pH-Weighted MRI Using Fast Amine Chemical Exchange Saturation Transfer (CEST) Imaging

Tech ID: 30284 / UC Case 2015-860-0

SUMMARY

UCLA researchers in the Department of Radiological Sciences and Department of Biomedical Physics have developed a novel magnetic resonance imaging (MRI) technique that utilizes amine chemical exchange saturation transfer (CEST) to capture pH-weighted images for measuring tissue acidity.

BACKGROUND

Changes in tissue pH are a strong indication of several disease conditions in humans and is particularly notable in cancerous tumors. Decreased pH in the tumor microenvironment has been implicated to be directly correlated with tumor growth and aggressiveness. Furthermore, tissue acidity is known to cause decreased immune function, hindering various therapies that are normally used to treat tumors, such as chemotherapy. Measurements of tissue pH can therefore be very useful for early diagnosis of tumors and identifying reliable treatment regimens for patients. While there are several methods for non-invasively measuring tissue pH, such as positron emission tomography (PET) and amide proton transfer (APT) imaging, there are downsides to these techniques. PET scans require the use of a radioactive exogenous agent while APT imaging is prone to image artifacts. Development of a fast, reliable, high-resolution method to acquire tissue pH measurements will significantly enhance current imaging technologies.

INNOVATION

UCLA researchers have developed a noninvasive MRI technique to accurately measure tissue pH by chemical exchange saturation transfer (CEST). This technique does not require any exogenous contrast reagents and instead utilizes the intrinsic characteristics of the tissue. Unlike the similar APT imaging technique, this invention uses amine CEST which requires a shorter RF saturation preparation time, significantly reducing scan time and increasing image quality. Furthermore, amine CEST imaging shows increasing positive contrast with decreasing pH, lowering the risk for image artifacts as compared to APT imaging.

APPLICATIONS

- Non-invasive method of measuring tissue pH

ADVANTAGES

- Does not require exogenous contrast reagents
- Less prone to image artifacts compared to APT imaging
- Shorter scan time
- Improved image quality due to acquisition of more image slices/averages

STATE OF DEVELOPMENT

This invention has been developed and has been shown to consistently generate accurate images of glioblastoma patients.

PATENT STATUS

Country	Type	Number	Dated	Case
European Patent Office	Issued Patent	3304060	09/18/2024	2015-860
United States Of America	Issued Patent	10,884,088	01/05/2021	2015-860
United States Of America	Issued Patent	10,677,869	06/09/2020	2015-860

CONTACT

UCLA Technology Development Group
ncd@tdg.ucla.edu
tel: 310.794.0558.

INVENTORS

- Ellingson, Benjamin M.

OTHER INFORMATION

KEYWORDS

MRI, CEST, amine, pH, acidity, medical imaging, glioblastoma, brain imaging

CATEGORIZED AS

- **Imaging**
  - Medical
- **Medical**
  - Imaging

RELATED CASES

2015-860-0

RELATED MATERIALS

- Harris, R. J., et al. pH-weighted molecular imaging of gliomas using amine chemical exchange saturation transfer MRI, Neuro-Oncology, Volume 17, Issue 11, Pages 1514-1524, November 1, 2015.

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Integrative Leakage Correction For Contrast Agent Extravasation In Dynamic Susceptibility Contrast (DSC) - MRI
- Simultaneous pH- And Oxygen-Weighted MRI Contrast Using Multi-Echo Chemical Exchange Saturation Transfer Imaging (ME-CEST)
- Multi-Echo Spin-, Asymmetric Spin-, And Gradient Echo Echoplanar Imaging (Message-EPI) MRI

UCLA Technology Development Group
10889 Wilshire Blvd., Suite 920,Los Angeles,CA 90095
tdg.ucla.edu
Tel: 310.794.0558 | Fax: 310.794.0638 | ncd@tdg.ucla.edu