ADDITIONAL POSTERS — TECHNOLOGIES NOT INCLUDED IN TECHNICAL PRESENTATIONS

Nanoparticles for Imaging: Targeted Nanoparticles That Can Be Imaged Through Magnetic Resonance, Optical and Radioisotope Imaging
Martin W. Brechbiel, Radiation Oncology Branch, NCI

Available for licensing and commercial development are patent rights covering tri-imageable nanoparticles which have great potential for application in the laboratory and clinic for labeling at the cellular level, diagnostics, and drug delivery. The particle includes a silica encased ultrasmall superparamagnetic iron oxide (SPIONs) that can be detected using MRI. A fluorescent probe (e.g., Cy5.5) for optical imaging is embedded in the silica. The resulting particles are about 20-25nm in diameter. Target specific antibodies are attached to the surface of the particles. Chelated to the antibodies is a radioisotope (e.g., Indium-111) useful for particle quantification and can be imaged through techniques such as single photon emission computed tomography (SPECT) or positron emission tomography (PET).

Nanoparticles for Imaging and Treatment of Brain Tumors
Hemant Sarin, M.D., Intramural Research Programs, NIBIB

Conventional chemotherapy drugs do not reach therapeutic levels in brain tumor tissue, and do not remain in brain tumor tissue for long enough to enter brain tumor cells and kill them. As a consequence, these chemotherapy drugs are not effective at treating malignant brain tumors growing in patients, even though these drugs are effective at killing brain tumor cells growing in culture. This invention claims that intravenously administered functionalized polyamidoamine (PAMAM) dendrimers of certain sizes can selectively cross the blood-brain barrier (BBB) of malignant brain tumors, and can accumulate over time within individual brain tumor cells. Gadolinium and fluorescent probe conjugated dendrimers with these properties can be used for simultaneous magnetic resonance and fluorescence imaging of brain tumor cells. Applications include anatomic and metabolic imaging of brain and spinal cord tumors for diagnostic and therapeutic purposes, intravenous treatment of brain and spinal cord tumors; imaging of intravenous drug delivery to brain and spinal cord tumors; and the potential to be used for imaging and treatment of other neurological disorders in which the BBB becomes porous.

Hollow Structured Mesoporous Silica Coated MnO Nanoparticles as Highly Efficient T1 Contrast Agents and Their Applications in MR tracking of Transplanted Mesenchymal Stem Cells
Taeho Kim[1,2,6], Eric Momin[5], Jonghoon Choi[1,2,7], Hasan Zaidi[5], Mi-hyun Park[6], Vytas Reipa[7], Alfredo Quinones-Hinojosa[5], Taeghwan Hyeon[6], Jeff W. M. Bulte[1-4], Assaf A. Gilad[1,2*]
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Ultrastable Atomic Force Microscopy: Atomic-scale Stability and Registration at Ambient Conditions
Thomas Perkins, JILA, NIST & CU-Boulder, NIST

Computer Aided Detection (CAD) of Colonic Polyps Using CT Colonography (CTC)
Jack Yao, Diagnostic Radiology Department, Warren Grant Magnuson Clinical Center, NIH

We have developed advanced image processing and machine learning techniques for computer aided detection of colon cancer using CT colonography. Our CAD system achieves high sensitivity and specificity. Automated polyp size evaluation provides a consistent way to characterize the polyps. The tools are useful for colon cancer screening. Most of our techniques are patented and ready for further commercial development.

Bone Imaging: Bone Mineral Density as a Biomarker for Assessing Bone Health
Herbert S. Bennett, Semiconductor Electronics Division, Andrew Dienstfrey, Information Technology Laboratory Office, Tammy Oreskovic, Materials Reliability Division, Lawrence Hudson, Ionizing Radiation Division, NIST

Multilayered RF Coil System for Improving Transmit B1 Field Homogeneity in High-Field MRI
Alan Koretsky, Jeff H. Duyn, Shumin Wang, Hellmut Merkle, Laboratory of Functional & Molecular Imaging, NINDS

We have developed a multilayered radio-frequency (RF) coil system for improving the transmit B1 field homogeneity for magnetic resonance imaging (MRI) at high field strengths. The current invention aims at manipulating the inhomogeneous profile of the transmit B1 field, which causes MR images to become less uniform as the magnetic field strength is increased, by utilizing an inner array of RF elements (e.g. surface coils) within and coupled to an outer transmit unit (e.g. a birdcage coil or other volume coil). The current design provides an effective approach for reducing B1 field homogeneity at high fields and can be implemented without the need for independent RF channels, thereby reducing MRI system complexity. Furthermore it can be readily implemented on existing MRI coil systems by detuning surface coils rather than decoupling them during the transmit phase, thus further reduces the cost of a system. The current status of the technology includes development of optimized methods based on real-time simulations of specific heads and a working coil for use with phantoms. We are looking for commercial partners to further develop the coil system and are working towards finishing the design for work in phantoms, the construction of a coil for use on human heads, and looking to explore benefits for whole body imaging.

Chip-Scale Atomic Magnetometers for Low-Cost Biomagnetic Imaging and NMR
Svenja Knappe, John Kitching, Time and Frequency Division, Physics Labs, NIST

Enhancing Bio-imaging Through Chemical and Elemental Mapping of Biological Structures
Stephan Stranick, Keana Scott, Surface and Microanalysis Science Division, NIST

Increasing the Throughput of in vitro Assays to Measure the Function of Antibodies to Pneumococci
Matthew L. Clarke, Optical Technology Division, NIST

Fluorescence Reporter Proteins for Studying the Protein Trafficking of Malaria Infected Human Red Blood Cells
Georgeta Crivat, Guest Researcher, Optical Technology Division, NIST, Laboratory of Malaria and Vector Research, NIH/NIAID

Tenascin-C is Unregulated at the End of the Cell Cycle in Proliferating NIH 3T3 Fibroblasts
Michael Halter, Benjamin L. Stottrup, Kurt J. Langenbach, Alex Tona, Anne L. Plant, John T. Elliott, NIST

Neutron Radiography in Biological Systems at Submicrometer Resolution
Jayne B. Morrow, R. David Holbrook, Muhammad Arif, R. Gregory Downing, Brian B. Maranville, NIST

Introduction to the NIBIB/NIH Clinical Center Laboratory of Molecular Imaging and Nanomedicine
Xiaoyuan (Shawn) Chen, Laboratory of Molecular Imaging and Nanomedicine, NIBIB/ NIH CC

Brief introduction of my laboratory that is divided into 4 sections: PET radiochemistry group, biological molecular imaging group, molecular imaging probe toolbox group, and theranostic nanomedicine group. We specialize in synthesizing molecular imaging probes for positron emission tomography (PET), single-photon emission computed tomography (SPECT), magnetic resonance imaging (MRI), optical (bioluminescence, fluorescence and Raman), contrast enhanced ultrasound, photoacoustic imaging as well as multimodality imaging. We aim to develop molecular imaging toolbox for better understanding of the biology, early diagnosis of diseases, monitoring therapy response, and guiding drug discovery and development. Our lab puts special emphasis on high sensitivity nanosensors for biomarker detection and theranostic nanomedicine for imaging, gene and drug delivery, and monitoring of treatment. A few exemplar images will be shown.

NIAID Integrated Research Facility
Richard C. Reba, M.D., Department of Nuclear Medicine, NIAID/NIH Clinical Center

The NIAID Integrated Research Facility (IRF) at Fort Detrick will occupy a unique niche in the world of Biosafety Level 4 containment laboratories. In addition to employing state-of-the-art laboratory research methods to study the pathogenesis and treatment of diseases caused by virulent viruses and bacteria, investigators will make use of an array of imaging instruments to track the course of illness in infected animals and assess the efficacy of new vaccines and therapies.