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PHAR 518: MRI in Drug Development

Learning goals:

1. Describe how T1 contrast arises and how contrast agents modify it.
2. Describe the ingredients of a dynamic contrast enhanced MRI acquisition protocol.
3. Describe how diffusion MRI detects the motion of water molecules.
4. Name further MRI techniques, and discuss how they quantify a physiologically relevant tissue parameter.

Resources for MRI physics:

good starting point with many references: http://www.imaios.com/en/e-Courses/e-MRI/

nice, slightly old-fashioned introduction: http://www.cis.rit.edu/htbooks/mri/

profound educational effort by Lars Hanson (http://www.drcmr.dk/MR) with a very useful simulator: http://www.drcmr.dk/BlochSimulator/

How will you use MRI in your future?

Assuming you are looking to aid drug discovery, what can MRI tell you ?

Where the drug goes? Where it doesn't?

Whether the drug is working? Whether the drug is toxic?

Whether it will work for some population? How it works?

MRI techniques:

T1-weighted imaging: how does it occur?, how do contrast agents work?

(dynamic) contrast enhanced MRI: looking at the time course of enhancement

diffusion weighted MRI: microscopic motion of water molecules

diffusion tensor imaging: capturing the anisotropy of water diffusion

MR spectroscopy: spatially resolved metabolite concentrations

MR angiography, functional (BOLD) MRI, aka fMRI,

MRI Safety – What are the risks of MRI?

Strong magnetic fields can violently move ferro-magnetic objects

cryogens can suffocate when evaporated in large amounts

RF fields cause heating of tissue

fast switching gradient field could induce currents in nerve cells ('peripheral nerve stimulation')