LIFE SCIENCES ONTARIO

Ideas to Action Life Sciences Forum

November 2nd, 2023

Hosted at the Borden Ladner Gervais LLP Offices
Bay Adelaide Centre, East Tower
Toronto, ON

Summary Report

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EXECUTIVE SUMMARY

This year marked the 14th year of Life Sciences Ontario's annual Ideas to Action Life Sciences Forum. Each year, our Ideas to Action Forum brings together leaders and stakeholders in the life sciences sector—from government, academia, and industry—to discuss how we can take actionable steps to build a resilient, vibrant, and diverse life sciences sector in Ontario and across Canada.

Our theme for this year, ***Disruption and Opportunity: Seizing a Pivotal Moment for Ontario's Life Sciences Ecosystem***, explored issues that are currently affecting and transforming our sector—from antimicrobial resistance and climate change to artificial intelligence and advances in precision medicine and medical technologies. The future of our sector will depend on how we handle the ongoing talent and skills shortage and our ability to attract and retain diverse talent. We also looked at challenges that life sciences companies in Ontario and Canada face when scaling up their business or commercializing their products, such as access to capital, infrastructure, and wet lab space.

During our panel sessions, our speakers highlighted Canada's strengths—from our history of breakthrough scientific and medical discoveries to our highly educated workforce. At the same time, we explored the challenges and barriers our sector needs to overcome to realize its full potential. To be prepared for the disruptions and opportunities our sector faces, we must encourage dialogue and partnership between industry and government and across our sector. In doing so, we can lay the groundwork for Canada to become a global leader in the life sciences—ensuring that Canadian companies can grow their businesses here, while also attracting multinational companies and international investment.

KEY ACTION ITEMS

What specific actions can we take to advance the growth and success of our life sciences sector? The following is a list of action items provided by our speakers.

- Take collaborative approaches in research, innovation, and government to help ensure sustainable development and access to new and existing antimicrobials, antimicrobials alternatives, and diagnostics that focus on preventing infections in both human and veterinary medicine.
- We need urgent action at all levels of public entities and private corporations to harness the untapped potential in Ontario to create globally impactful biotech and health tech companies. The time is now for big, bold and visionary ideas to be embraced, supported, and amplified by the community.
- Drive collaboration between government, industry, researchers, and health sector partners to generate health AI regulation that balances the need for accessible, linkable data with the need to protect patient privacy in the context of our world today.
- All life-science actors endorse and adopt the principles of the Health Data Charter and work collectively to improve data production, access, and use for innovation.
- Engage entrepreneurs and founders of life sciences companies in policy discussions.
- In your organization, set a policy for people managers, then all employees, to undergo unconscious bias training to underscore the importance of embedding diversity in our teams and valuing all perspectives.
- There simply is not enough resource availability, infrastructure, or entrepreneurship training in Ontario focused on improving the quality of commercially viable life sciences innovations emerging from the Ontario ecosystem; to address this, there should be a targeted 10-year funded effort to invest in a network of ecosystem drivers, including, but not limited to, ‘moonshot’ initiatives, co-working locations, and entrepreneurship accelerators.
- Develop a regulatory sandbox for innovative new technologies that don’t “fit” in existing regulatory categories, using concepts such as conditional approvals, iterative science-

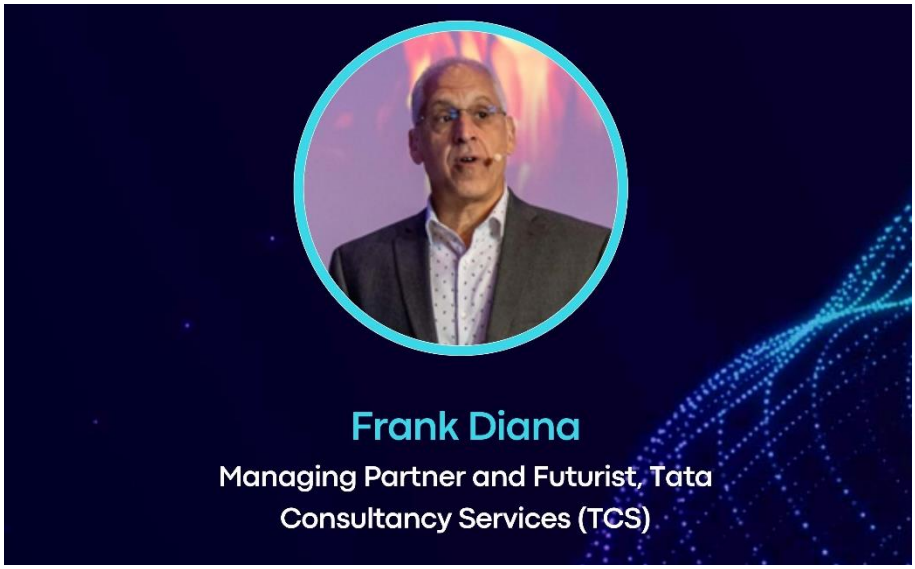
based assessments, and post-approval monitoring to fast-track effective technologies while still protecting the health of Canadians and the environment.

- Work in partnership to ensure that we have a robust life sciences sector that can capitalize on opportunities for economic growth and job creation, as well as contribute to greater domestic health emergency readiness.

OPENING REMARKS FROM MINISTER VICTOR FEDELI

LSO was pleased to welcome the Honourable Victor Fedeli, Ontario's Minister of Economic Development, Job Creation and Trade, to deliver video remarks. Minister Fedeli highlighted the work of Ontario's Life Sciences Council, which is chaired by LSO's CEO and President, Dr. Jason Field. Minister Fedeli announced a one-year extension of the Life Sciences Council's mandate to advise on the implementation of phase two of Ontario's life sciences strategy, *Taking Life Sciences to the Next Level*. Recognizing Canada's history of innovation and discovery in the life sciences, including the discoveries of insulin and stem cells, Minister Fedeli emphasized the crucial role that innovation plays in strengthening our health system and saving lives. In 2022, Ontario announced the Life Sciences Innovation Fund at LSO's annual Ideas to Action Forum. Since then, the Ontario government has invested $3 million in 6 life sciences companies, helping them to scale up their Ontario-made innovations.

KEYNOTE BY FRANK DIANA: *REIMAGINING THE FUTURE*



Our world is changing at an exponential rate from advancements in science and technology to changing industry dynamics and economic principles. Frank Diana, a globally recognized futurist and thought leader, presented an interdisciplinary perspective on how we can best navigate the dynamics and opportunities of the emerging future by looking at the past. To do so, we must be able to learn, unlearn, and relearn.

Key Takeaways:

- From the late 1800s and through the 20th century, the world witnessed a convergence point with unforeseen advancements in science and technology, changes in business and economic practices, and catalysts, such as major geopolitical events and catastrophes (e.g., World Wars I and II and the Great Depression) that forced humans to adapt.
- Patterns throughout history repeat themselves, with today's world most like the 1930s.
- Currently, society is facing major changes such as aging populations, reskilling society, the decline in fertility rates and a fall in the working-age population, and misinformation. Additionally, the traditional 4-stage life cycle for humans has shifted to a 5-stage life

cycle as people are delaying major life milestones, such as marriage and having children, are working longer, and taking care of aging or dependent parents.

- Building blocks in the life sciences are converging to address societal challenges: synthetic biology, climate change, food and water insecurity, personalized medicine, de-extinction, and biological warfare. Synthetic biology, for example, can help address climate change. Personalized medicine can help address health equity and improve outcomes for everyone.

PREPARING FOR THE NEXT BIG CRISIS IN THE LIFE SCIENCES

What is the next big crisis in the life sciences? This panel discussed some of our biggest challenges and risks across our sector that will impact our lives and health for years to come, including antimicrobial resistance and infectious diseases, aging populations, and climate change. Do we have the right policies and tools in place to deal with these crises? What actions do we–as a sector–need to take to get there?

Key Takeaways:

- We cannot ignore the global megatrend of aging. Everyday functions of our society are not designed to handle aging populations.
- Around one-third of the Canadian population are part-time caregivers, yet geriatrics is the most underfunded medical science.
- In a global study, the World Health Organization found that ageism is the most prevalent form of discrimination. We need a global mind shift to confront negative stereotypes on aging. Good policy decisions can help contribute to this mind shift and create an age-inclusive world.
- The public is not aware of the dangers of AMR. Yet in 2019, AMR contributed to approximately 4.95 million deaths globally—more than malaria, tuberculosis, and HIV combined. By 2050, AMR may be responsible for 10 million deaths annually worldwide,

costing the global economy over $100 trillion. In Canada, AMR is responsible for 15 deaths per day.

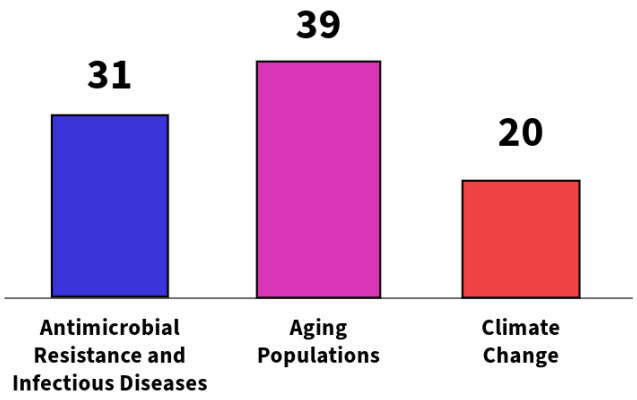
- Antimicrobials are also important to animal health, agriculture, and agri-food production systems. Therefore, AMR poses a risk to food security and animal welfare.
- Commonly performed procedures and treatments, like cesarean sections, knee replacements, and chemotherapy, may become life-threatening due to AMR.
- Global collaboration is necessary to address AMR, but implementation is currently fragmented and siloed. Low to middle-income countries are disproportionately affected.
- Canada released a 5-year action plan on AMR, *Pan-Canadian Action Plan on Antimicrobial Resistance in 2023.* The plan will work across federal, provincial, and territorial governments, along with Indigenous partners, to address five key pillars: research and innovation, surveillance, stewardship, infection prevention and control, and leadership.
- Climate change is a fundamental threat to human health and is already impacting human health through air pollution, extreme weather events, disease, forced displacement, food insecurity, and pressures on mental health.
- The life sciences sector's eco-footprint is 5% of global emissions, while the healthcare industry accounts for 10% of national global emissions—higher than the aviation and shipping industries. Globally, if healthcare were a country, it would be the 5th largest greenhouse gas emitter.
- We must act to both mitigate and adapt to climate change.

Hearing from the Audience

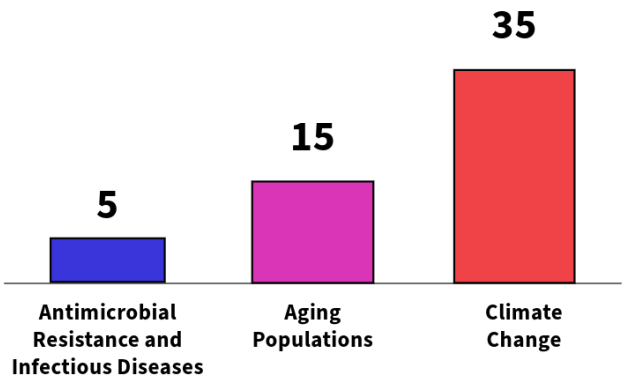
At the beginning of the panel, we asked the audience to respond to the following question, "What is the next big crisis in the life sciences?" with one of the three options: infectious diseases and antimicrobial resistance (AMR), climate change, or aging populations. Aging populations received the most responses in the pre-panel poll. In the post-panel poll, the audience voted for climate change as the next "big crisis." These results likely reflect the interdependency of the three topics discussed, with climate change exacerbating the impacts of aging populations, antimicrobial resistance, and infectious diseases. For example, older adults are more adversely affected by climate change, including air pollution and extreme weather events. Furthermore, over half of human pathogens are aggravated by climate change. Climate change also increases the rate of the spread of AMR, with the elderly at the greatest risk.

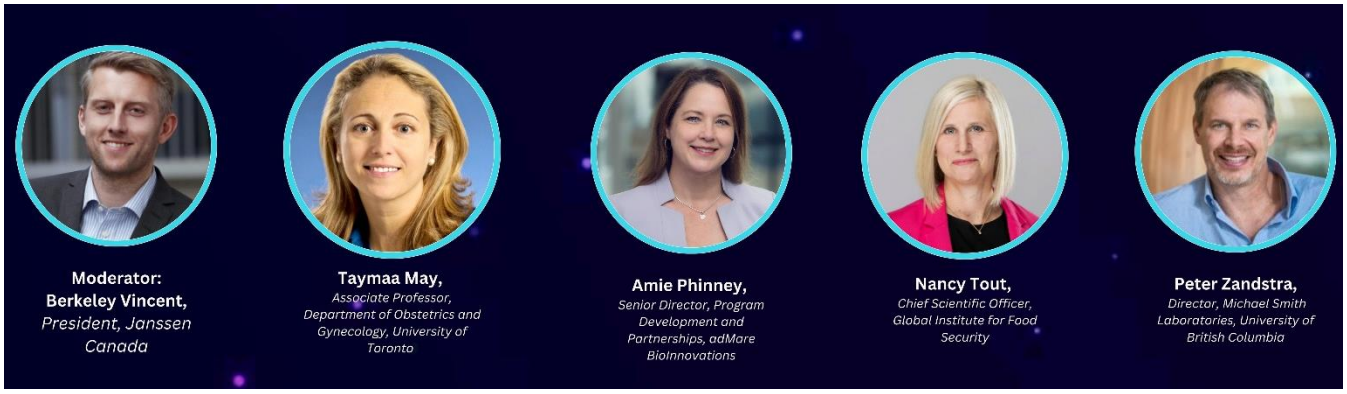
What is the next big crisis in the life sciences sector?

Pre-Panel Poll Results



Post-Panel Poll Results





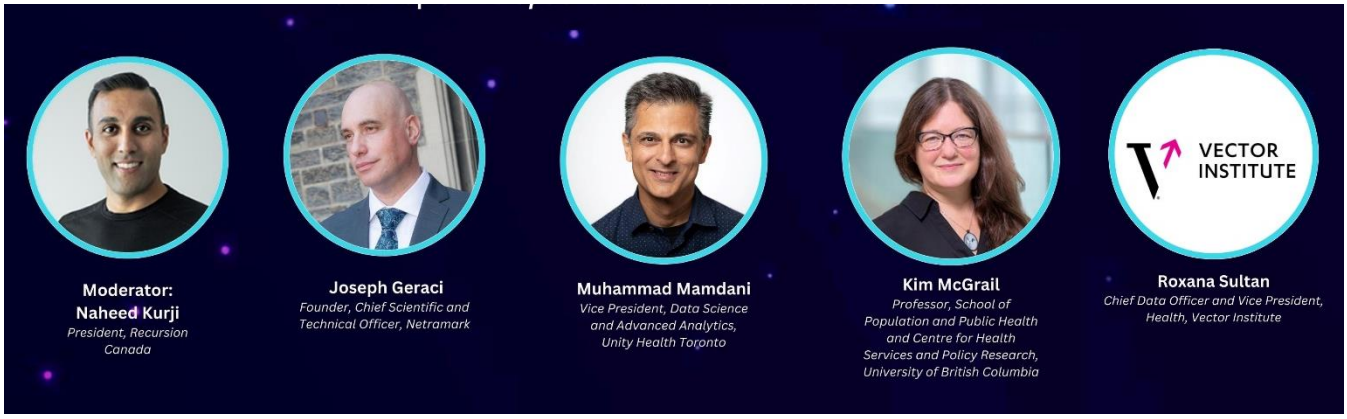
What will define the next decade in the life sciences? Advances in precision medicine, robotics surgery, and advanced medical technologies can improve patient outcomes and strengthen health system efficiency–transforming the health and quality of life for patients. Innovative solutions in agriculture, including engineering biology and precision agriculture, are important methods to improve sustainability and access to food. What barriers do we need to overcome to ensure the early adoption of and affordable access to innovative technologies? What actions do we need to take to ensure that Canada can serve as a leader in these areas of opportunity?

Key Takeaways:

- Surgical innovation is improving outcomes for both patients and the health system, including fewer complications and decreased hospital stays. Yet, there is a funding gap and a lack of incentives to adopt innovative surgical technologies in Ontario and across Canada.
- Examples of surgical innovation include robotics surgery. In Ontario, however, there are only three types of cancers that have been approved for use in robotics surgery.
- Access to surgical innovation needs to be more equitable. Patients who live in remote communities have less access to surgical innovation.
- Personalized therapies, such as cell and gene therapies and synthetic biology-based products, are transformative but we need to ensure early adoption and access to these technologies. This is especially important for patients in the early stages of disease.

- Canada has a strong history of discovery in medicine, but we need to translate discoveries into innovation and embrace a system that does this effectively. This will be driven by realizing the market value of innovation, which will drive the growth of our sector.
- We need policy and cultural changes at the post-secondary and university levels to recognize the impact of patents as equal to academic publications.
- Innovation in agri-food, such as engineering biology, gene editing, and precision agriculture, can improve food security. Yet Canada faces various challenges such as climate change, trade and regulatory barriers, limited resources (water, land), changing consumer demands, and policy barriers.
- During the COVID-19 pandemic, there was a sense of urgency and competition to develop innovative solutions. This should be a permanent part of our culture to encourage discovery and commercialize innovation.

DISRUPTIONS IN THE LIFE SCIENCES SECTOR: DATA & AI



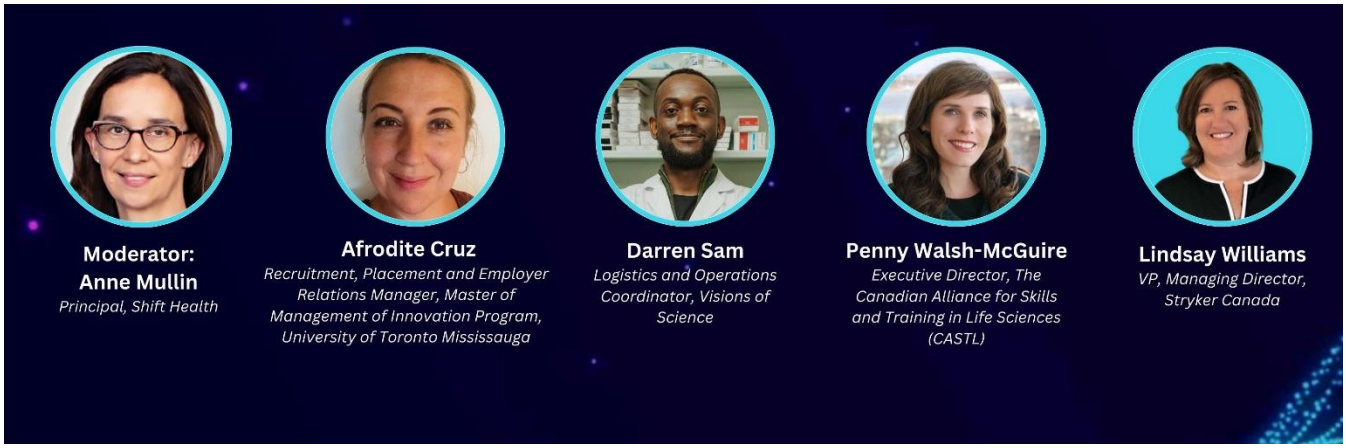
Data is necessary in all areas across the life sciences sector for making evidence-based decisions, but how do we ensure we have proper data infrastructure and processes in place to enable data to transform healthcare? Do we have the ideal technical infrastructure and framework in place to enable data to be leveraged to its potential? Do we have the right privacy frameworks to govern our use and access to data? How does this apply to policies on intellectual property? At the same time, advances in artificial intelligence (AI) have the potential to transform our sector, but also lead to major disruptions. How can AI transform healthcare? What do policymakers in health and life sciences need to know about AI and what actions should we be taking now?

Key Takeaways:

- The Pan-Canadian Health Data Strategy includes several key principles to guide the use of health data. For instance, data needs to be people-centric. We need broader health data literacy for the public, policymakers, and researchers. We need harmonization of data across Canada, but also need to ensure data sovereignty for Indigenous peoples.
- We need to shift from a culture of custodians of data, or keeping data safe, to stewardship of data—keeping data safe, but ensuring that it is used for public benefit.

- We need to engage the public on data and AI and earn their trust, especially diverse groups, to ensure data is not used in harmful ways.
- Canada's diverse population is untapped—our data does not reflect the diversity of Canada. For example, 94% of genomic data is not from diverse groups.
- It is important to consider the purpose of data. Is it to set up a research environment? Or is it to affect patient care? A national data framework that focuses on patient care decisions is different than a framework designed for research as the former may need to be updated in real-time and have mechanisms to engage healthcare providers and patients.
- We need to balance privacy protections with the need to be able to access more data at the individual level to drive personalized care.
- AI solutions in hospitals, which monitor patients' health in real-time, can improve patient outcomes, such as reduced mortality rates. AI also benefits the hospital system by decreasing human effort and improving error rates.
- To effectively scale AI solutions, however, hospitals need the capacity to understand, deploy, and manage machine learning solutions on an ongoing basis. The private sector can collaborate with the public sector to provide this expertise.

BUILDING A DIVERSE LIFE SCIENCES SECTOR: TALENT & IDEA (INCLUSION, DIVERSITY, EQUITY AND ACCESSIBILITY)



Canada's life sciences sector is currently facing a talent shortage. According to the BioTalent Canada, Canada will need to hire 36,000 bio-health workers by 2029 to replace retirees or those leaving the workforce.[1] To solve our sector's biggest challenges of today and the future, our sector must be able to attract, train, and retain skilled talent—including equity-deserving groups which are underrepresented in Canada's life sciences sector. In this session, we heard from experts in the industry on advancing best IDEA practices as well as key recommendations from the recent report by LSO and Shift Health, "Status of IDEA in Canada's Life Sciences Sector."

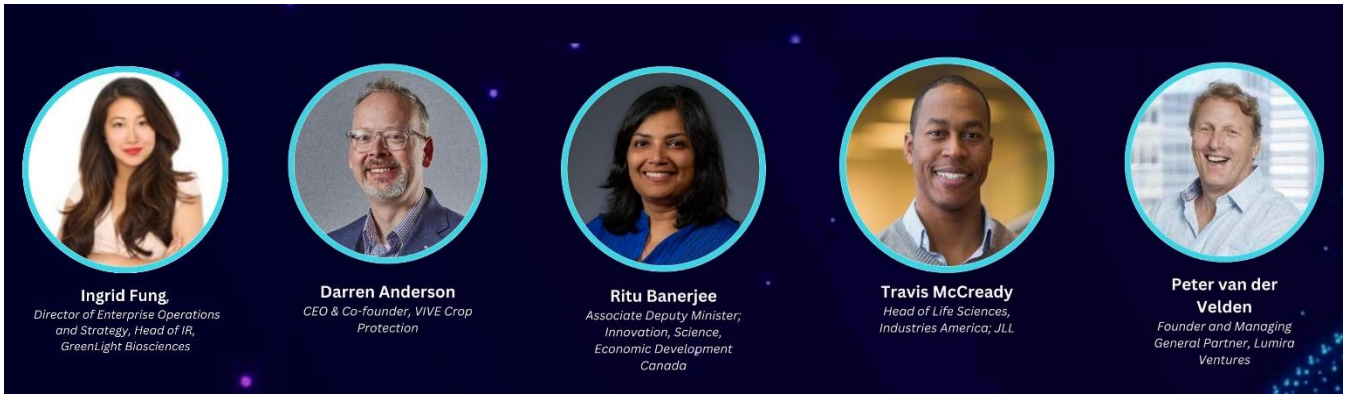
Key Takeaways:

- Our sector does not reflect Canada's labour market in its representation of women, visible minorities, people with disabilities, and Indigenous peoples. The future of the life sciences in Canada and Ontario depends critically on our ability to develop, attract, and retain diverse talent.

[1] BioTalent Canada, "Close-up on the bioeconomy," (2021), p. 33, https://biotalent.ca/wp-content/uploads/BioTalent-Canada-LMI-National-Report-13OCT2021-1.pdf.

- To best support youth from diverse backgrounds in STEM, authentic representation in leadership matters. Youth need to be exposed to people who look like them to see themselves. It is also important that youth are engaged in informal educational opportunities that are more focused on experience than grades and performance.
- Employee resource groups that represent diverse groups can help build a sense of belonging and inclusion in the workplace.
- To accelerate innovation and scale up life sciences companies, we need to support training programs that help generate knowledge and specific skills.
- Technical, hands-on training programs can help workers develop practical skills that are transferable to industry. These include different types of training such as new skilling or working directly with academic partners to train post-secondary students, upskilling or directly training with industry, and re-skilling, which includes individuals who are either transitioning from another industry or do not have relevant Canadian work experience.

GROWING COMPANIES IN THE LIFE SCIENCES SPACE: GAPS AND OPPORTUNITIES



Life sciences companies looking to grow their businesses face a range of challenges–from access to capital and wet lab space to policies that support innovation and intellectual property. Which is the most important component to growing life sciences companies? How might this differ depending on the size of the company (e.g., small and medium-sized organizations versus large organizations)? What policies do we need to ensure the long-term growth and success of life sciences companies in Canada? What learnings can be applied from other jurisdictions? In this panel, we explored the key requirements for growth as a life sciences company in Ontario and Canada and what specific policy actions are needed to achieve this.

Key Takeaways:

- Canadian life sciences companies face challenges with scaling up, including regulatory barriers, access to capital, and access to facilities and infrastructure—especially when compared to other jurisdictions such as the United States.

- Leveraging pension funds is one way to spur greater investment into Canada's life sciences sector. Pension plans have played an integral role in building the life sciences ecosystem in other jurisdictions, such as the United States.
- There aren't enough diverse infrastructure types to support a growing life sciences sector in Ontario.
- It is important to consider that different companies in the industry face different challenges. Biomanufacturing companies, for example, may face higher asset costs than research and development.
- A life sciences company's speed to market and ability to scale up depends on the degree to which it can use creative financing techniques and diverse types of infrastructure to manipulate speed to market. Innovation incubators excel at achieving this.
- We need to increase the number of companies in Canada that are scaling up. Mentorship can help small and medium-sized life sciences companies rapidly scale up their businesses by providing expertise, knowledge, and networking opportunities.
- Partnerships without jurisdictions are one way Canada is working to strengthen its biomanufacturing sector. For example, Canada currently has a memorandum of cooperation with the United Kingdom to improve collaboration with research in biomanufacturing and quantum science.
- From a policy perspective, there are many challenges with mitigating risk in the life sciences and biomanufacturing sector. Dialogue with industry stakeholders and the public is one way to address this.

FIRESIDE CHAT

To close the forum, this fireside chat explored how we can take the ideas discussed throughout the day to best empower our sector. What does success look like for our life sciences sector? This chat explored areas of alignment between Ontario's Life Science Strategy and the federal Biomanufacturing and Life Sciences Strategy and identified areas of opportunity for the provincial and federal governments to work together to build a resilient and prosperous life sciences sector.

Key Takeaways:

- The life sciences sector is Canada's greatest untapped opportunity to help people.
- The COVID-19 pandemic revealed the importance of having a life sciences strategy to create the right environment for our sector to succeed. However, we need to make sure that Canada's life sciences sector is sustainable beyond pandemic and health threats.
- Science communication to the public is crucial—societies that had the most trust between citizens and government had the lowest rates of COVID-19.
- Canada has many assets, such as educational attainment, which is the highest among OECD countries. Yet, we lag in science and STEM employment.
- Life sciences companies in Ontario and Canada exit too early. We need this talent and capital to be re-invested into the ecosystem.

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Delphic Research

Anne Mullin, Committee Co-Chair
Shift Health

Kerry Allerton,
3Sixty Public Affairs

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Lumira Ventures

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AmacaThera

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BD Canada

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