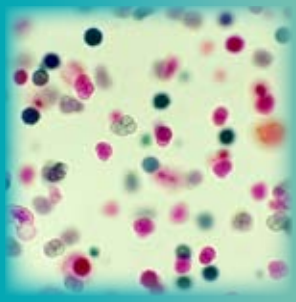

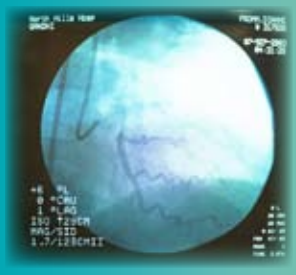

Canadian Institutes of Health Research (CIHR)
Institute of Cancer Research (ICR)

Molecular and Functional Imaging

Specific genetic alterations underlie many disease processes, including cancer. Molecular and functional imaging links these changes to image-related data. Detection, especially of very early changes, requires sophisticated technology, procedures and software, creating the need for expertise in bioinformatics, engineering, physics, chemistry and mathematics. Improvements are needed in imaging and spectroscopy devices, contrast agents, radiopharmaceuticals and optically-labeled probes.

The 2003 launch of the Novel Technology Applications in Health Research RFA addressed the need to integrate emerging technologies from fields outside the life sciences with biomedical and clinical research methodologies. The program offered up to $200,000 per year for two years to small, multidisciplinary teams in which investigators from different fields could combine their expertise to create new imaging tools and contrast agents. The specific objectives of the RFA were to:

- Integrate emerging technologies from fields outside the life sciences with traditional biological and/or medical imaging methods for more effective health care delivery;
- Promote the development of novel and improved imaging and spectroscopic technologies for early detection, screening, diagnosis and image-guided treatment of cancer; and
- Create small multidisciplinary teams in which investigators from different fields can combine their expertise to create new imaging tools and contrast agents.

ICR supported four teams over two years for a total investment of over $1.3 million.

Results and Outcomes

The following two year grants were supported through the Novel Technology Applications in Health Research strategic initiative:

Principal Investigator	Institution Name	Project Title
Benard, François	University of Sherbrooke	Integrated multimodality molecular imaging of tumour biological characteristics and vascular microenvironment in small animal models.
Ferguson, Stephen	John P. Robarts Research Institute, University of Western Ontario	Molecular Imaging of Ras/MAPK Signaling in Cancer: New Diagnostic Tools.
Fradin, Cecile	McMaster University	Optical Methods for Detecting the Progression of Apoptosis.
Wilson, Brian	Princess Margaret Hospital	Quantum-dot Based, Molecular-Targeted Fluorescence Endoscopy for Early Gastrointestinal Cancer Diagnosis.

In addition to numerous publications and presentations, the outcomes from this initiative include the following:

The team led by Dr. François Bernard, at the University of Sherbrooke has gained international recognition for the Sherbrooke Molecular Imaging Centre as demonstrated by the large number of workshops and educational symposia to which members of the team have been asked to present. In addition, members of the team have won several awards, published 14 papers and articles and obtained several additional grants to enable their work to continue.

The research supported through Dr. Benard's grant has resulted in three patent applications and the start up of two commercial activities. Advanced Molecular Imaging (AMI) Inc., now merged with Gamma Medica-Ideas Inc., was created to commercialize preclinical positron emission tomography (PET) scanners and ancillary devices for molecular imaging research in small animal models. The Sherbrooke Molecular Imaging Centre also launched a joint venture with Bristol-Myers Squibb Canada for the supply of cyclotron-produced PET radiopharmaceuticals for cancer imaging in eastern Canada.

Dr Stephen Ferguson's team succeeded in developing three fluorescent-tagged recombinant antibodies that recognize the activated form of specific proteins in vivo in real time – an important step in the development of new diagnostic tools.

Dr. Brian Wilson's team, although encountering problems with using quantum dots (Qdots) for in vivo imaging, went on to discover a new way to prepare fluorescent Qdots for use in obtaining a quantitative histopathology of (tumor) tissue samples. Specifically, the team prepared Qdots with different target coatings and used them to stain microarrays of tumour tissue. This is an important advance for the development of 'personalized medicine,' since it will allow more profiling of definitive tumors from individual patients so that optimum treatments can be designed. This is a positive first step towards the ultimate goal of improving the accuracy of gastrointestinal tract endoscopy using new nanotechnology-based imaging techniques. As a result of the team's success in bridging the gap between life sciences, photonics and nanotechnology, this project formed the basis for a much larger New Emerging Team Grant on quantum dot-based biomolecular imaging. In addition, the biophotonics group are part of a successful major Canadian Foundation for Innovation proposal and CIHR Team Grant. In Dr.Wilson's words, "the Novel Technology Applications in Health Research RFA was the prime stimulus for creating the team effort." The team has continued to work together after the grant period and on an expanded scale.