

OPINION

Glycomics is the new frontier in bioinnovation

By KARIMAH ES SABAR FEBRUARY 7, 2022

Canada has a tremendous opportunity with continued investment in glycomics to establish global leadership and economic prosperity while at the same time solving some of the world's most pressing challenges in health and environmental sustainability.



An investment in furthering glycomics research helps the nation secure new global markets by generating new technologies in health, agriculture, materials, and environmental sustainability while simultaneously meeting our 2030 Sustainable Development Goals, writes Karimah Es Sabar. *Unsplash photograph by Julia Koblitz*

As nations scramble to address global crises in antimicrobial resistance, food security, and climate change, the federal government's vision to invest in glycomics, a field of research laying the groundwork for the next biotechnological revolution, deserves particular recognition. Canada has a tremendous opportunity with continued investment in glycomics to establish global leadership and economic prosperity while at the same time solving some of the world's most pressing challenges in health and environmental sustainability.

Glycomics studies the role of carbohydrates—or glycans—in humans, animals, plants, bacteria, and viruses. Every organism contains glycans that guide and control many critical aspects of biology. For example, the COVID-19 virus uses glycans on its spike protein to attach to and infect human cells while evading the immune system. By understanding the impact of glycan changes and interactions, Canada's glycomics researchers are generating tools to broaden our understanding of biology—tools that will play a critical role in developing solutions to mitigate the effects of the current and future global pandemics.

Canada has been at the forefront of glycomics for decades. For example, nearly 90 years ago, Canadian glycomics researchers successfully optimized the production of heparin (a type of glycan) to reduce blood clotting. And 20 years ago, they were able to develop a next-generation vaccine for meningitis, which laid the foundation for the further development of glycan-based conjugate vaccines. [GlycoNet](#), a federally funded Network of Centres of Excellence led out of Alberta, has kept Canada at the global forefront in glycomics research. GlycoNet researchers have recently identified a new, more powerful group of enzymes that could turn any type of blood into the universal donor type O—addressing the blood supply shortage crisis. These and other life-saving discoveries demonstrate how glycomics is well positioned to lead the next chapter in biotechnology through new advancements in human and animal health and agriculture.

Recently, GlycoNet released its report, [Glycomics: The New Frontier in Bioinnovation](#), to increase awareness about glycomics and demonstrate how the research spans sectors to address government priorities in health, environmental sustainability, economic growth and recovery. Glycomics also aligns with Canada's 2030 Sustainable Development Goals and is poised to lead advances in health and well-being, support food security and drive innovation in plant-based renewable resources.



Karimah Es Sabar is board chair, Canadian Glycomics Network (GlycoNet) and the Canada Chair, Health Bioscience Economic Strategy Table, Government of Canada. *Photograph courtesy of GlycoNet*

GlycoNet has demonstrated regional economic benefits beyond glycomics research, leading to the establishment of several commercial startups; by transforming any donor's blood to the universal type O, ABOzymes Biomedical, founded in 2020, is revolutionizing the blood transfusion industry and has already secured more than \$1.3-million in seed financing; PanTHERA CryoSolutions, founded in 2017, is evolving the cryopreservation of stem cells and organs, attracting international recognition, and has secured strategic investments upwards of US\$4-million. A biotech that has become one of the sought-after drug discovery partners of the global pharmaceutical industry, 48Hour Discovery, has seen revenues double every year since the company was founded in 2017 and has reached revenues of \$5-million in 2021. With a heightened appetite for innovative and breakthrough technology, the pharmaceutical sector is primed for investment in glycomics. The global glycomics market is rapidly growing with drug discovery and development accounting for the largest market driver in 2018. Glycan-based therapeutics have experienced tremendous growth. Five of the top 10 global protein drugs on the market today, are glycan-linked, reaching a **combined revenue of US\$58-billion** in 2020.

The rapid evolution of glycomics is not without precedent in the broader “omics” field. Genomics—how genes influence biological life and our environments—has transformed biotechnology, yielding impressive health and economic benefits. The **Human Genome Project** alone created US\$794-billion in economic impacts and supported 310,000 jobs globally. With sustained investment, the burgeoning field of

glycomics will generate similar benefits, while paving the way for discoveries in health and environmental sustainability.

A recent high-profile heart transplant has signalled that biotechnology's next chapter is already here. Glycans play a crucial role in immune response and gained worldwide attention recently with the [experimental heart surgery](#) in which a patient received a pig heart that had undergone gene-editing to remove cellular glycans that trigger organ rejection.

Canada's glycomics research capacity and mobilization leverages the expertise across the country expanding the potential of glycomics to develop vaccines, drugs, therapies, diagnostics, sustainable food, and manufacturing platforms. Canada's strategic investment in glycomics creates jobs and builds biotech companies with high growth potential.

An investment in furthering glycomics research helps the nation secure new global markets by generating new technologies in health, agriculture, materials, and environmental sustainability while simultaneously meeting our 2030 Sustainable Development Goals. A solid commitment from industry, academia and government to build aggressively upon the progress to date will anchor Canada as a global leader. If the COVID-19 pandemic has taught us anything, it is that when governments are proactive and partner with business and academia, we witness tremendous impacts on the lives of Canadians resulting from investments in cutting-edge science.

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