

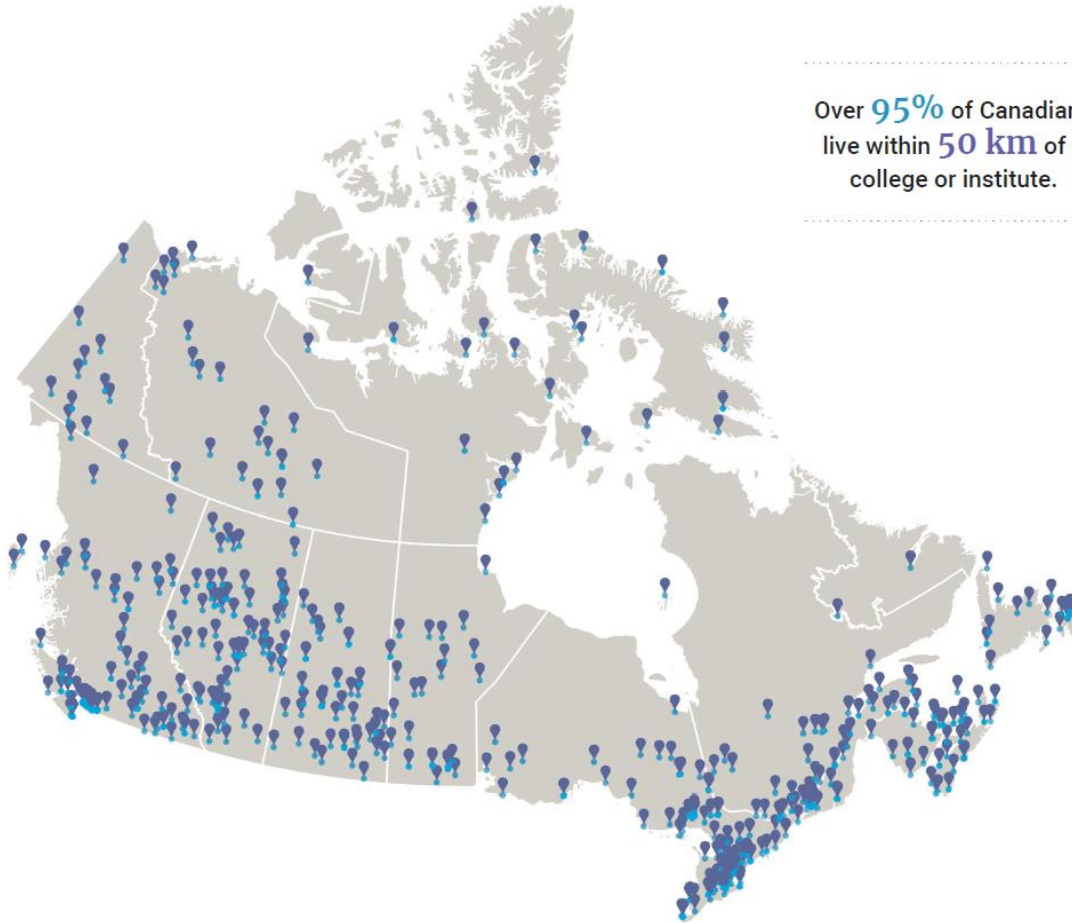


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Networks of Innovation: The Role of Colleges in Strengthening Canada's Biomanufacturing Capacity



Submitted to: Innovation, Science and Economic Development Canada (ISED)

March 2021



Networks of Innovation: The Role of Colleges in Strengthening Canada's Biomanufacturing Capacity

Submission to the Government of Canada consultation on the creation of new biomanufacturing capacity for Canada

Recommendations:

1. That the federal government consult with colleges to determine how to leverage existing training capabilities and develop them to meet the variety of needs and the high standards required by a growing biomanufacturing sector.
2. That any federal investment in establishing a new national biomanufacturing initiative include specific funding for partnered college applied research to strengthen the link between fundamental research and commercialization and support the thousands of SMEs that are involved either directly in biomanufacturing or in related industries.
3. That future investments in biomanufacturing support the development of networks that enable all research partners – from private companies to universities and colleges – to leverage existing capacity and more efficiently create a strong innovation ecosystem in this area.



Introduction

The COVID-19 pandemic has demonstrated that Canada needs to lay a durable foundation for our ability to respond to current and future health emergencies. The college sector is pleased to provide this response to the consultation on the [creation of new biomanufacturing capacity](#) for Canada organized by Innovation, Science and Economic Development Canada (ISED). This is a joint submission by [Colleges and Institutes Canada](#) (with 135 member institutions), [Tech-Access Canada](#) (with 60 Technology Access Centres (TACs)) and [Synchronex](#) (with 59 college centres for the transfer of technology (CCTTs)).

With 95% of all Canadians and 86% of Indigenous peoples living within 50 kilometres of a college, institute, cégep or polytechnic (hereafter “colleges”), our institutions serve as essential community learning hubs in every province and territory. They produce a highly skilled and competitive workforce for Canada’s employers, provide access to post-secondary education and skills training, and serve as gateways to the innovation ecosystem for thousands of Small and Medium Enterprises (SMEs), health partners and community organizations through applied research. Our members have been actively involved in supporting the COVID-19 pandemic response and are well positioned to assist in recovery efforts, including helping to lay the foundation for a renewed biomanufacturing sector.

The biomanufacturing industry is a complex ecosystem consisting of academic and private sector partners, significant investments in state-of-the art technology and skills, and strong supply chain relationships to sectors including logistics, packaging, occupational health and safety and digital technology. Thanks to their significant geographic reach across Canada, ability to respond nimbly to labour market needs, and strong connections to both universities and SMEs, colleges are uniquely positioned to contribute to this national effort in the areas of **highly skilled training, applied research, and networks for technology transfer and commercialisation.**

Training and highly qualified personnel

- *What is the appropriate balance between developing highly-qualified biomanufacturing personnel in Canada and sourcing expertise from abroad? What measures would you recommend be put in place to achieve that balance?*

The primary mission of colleges is skills training and workforce development that is responsive to the needs of the local labour market. Colleges across Canada currently offer hundreds of programs that support biomanufacturing and related supply-chain industries, including advanced manufacturing, logistics, packaging, transport, occupational health and safety and digital technology. Some 120 programs offer training specific to biomanufacturing, including:

- Biotechnology
- Pharmacology
- Manufacturing management
- Bioinformatics
- Pharmaceutical manufacturing



The strong linkages between employers and colleges ensures graduates complete their studies with job-ready skills. Many college programs already offer co-op placements, internships or other work-integrated learning (WIL) opportunities, such as applied research, as part of the curriculum. These could be further leveraged in a national effort to build capacity in the biomanufacturing sector. The close relationship between colleges and employers also enables colleges to offer continued training support to highly qualified personnel within the entire supply chain of biomanufacturing and associated industries.

- **Recommendation:** That the federal government consult with colleges to determine how to leverage existing training capabilities and develop them to meet the variety of needs and the high standards required by a growing biomanufacturing sector.

Applied Research with SMEs and the innovation ecosystem

- *What steps should be taken to foster closer links and alignment between Canada's biomanufacturing sector and academia?*
- *What supports or services could be put in place to help small- and medium-sized enterprises scale their innovations and grow their businesses in Canada?*
- *What assets should be considered beyond manufacturing lines?*
- *What capabilities should Canada have in-country in related industries, alongside biomanufacturing capacity, to support the sector?*

The applied research offices and centres at Canada's colleges, including Technology Access Centres (TACs) and college centers for the transfer of technology (CCTTs) play an important role in our nation's innovation ecosystem. In offering services such as technology transfer, commercialization, prototyping and product development, they help companies de-risk innovation and provide a critical link between the fundamental research performed at universities and the research and development challenges faced by the private sector. Partnered applied research solves innovation challenges at the "speed of business": In 2017-2018 [applied research offices reported](#) over 4,400 new processes, products, prototypes and services, 87% of which were completed in under one year. Colleges serve as local gateways to the innovation ecosystem for thousands of SMEs and community partners every year, specializing in research that is responsive to regional economies. In 2017-2018 alone, they reported over 7,300 research partnerships, 64% of them with SMEs, who often lack the resources, specialized technology and networks to solve innovation challenges on their own. College applied research is collaborative in nature and supportive of industry needs, with intellectual property (IP) remaining with the industry client.

The network of college applied research offices, TACs and CCTTs contain several centres that specialize directly in biomanufacturing and related supply-chain industries, including:

- [CERASP](#) (Centre d'expertise et de recherche appliquée en sciences pharmaceutiques) affiliated with John Abbot College and Cégep Gérald Godin, in Saint-Laurent, Quebec:
 - biopharmacy
 - pharmaceutical technology



- pharmaceutical production
- digital health
- [TransBIOTech](#) (Centre de recherche et de transfert en biotechnologies) affiliated with Cégep Lévis-Lauzon, in Lévis, Quebec:
 - bioanalysis
 - cellular biology
 - analytical chemistry
 - immunology
- [CNETE](#) (Centre national en électrochimie et en technologies environnementales) affiliated with Cégep de Shawinigan in Shawinigan, Quebec:
 - biotechnology
 - pharmaceuticals
 - health products
- [Technology Access Centre in Bio-Innovation](#) at La Cité in Ottawa, Ontario:
 - molecular biology
 - microbiology
- [Digital Integration Centre of Excellence](#) at Saskatchewan Polytechnic in Saskatoon, Saskatchewan:
 - automation
 - Time-Sensitive Networking (TSN) for industrial process and machine control
- [Selkirk Technology Access Centre](#) at Selkirk College in Trail, British Columbia:
 - material characterization
 - forensic engineering
 - material research and development

College applied research, with its technology transfer and industry-led focus, should be leveraged as a key component of a new national biomanufacturing strategy. In its submission for the 2021 federal pre-Budget consultations, the [College Applied Research Taskforce](#) recommended a new investment of \$165M over two years in the Natural Sciences and Engineering Research Council College and Community Innovation Program (NSERC CCIP) to empower SMEs to help in post-pandemic economic recovery. This includes \$85M for rapid-response and entry-level grants to improve or develop new products and services and \$80M to engage SMEs and other partners in applied research to support economic recovery efforts. This recommendation is highly complementary to the effort being undertaken to strengthen the Canadian biomanufacturing sector and the various supporting industries (composed mostly of SMEs) that are needed to form a robust supply-chain and healthy innovation ecosystem.

- **Recommendation:** That any federal investment in establishing a new national biomanufacturing initiative include specific funding for partnered college applied research to strengthen the link between fundamental research and commercialization and support the thousands of SMEs that are involved either directly in biomanufacturing or in related industries.



Building new capacity and new networks

- *What capabilities are required in any increased domestic biomanufacturing capacity and for enhanced pandemic preparedness? What capabilities are required to support increased pilot-scale production?*
- *To what extent should current Good Manufacturing Practices (GMP) be incorporated into any new capacity? What do you see as being the minimum standard capabilities and capacity output requirements?*
- *Should the proposed new capacity include physical assets, such as dedicated biomanufacturing capacity, just a network, or both?*

Biomanufacturing is a multidisciplinary field, requiring specialized production capabilities in chemistry, manufacturing and controls (CMC), and expertise in basic and applied chemistry, biochemistry, biology, toxicology, pharmacology and engineering. The manufacture of pharmaceuticals and other related products is expensive and resource-heavy, requiring adherence to the strictest possible quality control to ensure safety. The small number of facilities that are certified as Good Manufacturing Practices (GMP) are insufficient to meet the demand for research, pre-clinical trials and production in Canada. Although there is strong industry demand for such facilities, college applied research centres are generally not able to finance such operations on their own.

Any new investments in strengthening Canada's biomanufacturing capacity should consider supporting the creation of networks. The capacity for colleges to support innovation through applied research is amplified when they collaborate with other research institutions (both universities and the private sector) in the formation of networks and partnerships. With their strong relationships with local industry, colleges address a valuable segment of the research continuum.

The formation of new networks in biomanufacturing is already starting at the grassroots level. In Quebec a consortium consisting of 6 CCTTs, 3 universities and 2 industry partners is in the early stages of creating a new local hub or nexus for biomanufacturing innovation. This network approach will enable the sharing of specialized expertise and equipment to ensure a more efficient commercialization and industrial-scale production process for clients.

- **Recommendation:** That future investments in biomanufacturing support the development of networks that enable all research partners – from private companies to universities and colleges – to leverage existing capacity and more efficiently create a strong innovation ecosystem in this area.

Conclusion

With 95% of Canadians living within 50km of a college, institute, cégep or polytechnic, and with their strong relationships to both the academic and private sectors, Canada's colleges bridge a critical gap in the innovation ecosystem. Colleges play an important role in training a skilled workforce, de-risking technology transfer and commercialization, and bringing new private-sector entrants (notably SMEs) into R&D networks. All these aspects represent important ingredients in Canada's renewed commitment to the biomanufacturing sector, and colleges stand ready to assist in whatever way needed.