GlycoNet

# BUILDING A HEALTHIER CANADA

## CANADIAN GLYCOMICS NETWORK
## 2020 ANNUAL REPORT

The Canadian Glycomics Network (GlycoNet) is a federally-funded Network of Centres of Excellence established in 2015 to develop carbohydrate-based solutions to unmet health needs.

GlycoNet brings together more than 170 funded and affiliated researchers from 34 universities and research institutions across Canada. The Network works with industry, government, and non-profit partners on developing solutions for several healthcare areas: antimicrobials, chronic diseases, diabetes and obesity, rare genetic diseases, and therapeutic proteins and vaccines. In addition to funding research, GlycoNet focuses on knowledge mobilization, commercialization, networking, and partnerships to translate research into tangible benefits for Canadians. To date, GlycoNet has provided support and professional development to over 450 trainees in order for them to achieve their full potential, both during training and in the next steps of their careers.

## Our Vision

Delivering solutions to important health issues and improving the quality of life of Canadians through glycomics.

## Our Mission

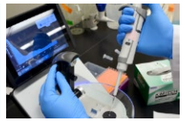
To ensure that GlycoNet and Canada are internationally recognized as leaders in glycomics research through delivering exceptional training in glycomics research, bridging the gap between research and industry, encouraging entrepreneurship, as well as translating research advances into tangible benefits for Canadians.

## What is glycomics?

Glycomics is the study of carbohydrates (sugars) in biological systems. Carbohydrate chains, or glycans, are found in the cell membrane of every living cell and are key to almost every biological process. The field is experiencing an explosion of activity with the recognition that there are many ways scientists can exploit biological processes involving carbohydrates to improve human health.



# Contents

**02.** Executives' Message

**19.** Training & Education

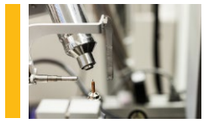
**04.** GlycoNet By the Numbers

**24.** Leadership & Management

**06.** Research Impact

**26.** Network Community

**12.** Knowledge Mobilization & Commercialization



**31.** Financial Statements

**16.** Networking & Partnerships



## Acknowledgement

GlycoNet is supported by the Government of Canada through the Networks of Centres of Excellence program, a joint initiative of the Natural Sciences and Engineering Research Council, the Canadian Institutes of Health Research and the Social Sciences and Humanities Research Council.

Government of Canada
**Networks of Centres of Excellence**

Gouvernement du Canada
**Réseaux de centres d'excellence**

# A message from the Board Chair and Executives

This year was one of achievement and growth for GlycoNet. One major milestone was the successful renewal of the Network from the Networks of Centres of Excellence (NCE) for an additional three years. As we enter Cycle II, we continue our mandate to improve the quality of life of Canadians through glycomics. With over 170 researchers at 34 research institutions across Canada, GlycoNet is proud to be in a position where we bring together academia, industry, non-profits, government, future leaders, and end users to work together in building a prosperous future for Canadians.

What underlines our success is the power of partnerships with health foundations, research consortia, and a range of public and private sector partners. In our first five years, we have grown from 32 partners in 2015 to 264 today. We have initiated and led 100 projects in a range of research areas: chronic diseases, antimicrobials, therapeutic proteins and vaccines, diabetes and obesity, and rare genetic diseases. Each of these projects have pushed research closer to the clinic or provided new technologies with commercial and clinical benefits. To date, 49 patent applications for therapeutic candidates and platforms for drug discovery have been filed.

Results of many of these innovative projects have been highlighted in high-impact journals and mainstream media. Recognizing the quality of the research and its potential impact, several industry leaders have approached us to discuss partnering opportunities emerging from GlycoNet-funded projects.

We have supported the incorporation and development of four start-up companies, whose core technologies stem from GlycoNet projects. GlycoNet also supports entrepreneurs in different ways—through partnerships on multi-year projects or by providing guidance and connections to industry leaders and potential customers. By doing so, we are keeping technologies in Canada, creating jobs and stimulating the growth of Canadian bio-economy.

Our unique training program prepares the next generation of glycoscientists and innovators. With more than 450 trainees to-date, we facilitate the development of personnel, work with the Trainee Association, and collaborate with other NCEs to organize workshops to help expand their professional skillset. Many of these talented individuals have transitioned to various positions in academia, government, and industry, including joining and/or creating start-up companies. They are establishing themselves as future leaders and experts in the field.

> “We have initiated and led 100 projects in a range of research areas: chronic diseases, antimicrobials, therapeutic proteins and vaccines, diabetes and obesity, and rare genetic diseases. Each of these projects have pushed research closer to the clinic or provided new technologies with commercial and clinical benefits. To date, 49 patent applications for therapeutic candidates and platforms for drug discovery have been filed.”

We continue to work with partners to deliver training resources to teachers across different provinces, aiming to connect research in glycomics with high school curriculum. In the past year, the Network specifically focused on reaching out to rural communities and Indigenous populations where professional development opportunities for teachers are often limited.

GlycoNet believes a strong equity, diversity, and inclusion (EDI) approach starts at the top. Both the Board of Directors and GlycoNet Management are committed to setting an example for a diverse and inclusive culture, which is essential in creating innovative and impactful technologies for the benefit of Canadians. As such, we established an EDI Committee and developed an action plan aiming to support a robust EDI culture through addressing and removing persistent systemic biases across the Network.

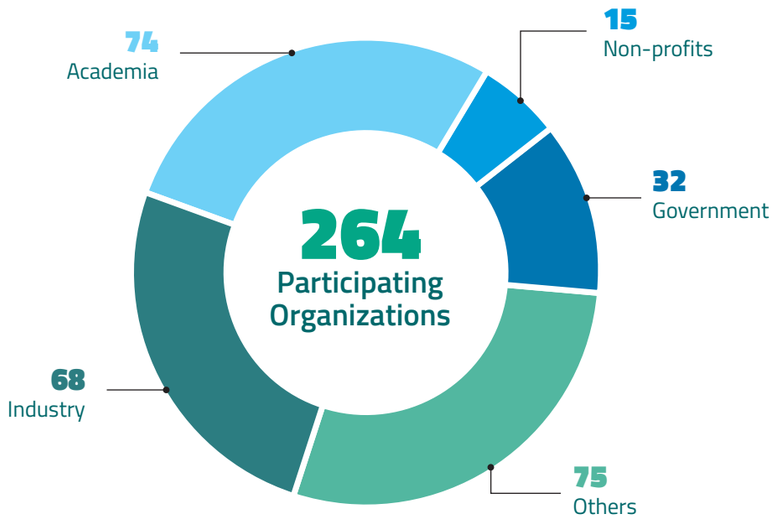
In all activities, GlycoNet relies on the experience and networks of Board and Committee members from diverse backgrounds and with exceptional and complementary skills. Management is honoured to have Ms. Karimah Es Sabar, CEO and Partner of Quark Venture, join us as the Chair of the Board of Directors. Ms. Es Sabar brings decades of experience in global pharmaceutical markets, business development, talent acquisition, and venture investment in the life sciences sector to the Network. We would also like to express tremendous appreciation to Mr. Frank Gleeson, the inaugural Chair of the Board and Immediate Past Chair. His leadership, unwavering support, and contribution has been invaluable to the growth and success of GlycoNet to date. Lastly, we thank our funders, and gratefully acknowledge our host institution, the University of Alberta. We are also indebted to our stakeholders who work with us devotedly to create this innovation-friendly, diverse, and inclusive environment to provide strategies for advancing and commercializing Network research.

**Sincerely,**

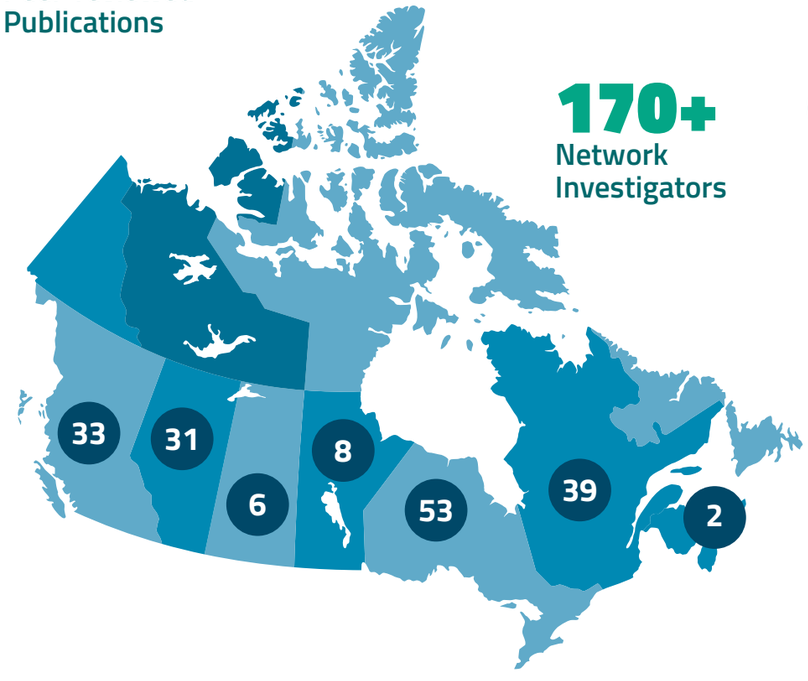
**Karimah Es Sabar**
**Todd Lowary**
**Elizabeth Nanak**
**Warren Wakarchuk**

# GlycoNet
# BY THE NUMBERS

**100**
Research Projects

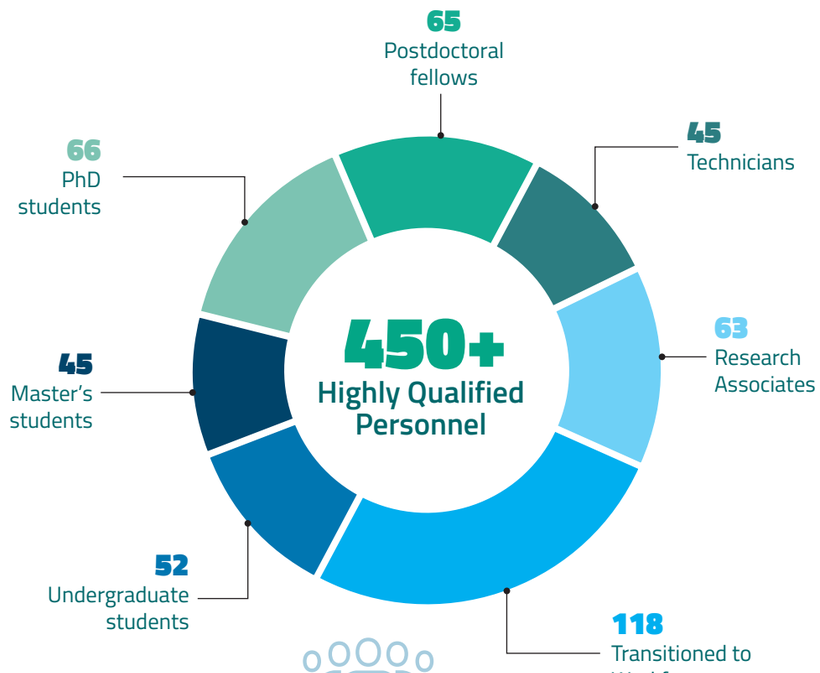



**323**
Peer-reviewed Publications




**170+**
Network Investigators

**34**
Member Universities and Research Institutions




**$20.3M**
research funds distributed and committed

**$21M**
cash and in-kind partner contributions

## COMMUNICATIONS

**1,348**
Twitter followers

**735**
GlycoNet newsletter subscribers

**727**
LinkedIn followers

**9K+**
YouTube video views

# Research Impact

GlycoNet research is solution-driven. Every project is expected to create one or more tangible technologies, knowledge, or applications. The outcomes must address healthcare and help Canadians from all walks of life, while delivering social and economic benefits.

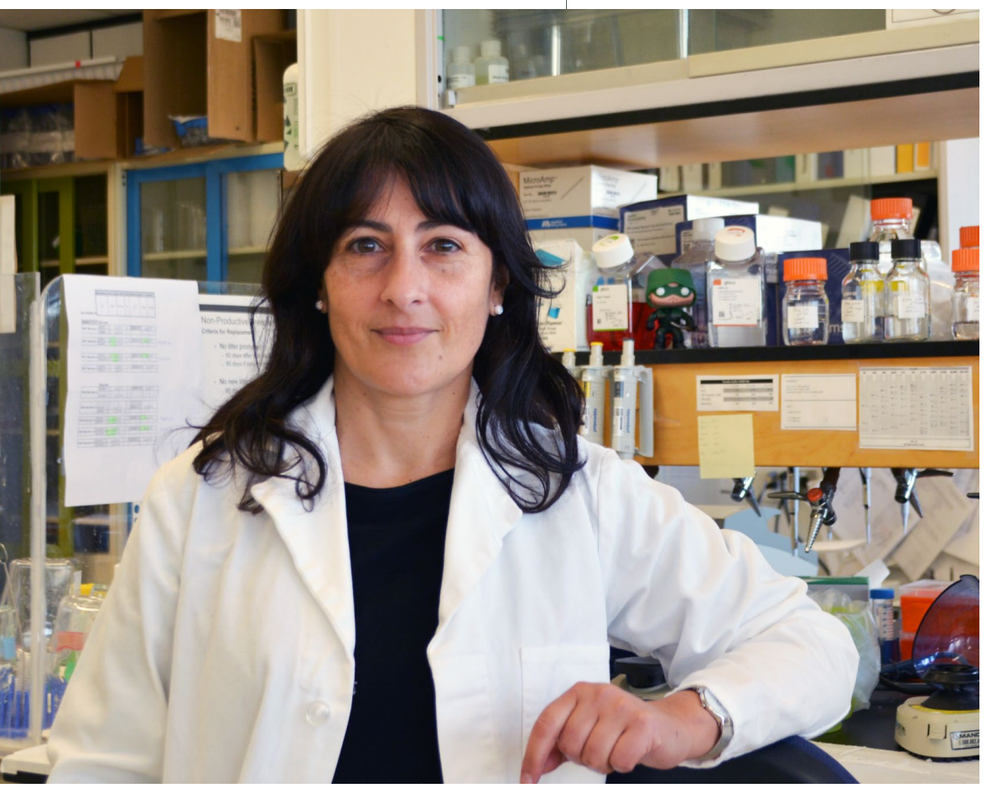
To date, the Network has supported 100 research projects through five different programs. The Catalyst Grant program invests in shorter-term early-stage projects, while the Collaborative Team program supports multidisciplinary teams involving two or more research groups. Our Strategic Initiatives program focuses on advancing high-impact projects that have industry partners. The Translational Program targets projects with intellectual property and ready to translate into applications, such as pre-clinical animal studies or synthesis scale-up.

## Long-term Care for Transplant Patients

Over 4,400 Canadians are currently awaiting solid organ transplantation, according to the Canadian Institute for Health Information. Expanding donor options through ABO blood group mismatched transplantation is the goal of a new blood test developed by a group of researchers, patients, community organizations, and clinicians. The test is a biochemical assay designed to check if the recipient has antibodies that can react to the ABO-carbohydrates on a donor's organ, and if so, exactly what quantities and what specific types of antibodies are present; these antibodies would result in rapid rejection of a mismatched transplant. The results from the test will help doctors decide if the transplant should take place, when and when not to treat the patients aggressively with antibody-removal therapies in order to reduce potential immune responses, and allow clinicians to accurately determine the time window in which a mismatched transplant can be done safely. The project is led by **Dr. Lori West, Director of the Alberta Transplant Institute (University of Alberta)**.

## Proactive Measures for Dementia

Neurodegenerative diseases, like Alzheimer's disease, are leading causes of death and disability in Canada, especially in people over the age of 65. Finding treatments and gaining better understanding of the progression of neurodegenerative diseases have been a major focus of GlycoNet Investigators. **Dr. Matt Macauley (University of Alberta)** has discovered a genetic variant of a protein in some people which makes them less susceptible to Alzheimer's disease. **Dr. Simonetta Sipione (University of Alberta)** found that a naturally occurring carbohydrate-derivative in healthy human brains could slow down neural cell death, providing a possible solution to treat patients suffering from a neurodegenerative disorder called Huntington's disease.



## Novel Treatment for Inflammatory Bowel Disease (IBD)

IBD is a lifelong, debilitating condition that afflicts one in every 150 Canadians. Treatment options are limited to managing symptoms with anti-inflammatory drugs, which are often complicated by undesired side effects. A "GlycoCaged" drug delivery system created by **Dr. Harry Brumer (University of British Columbia)** aims to provide an innovative form of treatment with advantages over the classical orally-administered steroid drugs. This system links the anti-inflammatory steroids to a complex carbohydrate derived from vegetables. The carbohydrate protects the steroids from premature uptake in the stomach, allowing them to pass to the lower bowel, where they are released by beneficial bacteria of the microbiota.

## Battling with Superbugs

Designing strategies to counteract antibiotic resistance has been the focus of several GlycoNet funded projects. The goal is to understand the superbugs—like the ones that cause Staph infections—at a molecular level so that scientists can use this knowledge to develop more effective vaccines or therapeutics. The key to combat drug resistance, according to one of the project leaders, **Dr. Eric Brown (McMaster University)**, is to develop a drug that does not kill the bacteria, but when combined with a common class of antibiotic, it becomes incredibly potent.

Another project initiated by **Drs. Chris Whitfield and Matthew Kimber (University of Guelph), and Todd Lowary (University of Alberta)** has led to the discovery of a previously unrecognized family of proteins required to assemble a structure vital for the survival of a range of important bacterial pathogens.

## Not-so-sticky Fungal Situation

Fungal infections are notoriously hard to treat because the fungus forms a sticky carbohydrate-rich matrix called a biofilm to protect the fungus from antifungal agents or the immune system. Through GlycoNet-supported projects, **Drs. Lynne Howell (The Hospital for Sick Children) and Don Sheppard (McGill University)** identified several key enzymes that help the fungus build the biofilm. They also found that if the enzymes were missing, the biofilm could not form and the fungus was weakened. These discoveries lay the foundational work for the team to develop antibody therapeutics that treat fungal infections by preventing biofilm formation.

## Maintaining a Healthy Heart

Chemotherapy, diabetes, and vascular diseases are just some of the factors for heart failure. Currently, there are no effective therapies to prevent its onset or progression. **Drs. Yvan Guindon (Institut de recherches cliniques de Montréal) and Mona Nemer (University of Ottawa)** are developing a carbohydrate-based molecule that can help treat heart failure. An evaluation study shows that this molecule can protect the loss of heart muscles under a variety of conditions including treatment with two different kinds of anticancer drugs, a physiological simulation of pressure overload in the body, and a genetic alteration that mimics congenital or acquired heart disease. The project is at the pre-clinical stage.

# Knowledge Mobilization and Commercialization

GlycoNet has developed a unique approach to evaluating the progress of our projects, which ensures that our teams are on track to pursue commercialization activities and knowledge mobilization.

## NURTURING ENTREPRENEURIAL CULTURE AND CREATION OF START-UP COMPANIES

*GlycoNet supports multiple Canadian start-ups in translating Network-developed technologies, and commercializing products. By doing so, GlycoNet contributes to the growth of the Canadian biotechnology industry. The following are a few examples.*

### 48HOUR DISCOVERY

#### When accelerated drug discovery meets cloud-based web search

Many large pharmaceutical and biotech companies pay anywhere between $500,000 to $1 million to discover a single viable pre-clinical molecule of interest. An Edmonton-based company, 48Hour Discovery, founded by **Dr. Ratmir Derda (University of Alberta)**, can do the same drug discovery process in just a few days for as little as one-tenth of the cost. Unlike traditional molecular discovery companies that operate without sharing their findings, 48Hour Discovery has a searchable, cloud-based molecular database accessible to its clients, which informs clients if the drug lead is unique or if it has been discovered before. The company is now providing services to several GlycoNet members and working with five of the top 20 pharmaceutical companies for drug discovery and diagnostics.

### PANTHERA CRYOSOLUTIONS

#### A game-changer for medical freezer burns

Freezing cells or tissues can lead to cell death and decrease in cell function. An Edmonton- and Ottawa-based company, PanTHERA CryoSolutions, co-founded by **Drs. Robert Ben (University of Ottawa)** and **Jason Acker (University of Alberta/Canadian Blood Services)**, developed a technology to improve the cooling and storing processes (cryopreservation) by using a carbohydrate-based molecule that inhibits the formation of ice crystals in order to preserve the integrity and viability of cells and tissues at very low temperatures. The technology will benefit patients who are in need of cell therapies and tissue transplantations. To date, the company has tested its products to preserve stem cells and CAR-T cells, in partnership with the National Research Council of Canada. In addition, over 35 other companies have evaluated, or are currently evaluating, this technology in cryopreservation. Research-grade molecules are commercially available.

### GLYCA BIOSCIENCES

#### Combining nanotechnology and precision medicine to perfect the diagnosis of prostate cancer

Right now, a diagnosis of prostate cancer has an error rate of approximately 20%. GlyCa BioSciences Inc., an Alberta-based company co-founded by **Drs. Hon Sing Leong (Sunnybrook Research Institute) and Karla Williams (University of British Columbia)**, is trying to eliminate this error with a next-generation blood test. The test is designed to detect a special sugar molecule in the blood that is found on tiny cell fragments naturally released by the patient's tumor. According to the team, high levels of this sugar molecule implies evidence of high-risk prostate cancer and low levels indicate low-risk prostate cancer. This blood test could help identify patients who should receive immediate treatment while sparing men with low-risk prostate cancer from surgery and its side-effects.

### CARBAFORM BIOSCIENCE

#### The “Less-is-more” in anticancer antibodies

Antibody-based treatment of cancer is one of the most successful therapeutic strategies. The manufacturing of anticancer antibodies, however, is not trivial. Most often, the antibodies are produced in the lab and under a condition such that they inevitably contain “fucose,” a type of carbohydrate, on their surface. Having fucose taints the potency of the antibodies, yet there are not many cost-effective methods on the market to remove fucose or prevent its incorporation. Carbaform Bioscience, founded by **Drs. Robert Britton and David Vocadlo (Simon Fraser University)**, employs a technology that uses a small molecule to inhibit the process of attaching fucose to antibodies during their production. The technology would significantly accelerate the manufacturing timeline, thereby lowering manufacturing costs.

## SUPPORTING ENTREPRENEURS

*Through the GlycoNet Strategic Initiative program, Network Investigators can partner with GlycoNet-affiliated start-up companies and assist them in their initial phase of development. Two Investigators are highlighted here.*

### More sustainable and safer delivery for post-operative pain

**Dr. Molly Shoichet (University of Toronto)** is developing a safer way to deliver painkillers for patients who undergo surgeries. This new biomaterial can deliver anesthetics to surgical sites without causing side effects typical of opioids, such as addiction. In collaboration with GlycoNet and AmacaThera Inc., a spinoff from her lab, Dr. Shoichet is advancing an improved drug delivery system that uses carbohdyrate-based hydrogel to target specific surgical sites. This system can provide pain relief for up to three days, while common local anesthetics typically wear off four to 12 hours after being administered, and then patients often resort to opioids to overcome pain. The company has secured funding to initiate a Phase I trial of non-opioid pain control therapeutic, and is exploring possibilities of using the platform hydrogel technology to treat stroke, traumatic spinal cord injury, and blindness.

### Natural food at its finest to treat kidney stones

SP Nutraceuticals, founded by **Dr. Paul Spagnuolo (University of Guelph)**, extracts molecules from food or plants and examines if any of the molecules have an effect on a specific disease. The company has discovered a carbohydrate-derivative from plants that could break down kidney stones. With GlycoNet support, a Phase I clinical trial is underway to test the compound's effects in healthy human volunteers to establish the drug's safety profile.

# Networking and Partnerships

What underlines and supports all GlycoNet activities is the power of our strong and varied partnerships. In five short years, the Network has grown significantly. We started with 32 partners and today it has increased to 264. Our partners come from health foundations, research consortia, industry, community, government, and a range of public and private sectors. By forging partnerships, we not only provide our Network members with access to world-leading expertise, but also ensure that we are targeting areas of priority and relevance to the community.

## Partnering with Industry on a Breast Cancer Project

Network Investigators **Drs. Yves St-Pierre, David Chatenet, and Nicolas Doucet (INRS)** leveraged a project initiated with GlycoNet to receive additional funding from the Consortium de recherche biopharmaceutique (CQDM), Zymeworks, Pfizer, the Canadian Cancer Society (CCS), and the Armand-Frappier Foundation. The team aims to develop a revolutionary technology based on the inhibition of a class of carbohydrate-binding proteins commonly overexpressed in cancer cells. The project lays the foundation for a new generation of cancer immunotherapy and will benefit from the expertise of two industry partners active in the field of immuno-oncology.

## Connecting Idea-generators with Decision-makers

GlycoNet is building non-conventional partnerships to expand research capacity and collaborations from different disciplines. CQDM, a consortium in biopharmaceutical research, and GlycoNet have formed a strategic partnership to identify and co-finance glycoscience projects across Canada in order to support the development of technologies in drug discovery, accelerate scientific talents across Canada, and advance Canada's position as an international leader for healthcare innovation. Other partners include the Alberta Machine Intelligence Institute and Applied Pharmaceutical Innovation, which will support projects involving machine learning and preclinical studies, respectively.

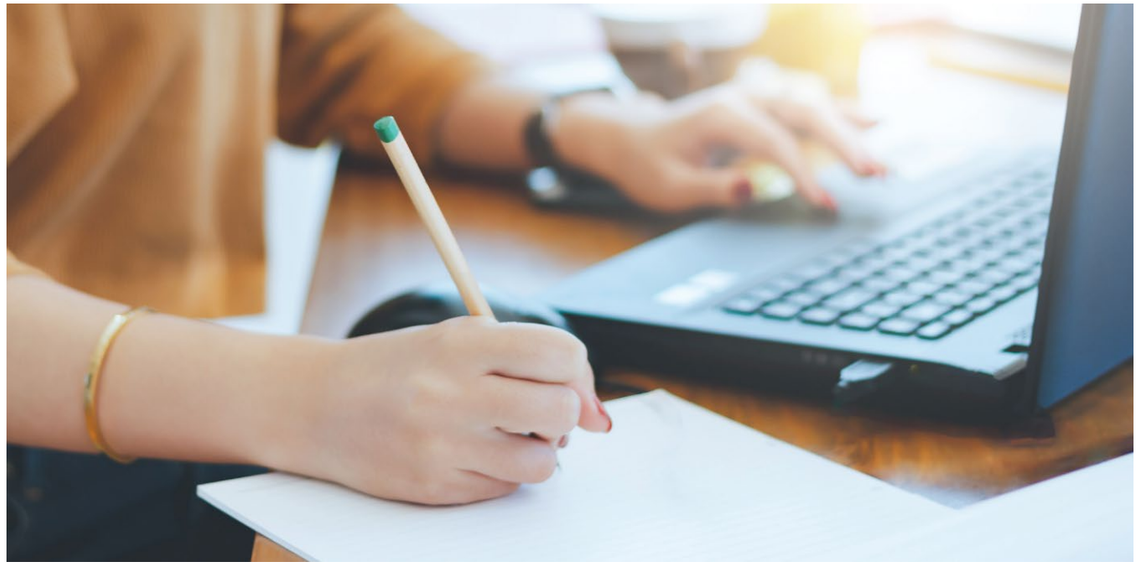
中央研究院 ACADEMIA SINICA

名古屋大学 NAGOYA UNIVERSITY

岐阜大学 GIFU UNIVERSITY

## Raising Canada's International Profile in Glycomics

In 2019, GlycoNet announced a partnership with Academia Sinica, the most preeminent academic institution in Taiwan, to co-fund research and development in glycomics, build relationships and partnership opportunities to address international challenges, and to create potential channels for future commercial collaboration. Nagoya University and Gifu University in Japan have also partnered with GlycoNet to support research in chemical biology and training.



## SHOWCASING GLYCOMICS INNOVATIONS GLOBALLY

***Due to the unprecedented times caused by the COVID-19 pandemic and the subsequent cancellation of the 2020 Canadian Glycomics Symposium, GlycoNet launched a weekly Webinar Series. This Series features speakers and workshop facilitators delivering topics of high interest to the glycomics community. To date, over 400 researchers, trainees, and representatives from industry, government, and non-profit organizations worldwide have been in attendance. Along with scientific and industry talks, there were professional development workshops and technical sessions, all designed to maximize networking, knowledge exchange and collaboration among GlycoNet stakeholders and external members.***

***In addition, GlycoNet hosted a virtual glycomics poster session. Fifty-seven posters were on display with more than 165 national and international attendees. This event also attracted industry speakers and attendees from Roche, Bayer, Sanofi, Fina BioSolutions, ChemBind LLC, CAREM, and more.***

> *There is so much of diversity of research presented in the GlycoNet Webinar Series. From SARS-CoV-2 research to designing enzyme probes, I learned a lot from all the presentations.*
>
> **Omozojie P. Aigbogun**, PhD Candidate, University of Saskatchewan



# Training and Education

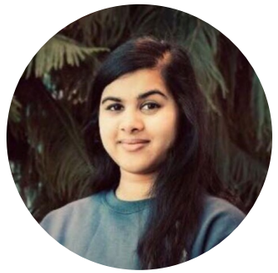
GlycoNet has distinguished itself with a well-rounded training program with the goal to prepare the next generation of glycoscientists. To date, the training program has made an impact on the lives of more than 450 trainees from 34 institutions across Canada.

### Inspiring the Next Generation of Scientists

The GlycoNet training program brings early-stage researchers, professionals, and HQP (highly qualified personnel) together and provides them with the knowledge and skills to drive innovation in their careers, both within and beyond academia. In addition to the existing training programs—Advanced Training Opportunity Program (ATOP), and Summer Awards for Undergraduate Students, GlycoNet has expanded the exchange program to include a Research & Travel Supplement program that can be used for attending conferences.

# BUILDING SUCCESSFUL CAREERS

*GlycoNet HQP alumni are embarking in positions in industry, academia, government, and non-profit organizations. Some are joining start-ups or launching their own. They are winning awards, competitions, and establishing themselves as future leaders and experts in the field.*



"GlycoNet helped me gain integral research experience in an excellent lab with a great mentor prior to starting my senior thesis," says **Farheen Khan**, an HQP and recipient of Summer Awards for Undergraduate Students in 2019. "This award provided me with the opportunity to work on two concurrent projects. By the end of the summer, I came to realize that research is a bittersweet combination of successes and setbacks that ultimately lead to novel discoveries. I learned to embrace setbacks as enriching learning experiences, and to remain positive, open-minded, and resilient when the unexpected occurs."

For **Nicole Thompson**, who received an opportunity from GlycoNet for a research exchange experience, there are also many valuable takeaways she applies in her current role as a lab technician at the University of Alberta. "The research exchange program pushed me to engage with other scientists and tackle problems from diverse perspectives. It was an excellent way to gain a greater appreciation for the interdisciplinary nature of emerging glycomics research, while accelerating the exchange of knowledge and ideas with collaborators. This insight is something I continue to apply to our ever-evolving research needs."

Science is not only limited in research activities in the laboratories. Four trainees—**Erum Razvi, Anne Halpin, Revathi Reddy, and Fernando Altamura**—were sponsored by GlycoNet to attend the Canadian Science Policy Conference in November 2019. All of them had valuable takeaways. "I was introduced to the complex field of science diplomacy, where international collaborations are formed to solve common global problems," says Mr. Altamura, a PhD candidate at McGill University. Ms. Razvi, a PhD student at SickKids Hospital states that attending the conference makes her realize that her future career may not necessarily involve science policy directly, but there are many activities she can engage in outside her career, such as participating in Wikipedia Edit-A-Thons, or taking part in a science advocacy group.

**Dr. Benjamin DiFrancesco**, thinks about GlycoNet in his role as an applied scientist at Cyclica in Ontario. "I was part of GlycoNet for four years and for two of those years, I was part of the GlycoNet Trainee Association Executive Committee where I helped implement networking and grant opportunities for trainees. My experience as part of GlycoNet was overwhelmingly positive, allowing me to form personal and professional connections with researchers across Canada." Dr. DiFranceso earned his PhD in Chemistry from the University of Toronto while he was a GlycoNet trainee conducting research on treatments for bacterial infections. At Cyclica, a Toronto-based biotechnology company, he uses computer-aided programs and computational biophysics to discover new drugs.

**Dr. Peter Rahfeld**, a post-doctoral researcher at University of British Columbia was a recipient of GlycoNet's ATOP award. This experience has impacted the way he will train junior students in the future. "The ATOP program allowed me to hire a student working on a promising side project of mine that I would have no time to advance otherwise. I was very lucky to have an experienced Co-op student who was adept in laboratory work and could start right away on the project," says Dr. Rahfeld. "Supervising students is an important experience—I often see that my own thought process not necessarily lines up with others—but this can be very helpful in becoming a better supervisor in the future."

Making life better and effective science communications are two top priorities for **Jennifer Crha**, who was the winner of the 3MT Community Choice Award at the University of Guelph for her graduate research project, and is now working at a start-up company, Rapid Novor (Ontario), as a Scientific Sales Executive. "Communications is a skill I'm striving to excel," says Ms. Crha. One of the greatest benefits of her time at GlycoNet was the ability to manage projects and communicating her research with end users. "That has certainly prepared me for what I am doing at Rapid Novor now because on a daily basis I need to communicate with my customers to let them know where the project is at now, and what we need from them to move forward."

## KEEPING THE COMMUNITY ENGAGED

***Innovation and success are not just about technologies, but about people. GlycoNet encourages engagement with science across the whole of society and we are especially keen to nurture the innate curiosity of young people.***

In 2019, GlycoNet's ongoing outreach partnerships with the University of Alberta's Centre for Mathematics, Science and Technology Education (CMASTE) focused on professional development and curriculum training for high school and middle school teachers. The outreach team traveled to Saskatchewan and surrounding rural areas including North Battleford and Lloydminster to deliver day-long workshops to over 40 teachers in total and demonstrate glycoscience activities that teachers could incorporate into their classrooms.

As part of an outreach effort with Indigenous students, GlycoNet was able to identify and send two Indigenous high school students and their teacher from a small community in Northern Saskatchewan to Montréal to attend the 2019 "Apprentis en Biosciences", a week-long research program held at INRS for grade 9-12 students that have an interest in science. The students were paired with research scientists and worked on glycomics projects. This was made possible thanks to the coordinated efforts of **Drs. Chris Phenix (University of Saskatchewan) and Dr. Yves St-Pierre (INRS)**.

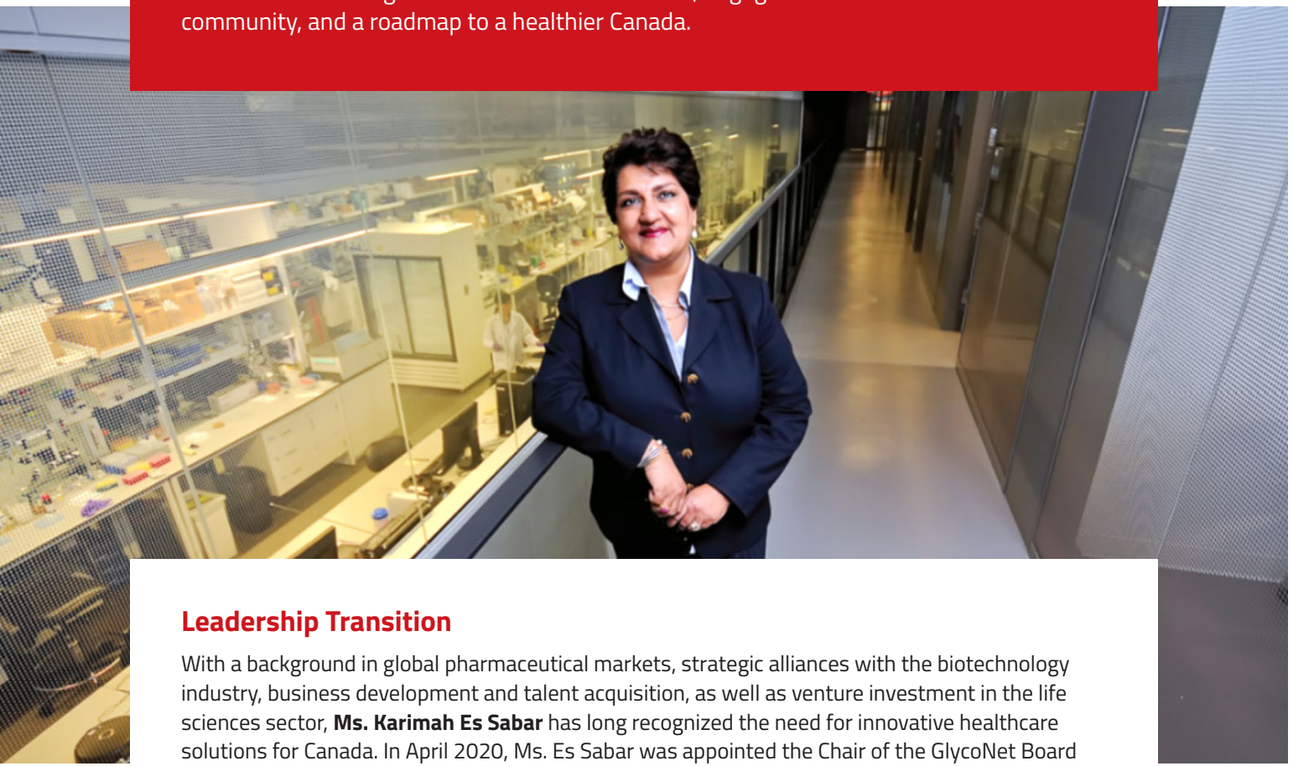
*"Being in a small school here (a total of 120 students from kindergarten to grade 12), we have very limited resources, I was excited about the abundance of hands-on activities that I could implement in several subjects I teach—health sciences, physical sciences, and environmental sciences. The resource about urine analysis is especially one of the first ones I plan to tailor to my classrooms."*

**Raecine Franke**, a science teacher at Glaslyn Central School teaching grade 6 to 12 students

# Leadership and Management

## Effective Management and Strong Governance

GlycoNet's Board of Directors plays an important role in guiding the Network. The Board and management team aim to deliver strong and sustainable legacy for the healthcare sector in Canada comprised of world-leading researchers, innovative technologies to address medical needs, engaged stakeholder community, and a roadmap to a healthier Canada.



## Leadership Transition

With a background in global pharmaceutical markets, strategic alliances with the biotechnology industry, business development and talent acquisition, as well as venture investment in the life sciences sector, **Ms. Karimah Es Sabar** has long recognized the need for innovative healthcare solutions for Canada. In April 2020, Ms. Es Sabar was appointed the Chair of the GlycoNet Board of Directors. Mr. Frank Gleeson, the inaugural GlycoNet Board Chair, will remain on the Board of Directors as Immediate Past Chair. "I am honoured to be appointed as Chair of the Board, and I look forward to working with GlycoNet as we move to a new chapter of novel development and commercialization to expand GlycoNet's portfolio," says Ms. Es Sabar. "I would like to thank Frank for his substantial contributions to GlycoNet over the past five years. Under his leadership, GlycoNet has gained a formidable reputation both nationally and internally as a leader in glycomics research, and in the translation of those activities to tangible outcomes." Ms. Es Sabar is currently the CEO and Partner at Quark Venture LP, a venture investment firm focused on health sciences globally.

**Dr. Elizabeth Nanak**, former Executive Director of GlycoNet, was promoted to Chief Executive Officer. Dr. Nanak has been with GlycoNet since its conception. During her tenure as the Executive Director, she developed strategic and operation plans, oversaw the implantation of several programs critical to GlycoNet's portfolio, and co-led the successful renewal of the Network. Along with the leadership team,  and building on the $16.3 million renewal funding from the NCE, Dr. Nanak will take GlycoNet to the next phase of improving human health through scientific knowledge and innovative technologies built upon glycomics. "It is imperative that as the leading organization in glycomics, we push ahead post-COVID-19 to continue to make positive impacts on Canadian healthcare," says Ms. Karimah Es Sabar, GlycoNet's Board Chair. "With Elizabeth as CEO, I am confident that GlycoNet will continue to fulfill that mission."

**Dr. Lara Mahal**, was recruited to the University of Alberta, from New York University, as the Canada Excellence Research Chair in Glycomics and became the GlycoNet Associate Director, Clinical Partnerships in early 2020. "GlycoNet has built on the strength and potential of glycomics to promote the study of carbohydrates through Canada," says Dr. Mahal. "Due, in part, to the efforts of the Network, glycobiology is now being seen as the powerful determinant of human health that it has always been." Dr. Mahal will promote GlycoNet partnerships with clinical scientists and agencies, demonstrating her track record of bridging academic research with clinical applications.

## Seeking Opportunities through Business and Clinical Alliances

In July 2020, **Dr. Rui Resendes** joined the Network as the Director of Strategic Partnerships. Dr. Resendes will develop business opportunities to advance GlycoNet's research priorities, while establishing the growth and legacy strategy of the Network. With over 20 years of experience in business leadership and commercial development, Dr. Resendes brings a new perspective through his former position as the Executive Director of GreenCentre Canada, a Centre of Excellence in Commercialization and Research. "Rui's demonstrated understanding of market needs will accelerate GlycoNet's traverse through the gap between academic literature and technology innovations," says Dr. Todd Lowary, Scientific Director at GlycoNet.

# NETWORK Community

## NETWORK MEMBERS

- CHU Ste-Justine
- Concordia University
- Dalhousie University
- Hospital for Sick Children
- Institut de recherches cliniques de Montréal
- Institut national de la recherche scientifique
- Laval University
- Lawson Health Research Institute
- McGill University
- McMaster University
- Queen's University
- Research Institute of the McGill University Health Centre
- Ryerson University
- Simon Fraser University
- Sir Mortimer B. Davis Jewish General Hospital
- University of Alberta
- University of British Columbia
- University of British Columbia - Okanagan
- University of Calgary
- University of Guelph
- University of Lethbridge
- University of Manitoba
- University of Montréal
- University of Ottawa
- University of Quebec at Montreal
- University of Saskatchewan
- University of Sherbrooke
- University of Toronto
- University of Victoria
- University of Waterloo
- University of Western Ontario
- University of Windsor
- Wilfrid Laurier University
- York University

## PARTNERS

**Canadian & International Government Departments/Agencies**

- Agriculture and Agri-Food Canada
- Alberta Innovates
- Alberta Livestock and Meat Agency
- Alberta Precision Laboratories
- Egyptian Government
- Fonds de recherche du Québec Santé
- Mitacs
- National Research Council
- Province of Ontario
- Saskatchewan Health Research Foundation
- US Department of Defense

**Foundations**

- Brain Canada
- Crohn's and Colitis Canada
- Cystic Fibrosis Canada
- David Braley Centre
- Heart and Stroke Foundation
- Leukemia Foundation
- Michael J. Fox Foundation for Parkinson's Research
- Michael Smith Foundation for Health Research
- Mizutani Foundation
- Sanfilippo Children's Research Foundation
- Sylvia Fedoruk Centre for Nuclear Innovation

**Industry**

- 48Hour Discovery Inc.
- Alberta Machine Intelligence Institute
- Alectos Therapeutics
- AmacaThera
- Amplyx Pharmaceuticals
- Appili
- BD Biosciences
- BioLife Solutions
- Canadian Poultry Research Council
- Eisai
- Fina Biosolutions LLC
- Gilead Alberta ULC
- Immucor
- IPSEN
- Juno Therapeutics
- LCB Pharma
- Limmatech
- Lysosomal Therapeutics
- MaRS Innovation
- Merck
- Mirexus
- Northern Therapeutics Inc.
- Novartis
- Novozymes
- One Lambda/ ThermoFisher
- Ossium Health
- Ovensa Inc.
- PanTHERA CryoSolutions
- PlantForm
- Poultry Science Cluster
- Repare Therapeutics
- Roche
- Sofie Biosciences Inc.
- StemCell Therapeutics
- Toronto Research Chemicals
- TRB Chemedica
- Univalor
- Waters Corporation
- Wellesley Therapeutics
- WuXi App Tec
- Zucara
- Zulia Inc.

**Universities**

- Academia Sinica
- Alberta Transplant Institute
- California Institute of Technology
- Cornell University
- Griffith University Institute of Glycomics
- Université de Nantes
- University of California
- University of Oklahoma
- University of Texas

**Other Partners**

- Australian Red Cross
- Canadian Donation and Transplantation Research Program
- CQDM
- Deutsche Forschungsgemeinschaft
- Ferrier Research Institute
- Harvard/Massachusetts General Hospital
- Immunology Drug Discovery Group for CNS Disorders
- Integrated Biobank of Luxembourg
- International Vaccine Institute
- Memorial Sloan Kettering Cancer Center
- Miller Thomson LLP
- National Cancer Institute
- National Institute of Health
- Ontario Institute for Cancer Research
- Quark Venture
- Scripps Research Institute
- Sir Mortimer B. Davis Jewish General Hospital
- The Smithsonian

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- **Frank Gleeson**, CEO and Founder, Satellos Bioscience Inc.
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- **Joseph Garcia**, Partner, Blake, Cassels & Graydon LLP
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- **Nils Petersen**, Professor Emeritus, University of Alberta
- **Norma Sebestyen**, Consultant, Independent
- **Patricia Lynne Howell**, Senior Scientist, Hospital for Sick Children
- **Stewart Fast**, (Observer) Senior Program Manager, Networks of Centres of Excellence
- **Stewart Roth**, President/Chief Executive Officer, Guardian Chemicals Inc.
- **Todd Lowary**, Scientific Director, GlycoNet
- **Walter Dixon**, Associate Vice-President (Research and Priority Initiatives), University of Alberta
- **Warren Wakarchuk**, (Observer) Associate Scientific Director, GlycoNet

## STAFF

- **Elizabeth Nanak**, Chief Executive Officer
- **Ali Chou**, Communications Associate
- **Cécile McNeil**, Financial Administrator
- **Claude Larrivee Aboussafy**, Administrative and Research Coordinator
- **Karli Stein**, Lead Administrative Assistant
- **Rui Resendes**, Director of Strategic Partnerships

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- **Akay Akohwarien**, Technician, University of Saskatchewan
- **Elizabeth Nanak**, (Observer) Chief Executive Officer, GlycoNet
- **Joerg Bohlmann**, Professor, University of British Columbia
- **Lisa Willis**, Assistant Professor, University of Alberta
- **Norma Sebestyen**, Consultant, Independent
- **Warren Wakarchuk**, Associate Scientific Director, GlycoNet

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- **Todd Lowary**, Scientific Director, GlycoNet

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- **Michael Lorimer**, Managing Director, Echelon Wealth Partners
- **Stewart Fast**, (Observer) Senior Program Manager, Networks of Centres of Excellence
- **Stewart Roth**, President/ Chief Executive Officer, Guardian Chemicals Inc.
- **Todd Lowary**, Scientific Director, GlycoNet
- **Warren Wakarchuk**, (Observer) Associate Scientific Director, GlycoNet

## NOMINATING COMMITTEE

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- **Elizabeth Nanak**, (Observer) Chief Executive Officer, GlycoNet
- **Karimah Es Sabar**, Chief Executive Officer, Quark Venture
- **Nils Petersen**, Professor Emeritus, University of Alberta
- **Norma Sebestyen**, Consultant, Independent
- **Stewart Fast**, (Observer) Senior Program Manager, Networks of Centres of Excellence

# NETWORK Community

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- **Elizabeth Nanak**, (Observer) Chief Executive Officer, GlycoNet
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- **Mariela Segura**, Professor, University of Montreal
- **Mark Nitz**, Professor, University of Toronto
- **Obadiah Plante**, Sr. Director, Moderna Therapeutics
- **Paul DeAngelis**, Presidential Professor, University of Oklahoma Health Sciences Center
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- **Lai-Xi Wang**, Professor, University of Maryland
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- **Warren Wakarchuk**, (Observer) Associate Scientific Director, GlycoNet

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- **Revathi Reddy**, MSc Student, University of Alberta
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# NETWORK Community

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- **Mark MacLachlan**, University of British Columbia
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- **Mark Taylor**, University of Toronto
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- **Marty Boulanger**, University of Victoria
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- **Neeloffer Mookherjee**, University of Manitoba
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- **Sebastien Bonnet**, Laval University
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- **Todd McMullen**, University of Alberta
- **Uri Saragovi**, Lady Davis Institute - Jewish General Hospital
- **Valerie Waters**, Hospital for Sick Children
- **Vesna Sossi**, University of British Columbia
- **Vincent Fradet**, Laval University
- **Wade Abbott**, Agriculture and Agri-Food Canada
- **Warren Wakarchuk**, University of Alberta
- **Wei Zhang**, University of British Columbia
- **Wesley Zandberg**, University of British Columbia – Okanagan
- **Yvan Guindon**, Institut de recherches cliniques de Montréal
- **Yves Dory**, University of Sherbrooke
- **Yves St-Pierre**, Institut National de la Recherche Scientifique
- **Zhou Xing**, McMaster University
- **Ziv Gan-Or**, McGill University



# FINANCIAL Statements

## CANADIAN GLYCOMICS NETWORK

## STATEMENT OF FINANCIAL POSITION

As at March 31, 2020

| | 2020 $ | 2019 $ |
|---|---|---|
| **Assets** | | |
| **Current assets** | | |
| Cash | 96,749 | 86,804 |
| Short-term investments (note 3) | 356,514 | 652,429 |
| Accounts receivable | 99,092 | 5,000 |
| GST receivable | 6,381 | 6,645 |
| Prepaid expenses | 8,835 | 310,647 |
| Due from Network Host (note 4) | 5,780,486 | 4,762,421 |
| | 6,348,057 | 5,823,946 |
| **Liabilities** | | |
| **Current liabilities** | | |
| Accounts payable and accrued liabilities | 162,877 | 57,000 |
| Deferred revenue (note 5) | 5,724,704 | 5,355,526 |
| | 5,887,581 | 5,412,526 |
| **Net Assets** | | |
| **Unrestricted net assets** | 460,476 | 411,420 |
| | 6,348,057 | 5,823,946 |

**Approved by the Board of Directors**

Director Director

The accompanying notes are an integral part of these financial statements.

# FINANCIAL Statements

## CANADIAN GLYCOMICS NETWORK

## STATEMENT OF OPERATIONS

As at March 31, 2020

| | 2020<br>$ | 2019<br>$ |
|---|---|---|
| **Revenues** | | |
| Grants (note 5) | 4,812,326 | 6,521,510 |
| Contributed services (note 6) | 110,000 | 172,401 |
| Symposium | 49,643 | 111,490 |
| Services | 40,991 | 73,671 |
| Interest income | 9,358 | 11,689 |
| | 5,022,318 | 6,890,761 |
| **Expenditures** | | |
| Research project funding | 3,219,502 | 4,758,203 |
| Salaries and employee benefits | 758,516 | 870,572 |
| Symposium | 294,357 | 373,302 |
| Patent costs | 209,842 | 46,792 |
| Travel | 122,895 | 143,505 |
| Communications | 96,438 | 136,370 |
| Training programs | 89,893 | 63,327 |
| Other | 65,774 | 178,044 |
| Consulting fees | 43,204 | 70,085 |
| Professional fees | 33,585 | 36,865 |
| Seminars, workshops and networking | 14,501 | 27,942 |
| Office | 12,043 | 15,989 |
| Insurance | 10,183 | 10,099 |
| Equipment | 2,529 | 389 |
| | 4,973,262 | 6,731,484 |
| **Excess of revenues over expenditures for the year** | 49,056 | 159,277 |

## CANADIAN GLYCOMICS NETWORK

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