NRC CNRC
From Discovery to Innovation...

Science at work for Canada

NRC Institute for Biological Sciences

Multi-Modal Imaging Agents for Molecular Diagnosis of Cancer

The Business Opportunity

Magnetic resonance imaging (MRI) is a powerful, non-invasive medical diagnostic technique that offers high-resolution anatomical information about the human body, and is frequently used for the non-invasive detection of a variety of diseases. While these images provide good anatomical information about the disease localization and spread, to obtain information about molecular characteristics of the disease a biopsy of diseased tissue is still required for molecular analyses ex-vivo (e.g., histopathology, immunochemistry, etc.).

Development of techniques for non-invasive molecular imaging of disease-specific biomarkers in vivo is expected to greatly improve disease diagnosis and treatment by a) providing early molecular information on disease, b) adjusting treatment to fit 'personal' characteristics of disease, c) selecting appropriate patient populations for clinical trials. The current gap in introducing these techniques into clinical practice is a lack of appropriately targeted, high contrast imaging agents.

NRC-IBS, NRC-IMI, and NRC-IBD have jointly developed novel targeted molecular imaging contrast agent platform for applications in cancer.

The Technology

By combining extensive expertise in nanoparticle synthesis (NRC-IMI), single-domain antibodies (NRC-IBS) and imaging (NRC-IBD), NRC developed a platform technology for Molecular Imaging Agents (MIA) consisting of the following 'building blocks':

a) novel high-contrast, surface functionalized, stealth paramagnetic nanoparticles that can be reproducibly synthesized and scaled up;

b) single-domain antibodies raised against specific disease targets and attached to nanoparticles in high

c) numbers to achieve specific molecular targeting and a robust signal amplification

d) optical contrast agent for multi-modal applications and pre-clinical validation

This platform technology was evaluated in animal proof-of-concept studies for cancer applications. Contrast nanoparticles were bioconjugated with a single-domain antibody recognizing a protein strongly and selectively up-regulated in vessels of glioblastoma brain tumors, expressed at lower levels in vessels of low-grade gliomas and virtually absent in normal brain vessels. Therefore, a non-invasive in vivo molecular imaging of the expression of this cancer protein could be used for staging malignancy level of intracranial tumors without need for invasive biopsy. The proof-of-concept studies in animals using optical imaging provided evidence that this MIA selectively targeted intracranial brain tumor vessels producing a high contrast-to noise ratio and favorable pharmacokinetic properties. Since targeted cancer protein is implicated in tumor neo-vascularization, this MIA could be developed for non-invasive assessment of angiogenesis as either predictive biomarker or for prospective monitoring of the efficacy of anti-angiogenic and vessel stabilizing treatments.

Patent Position

Patents Pending. NRC IBS case 12075.

The Markets

Numerous diagnostic markets are available for this technology, foremost of which are the established cancer applications. Applications in other markets will be driven by discovery of disease biomarkers and the development of antibodies targeting these biomarkers.

Technology Transfer Possibilities

- Development of this technology through a joint collaboration.
- A commercial exploitation license for the technology.

Contacts

Stacey Nunes
Tel.: (613) 993-9212
Business Relations
E-mail: stacey.nunes@nrc.gc.ca

Dr. Yves Geoffrion
Tel.: (613) 991-6377
Business Relations
E-mail: yves.geoffrion@nrc.gc.ca