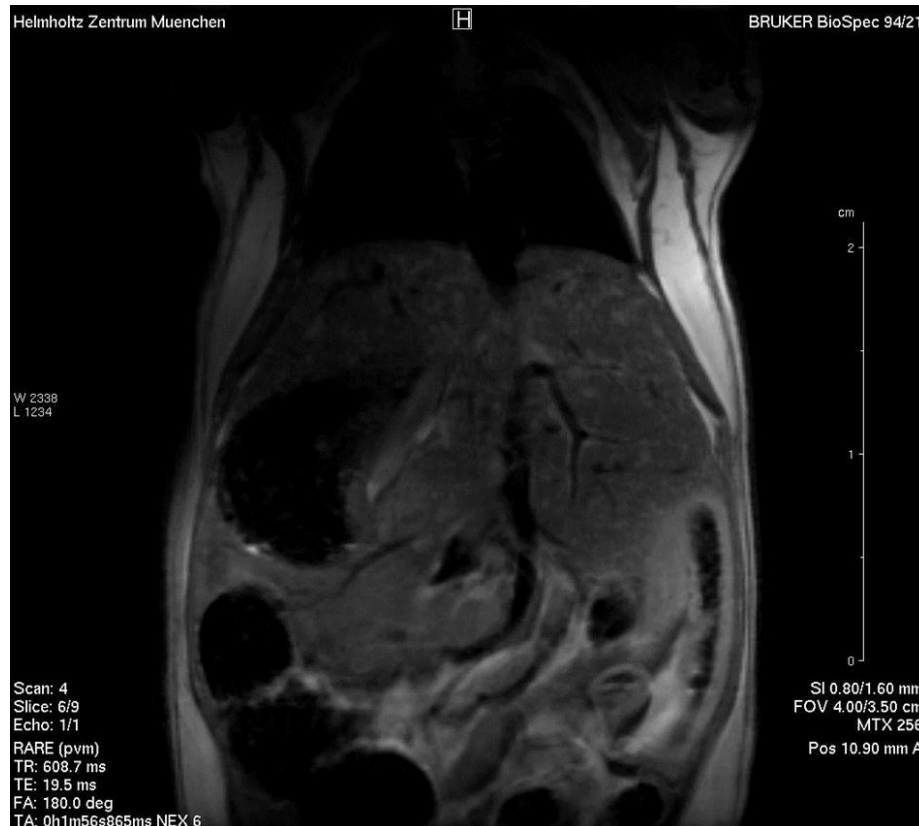
Liver MR Imaging and Spectroscopy for obesity/diabetes research

- Preliminary studies: mice on high fat diets
 - Saturated fatty acids
 - Unsaturated fatty acids
- MRI/S on different time points:
 - 0
 - 3 weeks
 - 6 weeks
 - 12 weeks

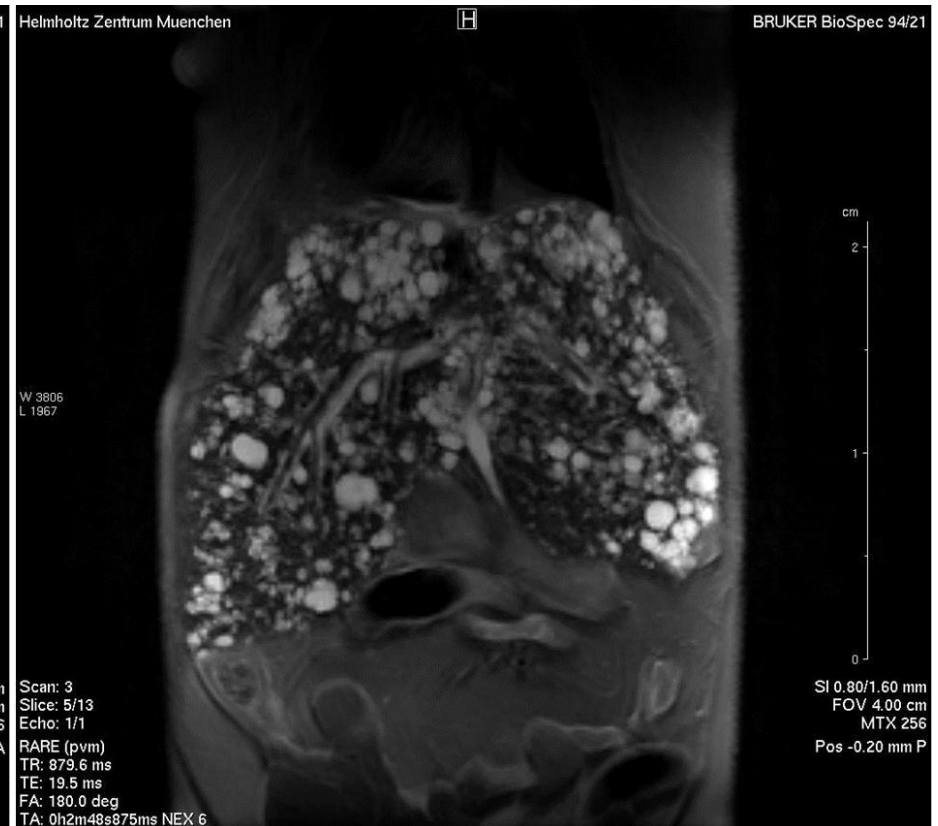


Hepatic diseases: Liver MRI and MRS

- MR Imaging

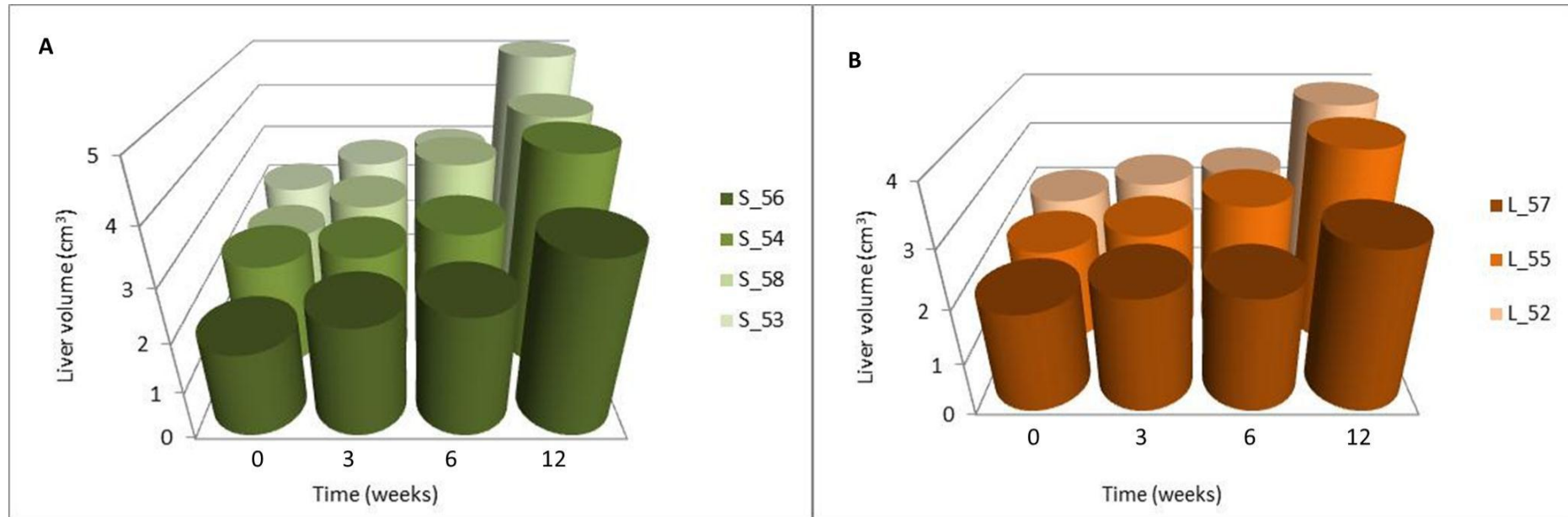


Week 0



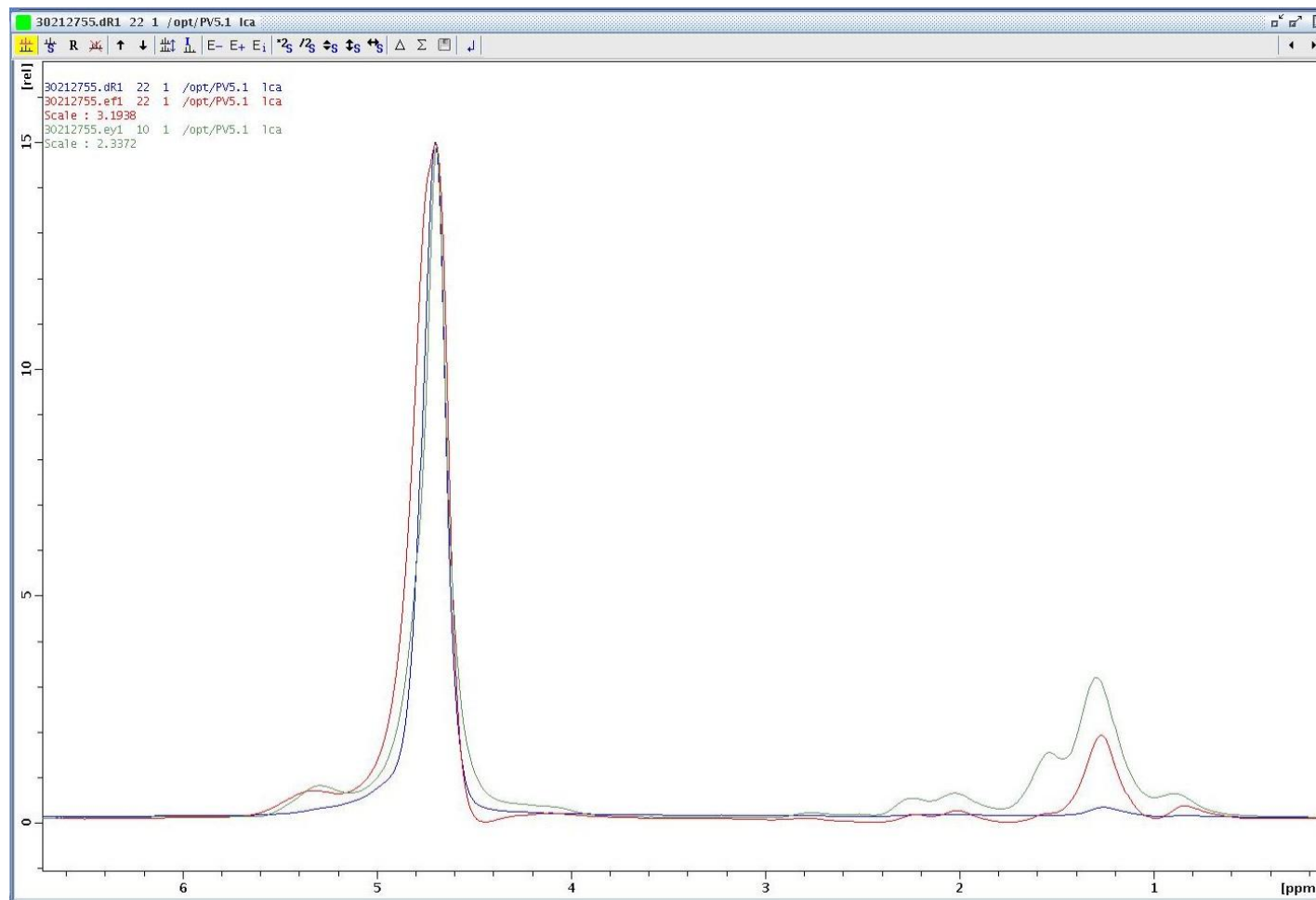
Week 12

Hepatic diseases: Liver MRI and MRS

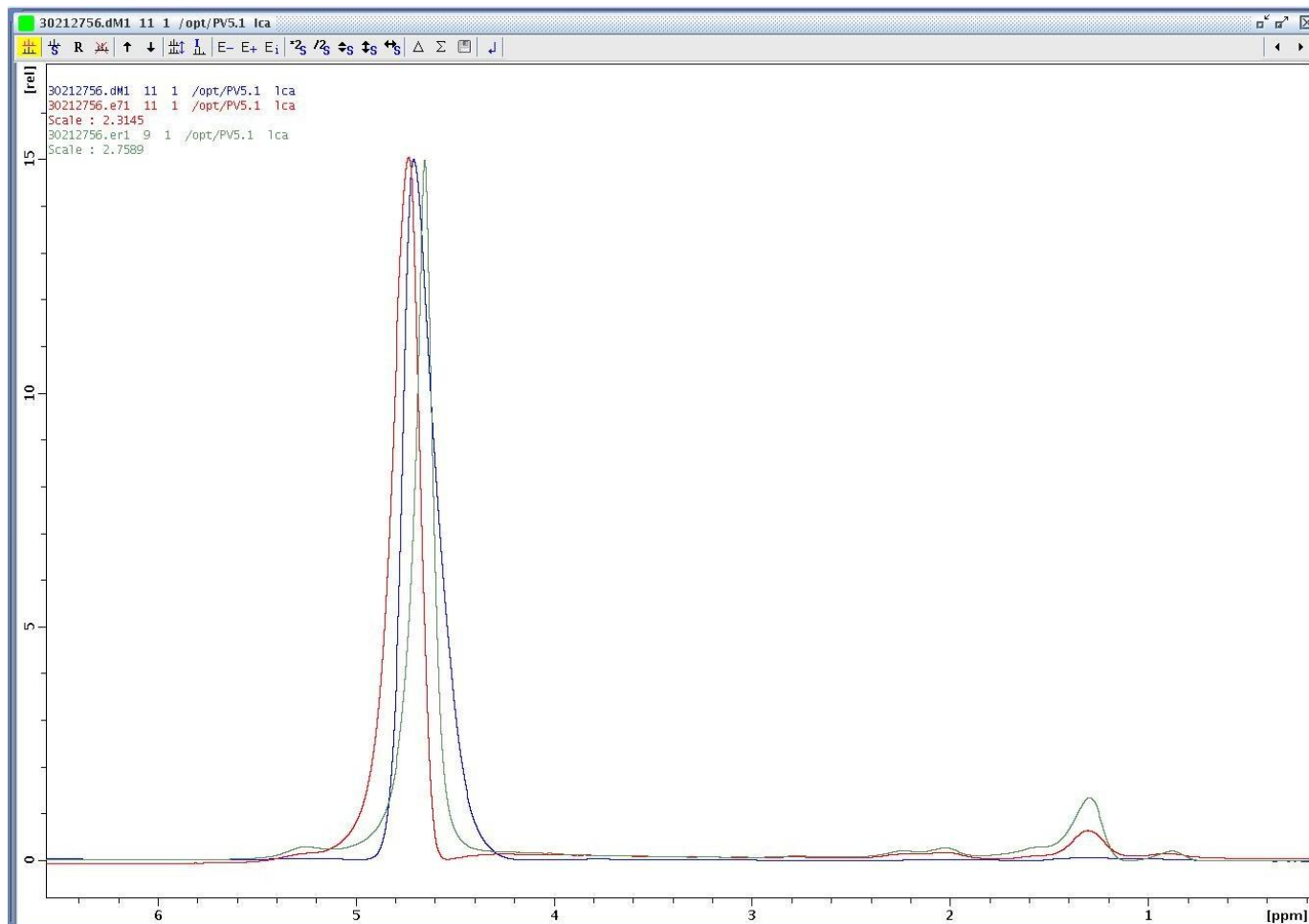


Hepatic diseases: Liver MRI and MRS

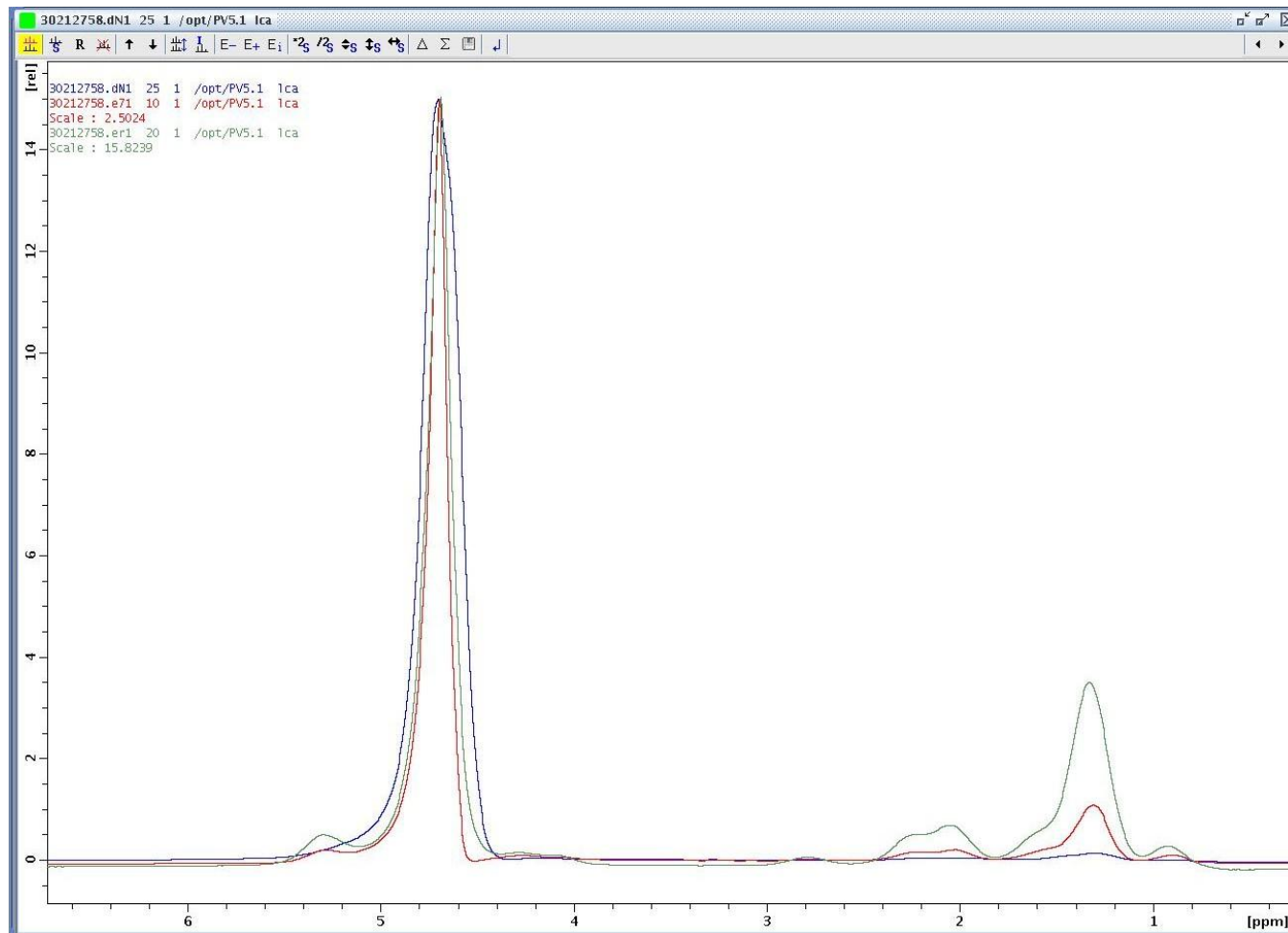
- MR Spectroscopy (^1H)



Hepatic diseases: Liver MRI and MRS

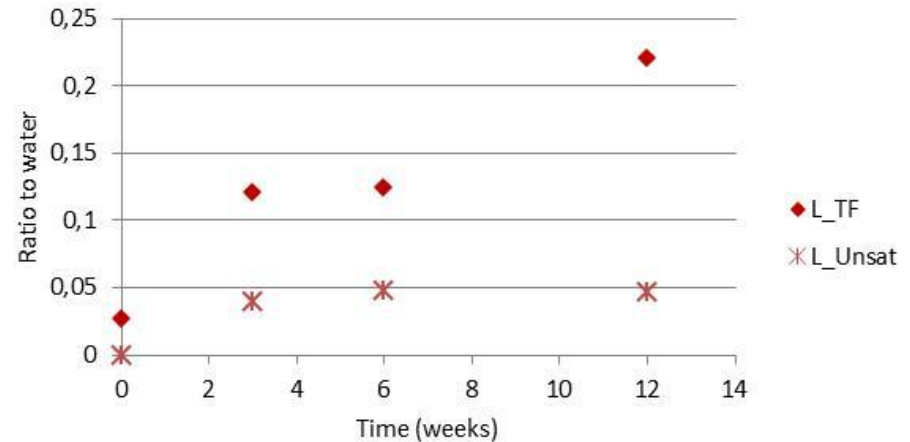
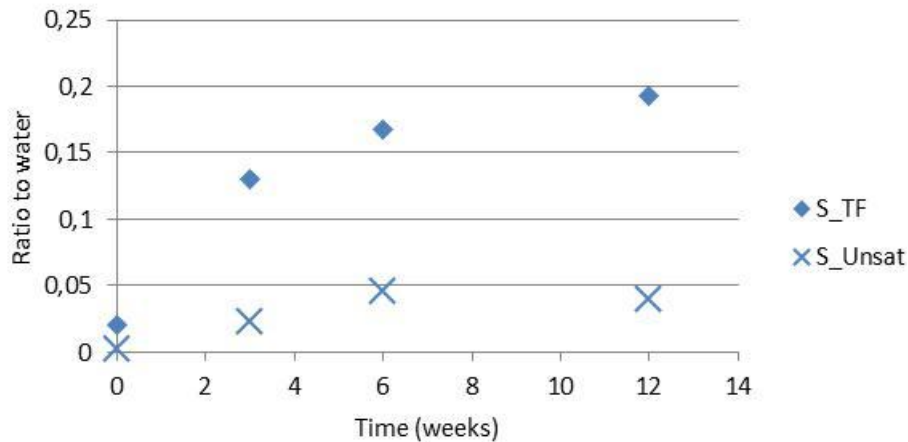


Hepatic diseases: Liver MRI and MRS



Hepatic diseases: Liver MRI and MRS

- Fat to water ratios



TF: Total fat

Unsat: Unsaturated fat (poly and mono)

Thanks for the attention!

Questions?