GlycoNet

YEAR 2
BUILDING COMMUNITY
CANADIAN GLYCOMICS NETWORK
2016 ANNUAL REPORT
Delivering solutions to important health issues and improving the quality of life of Canadians through glycomics
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VISION
Delivering solutions to important health issues and improving the quality of life of Canadians through glycomics

MISSION
Ensure that the network and Canada are internationally recognized as leaders in glycomics research

Deliver exceptional training in glycomics research and entrepreneurship

Bridge the translation gap between glycoscience research and industry

Translate research advances into tangible benefits for Canadians
On behalf of the Board of Directors, I am proud to provide an overview of the many accomplishments of the Canadian Glycomics Network during this, our first full year of operation. GlycoNet has made great progress in advancing glycomics research towards health benefits for Canadians.

Success in our mission requires the engagement of a broad spectrum of researchers and collaborators. Over the past year, a key achievement has been enhancing the number and breadth of individuals involved in GlycoNet’s activities. As such, we were pleased to welcome 27 new network investigators to our ranks, bringing our total number of investigators to 87. Another important emphasis of GlycoNet has been to identify, fund, and initiate the first wave of our core research programs. I am pleased to report that GlycoNet has committed more than $10 million in research funding to 25 projects, thus positioning us very well to deliver on the promise of Canada’s outstanding research in glycomics.

GlycoNet also made important strides in translating our research advances into actual products and commercial reality to benefit Canadians. Network management, led by Executive Director Dr. Elizabeth Nanak and in consultation with the Board, established an independent Commercialization Committee to assist in evaluating worthy projects, expanding patent protection, advancing product development and commercialization strategies, and identifying suitable translational partners.

A strong Network requires excellence at the Board level as well. Accordingly, we are excited to welcome three new Board members with exceptional experience: Dr. Luc Marengere (General Partner at TVM Capital in Quebec), an accomplished venture capitalist with a strong research background; Dr. Thorsten Melcher (Senior Director at New Ventures Johnston & Johnston Innovation), a business leader whose expertise includes establishing and guiding partnerships between universities and biotech companies; and Mr. Kirk Rockwell (Director, Centres for Research and Commercialization, Alberta Innovates Technology Futures), who has a decade’s worth of experience in technology translation.

GlycoNet is already making great strides in transforming the promise of glycomics into reality. As we move forward, the scale of our activities will expand—and, we hope, so will the clinical and commercial impact of our scientific endeavours. Together, we will ensure that GlycoNet gains national and international recognition for leadership in this important field and makes Canadians proud.

Frank Gleeson
CHAIR, BOARD OF DIRECTORS
With increasing headway, GlycoNet is building our network and bringing together researchers, clinicians and a growing list of industry partners with the common goal of achieving better health for Canadians through the application of cutting-edge glycomics research.

Our achievements during our first full year as a network include a diverse group of funded research projects in areas such as antimicrobials, rare genetic diseases and diabetes. In the following pages you will read about some of these exciting projects, and we are confident these successes represent just the beginning of what is possible in our field.

Our accomplishments over the past year also include a growing number of trainees brought into GlycoNet ranks through participation in professional workshops, lab placements and mentorship from some of the nation’s top scientists. We also organized the first annual Canadian Glycomics Symposium, attracting more than 200 researchers and students from across the country and the world to Banff, Alberta for our annual general meeting and a scientific conference featuring internationally acclaimed keynote speakers.

GlycoNet’s growing stature in the Canadian research landscape is evident through the increasing number of researchers, institutions, and partners who wish to join us in achieving our goals. In just one year, 27 principal investigators joined our ranks, while our partners more than doubled from 32 to 67, including 20 international partners.

We would like to acknowledge the members of our governance committees for the time and energy they have devoted to ensuring our continued success. Our progress would not have been possible without their enthusiastic support and collaboration, and that of our member institutions and partners.

We have been making connections and building our community, and we are proud to be the catalyst that brings together world-class industry and scientists from across fields and the country, uniting them all in a common goal. We are confident that our greatest achievements still lie ahead.

Todd Lowary
Scientific Director
67 Network Partners

- 67 total partners
- 32 in 2015, 67 in 2016
- 20 international partners

87 Network Investigators

- 87 total investigators
- 60 in 2015, 87 in 2016

Network partners include...

- 10 Industry partners
- 13 Other
- 8 Federal or provincial departments and agencies
- 36 Universities and research institutes

Discipline representation

- Agriculture, Forestry and Veterinary Medicine: 3
- Biochemistry: 12
- Biology: 8
- Chemistry: 35
- Microbiology and Medicine: 13
- Molecular Medicine: 12
- Physics and Astronomy: 1
- Pharmacy: 3
$10.7 million research funds distributed and committed

$1.7 million cash and in-kind partner contributions

114 Network Trainees

- 10 Undergraduate students
- 10 Master's students
- 24 PhD students
- 42 Post-doctoral fellows
- 28 Technicians and research associates

25 Refereed publications

Communications

- 236 Twitter followers
- 100 LinkedIn followers
- 345 newsletter subscribers
- 1,241 YouTube video views
- 35,869 website pageviews (in the past year)

Top Tweet:

Our Scientific Director won the @ASTechFDN Award for Outstanding Leadership in Alberta Science! astech.ca/awardee/final... @ualbertaScience
Glycomics is a multidisciplinary field with broad potential applications. GlycoNet’s research program focuses on applications in human health and is based on five themes: antimicrobials, rare genetic diseases, diabetes and obesity, chronic diseases, and therapeutic proteins and vaccines.

$10 MILLION IN FUNDED PROJECTS

25 research projects

5 THEMES
Over the past year, the network committed more than $10 million to 25 research projects in these five themes, including 17 collaborative team projects that involve numerous network investigators.

Each of these projects has a translational vision, with some projects having a clear path toward a drug, product or technology, and others aimed at validation of a drug target or technology platform. Many of these projects include key partnerships with industry or other institutions, including the Centre for Drug Research and Development, the U.S. National Institutes of Health, and foundations such as the Michael J. Fox Foundation, all of which help support our translational goals.
Antimicrobials

The area of antimicrobials is one of our largest and most active research areas. It is also an area of utmost importance, as there is a recognized need for novel treatments of bacterial and fungal infections in the face of growing antibiotic resistance. Dr. Sachiko Sato and her team are researching therapies for Cryptococcus gattii, a serious fungal infection common in British Columbia. Other work by Dr. Eric Brown and his co-investigators examines the role of wall teichoic acid as a target for treating methicillin-resistant Staphylococcus aureus, while a project led by Dr. Lynne Howell is focused on the acetylation of carbohydrates in bacterial biofilms, which could have far-reaching effects on numerous bacterial and fungal infections. Read more about these two projects on pages 18 and 20.

THE SECRET LIFE OF CARBOHYDRATES

Everyone knows that carbohydrates are an important source of food energy, but did you know that carbohydrates play a central role in how cells work? Carbohydrate chains, or glycans, are found in the membrane of every living cell. Carbohydrates can also attach to proteins or lipids to form larger, more complex molecules. This makes them one of the largest, most diverse classes of molecules in nature – they are the key to almost every biological process. Glycomics is the study of these carbohydrate chains. With glycans playing such a diverse role in our bodies, there are many ways that glycoscientists can harness carbohydrates to improve human health.
Rare Genetic Diseases

There are unique opportunities to apply glycomics research to treatment for rare genetic diseases, and we have been making strides in this area. Dr. Lorne Clarke and Dr. Stephen Withers have made excellent progress developing pharmacological chaperones – therapeutics that help key proteins to function better – that could be used to treat Gaucher disease, Tay Sachs disease, and even Parkinson’s. Read more about this story on page 16. Dr. David Vocadlo and his co-investigators are also working towards glycomics-based diagnostic and treatment methods for Parkinson’s disease by boosting levels of a key beneficial enzyme in the brain.

Diabetes and Obesity

Regulating the human breakdown of carbohydrates has many associated clinical applications, particularly in the areas of diabetes and obesity. Dr. Stephen Withers and his team are developing a new therapeutic called Montbretin A that would help diabetics control their blood glucose levels, without the unpleasant side effects of current treatments. Read more about this project on page 14.
Chronic Diseases

Research in this area is largely focused on exploiting changes in carbohydrate expression, which is often abnormal in cancerous cells and other diseased human tissues. Dr. Christopher Cairo is researching a therapeutic target for the prevention or treatment of atherosclerosis, a buildup of fatty plaque in the arteries that contributes to heart attack and stroke. Dr. Yvan Guindon’s work is focused on treatment of inflammation-related diseases, while other projects in this area are looking at treatments for cancer, inflammatory bowel disease and new techniques for tumour detection.

Therapeutic Proteins and Vaccines

Therapeutic proteins and vaccines are key biologicals in which carbohydrates play a critical role. Dr. Warren Wakarchuk is studying the potential for genetically engineered *E. coli* to be used to glycosylate proteins for therapeutic application. Dr. Ken Ng’s project is focused on antibody-based therapeutics that recognize carbohydrates for *Clostridium difficile* infections, which is a serious infection common in hospitals. In Canada in 2013, the overall rate of *C. difficile* infection was 4.25 per 1,000 patient admissions.
This section of the GlycoNet annual report highlights some of our most exciting research to date.

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A better way to manage blood glucose levels for diabetics

16
Pharmacological chaperones: A promising new treatment for genetic diseases

18
Disassembling bacteria’s protective walls

20
Developing new leads in the fight against antibiotic resistant bacteria
Thanks to a common garden flower, a GlycoNet project is making progress on a new therapy to help diabetics keep their blood glucose levels stable.

Dr. Stephen Withers has discovered a compound called Montbretin A, which comes from the common garden plant called Montbretia. He plans to use this compound to control the release of glucose into the bloodstream.

When we eat meals containing starch, it is degraded to glucose in our digestive system by enzymes, before being released into the bloodstream. For people with diabetes, whose bodies are unable to balance their blood glucose levels, a flood of glucose – high blood sugar – can cause serious complications, including kidney and nerve damage.

“If you could inhibit those enzymes – develop molecules that would slow those enzymes down – then you could slow the release of glucose into the bloodstream,” explains Withers, a professor at the University of British Columbia and lead investigator on this project.
While there are two drugs on the market that achieve a similar end, they come with a variety of unpleasant side effects, meaning that many people do not take them as they should. Withers and his team have tested Montbretin A on diabetic rats and found that it slows the release of glucose and has limited side effects, making it an ideal therapy.

Withers is optimistic about the potential of the drug, especially given the growing diabetes epidemic around the world. The Canadian Diabetes Association estimated that in 2015, 3.4 million Canadians were living with diabetes, and an additional 5.7 million – 22 per cent of the population – have pre-diabetes. Pre-diabetes occurs when blood glucose levels are elevated, and about 50 per cent of pre-diabetics will develop Type 2 diabetes in their lifetime.

“It’s a situation that’s going to need multiple different approaches,” says Withers. “What we’re developing is not a cure, but we’re going to need other control means – and one such means is the sort of molecule we’re talking about.”

Now the team, consisting of Withers, Dr. Joerg Bohlmann and Dr. Gary Brayer, are looking at scaling up the production of Montbretin A. Bohlmann is specifically working on understanding how Montbretia synthesizes the Montbretin A compound, with the goal of providing an alternative supply.

“The key thing we need to know now is if we could ever produce sufficient quantities to deal with the market size that is potentially there,” says Withers, who estimates that the drug may be needed to treat tens of millions of people.

The team plans to use a GlycoNet commercialization grant to produce enough Montbretin A to carry out a large animal study. If they get promising results, they hope to move on to a human clinical trial in partnership with a start-up pharmaceutical company called Montbretin Therapeutics and Health Canada.

"The key thing we need to know now is if we could ever produce sufficient quantities to deal with the market size that is potentially there."

DR. STEPHEN WITHERS
PHARMACOLOGICAL CHAPERONES: A PROMISING NEW TREATMENT FOR GENETIC DISEASES

Potential applications for Gaucher disease and Tay-Sachs disease

Every protein in a cell is sorted in the endoplasmic reticulum before it moves to other parts of the cell – think of it as a mailroom for proteins. If a piece of mail is missing an address, it’s thrown in the garbage. The same thing happens to defective proteins in a cell.

One way proteins can be defective is that they don’t fold into the right shape. But in many genetic diseases, including Gaucher disease and Tay-Sachs disease, a mutation prevents proteins from folding properly, but the proteins actually still work. If only they weren’t thrown in the garbage, they would be able to perform their proper function. That’s where a pharmacological chaperone, a small molecule that helps proteins fold, can assist.

“One of the most exciting aspects of this project is that we’re really at the cutting edge of the development of a novel group of therapeutic drugs,” says Dr. Lorne Clarke, a professor at the University of British Columbia and lead investigator on the GlycoNet project developing this therapy.
“If you isolate the protein and protect it from being degraded, it actually is active,” says Clarke. “For proteins taking too long to fold, chaperones encourage the proteins to fold and allow them to be escorted to where they should be – the lysosome.”

Clarke and co-investigator Dr. Stephen Withers are testing pharmacological chaperones in humanized mice models as potential treatments for Gaucher disease and Tay-Sachs disease, and so far they’ve had promising results. Their preliminary data for Gaucher disease indicated that their compounds resulted in a two-fold increase in the amount of proteins active in their mice. The next step will be tweaking their compounds.

“The molecules we have now are designed to be inhibitors. The inhibitor will hold the protein in the folded state in order for it to be targeted properly in the cell,” says Clarke. “But the inhibitors that we made are so good that they continue to inhibit the enzyme once it leaves the endoplasmic reticulum. The next step is making the inhibitor good in the endoplasmic reticulum, but poor in the lysosome where we want the enzyme to function properly.”

The hope is that by preserving the protein and preventing it from being degraded, it will ultimately work as intended, decreasing symptoms in patients.

“We specifically chose these disorders because we know the proteins still work in isolation,” adds Clarke. “Another exciting thing is the link between mutations in Gaucher disease and Parkinson’s disease. So chemical chaperones may be applicable for Parkinson’s.”

The genetic mutation that indicates a risk for Parkinson’s disease is the same mutation present in Gaucher disease, and so a link seems likely.

Gaucher disease is a genetic lipid storage disease that affects 1 in 50,000 people, resulting in liver malfunction, neurological complications, skeletal complications and more. While some treatments are already available for Gaucher disease, they are not effective for all patients. Tay-Sachs disease causes the deterioration of nerve cells in the brain and spinal cord and there is no known treatment. The most common form of Tay-Sachs disease occurs in infants who usually do not survive past early childhood.
A bacterium or fungal infection is difficult enough to treat, but when these infections form protective biofilms, it makes them even more stubborn. Now, the solution being explored by GlycoNet scientists is to prevent the biofilm from forming in the first place.

“Bacteria and fungi can produce a force field or matrix around themselves,” says Dr. Lynne Howell, lead investigator of the project and a researcher at The Hospital for Sick Children in Toronto. This force field – the biofilm – is a protective barrier composed of proteins, DNA and sugar polymers that makes bacteria or fungi 1,000 times more tolerant of antibiotics.

The team, made up of eight network investigators, is studying four different sugar polymers found in microbial biofilms, with the aim of influencing polymer composition and biofilm production. For these polymers, the addition or removal of acetate is critical for the virulence of the bacteria. A fifth polymer being studied is crucial for the structural integrity of the bacteria and in this case, the addition of acetate allows resistance to host defence mechanisms.
“The general concept is that if you can prevent the removal or addition of acetate, then you have a means of modulating the biofilm that’s formed and reducing the virulence of the bacteria, or removing their resistance to innate immune response,” says Howell.

By disrupting the biofilm’s production, the overall goal is to make a bacterial or fungal infection more treatable.

“We would use these inhibitors in conjunction with traditional antimicrobials. This could prevent bacteria from forming biofilms in the first place, which will make conventional antibiotics much more effective,” says Howell. “We would have the ability to target a very large number of different pathogens through the various polymers that we’re hitting.”

This approach could be particularly effective in chronic bacterial infections, such as cystic fibrosis. About 80 per cent of chronic bacterial infections are thought to produce biofilms.

“We need alternative ways of treating chronic infections,” says Howell. “It’s increasingly appreciated that targeting free-swimming bacteria or fungi is not relevant to the types of infections in which the bacteria or fungi are now embedded in a biofilm.”

In addition, Howell and her team suspect that this approach may help slow antibiotic resistance, which has been identified by the Centers for Disease Control and Prevention in the United States as one of the most pressing health issues of our time.

“If you’re not putting a selective pressure on the bacteria to be killed, then resistance to the compounds we’re developing should develop more slowly” •
PROJECT INVESTIGATORS: DR. ERIC BROWN, DR. NATALIE STRYNADKA, DR. GERARD WRIGHT

DEVELOPING NEW LEADS IN THE FIGHT AGAINST ANTIBIOTIC-RESISTANT BACTERIA

A unique cell wall target yields promising results against *Staphylococcus aureus*

Dr. Eric Brown and his co-investigators have several promising leads in their novel approach to targeting methicillin-resistant *Staphylococcus aureus* (MRSA).

MRSA is a bacterial infection that is resistant to most antibiotic treatments, often occurring in healthcare settings such as hospitals or nursing homes, and also in the community. It is one of the leading causes of health-care associated infections worldwide.

The approach of Brown and his co-investigators is unique in that they are targeting a component of the cell wall that has not been targeted before called wall teichoic acid (WTA), a glycopolymer on the bacterial cell wall that is essential for the organism to survive and thrive. WTA plays a key role in resistance to antibiotics.
“We just think this pathway is ripe for more discovery,” explains Brown, a professor at McMaster University. “We can run chemical screens just looking for inhibition of growth of bacteria, but that doesn’t give us a lot of information. You want to put effort into something that is very selective.”

The synthesis of WTA consists of numerous steps — the idea is that by inhibiting one of these steps and disrupting the synthesis, the bacteria will become more sensitive to antibiotics.

This approach has already proved successful, as the team previously identified two drugs capable of reducing drug resistance in MRSA: clomiphene, a fertility drug; and ticlopidine, which can be used to prevent stroke. The next step will be optimizing these leads for potential clinical use.

“We think they’re not quite as potent as they need to be,” says Brown. “After all, these are cryptic activities. We think they’re great leads, though they might not be the end game, but they’re good starting points.”

Meanwhile, the team is doing more screening, both of synthetic and natural compounds, and Brown is hopeful that they will find more leads in this area.

“There’s already one known natural product that targets the first step in WTA synthesis but it’s not an ideal lead,” says Brown. “But it’s kind of proof-of-principle that natural products out there can halt WTA synthesis.”

If we take on truly new targets, we believe that will generate new chemical matter that will get around resistance mechanisms.

DR. ERIC BROWN

The team is working on optimizing both clomiphene and ticlopidine in an effort to make the drugs more potent against MRSA. They are currently engaged in discussions with the U.S. National Institutes of Health on the potential of ticlopidine.

“There’s a real crisis in terms of drug resistance that’s really changing modern medicine. There’s been no truly new drugs discovered for at least 30 years... If we take on truly new targets, we believe that will generate new chemical matter that will get around resistance mechanisms.”
First annual Canadian Glycomics Symposium brought together diverse scientific community

200 ATTENDEES

20 invited and selected presentations

7 trainee speakers

66 HQP workshop participants

91 POSTERS
Academic and industry members of the glycomics research community in Canada and throughout the world travelled to Banff, Alberta for the first Canadian Glycomics Symposium, held May 18-20, 2016.

The event drew more than 200 delegates and featured eight keynote speakers, who spoke on a variety of topics from synthetic chemistry to clinical sciences. The event is the sole conference dedicated to glycomics in Canada.

"It was exciting to see the diversity of delegates who attended from across the country," says GlycoNet Scientific Director Dr. Todd Lowary. "We had attendees from different backgrounds – from synthetic chemists to microbiologists to clinicians – and we gave them the forum to meet, network and discuss collaborations. I am confident we’ll see the fruit of these discussions in the future."

Sessions during the symposium featured eight keynote presentations, as well as selected talks from network investigators, trainees and other researchers. The presenters were from a variety of disciplines, and demonstrated the breadth of diseases under investigation and the interdisciplinary nature of glycomics research.
“I think the scientific portion of the symposium was incredible,” says Lowary. “All presentations were high-caliber and shared ground-breaking and fascinating work.”

The symposium was preceded by GlycoNet’s first Annual General Meeting, a gathering of the network and its membership, focused on evaluation of the GlycoNet research program, along with networking and professional development opportunities for trainees.

“"We had attendees from different backgrounds – from synthetic chemists to microbiologists to clinicians – and we gave them the forum to meet, network and discuss collaborations."

DR. TODD LOWARY, GLYCONET SCIENTIFIC DIRECTOR

Other highlights from the event included a seminar on translation, ethics, and intellectual property in the health sciences, an industry presentation from companies active in glycomics and a joint workshop with the Canadian National Transplant Research Program (CNTRP).

The event also featured a poster session, with more than 90 posters presented by network trainees and scientists from outside the network. Five poster awards, as voted on by symposium delegates, were awarded.
The GlycoNet trainee community is made up of more than 100 students and professionals conducting network research and participating in the training program.

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Undergraduate students gain new skills and connections

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Teachers delve into carbohydrate chemistry

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AGM provides networking and professional development opportunity
Training the next generation of scientists is essential to continuing the tradition of groundbreaking research in glycomics.

Through GlycoNet, trainees are conducting original research, receiving mentorship from world-class scientists, and gaining unique opportunities for training and networking, all of which prepare them for successful careers in academia or industry. In addition to research, our training program includes industrial internships, lab exchanges, and professional and technology workshops and webinars. We also offer programs geared towards high school and undergraduate students, with the aim of introducing young students to the field of glycomics and its far-reaching applications.

The Training Committee and the GlycoNet Trainee Association Executive Committee (GTA-EC) are the driving forces behind GlycoNet’s training program. The GTA-EC takes an active role in informing and developing program initiatives, including the planning and facilitation of activities and workshops at the GlycoNet annual general meeting. The GTA-EC also facilitates networking and communication among trainees through a trainee newsletter. The number of GlycoNet trainees continues to grow and activities are being enhanced to ensure an enriching experience for the trainee community.

UNDERGRADUATE STUDENTS GAIN NEW SKILLS AND CONNECTIONS

The GlycoNet undergraduate student awards allow undergraduate students to pursue summer research projects supervised by a GlycoNet network investigator. Here are what some of this year’s award winners had to say about their experiences.

Gray Meckling
University of British Columbia

Supervisor: Dr. Joerg Bohlmann
Project: Improved therapeutic amylase inhibitors via synthesis and synthetic biology

“My summer research project has been a valuable experience that has helped solidify my goals. One of the key insights I’ve obtained is a new appreciation for the relationship between basic research and applied science. Investigating the novel anti-diabetic Montbretin A has exposed me to the early stages of drug development and increased my passion for research. I’ve also reinforced a set of transferable skills that will act as a foundation for my future in science.”
Alysha Burnett
Wilfrid Laurier University

**Supervisor:** Dr. Joel Weadge  
**Project:** Unraveling the biosynthetic logic of exopolysaccharide phosphonate tailoring in the oral microbiome: towards species-specific disruption of pathogenesis in periodontal disease

“Being part of a research team on a GlycoNet project this summer has allowed me to expand my microbiology and biochemistry skills with independence. My experiences have granted me more confidence as a future scientist and led to my decision to pursue a Master’s degree at Wilfrid Laurier University. The feedback I received from the GlycoNet conference, as well as from my own supervisors, has given me a new perspective on the project and truly demonstrated how important glycomics is in research related to human disease. I strongly believe that the GlycoNet projects will lead to a better future for Canadians suffering from serious illnesses based on the research collaborations and the goals set by each project.”

Zahra Yussuf
Wilfrid Laurier University

**Supervisor:** Dr. Geoff Horsman  
**Project:** Unraveling the biosynthetic logic of exopolysaccharide phosphonate tailoring in the oral microbiome: towards species-specific disruption of pathogenesis in periodontal disease

“Beyond my undergraduate studies, I hope to one day contribute to the development of drug and antimicrobial research in a career as a medical professional. I believe the experiences I’ve gained this summer in my involvement with research have brought me closer to my future career aspirations. Through the exploration of bacterial pathogens involved in periodontal disease, I have established an understanding of bacterial cellular machinery and its role in pathogenicity. I believe that the progression of this project may have the potential to make significant contributions to the advancement of antimicrobial research, which ultimately aims to improve the quality of healthcare and, consequently, the lives of Canadians.”
Michelle Johnsrude may be the head of the science department at Highroad Academy in Chilliwack, BC, but she admits she didn’t know much about glycomics when she was first presented with the opportunity to work in a GlycoNet research lab.

But after being placed in the labs of Dr. Stephen Withers and Dr. Harry Brumer at the University of British Columbia in summer 2015, Johnsrude entered September with some new material on carbohydrate chemistry to use in her classroom.

Johnsrude was one of four teachers that had the unique experience of working within the labs of GlycoNet researchers in summer 2015, as part of a joint initiative between GlycoNet and the Centre for Mathematics, Science & Technology Education (CMASTE) at the University of Alberta. The project places teachers within the labs of researchers where they can develop resources and activities for use in high school classrooms.
“It gives teachers a more in-depth perspective of a scientific research world, because science teachers understand science...but few of them have actually spent time in a research lab,” says Dr. Robert Bechtel, Associate Director of CMASTE. “They become better teachers because they understand science even more after the experience.”

Johnsrude describes the placement as an extremely valuable professional development opportunity, particularly to have such open access to scientists who are at the forefront of their fields. “I wish that every teacher could have the opportunity to do this, just because you get immersed in real science again,” says Johnsrude, who was one of two BC teachers placed at UBC.

In addition to the UBC placements, two Ontario teachers were placed in the labs of Dr. Chris Whitfield at the University of Guelph and Dr. Eric Brown at McMaster University, including David Kamatovic.

“It’s not often that you get to work with some of the leading scientists and researchers in the areas of biochemistry and microbiology, so that was quite rewarding to interact with them on some curriculum,” says Kamatovic. “I think more projects like this, where you’re linking secondary teachers with university professors helps that transition.”

Beyond the benefits for teachers and students, Bechtel stresses how important this program is for promoting science within the community. The goal is for the program to expand in future years, and in summer 2016, teachers were placed in labs in Edmonton and Quebec City.

“It’s an opportunity for the science that’s happening in local universities to actually be dispersed out through the community,” Bechtel says. “It’s a great way of letting the community know the quality and level of science that’s literally happening in their backyard.”

The lesson plans created by the teachers are available in both English and French and are offered for free, for anyone to use, on the CMASTE and GlycoNet websites.
AGM PROVIDES NETWORKING AND PROFESSIONAL DEVELOPMENT OPPORTUNITY TO TRAINEES

“It was one of the best conferences that I’ve ever been to,” says François Le Mauff, a post-doctoral fellow at McGill University who attended the first GlycoNet Annual General Meeting in Banff from May 16-18, along with more than 60 other network trainees.

Trainees attending the AGM had plenty of networking opportunities, including a trivia night and a mixer.

“I really enjoyed the interaction and networking with the other trainees,” says Le Mauff, who is also part of the GlycoNet Trainee Association Executive Committee. “The trainees are the PIs of tomorrow so having a good network now will mean that we have a good network in the future.”

The trainees also participated in a full-day workshop on one of three topics of their choice: science communication, project management, and entrepreneurship.

“All the events were just amazing. Everyone had good feedback about the organization and choice of presenters for the workshops,” says Le Mauff.
The science communication workshop was led by Jay Ingram, former host of CBC Radio’s *Quirks & Quarks* and the Discovery Channel’s *Daily Planet*, and Mary Anne Moser, author and founder of the Banff Centre Press. The project management workshop was led by Robyn Roscoe, Director of Management and Administration for the BC Cancer Agency Genome Sciences Centre (GSC), while the entrepreneurship workshop was offered in conjunction with Mitacs and led by Roger Patterson, one of Canada’s foremost tech entrepreneurs.

The following morning, trainees also participated in a seminar entitled “Translation, ethics, and intellectual property in the health sciences.” This seminar provided trainees with a solid introduction to the “bench-to-bedside” journey of health treatments, highlighting important considerations and decisions that must be made along the way. The presenters, with complementary expertise in commercialization, IP, and clinical ethics, concluded the seminar by answering audience questions in a panel discussion.

“The AGM is a fantastic opportunity to build the trainee community. It was great to see people from across the country and from different labs interacting with each other,” says GlycoNet Training Coordinator, Ryan Snitynsky. “Many of these relationships will be important throughout their entire careers.”

“If trainees want to meet people from GlycoNet and continue to work in glycobiology in Canada, it’s the place to be,” adds Le Mauff. “
GlycoNet recognizes that partnership is key to successfully translating outstanding research into tangible outcomes. The pillars of our partnership strategy include:

Building strong lines of communication with industry

Partnering with industry in joint funding of research projects

Developing an industrially-focused research program

Leveraging existing relationships
Work in this area has already started. On a project level, GlycoNet researchers have engaged private companies, foundations and institutions for collaboration and have received $1.7 million in cash and in-kind contributions from partners in the past year.

Here are some of our other recent successes.

### Alberta Innovates Technology Futures provides funding support to GlycoNet

Alberta Innovates Technology Futures has agreed to provide GlycoNet with $500,000 per year over three years, with the possibility of two additional years of funding. This $1.5 million dollar commitment will be used for network governance, partnership and business development activities. AITF supports research and innovation activities that encourage science and technology development in Alberta.

### GlycoNet partners with international companies on carbohydrate provision

GlycoNet has partnered with French biotech company Elicityl, which offers a catalogue of carbohydrates for fundamental research. Elicityl is interested in strategic partnerships for the design and development of oligosaccharides and polysaccharides for biomedical applications and nutraceuticals. Elicityl has also agreed to sponsor the annual symposium and provide two per cent cashback on GlycoNet on network investigator purchases.

GlycoNet has also partnered with the American company CordenPharma, which will provide a compound library to GlycoNet, enhancing the network’s collection of mammalian and microbial glycans.
GlycoNet-CNTRP workshop brings researchers together

At the Canadian Glycomics Symposium in May 2016, GlycoNet and the Canadian National Transplant Research Program (CNTRP) hosted a joint workshop. The workshop brought together glycomics and transplantation researchers to interact, learn about each other’s research, and explore research partnerships.

“The GlycoNet-CNTRP workshop was a great way to foster new relationships among scientists in overlapping areas,” says GlycoNet Executive Director, Dr. Elizabeth Nanak. “There are many areas in which transplantation and glycomics fit together, including on issues of rejection and preservation of organs.”

GlycoNet establishes Commercialization Committee

The ability of GlycoNet to translate research advances into tangible benefits for Canadians will be greatly aided by the newly-established independent Commercialization Committee. The Commercialization Committee will assist in evaluating worthy projects, developing patent protection, product development and commercialization strategies, and identifying suitable partners to help turn great ideas into reality. Independent committee members include Dr. Stephanie White (Partner at MBC Intellectual Property Law), Dr. David Rabuka (Global Head of R&D and Chemical Biology at Catalent Pharma Solutions), and Dr. Diane Gosselin (CEO of CQDM, a business-led NCE).
GlycoNet provides $800,000 to fund translational research

Four GlycoNet projects were recently awarded $200,000 one-year translational grants to advance promising research towards commercialization.

Dr. Steven Withers received a grant for continuing research on a glucose control drug called Montbretin A, which will be used for large-animal studies. Dr. Yvan Guindon will use the grant to further preclinical testing of a molecule that may be effective in preventing chemotherapy-induced heart failure, which is an increasingly common complication associated with anti-cancer therapy.

Dr. Donald Sheppard received a grant to pursue preclinical evaluation of hydrolase therapy for two pulmonary pathogens, while Dr. Yves St-Pierre received a grant to pursue the development of a new class of anti-cancer drugs.

These projects were selected based on their research merit and also their plans for commercialization. Phase II funding will be available, provided the projects bring an industry partner on board to continue development.

Workshop brings together network investigators and industry

Four national and international companies active in the glycomics field participated in a workshop at the GlycoNet Annual General Meeting. The companies detailed their research programs and discussed strategies and challenges of industrial research. They also offered opportunities for collaboration with GlycoNet researchers. The companies included: Limmatech Biologics, ProZyme, Mirexus, and Glycosyn.
GlycoNet is proud to have a number of internationally-acclaimed and award-winning scientists within our ranks. These researchers are top in their fields and their involvement in the network is crucial to our research program. This section details the accomplishments of some of our network investigators over the past year.
**Dr. Natalie Strynadka named a Fellow of the Royal Society**

Dr. Natalie Strynadka (University of British Columbia) became a Fellow of the Royal Society in July 2015 for her pioneering work on the study of proteins and protein assemblies essential to bacterial pathogenicity and antibiotic resistance.

Dr. Strynadka’s agenda-setting dissection of the membrane assemblies involved in infection, virulence and bacterial cell wall synthesis is having major impact in the development of therapeutic agents, including both antibiotics and vaccines.

**Dr. Lori West receives 2015 Dossetor Award**

GlycoNet investigator Dr. Lori West (University of Alberta) was awarded the Dr. John B. Dossetor Research Award from the Kidney Foundation of Canada in June 2015.

The award recognizes outstanding service to the Kidney Foundation’s research program. Dr. West, who is also the Director of the Canadian National Transplant Research Program, received the award along with her co-director Dr. Marie-Josée Hébert.

**Dr. John Klassen wins ASMS Ron Hites Award**

Dr. John Klassen, GlycoNet investigator and Scientific Director of the Alberta Glycomics Centre, received the 2015 Ron Hites Award from the *Journal of the American Society for Mass Spectrometry* in June 2015.

The Ron Hites Award recognizes an outstanding presentation of original research. Dr. Klassen received the award, along with his co-authors, for their paper *Energetics of Intermolecular Hydrogen Bonds in a Hydrophobic Cavity*, published in JASMS in 2014.

**Dr. Mona Nemer inducted into National Academy of Medical Sciences**

GlycoNet investigator Dr. Mona Nemer (University of Ottawa) was inducted into the National Academy of Medical Sciences in Córdoba, Argentina in May 2016.
Dr. Joerg Bohlmann named a Fellow of the Royal Society of Canada

Elected for his contribution to the fields of plant and forestry genomics, GlycoNet investigator Dr. Joerg Bohlmann became a Fellow of the Royal Society of Canada in November 2015.

Election to the RSC is one of the highest Canadian honours a scholar can achieve and recognizes the outstanding contributions the recipient has made to their field.

Dr. Bohlmann (University of British Columbia) is distinguished for his research on the genomics of defence and resistance mechanisms of conifers against insect pests and insect-associated fungal pathogens, as well as on plant terpenoid biochemistry. New systems for high value bioproducts, as well as groundbreaking approaches for conifer improvement, are emerging from this work.

Dr. Todd Lowary receives ASTech Award for Outstanding Leadership

Recognized for his leadership in synthetic carbohydrate chemistry and for his work in establishing the Canadian Glycomics Network, GlycoNet Scientific Director Dr. Todd Lowary received the 2015 ASTech award for Outstanding Leadership in November 2015.

Dr. Lowary is the Scientific Director of GlycoNet and holds a Canada Research Chair in carbohydrate chemistry at the University of Alberta. His work focuses on the function of carbohydrates in mycobacterial diseases, including tuberculosis, and is leading to the development of new diagnostic tools and therapeutic approaches to address global health challenges.

This award salutes an individual who has played a substantial leadership role in a scientific innovation or breakthrough. The Alberta Science and Technology Leadership (ASTech) Foundation is a not-for-profit organization dedicated to showcasing the substantial achievements in science and technology in Alberta.

Dr. Mark Nitz awarded Horace S. Isbell Award

Dr. Mark Nitz (University of Toronto) was awarded the 2016 Horace S. Isbell Award from the American Chemical Society Carbohydrate Division. The award acknowledges excellence in and promise of continued quality of contribution to research in carbohydrate chemistry. The winner must be under the age of 45 at the time of the award.
NETWORK MEMBERS

CHU Sainte Justine
Dalhousie University
Institut de recherches cliniques de Montréal
Institut national de la recherche scientifique (INRS)
London Health Sciences Centre
McMaster University
Queen’s University at Kingston
Ryerson University
Simon Fraser University
The Hospital for Sick Children
The Research Institute of the McGill University Health Centre
Université de Montréal

Université du Québec à Montréal
Université Laval
University of Alberta
University of British Columbia
University of Calgary
University of Guelph
University of Manitoba
University of Ottawa
University of Saskatchewan
University of Toronto
University of Victoria
University of Waterloo
Wilfrid Laurier University
PARTNERS

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Infectious Diseases and Immunity in Global Health, McGill University
Medical University of South Carolina
Tohoku Pharmaceutical University
University of Adelaide Center for Molecular Pathology
University of California, Los Angeles
University of California, San Francisco
University of Michigan Medical School
University of Minnesota Twin Cities
University of Texas – Southwest Medical Centre
University of Tokyo
University of Washington

Federal/provincial departments and agencies
Agriculture and Agri-Foods Canada
Alberta Glycomics Centre
Alberta Health Services
Alberta Innovates - Technology Futures
Alberta Livestock and Meat Agency
National Research Council
Province of Ontario
Research Manitoba

Industry
Alberta Chicken Producers
Alectos Therapeutics
Baebies Inc. (US)
CordenPharma (US)
Elicityl (France)
Montbretin Therapeutics
PlantForm
PROCURE Biobank
Seneb Biosciences (US)
Zymeworks Inc.

Other
Centre for Drug Research and Development (non-profit)
CQDM (non-profit)
Cystic Fibrosis Canada (non-profit)
Institut des Maladies Metaboliques et Cardiovasculaires (France)
MaRS Innovation (non-profit)
Massachusetts General Hospital (US)
Memorial Sloan-Kettering Cancer Center (non-profit) (US)
Michael J. Fox Foundation (non-profit) (US)
National Institute of Allergy and Infectious Diseases (US)
Shemyakin & Ovchinnikov Institute of Bioorganic Chemistry (Russia)
St. Paul’s Hospital, Vancouver
Structural Genomics Consortium (research consortium)
TRIUMF
Network Community

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Executive Director, Canadian Glycomics Network (GlycoNet) (observer)

Richard Schwartzburg
Senior Program Manager, Networks of Centres of Excellence (observer)

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Frank Gleeson
President, Gleeson & Associates

Diane Gosselin
President and Chief Executive Officer, CQDM

Digvir Jayas
Vice-President (Research & International), University of Manitoba

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Senior Director, Johnson & Johnson Innovation

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Global Head of R&D, Catalent Pharma Solutions

Stephanie White
Partner, MBM Intellectual Property Law

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Executive Director, Canadian Glycomics Network (GlycoNet) (observer)

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Senior Program Manager, Networks of Centres of Excellence (observer)
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Partner, Blake, Cassels & Graydon LLP

Frank Gleeson
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Managing Director, Echelon Wealth Partners

Todd Lowary
Professor, University of Alberta & Scientific Director, Canadian Glycomics Network (GlycoNet)

Mark Nitz
Professor, Department of Chemistry, University of Toronto

Elizabeth Nanak
Executive Director, Canadian Glycomics Network (GlycoNet) (observer)

Richard Schwartzburg
Senior Program Manager, Networks of Centres of Excellence (observer)

Nominating Committee

Frank Gleeson
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Vice-President (Research), Simon Fraser University

Todd Lowary
Professor, University of Alberta & Scientific Director, Canadian Glycomics Network (GlycoNet)

Mark Nitz
Professor, Department of Chemistry, University of Toronto

Elizabeth Nanak
Executive Director, Canadian Glycomics Network (GlycoNet) (observer)

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Senior Program Manager, Networks of Centres of Excellence (observer)
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Director, Genentech

Paul DeAngelis
Presidential Professor, University of Oklahoma

Yvan Guindon
Professor & Director, Institut de Recherches Cliniques de Montréal

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Principal, Llinas-Brunet MedChem Consulting Inc

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Maarten Postema
Director, Eisai Pharmaceuticals

Vern Schramm
Ruth Merns Chair in Biochemistry, Albert Einstein College of Medicine of Yeshiva University

Donald Vinh
MD, Research Institute of the McGill University Health Centre

Chris Whitfield
Professor, Guelph University

Stephen Withers
Professor, University of British Columbia

Steven Xanthoudakis
Director, Merck Research Lab

Frank Gleeson
Board of Director Chair, Gleeson & Associates (observer)

Elizabeth Nanak
Executive Director, Canadian Glycomics Network (GlycoNet) (observer)

Richard Schwartzburg
Senior Program Manager, Networks of Centres of Excellence (observer)

Ryan Snitinsky
Training and Project Management Coordinator, Canadian Glycomics Network (GlycoNet) (observer)

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Professor, University of Maryland

Robert Young
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Senior Research Scientist I, Process Development, Gilead Alberta ULC

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Tianlin Guo
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Post-Doctoral Fellow, University of Toronto

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Training and Project Management Coordinator, Canadian Glycomics Network (GlycoNet) (observer)

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Scientific Director

Elizabeth Nanak
Executive Director

Ryan Snitynsky
Training and Project Management Coordinator

Chardelle Prevatt
Communications Associate

Karli Buckle
Administrative Assistant

Jennifer Hicks
Financial Administrator
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Joerg Bohlmann
University of British Columbia

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Marty Boulanger
University of Victoria

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University of Alberta

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University of Guelph

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University of Alberta

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Concordia University

Joseph Lam
University of Guelph

Chang-Chun Ling
University of Calgary

Todd Lowary
University of Alberta

Mark MacLachlan
University of British Columbia
Network Investigators continued

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David Rose  
University of Waterloo

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University of Alberta

Roman Melnyk  
Hospital for Sick Children

Rene Roy  
University of Quebec and Montreal

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Queen's University

Heather Wilson  
University of Saskatchewan

Manu Rangachari  
University of Laval

Vesna Sossi  
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Stephen Withers  
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Brian Rempel  
University of Alberta

Natalie Strynadka  
University of British Columbia

Gerard Wright  
McMaster University

James Rini  
University of Toronto

Michael Suits  
Wilfrid Laurier University

Wesley Zandberg  
University of British Columbia

Bingyun Sun  
Simon Fraser University

George Zhanel  
University of Manitoba
Independent Auditor’s Report

To the Members of the Canadian Glycomics Network

We have audited the accompanying financial statements of Canadian Glycomics Network which comprise the statement of financial position as at March 31, 2016 and the statements of operations, changes in net assets and cash flows for the year then ended and a summary of significant accounting policies and other explanatory information.

Management’s Responsibility for the Financial Statements
Management is responsible for the preparation and fair presentation of these financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of financial statements that are free from material misstatement, whether due to fraud or error.

Auditor’s Responsibility
Our responsibility is to express an opinion on these financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor’s judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the organization’s preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the organization’s internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

Opinion
In our opinion, the financial statements present fairly, in all material respects, the financial position of Canadian Glycomics Network as at March 31, 2016 and its financial performance and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

Edmonton, Canada
July 20, 2016

Chartered Professional Accountants, Chartered Accountants
# Canadian Glycomics Network
## Statement of Financial Position

March 31, 2016

<table>
<thead>
<tr>
<th>Assets</th>
<th>2016</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td></td>
<td>(Restated)</td>
</tr>
<tr>
<td>Cash</td>
<td>$522,882</td>
<td>$-</td>
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<tr>
<td>Accounts receivable</td>
<td>1,000</td>
<td>-</td>
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<tr>
<td>Prepaid expenses</td>
<td>8,416</td>
<td>9,257</td>
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<tr>
<td></td>
<td><strong>532,298</strong></td>
<td><strong>9,257</strong></td>
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<td>Due from Network Host (Note 3)</td>
<td><strong>6,932,726</strong></td>
<td><strong>4,095,121</strong></td>
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<tr>
<td></td>
<td><strong>$7,465,024</strong></td>
<td><strong>$4,104,378</strong></td>
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<table>
<thead>
<tr>
<th>Liabilities</th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payables and accruals</td>
<td>$8,635</td>
<td>$1,825</td>
</tr>
<tr>
<td>GST/HST payable</td>
<td>2,158</td>
<td>-</td>
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<tr>
<td></td>
<td><strong>10,793</strong></td>
<td><strong>1,825</strong></td>
</tr>
<tr>
<td>Deferred revenue (Note 4)</td>
<td><strong>7,426,730</strong></td>
<td><strong>4,102,553</strong></td>
</tr>
<tr>
<td>Net assets</td>
<td><strong>7,437,523</strong></td>
<td><strong>4,104,378</strong></td>
</tr>
</tbody>
</table>

| Net assets                   |        |        |
| Unrestricted net assets      | 27,501 | -      |
|                              | **$7,465,024** | **$4,104,378** |

Approved on behalf of the Board

[Signatures of Directors]

FINANCIAL STATEMENTS 49
## Canadian Glycomics Network
### Statement of Operations

<table>
<thead>
<tr>
<th>Year Ended</th>
<th>2016</th>
<th>2015</th>
<th>Period from commencement on February 14, 2015 to March 31, 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td></td>
<td></td>
<td>(Restated)</td>
</tr>
<tr>
<td>Grants</td>
<td>$4,216,462</td>
<td>$60,488</td>
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<tr>
<td>In-kind donations</td>
<td>296,137</td>
<td>44,541</td>
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<tr>
<td>Services</td>
<td>27,348</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Interest income</td>
<td>153</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,540,100</strong></td>
<td><strong>105,029</strong></td>
<td></td>
</tr>
<tr>
<td>Expenditures</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project expenditures</td>
<td>3,767,126</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Salaries and employee benefits</td>
<td>433,377</td>
<td>47,709</td>
<td></td>
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<tr>
<td>Communications</td>
<td>104,740</td>
<td>1,653</td>
<td></td>
</tr>
<tr>
<td>Travel</td>
<td>89,125</td>
<td>32,143</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>34,188</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Professional fees</td>
<td>28,262</td>
<td>15,693</td>
<td></td>
</tr>
<tr>
<td>Consulting fees</td>
<td>20,697</td>
<td>1,403</td>
<td></td>
</tr>
<tr>
<td>Office</td>
<td>14,363</td>
<td>5,586</td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td>10,941</td>
<td>842</td>
<td></td>
</tr>
<tr>
<td>Equipment</td>
<td>9,780</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,512,599</strong></td>
<td><strong>105,029</strong></td>
<td></td>
</tr>
<tr>
<td>Excess of revenue over expenditure</td>
<td><strong>$27,501</strong></td>
<td><strong>$-</strong></td>
<td></td>
</tr>
</tbody>
</table>

See accompanying notes to the financial statements
Canadian Glycomics Network  
Statement of Changes in Net Assets

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening unrestricted assets</td>
<td>$ 126,817</td>
<td>$ -</td>
</tr>
<tr>
<td>Restatement (Note 7)</td>
<td>(126,817)</td>
<td>(restated)</td>
</tr>
<tr>
<td>Adjusted opening unrestricted assets</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Excess of revenue over expenditure</td>
<td>27,501</td>
<td>-</td>
</tr>
<tr>
<td>Unrestricted net assets, end of year/period</td>
<td>$ 27,501</td>
<td>$ -</td>
</tr>
</tbody>
</table>

See accompanying notes to the financial statements
## Canadian Glycomics Network
### Statement of Cash Flows

<table>
<thead>
<tr>
<th>Year Ended</th>
<th></th>
<th>Period from Commencement on February 14, 2015 to March 31, 2015</th>
<th>(Restated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td></td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Increase in cash

**Operating activities**

<table>
<thead>
<tr>
<th>Description</th>
<th>2016</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess of revenues over expenditures</td>
<td>$27,501</td>
<td>-</td>
</tr>
<tr>
<td>Change in non-cash working capital items</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>(1,000)</td>
<td>-</td>
</tr>
<tr>
<td>Prepaid expenses</td>
<td>841</td>
<td>(9,257)</td>
</tr>
<tr>
<td>Payables and accruals</td>
<td>6,810</td>
<td>1,825</td>
</tr>
<tr>
<td>GST payable</td>
<td>2,158</td>
<td>-</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>36,310</td>
<td>(7,432)</td>
</tr>
</tbody>
</table>

**Financing**

<table>
<thead>
<tr>
<th>Description</th>
<th>2016</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advances to Network Host</td>
<td>(2,837,605)</td>
<td>(4,095,121)</td>
</tr>
<tr>
<td>Deferred revenue</td>
<td>3,324,177</td>
<td>4,102,553</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>486,572</td>
<td>7,432</td>
</tr>
</tbody>
</table>

Increase in cash

<table>
<thead>
<tr>
<th>Description</th>
<th>522,882</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash, beginning of year/period</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Cash, end of year/period</td>
<td>$522,882</td>
<td>-</td>
</tr>
</tbody>
</table>

See accompanying notes to the financial statements
Canadian Glycomics Network  
Notes to the Financial Statements  
March 31, 2016

1. Nature of operations

Canadian Glycomics Network (the “Network”) is a world-leading network of glycomics researchers and trainees, government laboratories and industry partners which was incorporated on February 4, 2015. The Network addresses key challenges in human health; the Network’s research, in collaboration with Network partners, lead to novel approaches for preventing and treating disease. The Network is a not-for-profit organization and, accordingly, is exempt from income tax in accordance with Section 149(1)(e) of the Canadian Income Tax Act and Section 35 of the Alberta Income Tax Act.

2. Summary of significant accounting policies

Basis of presentation

These financial statements were prepared in accordance with Canadian accounting standards for not-for-profit organizations (ASNPO) and include the following significant accounting policies:

Use of estimates

In preparing the financial statements in conformity with ASNPO, management is required to make estimates and assumptions that affect the reported amounts of assets and liabilities, and the disclosures of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the period. The most significant estimates included in these financial statements are the valuation of the due from Network Host and accrued liabilities. Actual results could differ from these estimates.

Revenue recognition

The Network follows the deferral method of accounting for contributions. Externally restricted contributions are recognized as revenue in the year in which the related expense is incurred. Unrestricted contributions are recognized as revenue in the year received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

Donated material and services

Donated materials and services are recorded in the financial statements at fair value on the date contributed when fair value can be reasonably estimated and the donated materials or services would have otherwise normally been purchased by the Network. Projects funded by the Network have reported receipt of cash and in-kind contributions of services, personnel and supplies of approximately $1,520,000. These contributions are not recorded in the financial statements of the Network due to the difficulty in verifying their fair value.
Canadian Glycomics Network
Notes to the Financial Statements
March 31, 2016

2. Summary of significant accounting policies (continued)

Financial instruments

Financial assets and financial liabilities are initially recognized at fair value and are
subsequently accounted for based on their classification as described below. The
classification depends on the purpose for which the financial instruments were acquired and
their characteristics. Except in very limited circumstances, the classification is not changed
subsequent to initial recognition.

Financial assets and financial liabilities classified as held-for-trading are measured at fair
value with changes in fair value recognized in the statement of operations. Financial assets
classified as held-to-maturity or as loans and receivables, and financial liabilities classified
as other financial liabilities are measured at amortized cost using the effective interest rate
method. Available-for-sale financial assets are measured at fair value with changes in fair
value recognized in net assets.

As at March 31, 2016, the Network had the following financial instruments:

<table>
<thead>
<tr>
<th>Financial assets and liabilities</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>Amortized cost</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>Amortized cost</td>
</tr>
<tr>
<td>Due from Network Host</td>
<td>Amortized cost</td>
</tr>
<tr>
<td>Payables and accruals</td>
<td>Amortized cost</td>
</tr>
<tr>
<td>GST/HST payable</td>
<td>Amortized cost</td>
</tr>
</tbody>
</table>

Financial assets measured at cost or amortized cost are tested for impairment when there
are indicators of impairment. Previously recorded impairment losses are reversed to the
extent of the improvement provided the asset is not carried at an amount, at the date of the
reversal, greater than the amount that would have been the carrying amount had no
impairment loss been recognized previously. The amount of any write downs or reversals
are recorded in the statement of operations.

3. Due from Network Host

Due from Network Host relates to amounts held in trust by the University of Alberta
("Network Host") in its role as network host under an agreement dated February 4, 2015
between the Network and the Network Host. Under the terms of the agreement, the Network
Host is responsible for receiving and administering grant funding received under the Centres
of Excellence (NCE) of Canada program, and providing administrative support in the
disbursement of funds as directed by the Network.

In addition to administering grant funding for the Network, the Network Host also provides
contributed services and material to the Network. In-kind donations totaling $296,137 (2015
- $44,541) relate to salaries and benefits paid on behalf of the Network by the Network Host.
Additionally, during the period, the Network Host contributed $150,000 (2015 - $150,000) of
grant funding, along with Snil (2015 - $17,041) of payments made on behalf of the Network,
which are recorded in grant revenue.

These transactions are in the normal course of operations, and are recorded at their
exchange amount, which is the amount agreed to by the parties. Due from Network Host is
unsecured, noninterest bearing with no set terms of repayment.
Canadian Glycomics Network  
Notes to the Financial Statements  
March 31, 2016

4. Deferred revenue

Funding received in the period includes grants from the Network Centres of Excellence ("NCE") of Canada program, which are restricted to eligible expenditures under the terms of the grant agreement.

Details of the changes in deferred revenue from NCE are as follows:

<table>
<thead>
<tr>
<th></th>
<th>2016</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening balance</td>
<td>$ 3,975,736</td>
<td>$ -</td>
</tr>
<tr>
<td>Grant received</td>
<td>6,854,000</td>
<td>3,996,000</td>
</tr>
<tr>
<td>Amounts recognized as revenue</td>
<td>$(4,108,991)</td>
<td>$(20,264)</td>
</tr>
<tr>
<td>Ending balance, March 31</td>
<td>$6,720,745</td>
<td>$3,975,736</td>
</tr>
</tbody>
</table>

Details of the changes in deferred revenue from Other Grantors are as follows:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening balance</td>
<td>126,817</td>
<td>-</td>
</tr>
<tr>
<td>Grant received</td>
<td>650,000</td>
<td>150,000</td>
</tr>
<tr>
<td>Amounts recognized as revenue</td>
<td>$(73,782)</td>
<td>$(23,183)</td>
</tr>
<tr>
<td>Ending balance, March 31</td>
<td>$703,035</td>
<td>$126,817</td>
</tr>
</tbody>
</table>

Total Ending balance, March 31

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$7,426,730</td>
<td>$4,102,553</td>
</tr>
</tbody>
</table>

5. Financial instruments

The Network is exposed to various risks through its financial instruments. The following provides a measure of the Network's risk exposures and concentrations at March 31, 2016. Unless otherwise noted, it is management's opinion that the Network is not exposed to significant credit, liquidity or interest rate risk.

Liquidity risk

Liquidity risk is the risk that the Network will not be able to meet its obligations as they fall due or to fund any commitments that the Network has planned. The Network is exposed to this risk mainly in respect of its payables and accruals. The Network manages liquidity risk through management of its capital structure in conjunction with cash flow forecasting including anticipated investing and financing activities.

Credit risk

The Network is exposed to credit risk related to the due from Network Host. The Network monitors the balance due from Network Host and does not consider that it is exposed to significant credit risk due to the creditworthiness of the Network Host.
6. Economic dependence

The operations of the Network are primarily dependent on NCE funding received from the Government of Canada, and ongoing support from the University of Alberta in its role as Network Host. At the date of this report the Board of Directors believe that adequate funding will continue to enable the entity to continue operations.

7. Prior period adjustment

For the year ended March 31, 2016, the Network reviewed its unrestricted and restricted revenue and determined that the unrestricted revenue for the year ended March 31, 2015, should have been recorded as restricted revenue. As a result, the Network determined that a restatement to record the revenue as unearned revenue was required and a prior period adjustment was completed.

The following adjustments have been made to the comparative amounts in the March 31, 2016 financial statements:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Deferred revenue</td>
<td>3,975,736</td>
<td>4,102,553</td>
<td>126,817</td>
</tr>
<tr>
<td>Unrestricted net assets</td>
<td>126,817</td>
<td>-</td>
<td>(126,817)</td>
</tr>
<tr>
<td>Statement of Operations</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grants</td>
<td>187,305</td>
<td>60,488</td>
<td>(126,817)</td>
</tr>
<tr>
<td>Excess of revenue over expenditure</td>
<td>126,817</td>
<td>-</td>
<td>(126,817)</td>
</tr>
<tr>
<td>Statement of Changes in Net Assets</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excess of revenue over expenditure</td>
<td>126,817</td>
<td>-</td>
<td>(126,817)</td>
</tr>
<tr>
<td>Statement of Cash Flows</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unearned revenue</td>
<td>126,817</td>
<td>-</td>
<td>(126,817)</td>
</tr>
<tr>
<td>Deferred revenue</td>
<td>3,975,736</td>
<td>4,102,553</td>
<td>126,817</td>
</tr>
</tbody>
</table>
CANADIAN GLYCOMICS NETWORK

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