Novel MRI Method for the Direct, Quantitative Imaging of Nanoparticles in Cells, Tissues, Tumors, Brains, All in a Non-Invasive Way

Published date: Feb. 18, 2016

Technology description

A novel, quantitative MRI system for the measurement of nanoscale magnetic objects introduced into biological systems.
This method termed FeMRI (pronounced fem-ree) can be applied to determine the concentration of iron through MR images into Fe images, along with the study of temporal and spatial disposition of SPIONs in tumors, especially prostate tumors. This new ability to directly, and simply, measure the amount of a nanoparticle, or other magnetic material using standard MRI, will enhance a large class of nanotechnology studies.

Background

A goal of molecular imaging is to produce quantitative maps of the distribution of a particular tracer or endogenous substance with the resolution characteristic of the chosen method of detection. For this to be accomplished, a quantitative relationship must exist between an image parameter and the imaging agent’ s concentration. Magnetic resonance imaging (MRI) has been successful in medicine due to the richness of the set of spin manipulations that introduce specific contrast variations in tissue.
The range of applications of MRI has been expanded through the discovery and usage of agents that introduce image contrastviaperturbations of the magnetic relaxation rates of nearby nuclei. MRI contrast is a complex, non-linear function of the concentration of contrast agents on nuclear relaxation rates. However, as long as these non-linearities give rise to single-valued, monotonic dependences of contrast on the agent concentration, it is possible to anticipate these nonlinear effects through theory and then to use these relationships to measure the concentration of a given contrast agent in a particular imaging slice.

Technology Description

A researcher at the University of New Mexico has developed a novel, quantitative MRI system for the measurement of nanoscale magnetic objects introduced into biological systems. This method termed FeMRI (pronounced fem-ree) can be applied to determine the concentration of iron through MR

images into Fe images, along with the study of temporal and spatial disposition of SPIONs in tumors, especially prostate tumors. This new ability to directly, and simply, measure the amount of a nanoparticle, or other magnetic material using standard MRI, will enhance a large class of nanotechnology studies.

Application area

Sophisticated, non-invasive, quantitative MRI method for direct imaging of nanoparticles in cells/ tissues
FeMRI will enhance further nanotechnology studies
Easy to apply, which could result in widespread adoption of FeMRI to a large class of biological and physical-chemical problems
Previous attempts at iron-specific imaging did not produce images, whereas FeMRI does produce images where the intensity is only dependent on iron
Applications in studying the temporal and spatial disposition of SPIONs in tumors
Additional applications in measuring the infiltration of tissues by macrophages

Institution

The University of New Mexico

Inventors

Laurel Sillerud

联系我们

叶先生

电 话：021-65679356

手 机：13414935137

邮 箱：yeyingsheng@zf-ym.com