

Advances in medical diagnosis

Transforming Medical Diagnosis with New Scanning Technology, University of York

Meeting Global Challenges

In medicine, time is everything. The faster a diagnosis can be made with regards to a vast array of illnesses, the sooner treatment can be applied and recovery assured. By reducing the cost and, more importantly, reducing the time it would be possible to increase comfort with ageing as well as promoting life-long health & well-being with ease.

The Team of Professor Simon Duckett and Professor Gary Green have developed a technique, based on manipulating parahydrogen, to improve the effectiveness of high resolution medical scanners at a lower cost to medical institutions. This will increase the range of medical conditions (NMR & MRI) that can be examined and it is hoped allow the earlier detection of tumours.

A Multidisciplinary Approach

This work draws on the joint work being undertaken by the Department of Chemistry and the Department of Psychology at the University of York. It links to work within the SRIF funded York Centre for Magnetic Resonance, in the Department of Chemistry and the similarly funded York Neuroimaging Centre. There are also links with the Hull York Medical School and Biology.

Research Impact

By taking parahydrogen and, through a uniquely designed process, researchers have successfully transferred its magnetism to a range of molecules. The resulting molecules are much more easily detected than was previously possible with a few seconds of data collection replacing what would, if possible, have previously taken several months of analysis. No-one has been able to use parahydrogen in this groundbreaking way before.

The new method has major implications for scientific research because it radically reduces the time taken to obtain results using Nuclear Magnetic Resonance technology, the most popular method for obtaining information in chemistry. It has been shown to increase sensitivity in the scanners by over 1000 times so data that once took 90 days to record can now be obtained in just five seconds. Similarly, MRI images can now be collected not only with a higher resolution, but also in a fraction of a second rather than over 100 hours.

In March 2009, Professor Duckett gave a presentation on this work at the 50th Experimental Nuclear Magnetic Resonance meeting in Asilomar at the invitation of Bruker BioSpin. They predicted that this advance in medical technology would be a commercial product by the end of the year and declared it as the most significant current development in NMR.

Funding Sources

After initial funding came from the University, additional pump priming funding was awarded to develop innovative research within Neuroimaging. A White-Rose Health Innovation Partnership provided critical continuation funds that subsequently provided data for successful EPSRC, the MRC, BBSRC, Spanish MEC (Project Consolider ORFEO (CSD 2007-00006)) and Bruker BioSpin applications.

A non-exclusive licensing agreement with Bruker BioSpin has already been signed to develop this technology. AstraZeneca are funding a studentship to starting Oct 2009. The team are establishing active collaborations with Prof Lucio Frydman (Weizmann Institute), Prof Daniel Weitekamp (Caltec), Prof Gareth Morris (Manchester) and Prof Juergen Hennig (Freiburg).