BioCanRx
Canada's Immunotherapy Network
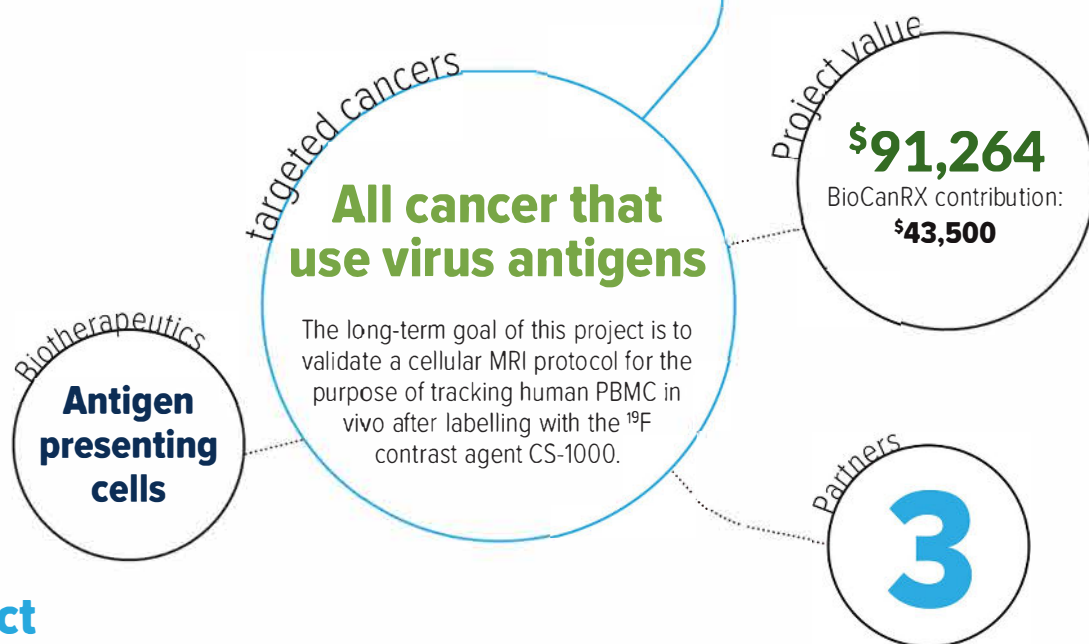### Le réseau canadien d'immunothérapie

Enabling Studies Program

In vivo human therapeutic cell tracking using a [^{19}F]-perfluorocarbon cellular MRI contrast agent: Phase I feasibility and preliminary safety trial

Oct 14, 2016 to May 31, 2017

Highlights

- Newly developed MRI techniques to track APC-based vaccines in the human body

- First time in Canada that the fate of injected therapeutic immune cells will be tracked in humans

targeted cancers

All cancer that use virus antigens

The long-term goal of this project is to validate a cellular MRI protocol for the purpose of tracking human PBMC in vivo after labelling with the ^{19}F contrast agent CS-1000.

Biotherapeutics

Antigen presenting cells

Project value

$91,264
BioCanRX contribution:
$43,500

Partners

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OICR — Ontario Institute for Cancer Research

Dendreon — *Targeting Cancer, Transforming Lives®*

Celsense

About the project

Recently, immune-based therapies have been developed that control cancer progression. One approach is to target tumours with a tumour specific protein (antigen) vaccine. Immune cells, known as antigen presenting cells (APC), when loaded with a tumour antigen, activate other immune cells to specifically kill tumour cells. Cell-based cancer vaccine immunotherapy (CCVI) has shown potential for improvements in markers of tumour progression, quality of life and survival of treated patients. Yet CCVI has not met expectations of progression free survival, a goal that remains an unmet medical need. Thus, improvements to cancer vaccines are needed including the optimization of APC-based vaccine delivery to the immune system.

An important method now possible with MRI is the non-invasive tracking of transplanted therapeutic cells in patients undergoing treatment. In an immunotherapy setting, tracking infused optimized or engineered immune cells will confirm they localize to their intended target site, inform quantitatively on their number, persistence and viability thereby providing biomarkers predictive of therapeutic outcome in real time.

To do this, the team developed magnetic resonance imaging (MRI) techniques to track APC-based vaccines in the human body. This will determine if the APC-based vaccine reaches immune tissues and the tumour, whether sufficient numbers of the vaccine APC are present to stimulate successful tumour cell killing and how long the vaccine APC persist in a cancer patient. To distinguish cancer vaccine APC from the surrounding tissue the APC are labeled with a contrast agent. The contrast agent creates a MRI detectable signal wherever these labeled cells are located. It remains to be proven whether injected therapeutic cells actually reach their intended target (lymphoid organs or tumour) in ample numbers to create an effective anti-tumor response.

This project will determine the feasibility and safety of using perfluorocarbon nanoemulsion (Cell Sense [CS-1000]) as a contrast agent to assess delivery of APC-based vaccines in humans. This will be the first time in Canada that the fate of injected therapeutic immune cells will be tracked in humans, a technology that is applicable to the treatment of many cancers. Providing a diagnostic biomarker will allow physicians to make real time assessments of therapy and adjust patient treatment accordingly.

Key investigators

Project Lead:
Dr. Gregory A. **Dekaban**

Co-Principal Investigator:
Dr. Paula J. **Foster**

robarts RESEARCH

Western UNIVERSITY · CANADA

Enabling Study Investigators

London
London Health Science Centre,
Robarts Research Institute,
University of Western Ontario
Dr. Gregory A. Dekaban
Dr. Paula J. Foster
Dr. Joseph Chin
Dr. Micheal Rieder
Dr. Gary Brahm

Toronto
University Health Network,
University of Toronto
Dr. Sowmya Viswanathan

Partners

Ontario Institute for Cancer Research (OICR)
$10,139

Dendreon Corp.
$2,625

Celsense Inc.
$35,000

Key Milestones

January – April 2017
- Safety testing of 4 cm human dual ^{1}H/^{19}F RF coil
- Complete Validation of CS interference testing for endotoxin, sterility, mycoplasma

April – May 2017
- Compile and submit a CTA to Health Canada

The power to kill cancer lies within us.
Let's tell our bodies how.

BioCanRx
Biotherapeutics for Cancer Treatment
Biothérapies pour le traitement du cancer