Washington University in St. Louis
Office of Technology Management

DEVELOPMENT OF COLLOIDAL IRON OXIDE CONTRAST AGENT FOR MRI AND MPI

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T-007545

Background: Biodegradable magnetic carriers have been increasingly utilized in biomedical and clinical research, but the larger size of ferromagnetic agents previously used leads to long circulation times and restriction to the vasculature, making these particles ideally suited for detection of sparse angiogenic biomarkers. Magnetic nanomaterials can be used in magnetic resonance imaging (MRI), as well as magnetic particle imaging (MPI).

Technology Description: A series of non-gadolinium, lipid encapsulated colloidal susspension agents have been created for various imaging uses. Manganese-organic compounds are incorporated at high metal density for very sensitive MR imaging. The particles are easily functionalized, highly stable, can deliver drug therapy, easily manufactured, and have sensitivity detection in the low nanomolar range and thus can be used for imaging based drug delivery. Additionally, researchers developed gold-based nanocolloids, called NanoPA, which can be used for photoacoustic imaging and drug delivery. These particles are tuned to the NIR for very sensitive PAT imaging, and are easily functionalized, highly stable, can deliver drug therapy, and are ideally suited for non-invasive cardiovascular (carotid) and cancer (breast, prostate, GI, and head/neck) imaging. Lastly, colloidal iron oxide nanoparticles (CION) are ferromagnetic particles that have been developed for use in MRI or MPI. The CION particles can be functionalized before or after the synthesis process, in order to enable drug delivery and/or site-specific targeting, and drugs can be either embedded in the hydrophobic core or the outer lipid layer. Current imaging with iron oxide particles requires at least 24 hours before imaging, but site-targeted nanoparticles of this invention enable imaging within 1 hour of contrast agent delivery.