

StemSpecs

Volume 2, Issue 1 April, 2006

Welcome to the latest issue of StemSpecs, the on-line newsletter of “Mass Spectrometer-based Flow Cytometer, Methods and Applications”, a Genome Canada project launched in February 2005. This issue includes a biography of Yingfu Li - the leader of the aptamer team. We’ve also included some new data using in-house designed element tags.

Our website, launched in June 2005, is intended to inform readers of the goals and structure of our project, and to introduce you to the multidisciplinary team that is doing this work. If you haven’t seen the site, please have a look, starting from our homepage: <http://www.uhnres.utoronto.ca/studies/stemspec/index.html>. We hope that you will find the website informative, and that you’ll check back to follow our progress.

Since our last issue, we have reluctantly said goodbye to Amy Dambrowitz, our Project Manager during the first year of the project and a Contributing Editor of StemSpecs. Amy got the project off the ground and established the inter-institutional relationships that will see it succeed. She also became an integral part of the UofT project team, and her enthusiasm will be missed. However, we have been fortunate to be able to recruit Adrienne Halupa as our new Project Manager. Adrienne brings her complementary skills to the project (see below) and looks forward to seeing us through the next stages (in addition to assuming her role as Contributing Editor of StemSpecs).

Welcome to StemSpecs!

Sincerely,
The Editors

Editor-in-Chief: John Dick
Contributing Editors: Scott Tanner, Adrienne Halupa

Inside this issue:

Editor’s Letter	1
Biography-Yingfu Li	2
Element Tags for Multiplex Detection	3
Heading Off to Canada’s Rocky Mountain Playground	4
And Now, Appearing in Her New Lead Role as Project Manager...	5

This project was funded by Genome Canada through the Ontario Genomics Institute.
Complementary funding is gratefully acknowledged from:
Ontario Cancer Research Network | National Cancer Institute of Canada | Leukemia and Lymphoma Society (USA) | University of Toronto | MDS Sciex | DVS Sciences Inc. | Parker Life Sciences | Leybold Vacuum GmbH | Materials and Manufacturing Ontario

Biography: Yingfu Li



Professor Yingfu Li, leader of the aptamer development project at McMaster University, wants to create novel tools to distinguish leukemic stem cells from a mixture of cells. His group specializes in developing biomedical applications that use DNA or RNA molecules that are imbued with special properties. For the purposes of this project, the Li lab will develop DNA aptamers that bind with high affinity and specificity to proteins that characterize the leukemic stem cell.

Dr. Li, who holds a Canada Research Chair in Directed Molecular Evolution of Nucleic Acids, is a native of Anhui, China. He studied at Anhui University (B.Sc.) and China Agriculture University (M.Sc.) before heading out to British Columbia to complete his Ph.D. at Simon Fraser University. Following a 2-year Post-doctoral Fellowship at Yale University funded by the Medical Research Council of Canada, Yingfu returned to Canada in 1999 to accept a position at McMaster University in Hamilton, Ontario. Yingfu currently holds joint appointments as Associate Professor in the Department of Biochemistry and Biomedical Sciences and in the Department of Chemistry at McMaster.

“An important component of my research program is to provide unique training opportunities to develop highly skilled young scientists,” says Yingfu. Acting as a mentor is clearly

something Yingfu enjoys. Early in his career, he spent 6 years teaching science courses at the Agriculture College of South Anhui and Anhui University. So far at McMaster, Yingfu has supervised 7 Master’s students, 7 Ph.D. students, as well as dozens of undergraduate research students.

The ability to detect specific cell types, such as leukemic stem cells, is essential for the development of protocols for the personalized diagnosis of the disease. The importance of having a suite of readily labeled and highly specific affinity products cannot be understated. The Li lab has thoroughly investigated various approaches to aptamer selection. Of special interest is an approach Li has developed for selections using whole cells rather than purified proteins. For example, multiple rounds

(Continued on page 3)



Did you know?

Aptamers are artificial single-stranded DNA or RNA molecules with the ability to bind a non-nucleic acid target. The term “aptamer” is derived from the Latin *aptus* meaning “to fit”.

This project was funded by Genome Canada through the Ontario Genomics Institute.

Complementary funding is gratefully acknowledged from:

Ontario Cancer Research Network | National Cancer Institute of Canada | Leukemia and Lymphoma Society (USA) | University of Toronto | MDS Sciex | DVS Sciences Inc. | Parker Life Sciences | Leybold Vacuum GmbH | Materials and Manufacturing Ontario

Li Biography (Cont.)

(Continued from page 2)

of selection (and anti-selection) have been conducted using CD34+ cells. The goal is to isolate DNA species that are able to recognize the cell, through binding to proteins or small molecules. It is hoped that Yingfu Li's pioneering work in developing and optimizing methods to generate cell-type-specific aptamers will mark a significant advancement in personalized human health care.

As Yingfu puts it,

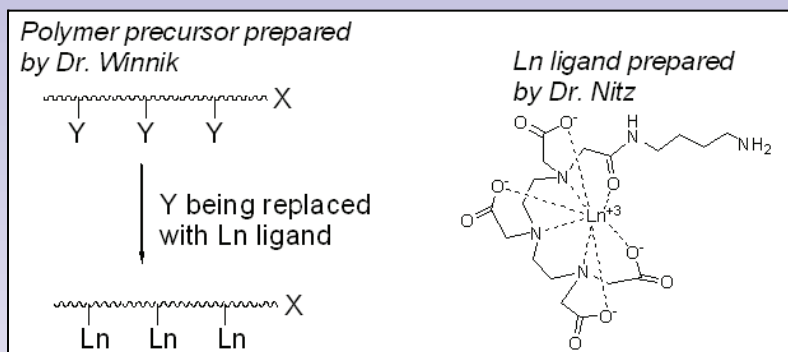
“We’re examining DNA not for its well-recognized role as the genetic material to store and transmit genetic information, but rather for its less-known potential to act as a novel cancer diagnostic tool.”

Element Tags for Multiplex Detection

The Stemspec group is excited to report the successful development of a first generation of element tags that are specific for the ICP-MS detector. Generated with the help of our collaborators in the Department of Chemistry at the University of Toronto, these tags incorporate multiple atoms of a se-

lected element and are linked to antibodies for the mass spectrometric determination of characteristic cell antigens.

(Continued on page 4)



Lanthanide chelators made in the lab of Dr. Mark Nitz were bound to functionalized polymers developed by Dr. Mitch Winnik's group. The resulting tags were then used to label primary antibodies.



Did you know?

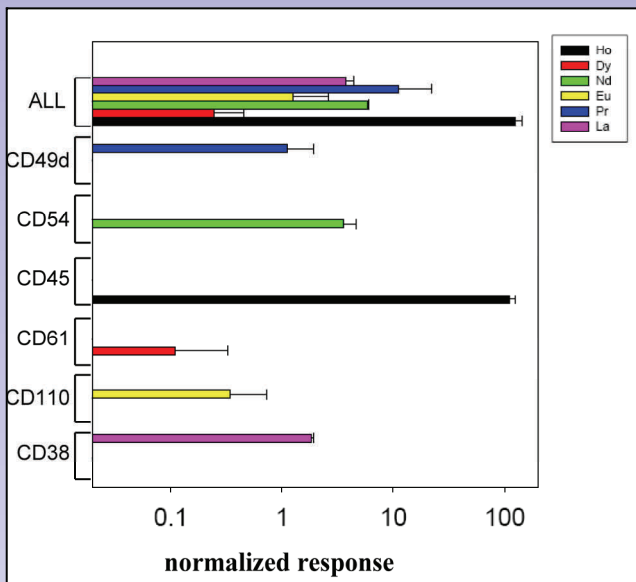
CD34 (Cluster of Differentiation or Cell Differentiation antigen 34) is a trans-membrane glycoprotein constitutively expressed on hematopoietic stem cells. It serves as a cell-to-cell adhesion factor, and is theorized to play a role in early hematopoiesis by mediating the attachment of stem cells to the bone marrow extracellular matrix or directly to stromal cells.

This project was funded by Genome Canada through the Ontario Genomics Institute.

Complementary funding is gratefully acknowledged from:

Ontario Cancer Research Network | National Cancer Institute of Canada | Leukemia and Lymphoma Society (USA) | University of Toronto | MDS Sciex | DVS Sciences Inc. | Parker Life Sciences | Leybold Vacuum GmbH | Materials and Manufacturing Ontario

Element Tags for Multiplex Detection (Cont.)



(Continued from page 3)

In March 2006, distinct tagged antibodies were prepared incorporating 6 different lanthanide elements. A successful multiplex assay using our ICP-MS in homogeneous (bulk) format was performed with the erythro-leukemia cell line K562. As we go to press, first experiments for multiplex detection in individual cells using these tags with our research prototype cytometer instrument are being performed, for which we hope to soon present the first successful results.

Using in-house prepared first generation element tags, the ICP-MS research prototype has successfully performed multiplex detection of 6 cell surface antigens.

Heading Off to Canada's Rocky Mountain Playground

Amy Dambrowitz stretched and achieved much in her role as Stemspec Project Manager during our first year of operation: she got our budgets in order and kept them on track; cemented the all-important links between the institutions and their administrators, the PI's, the project teams and our funding sponsors. She also managed our reporting and our public outreach, including our website and this newsletter. And all of this while maintaining her many years of community volunteerism. The Stemspec team appreciates Amy for

the important guidance she has given us, and wishes her the very best as she relocates to Alberta with her family. We expect that our loss will be Alberta's gain!

Editor's note: Our return readers might notice a change in the couter of our head-dressing (well, OK, anything might be better than the hand-clapping headbands in our last issue): of course the new code is in honour of Amy's new home.



Prior to her departure, Amy Dambrowitz (left) briefed Adrienne Halupa (right) on the many job requirements of the Project Manager, with special emphasis on the recently implemented dress code.

This project was funded by Genome Canada through the Ontario Genomics Institute.

Complementary funding is gratefully acknowledged from:

Ontario Cancer Research Network | National Cancer Institute of Canada | Leukemia and Lymphoma Society (USA) | University of Toronto | MDS Sciex | DVS Sciences Inc. | Parker Life Sciences | Leybold Vacuum GmbH | Materials and Manufacturing Ontario



(From left to right) John Dick, Sergey Vorobiev, Olga Ornatsky and Scott Tanner embrace the new Amy-inspired Stemspec uniform.

And Now, Appearing in Her New Lead Role as Project Manager...



We are happy to welcome aboard Adrienne Halupa as the new Stemspec Project Manager. An art enthusiast with a penchant for ladybugs who likes to organize things in her spare time, Adrienne completed her Ph.D. at the Ontario Cancer Institute in the University of Toronto's Department of Medical Biophysics. Her research focused on untangling the web of signal transduction pathways involved in hematopoietic and leukemic cell development. Later, as a member of the

Blueprint Initiative, Adrienne analyzed molecular interaction data for the Biomolecular Interaction Network Database (BIND), a bioinformatics resource based at Mount Sinai Hospital in Toronto. Adrienne is thrilled to once again be a hematopoet.



This project was funded by Genome Canada through the Ontario Genomics Institute.
Complementary funding is gratefully acknowledged from:
Ontario Cancer Research Network | National Cancer Institute of Canada | Leukemia and Lymphoma Society (USA) | University of Toronto | MDS Sciex | DVS Sciences Inc. | Parker Life Sciences | Leybold Vacuum GmbH | Materials and Manufacturing Ontario

Interested in our work? To contact the group:

Email: stemspec@uhnres.utoronto.ca

Or call or fax:

Phone: 416-946-8850 or 416-581-7466

Fax: 416-581-7476

Or send us mail:

Dr. John E. Dick
RE: Mass Spectrometer-based Flow Cytometer, Methods and Applications
University Health Network
Toronto Medical Discovery Tower
8th Floor, Room 8-301
101 College Street
Toronto ON M5G 1L7
Canada

This project was funded by Genome Canada through the Ontario Genomics Institute.
Complementary funding is gratefully acknowledged from:
Ontario Cancer Research Network | National Cancer Institute of Canada | Leukemia and
Lymphoma Society (USA) | University of Toronto | MDS Sciex | DVS Sciences Inc. | Parker Life
Sciences | Leybold Vacuum GmbH | Materials and Manufacturing Ontario