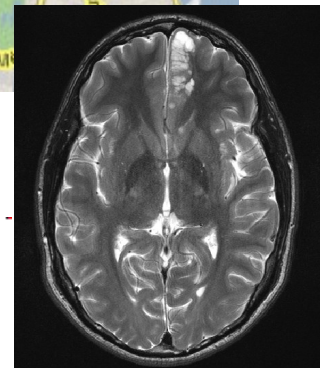
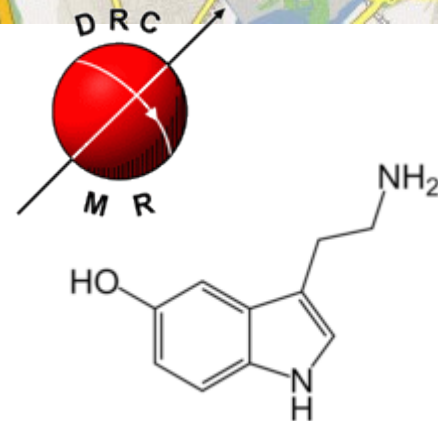
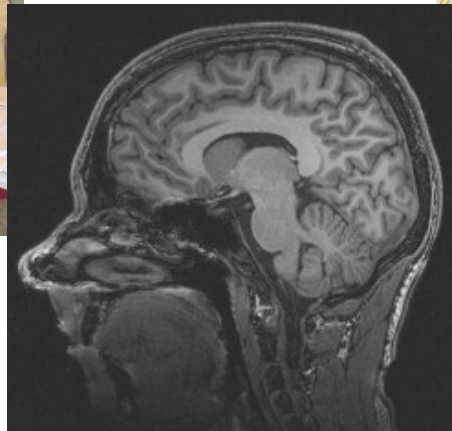
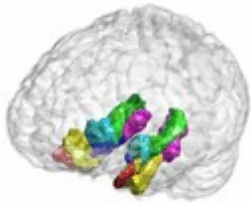


Projects at the Danish Research Centre for Magnetic Resonance

Five projects involving MRI presented by Bettina Hornbøll (biologist) and Lars G. Hanson (physicist)



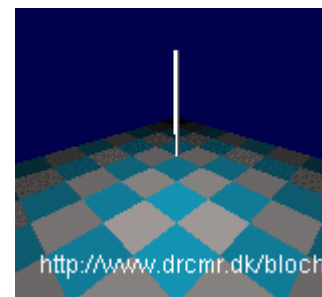
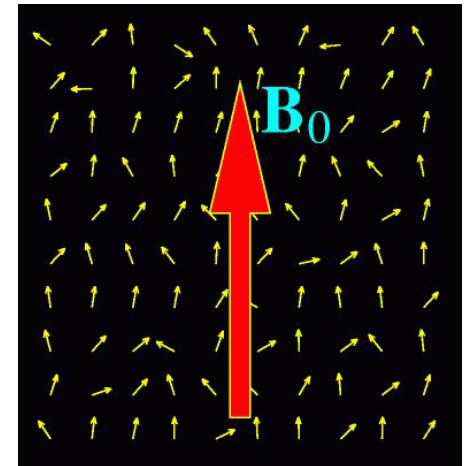
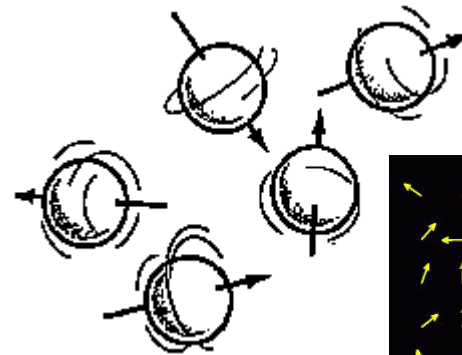
Cimbi
Center for integrated
molecular brain imaging



Magnetic Resonance Imaging, MRI

Magnetic Resonance Imaging

- Nuclei in body are aligned so the patient becomes magnetic.
- Radiowaves are used to make "magnetic needle" swing.
- Radiowave signal from oscillating dipole is detected.



MR-basics, measurement and analysis projects

The following 5 projects are described in detail at

http://www.medicin-ing.dk/info_site/?projekter/2009/projekter.html

- BSc/MSc-project: Using MR-scanning to image macromolecules in the brain.
 - Supervisors: Lars G. Hanson, Lise Vejby Søgaard, Xingchen Wu, Ellen Garde
- BSc/MSc-project: Measurement of the magnetization of Carbon13 used for MRI
 - Supervisors: Lars G. Hanson, Lise Vejby Søgaard, Peter Magnusson.

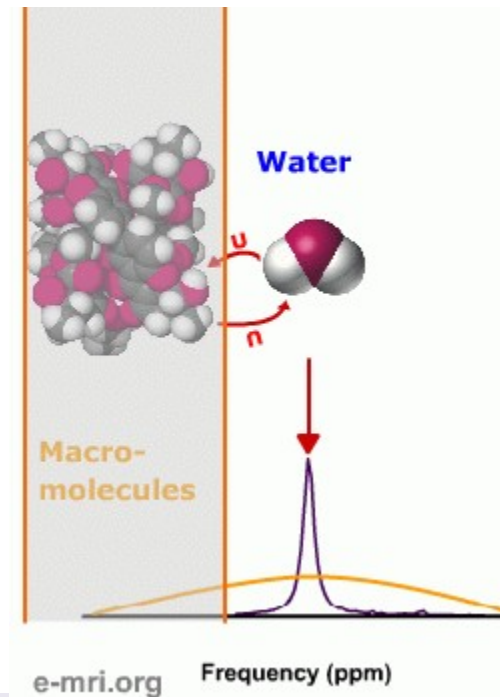
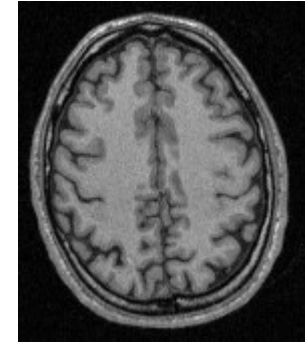
Brain mapping and structural analysis

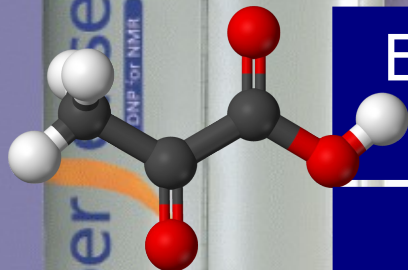
- BSc/MSc-project: Investigating acute changes in brain structure in response to experimentally induced changes in serotonergic function
 - Supervisors: Hartwig Siebner, Arnold Skimminge, Julian Macoveanu, William Baaré
- MSc-project: How do acute changes in the central serotonergic system modify the functional cross-talk within functional brain networks?
 - Supervisors: Julian Macoveanu, Hartwig Siebner, Olaf Paulson, Bettina Hornbøll
- MSc/BSc-project: Changes in brain function in healthy individuals who are at risk for depression
 - Supervisors: Julian Macoveanu, Hartwig Siebner, Lars Kessing, Bettina Hornbøll

Interdisciplinarity: Supervisors are MDs, psychologist, biologist, engineers and physicists.

Project: Indirect MR imaging of macromolecules

- Only small mobile molecules give MR signal, most notably water.
- Macromolecules can be indirectly imaged due to chemical exchange of hydrogen.
- Important in research and drug development for **Multiple Sclerosis**.
- Relies on analysis of images acquired with and without saturation of bound protons using radiowaves: **Magnetization Transfer Imaging**
- Project: Implementation of MTI at the DRCMR. Acquisition and analysis of pilotdata.
- Project name: **Using MR-scanning to image macromolecules in the brain.**

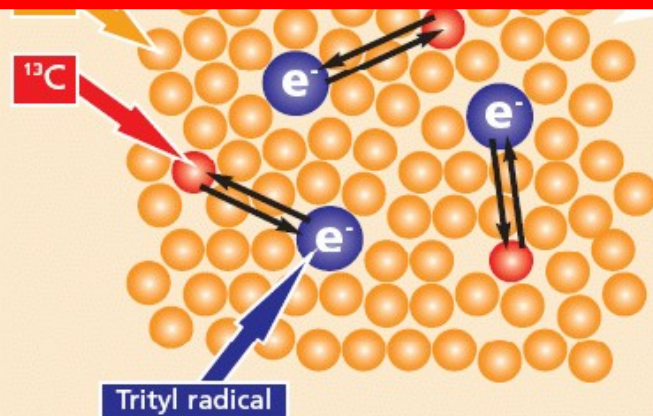
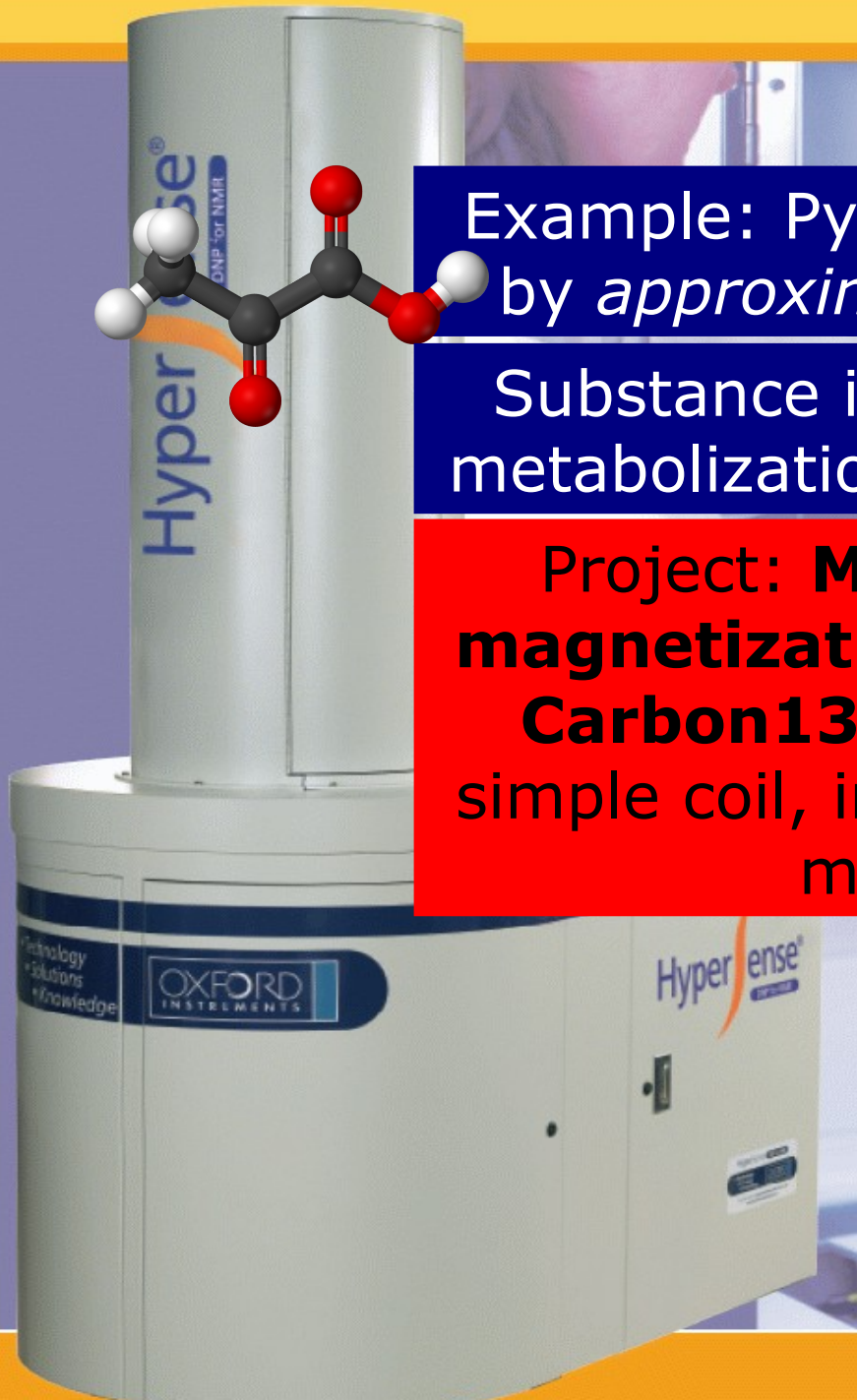




Example: Pyruvate signal enhanced by *approximately* a factor 10000!

Substance is heated, injected and metabolization is imaged in scanner.

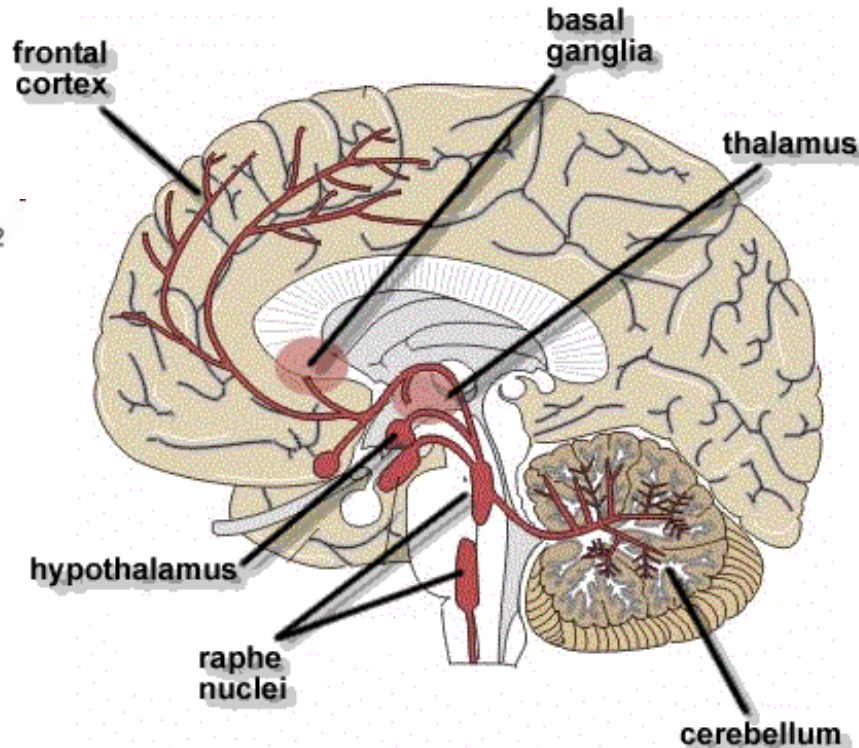
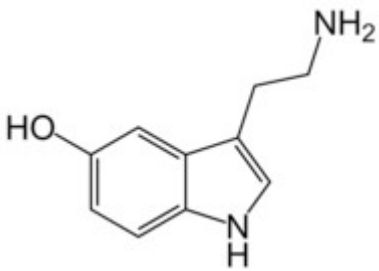
Project: **Measurement of the magnetization of hyperpolarized Carbon13 used for MRI.** Build simple coil, interface it and program measurement.



Serotonin (5-Hydroxytryptamin)

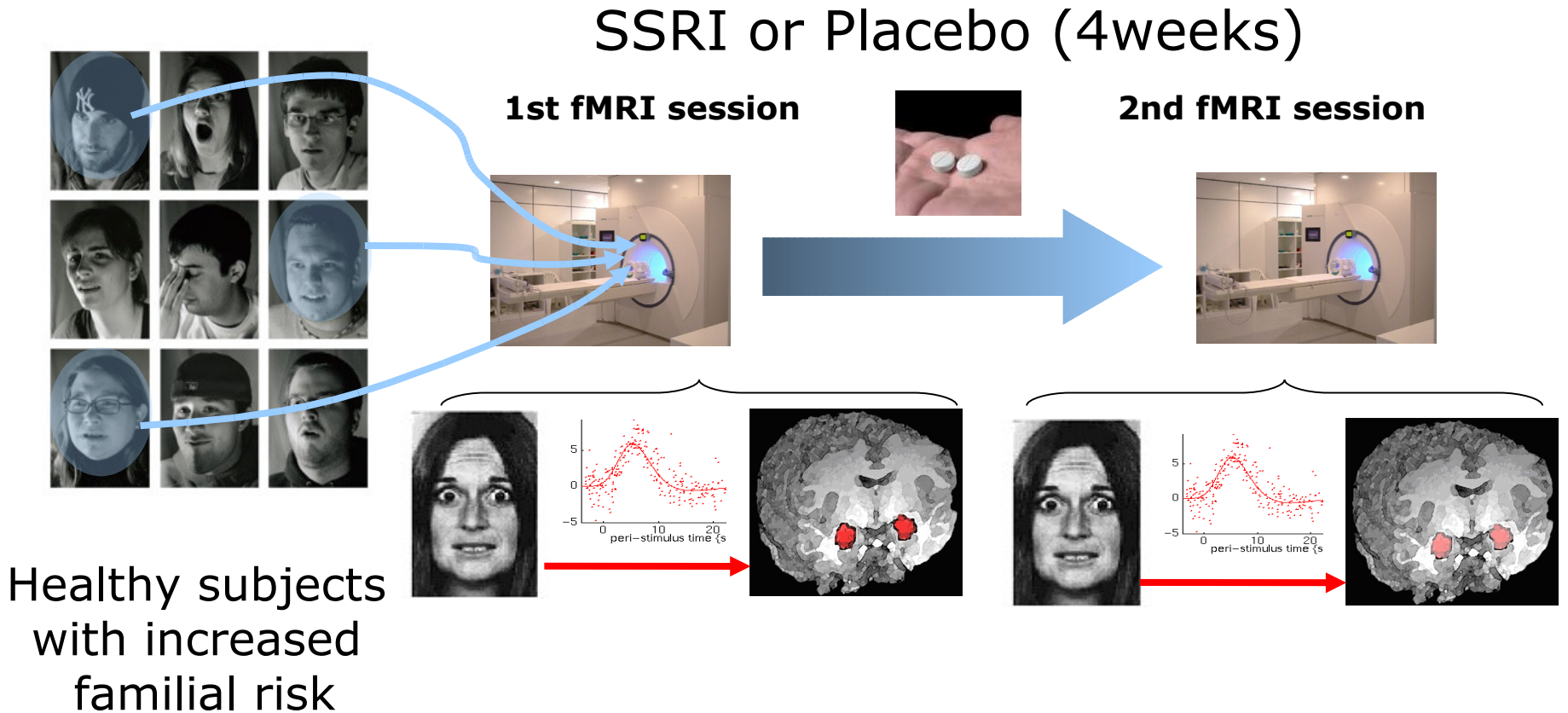
– a key player in regulating emotions

The serotonergic system consists of ascending axons from cell bodies in the raphe nuclei



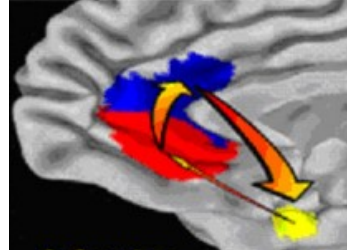
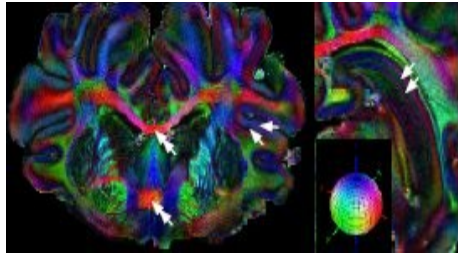
5HT plays an important role as a neurotransmitter in the modulation of anger, aggression, mood, sleep, sexuality, appetite, body temperature ...

Altered brain activity in individuals at risk for depression: Serotonin re-uptake inhibitor normalizes latent dysfunction



Julian Macoveanu, PhD. MSc (julianm @ drcmr.dk); Tel 3195 3196
Prof. Hartwig Siebner, MD (hartwig.siebner @ drcmr.dk); Bettina Hornbøll, MSc (bettinah @ drcmr.dk)
Prof. Lars Kessing (MD, DMSc, Department of Psychiatry, Rigshospitalet)

How do acute changes in the serotonergic system modify the functional cross-talk within functional brain networks?



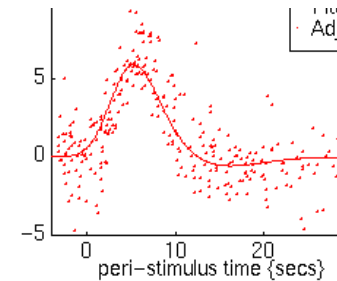
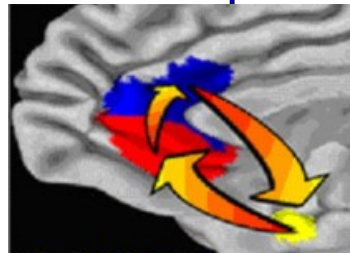
Reduced serotonergic tone

- Acute Tryptophan Depletion
- Blockade of 5-HT_{2A} (Ketanserin)



Increased serotonergic tone

- Selective Serotonin Re-uptake Inhibitor (SSRI)



Angry

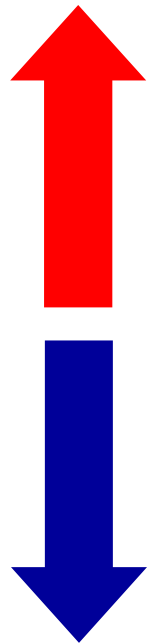
Julian Macoveanu, PhD, MSc, julianm @ drcmr.dk; Tel 3195 3196

Prof. Hartwig Siebner, MD (hartwig.siebner @ drcmr.dk); Bettina Hornbøll, MSc (bettinah @ drcmr.dk)

Prof. Gitte Moos Knudsen, MD, PhD (CIMBI, NRU, Rigshospitalet)

Morphometric changes in brain structure triggered by experimentally induced changes in serotonergic function

Voxel-based morphometry (VBM)

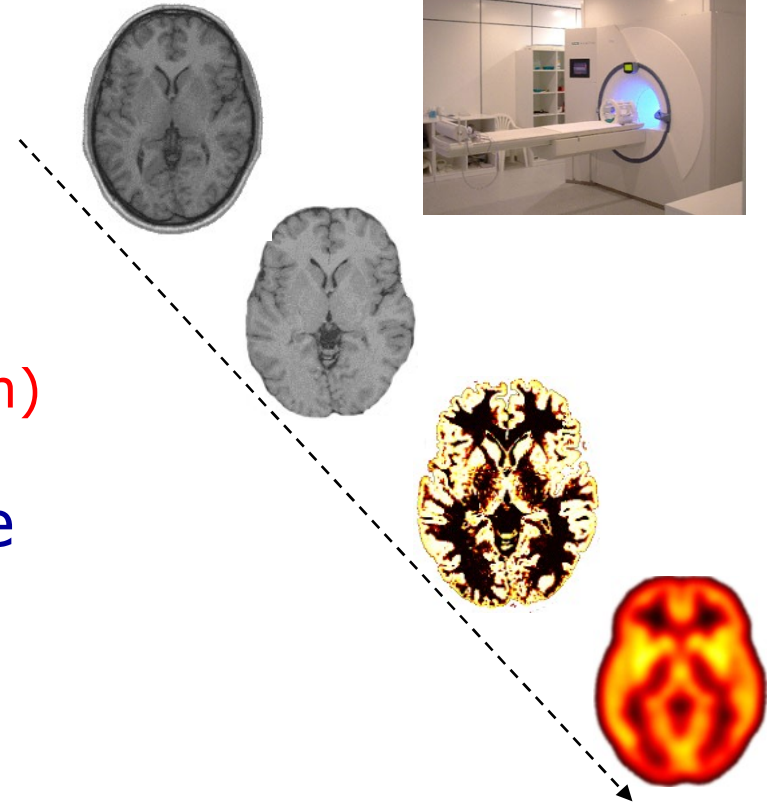


Reduced serotonergic tone

- Acute Tryptophan Depletion
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Increased serotonergic tone

- Selective Serotonin Re-uptake Inhibitor (SSRI)



Prof. Hartwig Siebner, MD (DRCMR, Hvidovre Hospital), hartwig.siebner@drcmr.dk; 3632 6212
Prof. Olaf Paulsen, MD, PhD (DRCMR, Hvidovre Hospital; NRU, Rigshospitalet)
Prof. Gitte Moos Knudsen, MD, PhD (CIMBI, NRU, Rigshospitalet)

Additional information

- The five projects are described in detail at http://www.medicin-ing.dk/info_site/?projekter/2009/projekter.html
- Learn more at the poster session, and....
- contact the supervisors to learn more.

- See also <http://www.drcmr.dk/>
and <http://www.cimbi.org/>

