Iron Biomineralization and Biomagnetics

Tim St Pierre
School of Physics
University of Western Australia

Diseases Studied
- Thalassemia
- Haemochromatosis
- Hepatitis
- Liver cancer
- Alzheimer’s Disease
- Malaria
- hereditary hyperferritinaemia cataract syndrome

The “SQUID”
Magnetic properties measurement system

Iron storage strategies

Energy barrier distn as a probe of particle size

Iron Overload Disease Gene Frequency

Iron Overload Diseases

Strange magnetic energy barriers

Surface roughness and spin disorder

Magnetic properties of ferritin

Nanoparticles of iron oxide in liver
Cirrhotic liver: chronic hepatitis

Proton Transverse Relaxation Rate (R2) Image and Distribution

Liver R2 images and distributions for a healthy volunteer and 3 iron loaded subjects with sequentially increasing liver iron concentrations

Iron in the brain where is it?

Magnetic nanoparticles for biomedical applications

World-wide location of MBI units set up for R2-Liver Iron Measurements
Water-in-Oil Microemulsions

“Nanoreactors”

Iron Oxide Formed in Nanoreactor:

H2O

Water-in-Oil Microemulsions

Nonpolar Solvent Nonpolar Solvent

Iron Oxide Formed in Nanoreactor:

OCOFe+3Fe+2 -OH

Magnetic Particles for Biomedicine

Magnetic Particles for Biomedicine

Prior to separation

Iron & Malaria

Iron & Malaria

8% infected cells
Non magnetic cells

7% infected cells
Magnetic cells

64% infected cells

Prior to separation

Magnetic cells

Non-magnetic cells
Funding Sources
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Scientific Collaborators
- Prof Judy Riffle - Virginia Tech
- Prof Gordon Parkinson - Curtin
- Dr Martin Saunders - CMM @ UWA
- Dr Elliot Gilbert - ANSTO
- A/Prof Craig Buckley - Curtin
- Dr Steve Jones - SirTex
- Prof Sue Berners-Price - UWA
- Prof John Webb - Murdoch
- Prof Jon Dobson - Keele University

Clinical Collaborators
- Prof John Olynik - Fremantle Hospital
- A/Prof Gary Jeffrey - SCDH
- Prof Tim Davies - Fremantle Hospital
- Prof Pensri Pootrakul - Mahidol University