Magnetic Resonance Imaging of Metabolites

View U.S. Patent No. 7,202,665 in PDF format.

WARF: P06190US

Inventors: Scott Reeder

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing *in vivo* metabolite imaging using paramagnetic labels such as hyperpolarized carbon-13.

Overview

In magnetic resonance imaging (MRI), tissue is scanned using magnetic fields that excite atoms and cause them to emit signals. These nuclear magnetic resonance (NMR) signals can be processed into an image using well-known reconstruction techniques.

An isotope called hyperpolarized carbon-13 has spurred interest in a variety of *in vivo* imaging applications such as vascular imaging and metabolic flux. In particular, C-13 labeled pyruvate and its metabolites (lactate and alanine) are of interest in oncology. The NMR spectrum of these three metabolites is relatively sparse, making them well-suited for chemical shift-based imaging methods like those commonly used to separate water and fat.

The standard method for imaging these C-13 isotopes requires large amounts of data: more than 60 NMR signals must be acquired at different echo times to resolve the spectral peaks of alanine and pyruvate. This makes for a difficult choice between scan time and spatial resolution.

The Invention

A UW–Madison researcher has developed a method for imaging *in vivo* metabolites that dramatically reduces scan time.

The metabolite images are produced with an MRI system using *a priori* information about their resonant peaks and relative sizes. This reduces the amount of NMR data needed for proper spectral resolution. Also, the NMR signal can be modeled with an equation of relatively few unknowns. Using this model and NMR data acquired at a plurality of echo time (TE), the metabolite at each image pixel can be calculated and imaged.

Applications

- MR imaging of metabolites such as C-13 labeled pyruvate, lactate and alanine

Key Benefits

- Works 16 times faster than echo planar spectroscopic imaging (EPSI)
- Substantially reduces the amount of NMR data needed to produce an image
- Shortens scan time

Stage of Development

Work has focused on C-13 imaging, but the approach may be applied to chemical species with other nuclei.

Additional Information

For More Information About the Inventors

- Scott Reeder

Related Technologies

- For more information about the researcher's IDEAL method of chemical species separation, see WARF reference number P090389US01.

Tech Fields

- Medical Imaging : MRI

For current licensing status, please contact Jeanine Burmania at jeanine@warf.org or 608-960-9846