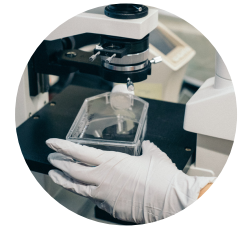


ONTARIO UNIVERSITIES: EMPOWERING ONTARIO'S LIFE SCIENCES ECOSYSTEM



The Issue: A strong, resilient health-care and life sciences sector is critical to Ontario's success and prosperity. By enabling growth and innovation in this key sector, the government can establish Ontario as a global leader in life sciences, biomanufacturing and biomedical research, and attract investment to regions throughout the province, helping support the health and well-being of all Ontarians.

Background

- The last three years clearly demonstrated the need for a strong life sciences sector in Ontario, as hospitals, researchers, industry and innovators quickly pivoted to address immediate needs brought on by the pandemic.
- A highly skilled workforce and Ontario-made innovations within life sciences will ensure Ontario is self-sufficient and well-positioned to weather future shocks in the years to come.

As of 2017, the life sciences sector in Ontario employed one in 13 Ontarians, according to Life Sciences Ontario. In addition, Ontario is one of the top five markets in North America for life sciences employment and investment.

- Strong partnerships are essential to continue to translate and mobilize knowledge, build Ontario's supply chain resiliency and commercialize innovations that support the health of Ontarians and drive economic growth.
- More jurisdictions across Canada, such as Quebec, Alberta and B.C., are prioritizing life sciences and ensuring they receive their fair share of federal funding. Ontario must leverage these opportunities to remain competitive both locally and internationally.
- Without investment throughout Ontario's life sciences ecosystem to support talent development and retention, as well as innovative solutions, the potential growth in the life sciences sector cannot be fully realized.

From 2017-2022, more than 720 start-up companies were created in life sciences across 10 universities in Ontario, including more than 290 research-based start-up companies and more than 300 student originated start-up companies.

Between 2017-22, nine Ontario universities reported that more than 2,300 students participated in research internships in industries related to life sciences, provided by programs through Mitacs, the Vector Institute and others, according to data collected by COU.

How Universities are Supporting Ontario

By contributing talent and research, Ontario's universities play a vital role in the province's life sciences sector, helping attract investment, commercialize innovative solutions and propel the sector forward.

- In addition, over the past five years, universities attracted \$3.5 billion from private-sector sources for life sciences research conducted at affiliate hospitals, including funding from business enterprises, individuals, as well as foundations and non-profits.
- Through innovative programming and work-integrated learning opportunities, Ontario's universities are also working to develop a highly skilled life sciences workforce.

More than 614,000 students enrolled in undergraduate programs in life sciences at Ontario's universities from 2017-22, while more than 100,000 students enrolled in graduate life sciences programs, according to COU enrolment data.

- Universities will continue to help establish Ontario as a global leader in life sciences - one that attracts investment and talent, and brings prosperity to regions throughout the province for decades to come.

Partnering to Build a Stronger Ontario

In order to build on its life sciences strategy and the efforts made throughout the pandemic and in the years leading up to it, the government can:

1. Invest throughout the life sciences ecosystem, including in life sciences research and innovation and support to expand enrolment in high-demand programs.
2. Strategically match federal dollars in biomanufacturing and life sciences to ensure Ontario does not fall behind what Quebec, B.C. and Alberta are leveraging.
3. Continue to foster collaboration and conversation through Ontario's new Life Sciences Council and ensure a diverse range of perspectives, from academia and hospitals to industry, are reflected.



PARTNERING TO SUPPORT A ROBUST LIFE SCIENCES SECTOR



Life sciences play a critical role in all aspects of our daily lives – from the food we eat, to the energy we use, to the vaccines which protect us from disease. As Ontario builds a stronger economy, the life sciences sector is well-poised to help the province face future shocks to the health-care system and develop products and services that will drive economic growth in communities across Ontario.



From adopting cutting-edge health technologies that are helping evaluate the long-term effects of COVID-19, driving innovation in digital health and agriculture, and investing in talent and innovation through entrepreneurship, Ontario's universities are helping address critical life sciences challenges for the benefit of Ontarians.

Below are some of the ways universities are leveraging their talent and expertise, alongside their partnerships with hospitals, research institutes and industry, to foster innovation in life sciences and attract investment across the province.

● Developing life sciences talent through work-integrated learning

● To help students gain valuable research skills, as well as support the needs of local businesses, a partnership between **Algoma University** and Mitacs, is helping students access high-quality internships in the local community. Through the Algoma-Mitacs partnership, businesses are gaining access to research and development resources while students are developing in-demand skills that will help future-proof them for a changing labour market.

● As a way to help more young women and girls learn about career opportunities in STEM and foster a diverse STEM workforce, students at **Carleton University** designed the digital platform, PowHerStem. The platform aims to provide information and resources to girls aged 11 to 19 by connecting them with role models and creating an empowering online community.

● Providing training opportunities for students to learn and develop in-demand skills in digital health will be crucial for optimizing the health-care system and improving patient care. Researchers at **Queen's University**, in partnership with Kingston Health Sciences Centre, are leading a graduate training and research program that provides comprehensive training in medical informatics, experiential learning and skills development to help prepare Canada's workforce to analyze and interpret complex health data.

● By connecting scientists, engineers and medical practitioners from around the world to develop and prototype health-care innovations, students in the Medical Innovation Fellowship (MIF) at **Western University** are helping generate new intellectual property to address critical market gaps and support patient care. Through the program, students have access to training opportunities in innovation, prototyping, intellectual property, regulatory affairs and business strategy that will help them develop the health-care innovations of tomorrow.

● Through a series of innovative STEAM-related workshops, lectures and hands-on learning experiences, the Shad program at **Wilfrid Laurier University** offers high school students the opportunity to explore careers in STEAM. The program also empowers students to engage in entrepreneurial pursuits to discover their passions by offering the opportunity to live on campus, participate in workshops in university labs, and participate in real-world design challenges.

● As medical technologies and best practices evolve, health professionals require upskilling to keep at pace with advancements in the field. The **University of Windsor** Summer Institute for Clinical Health Research is helping learners gain new knowledge and relevant skills, including qualitative research, epidemiologic research designs and statistical modeling techniques, keeping them up-to-date with new treatments and technologies to enhance patient care.

● Canada ranks fourth in the world for number of clinical trial sites, and in the wake of the COVID-19 pandemic it is essential that Ontario develop the highly skilled workforce needed to support this growing field. **York University's** Certificate in Clinical Research provides students with up-to-date knowledge of the field, developing the critical skills needed to deliver ground-breaking innovations in clinical research.

● Partnering to grow Ontario's life sciences ecosystem

● Soybeans are an extremely valuable export, generating \$2.6 billion for Canada in 2019 – and Ontario is leading the nation in production, representing more than half of all Canadian soybean acreage in 2021. Researchers at the **University of Guelph** are supporting Ontario's leadership in soybean production with the development of more than 80 soybean varieties with superior genetics, which generated \$130 million in sales in 2019.

● Research partnerships between Ontario's universities and industry are contributing to advancements in our understanding of natural phenomena on Earth and beyond. Researchers at **Laurentian University** are collaborating with NASA to launch yeast samples, which are utilized as living radiation detectors in space, to identify the effects of radiation on astronauts and aid in the development of measures to improve the safety of manned space flights.

● Developing effective and efficient methods of evaluation for those with brain injuries, dementia and cognitive impairments is critical to improving health outcomes and quality of life for patients. Researchers at **McMaster University** are driving innovation in the field with the Cognitive Health Assessment Management Platform, which tracks brain activity through a series of neuropsychological tests to help clinicians evaluate cognitive health and functions, improving diagnostic capabilities.

● Novel technologies continue to provide researchers and innovators with the necessary tools to make ground-breaking discoveries. **Ontario Tech University** is the new home of Canada's first-ever X-Ray photoelectron spectroscope (XPS), which allows researchers to analyze materials at a nanoscale to determine their elemental composition, with applications in various fields, including medicine, forensics, and biology which will improve the health and well-being of people living in Ontario.

● Improving efficiency in healthcare is one way Ontario can expand the capacity of the sector to meet the needs of a growing population. Researchers at the **University of Ottawa** and The Ottawa Hospital are making advancements in this area with CANImmunizes, the world's first digital immunization app, which allows patients and health care providers to efficiently and conveniently review and monitor vaccination records.

● A growing number of Ontarians continue to face the burden of chronic diseases like diabetes and require innovative solutions for treatment and preventions. The **University of Toronto** in partnership with Novo Nordisk has launched the Network for Healthy Populations. The Network is finding solutions that address the root causes of type 2 diabetes and other serious chronic diseases and is developing interventions to prevent their rise and the unsustainable impacts on individuals and health-care systems.



● As the impacts of climate change become increasingly pronounced, fostering resiliency in agriculture is critical. **Trent University's** research has become the basis for a new natural fertilizer, M-BOS, which was recently launched by Toronto-based NutriAg Ltd. M-BOS feeds on plant waste and produces growth-promoting hormones in return with potential to shore up crop resiliency in the face of heat and droughts.

● Ontario's life sciences sector is the largest in Canada, employing more than 70,000 people across roughly 1,900 life sciences firms. By providing space for students, researchers, and start-ups to develop and commercialize new health technology and life-saving innovations, the **University of Waterloo's** Innovation Arena will help expand the already significant life sciences innovation sector in Southwestern Ontario, while creating 750 new jobs for those living in the Region of Waterloo.



● Supporting revolutionary discoveries in life sciences and health care to foster a resilient Ontario

● By supporting research and development in the field of immunology, we can accelerate discoveries that will have a lasting impact on the health of populations around the world. Researchers at **Brock University** have identified, for the first time, that anti-dengue fever antibodies can potentially enhance Zika infection. The findings lay the groundwork to further analyze how disease occurs and spreads in the human body, providing insight into outbreak management and treatment.

● The frontier of research in the field of multinuclear magnetic resonance imaging at **Lakehead University** has developed lung imaging techniques, which are now being used to monitor symptoms of long COVID in patients, allowing health-care providers to develop individualized treatment plans. Furthermore, cutting-edge translational research programs utilizing novel hyperpolarized ¹²⁹Xe imaging techniques based at Lakehead University enhance and ensure the excellence of functional and molecular imaging to strengthen Canada's health systems.

● Variations in the age of pubertal onset are intrinsically tied to individual physical and mental health development and have broader implications for our understanding of biology and human evolution. A researcher at **Nipissing University** has identified a linkage between genetic predictors of infectious disease resistance and later pubertal development, indicating a genetic trade-off between immunocompetence and sexual maturation in men which links back to human evolutionary pressures.

● Partnering with industry and communities to provide accurate vaccine information helps ensure populations are well-informed and educated. **OCAD University's** Health Design Studio partnered with local physicians and community organizations to launch The Button Project, which provides buttons to be worn by health care workers featuring a QR code leading to a webpage with answers to common vaccine-related questions.

● Each year more than 200,000 Canadians are diagnosed with cancer, resulting in immeasurable impacts on their personal health and quality of life. Researchers at **Toronto Metropolitan University** have developed a mathematical modeling strategy used to help develop individualized treatments for cachexia, a dramatic loss of muscle and fat tissue common in cancer patients.