



Life Sciences in Metro Vancouver

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April 2023

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Cover photo: AbCellera

AbCellera scientists examine a 3-D rendering of the COVID-19 spike protein.

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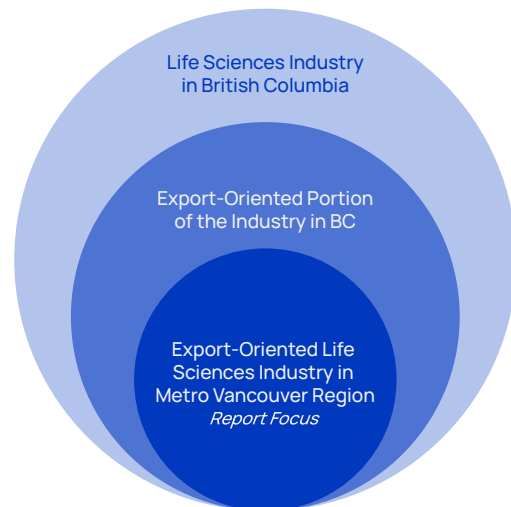
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Report Overview

The Metro Vancouver region has a flourishing life sciences industry that has made significant contributions in drug delivery, antibody discovery, and precision health. The industry is powered by a concentration of highly skilled people and backed by an extensive and expanding innovation ecosystem. Its contribution to regional Gross Domestic Product (GDP) and employment has increased substantially since 2001. The growth of the industry accelerated during the pandemic and is set to continue. With focused, coordinated support from public and private stakeholders, the industry could expand and add jobs even more quickly, and rise in prominence as a global hub. Elevating the industry's growth trajectory will require matching the supply of talent to the needs of a rapidly expanding industry; ensuring early-stage firms have access to wet labs; and keeping the cost of doing business in the region competitive.

This report focuses on the export-oriented portion of the regional life sciences industry, as shown in Figure 1.¹ The industry is comprised of firms that “work with living organisms and life processes, including biology, pharmaceuticals, biomedical technology, and nutraceuticals.”² Life sciences innovation is improving human health and creating economic value. In the Metro Vancouver region, the industry has specializations in biotechnology; medical devices and diagnostics; drug discovery, delivery, and pharmaceuticals; and digital health.

Figure 1: Segments of the Life Sciences Industry



- 1 Invest Vancouver works with export-oriented industries because firms competing in global markets can boost regional output and employment unconstrained by the local economy. Moreover, adding new exporting firms in the region does not necessarily displace existing ones, as would be the case, for example, if a new player were to enter the already saturated local market for grocery stores.
- 2 This is how Pitchbook, a data and research service covering global capital markets, describes the life sciences “industry vertical”, i.e. a group of companies that focus on a shared niche or specialized market spanning multiple industries.

Invest Vancouver believes the region can attract investment and create employment in the life sciences industry, which is growing and supports good quality jobs. The region has an enviable combination of research competencies, talent, supporting institutions, and emerging and established firms. Global demand for the industry's products and services is increasing due to ageing populations, innovation, and the need to relieve overburdened health systems. Spending on health care for the elderly has been rising with life expectancy, particularly in the developed world. Scientific breakthroughs such as CRISPR gene editing, which has opened up new treatment pathways, and novel applications such as the use of machine learning algorithms to scan digital images and spot tumours, are creating markets where none previously existed. Digital solutions can improve productivity in the delivery of patient care. Investment activity and government interest in the life sciences industry, already strong prior to COVID-19, were amplified by the pandemic.

This report is organized into five sections. The first section introduces the regional life sciences industry, including its dynamic nature, specializations, and a snapshot of current firms.³ The second section emphasizes the industry's long-term growth trend based on two decades of economic data and five years of investment activity. The third section highlights the major pieces of the supporting innovation ecosystem, a vital regional asset and linchpin of the industry's success. We describe ecosystem expansions, including those currently underway, in planning, and just announced. The fourth section covers the microeconomic perspective, summarizing themes that emerged from our

interview-based investigation into what is working and what could be improved in the region. The final section presents models from other jurisdictions that, if adopted here, would help make the region a more attractive place for incumbent and prospective life sciences firms. The rest of this overview explains what we hoped to learn from the research, describes our research methods, summarizes our main findings and recommendations, and explains how the results will be used.

What we hoped to learn

Invest Vancouver sought to answer two questions in this report:

1. Why do firms in the life sciences industry invest in Metro Vancouver?

We answer this question by looking beyond Metro Vancouver's spectacular location and attractive lifestyle to discover the specific advantages and assets offered by the region.

2. What actions would unlock additional growth and investment in the life sciences industry?

We pull from models in other jurisdictions to suggest ways elected leaders, civil servants and other decision makers can leverage this regional asset.

³ Our focus is on the 21 municipalities, Treaty First Nation, and Electoral Area served by Invest Vancouver. The export-oriented portion of the BC life sciences industry is heavily concentrated within this region, which accounts for more than three-quarters of the provincial output and employment.



Methods

Invest Vancouver investigated these questions using qualitative and quantitative research approaches. The qualitative work, based on in-depth interviews, was conducted to gain an insider's perspective on the state of the industry in the region, its strengths, and its challenges. The quantitative work looked at 20 years of economic data and the most recent five years of investment activity to provide context and shed light on long-term industry trends. These efforts were supplemented with reviews of federal and provincial life science strategies and investments, and various reports on the industry.

For the qualitative work, we focused on interviews with chief executives (CEOs), founders, and senior executives from the region's life sciences firms. We also held interviews and discussions with representatives from the supporting ecosystem, including government representatives, industry associations, academic institutions, accelerators, capital providers, and others providing support to the life sciences industry. Prospective interview targets were drawn from two commercial services, Lightcast and PitchBook, as well as the member directory of provincial industry association, Life Sciences BC, and referrals from interviewees.

Each of these semi-structured interviews consisted of a number of predetermined topics to be explored, including access to funding, workforce supply and labour markets, network organizations and supporting infrastructure, business climate, and so on. Interviews were allowed to unfold naturally in order to pursue an idea, line of inquiry, or response in more depth. This approach enabled the discovery of information relevant to regional value proposition, and the uncovering of information that may not have been previously recognized as pertinent. Input from the interviews has been anonymized in the report to encourage candid discussion.

For the quantitative work, we drew for the first time on the Invest Vancouver Strategic Industries Analytics project results. The Strategic Industries Analytics project is a separate effort undertaken to meet the critical need for data and data-driven understanding of key export-oriented industries, including life sciences. Conducting a data-driven analysis of the life sciences industry is particularly challenging because it is not included as a distinct category at any level of the North American Industry Classification System (NAICS) that the government uses to collect and organize firm-level statistical data.

The export-oriented parts of the life sciences industry are scattered across the manufacturing; professional, scientific, and technical services; and information (software) sectors. We used government data on output, employment, labour hours, and capital stock for the "national industries" (i.e. the most-specific, 6-digit NAICS codes) that most closely align with the life sciences industry.⁴ While an imperfect match, there is no better alternative. For ease of exposition and because we are treating the life sciences as a single industry even though the NAICS codes do not, these national industries are described throughout the report as "industry components" or "components of the life sciences industry". We rounded out the quantitative analysis with investment information from PitchBook, job posting and skills data from Lightcast, and comparative information from fDi Benchmark, a service from the Financial Times of London.

In the final phase of the study, we investigated how other jurisdictions, particularly those elsewhere in Canada, have dealt with issues similar to the challenges faced by life sciences firms in our region. Where appropriate, we conducted further interviews to better understand how these different approaches have fared, and whether they might be applicable here.

⁴ See the appendix for more information on NAICS codes and the life sciences industry.





Image: adMare BioInnovations

Summary of Findings and Recommendations

The Metro Vancouver region has a growing, export-oriented life sciences industry supported by a robust life sciences ecosystem and a pool of highly specialized talent. With a history of innovation that includes significant contributions to the development of the COVID-19 vaccine, the region is increasingly attracting global attention. Current economic uncertainty notwithstanding, the long-term outlook for the industry is bright. There are significant investments and commitments from the federal and provincial governments, universities, health authorities, and the private sector currently being developed or already underway.

The dynamic nature of the life sciences industry reflects multiple forms of risk. Early-stage firms deal with considerably more scientific risk than business risk, with the balance between the two shifting as the firms scale up. The entire industry deals with fluctuations in the relative availability of financial capital and there have been long stretches where capital has been extremely scarce. The recent past has been characterized by a surge in investment, with almost \$3.5 billion flowing into the life sciences industry in Metro Vancouver since the start of 2018. (AbCellera, the Vancouver-based therapeutic antibody discovery and development company, accounted for 30% of the 2018-2022 total.) The number of

investment deals peaked in 2021, with 57 deals worth a total of \$1.02 billion, but declined sharply to \$137 million in 2022 as investors turned cautious. As in many other industries and regions, the implications of global macroeconomic uncertainties are top of mind.

While the life sciences industry is often described as “cyclical”, particularly with respect to the ease of access to financial capital, the industry’s output in the region is rising over the long term, and employment growth has been particularly strong in research and development, and pharmaceuticals and medicine manufacturing. In each of the four life sciences industry components we examined (i.e. the NAICS *national industries*), contribution to regional GDP increased by least 2.5 times since 2001, with the strongest growth occurring over the past five years. Employment gains over the same timeframe were greatest in pharmaceuticals and medicine manufacturing (measured as percentage change in number of workers) and in research and development (when comparing percentage change in total labour hours). Research and development, a core regional strength and the largest of the four components, was the real standout: contribution to GDP increased 2.6 times; employment climbed 3-fold; labour hours were up 6.5 times; and total capital stock rose 3.8-fold.

To grow more rapidly and build on existing strengths, the region needs to address three challenges. First, the backbone of the industry is skilled talent, and as



the industry expands it will require more (and more specialized) talent. Second, the relative cost of doing business is a concern in any globally competitive industry, especially for early-stage, pre-revenue firms facing an environment in which financial capital is more difficult to access. Helping firms with cost control is essential for existing firms and future investment attraction efforts. Third, with the local industry concentrated at the front end of the life sciences value chain, the region needs additional wet lab space, particularly for the earliest stage firms. The lack of wet lab space is a severe bottleneck constricting growth.

Recommendations

- **Actively promote talent attraction for the life sciences industry.** The industry relies on a pool of highly trained, specialized workers. Increasing the size of the talent pool will be critical as the overall industry grows, and additional skill sets will be needed as more firms scale up. The region needs a two-pronged effort to add people to the talent pool through local training (the subject of a forthcoming study from the industry association Life Sciences BC) and recruitment from outside the region. Talent attraction efforts could incorporate elements of the Montreal International strategy.
- **Look for opportunities to help firms control costs through economies of scale.** Cost containment is always an issue, particularly for start-ups, and looms larger when the economy (and access to investment dollars) slows. BIOQuébec offers an example of how

to help firms contain costs and maintain the region's cost-competitiveness.

- **Build public sector-supported wet lab space for young firms.** There is an acute shortage of wet lab space (i.e. specialized laboratory spaces), especially for young firms emerging from the region's universities and accelerators. The market will not provide a solution since developers can make more money with less risk with alternative projects. A lower (and still positive) return may be acceptable to the government, because unlike private developers, it benefits from the long-term gains from greater employment and tax revenue generation. The government could replicate models from Montreal, Toronto, and Halifax to unlock growth in the life sciences industry.

Invest Vancouver will promote the region's life science industry to potential investors based on the specific strengths identified in this report, with the goal of influencing their location decisions. We will prepare investor-oriented materials and a regional "pitch deck" that our investment attraction team will use at industry events and in their day-to-day efforts. We hope that public and private sector stakeholders will use the intelligence gathered through this research to focus their attention on addressing the obstacles to growth identified by people in the industry. Doing so will foster conditions that will help firms succeed here, reinforce investment attraction efforts, and potentially elevate the entire industry, increasing its global prominence.

Life Sciences Industry in Metro Vancouver

The regional strength in early-stage research is reflected in the frequent emergence of new firms. The successful ones attract investment as they scale, adding employment as they advance the frontiers of medical treatment. Even the firms that fail contribute to the ongoing vitality of the industry as their talent is redeployed in other ventures. This section describes the pattern of constant renewal in the life sciences industry, defines the regional specializations (in biotechnology; drug discovery, delivery and pharmaceuticals; medical devices and diagnostics; and digital health) and presents a snapshot of firms in the industry.

A Pattern of Constant Renewal Producing Overall Growth

The life sciences industry in Metro Vancouver has seen the rapid rise of many companies, yet has relatively few enduring regional champions. In part, this is a natural consequence of the region's strengths being concentrated closer to the initial discovery end of the industry value chain. The life sciences value chain stretches from an idea or discovery through development and testing to regulatory approval, manufacturing, and distribution to medical practitioners and patients. The initial commercialization stage is difficult and risky, and many firms built on cutting-edge science fail. Even when everything goes right, successful firms are often acquired by larger firms from outside the region. The fate of individual firms disguises the long-term increases in overall employment and output that have been produced by this dynamic (and sometimes tumultuous) industry.

The acquisition of local firms by outsiders is often a net positive for the region, either by increasing resources and providing a path to large-scale distribution or “recycling” people and profit in the local ecosystem. NOVADAQ Technologies Inc. (NOVADAQ) and ImmGenics Pharmaceuticals (ImmGenics) are examples of the former; Quadra Logic Technologies (QLT) is an example of the latter.

NOVADAQ was a Mississauga-based medical technology company with an R&D centre located in Burnaby that developed fluorescence imaging solutions for minimally invasive and open surgeries. It was acquired by the Michigan-based Stryker Corporation in 2017 for US\$654 million. Stryker kept the R&D office in Burnaby, where it continues to employ more than 100 people. Similarly, Vancouver-based ImmGenics was founded in 1993 to commercialize a technology that sped up the discovery process by increasing the number of antibodies that could be screened for a given target. In 2000 it was acquired by California-based Abgenix, which itself was acquired in 2006 by Amgen, one of the world's largest biotechnology companies. The original ImmGenics research centre has expanded under the ownership of successively larger companies, each seeking to tap into the innovation, research and talent in the region.

QLT was a pharmaceutical company founded in 1981 by a group of scientists from the University of British Columbia (UBC) who developed a drug to treat macular degeneration. In the early 2000s, QLT peaked with 500 employees before entering a long decline.⁵ By 2016, the firm employed just 24 people and had merged with the Boston-based

⁵ <https://vancouversun.com/business/local-business/qlt-points-to-mutual-needs-in-pending-merger-with-aegerion>



pharmaceutical company Aegerion Pharmaceuticals to become Novilion Therapeutics. Today, it no longer has a corporate presence in the region. However, the hundreds of people who worked at QLT did not disappear. Their skills and experience were redeployed when they found new jobs, started new firms, or joined one of the many entities that comprise the industry's supporting ecosystem (described later in this report).

Acquisitions can also provide the seed capital for new firms. (Many of the people we interviewed for this report had started more than one firm.) Despite the disappearance of QLT and many of its contemporaries, the industry today employs considerably more people than it did in the early 2000s.

Industry growth is fueled by the groundbreaking research carried out at the region's universities and research institutes. For example, the BC Centre for Excellence in HIV/AIDS led pioneering research into the prevention and treatment of the human immunodeficiency virus (HIV) and related diseases. Research at the Terry Fox Laboratory preceded the creation of STEMCELL Technologies Inc., a firm that develops media and processes to grow stem cells in lab environments. It is now the largest Canadian biotechnology firm by employment.⁶ More recently, Acuitas, a local firm based on decades of research into lipid nanoparticles by Dr. Pieter Cullis, licensed its technology to BioNTech for use as the delivery vehicle for the latter's mRNA vaccine for COVID-19. Acuitas also signed an agreement giving Pfizer the option to license its technology for further vaccine or therapeutic development. Going forward, the industry will continue to be powered by groundbreaking research being carried out in the region.



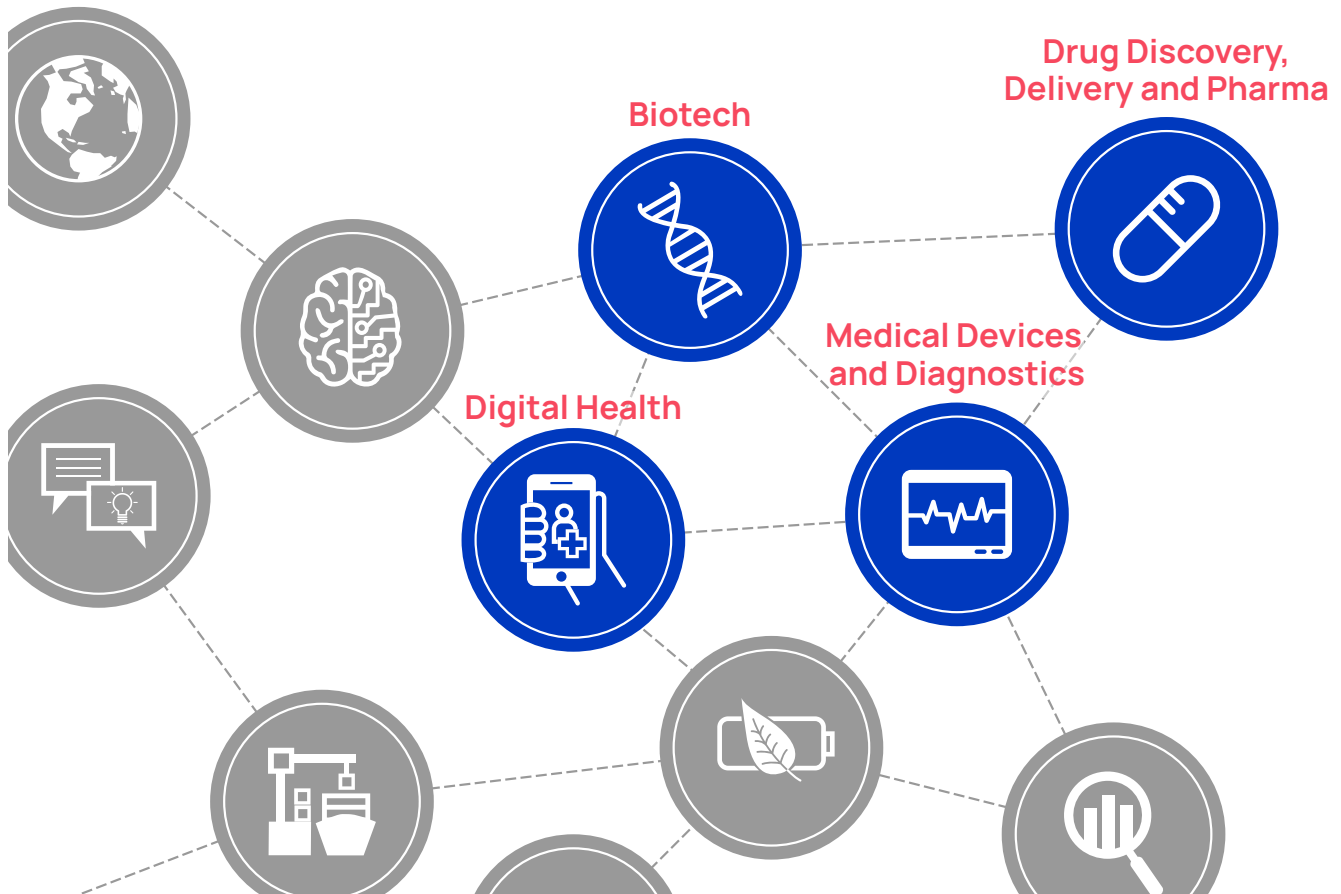
Image: adMare BioInnovations

6 <https://www.canada.ca/en/innovation-science-economic-development/news/2018/04/federal-and-provincial-governments-support-creation-of-biotech-manufacturing-facility-in-the-lower-mainland.html>

Current Firms and Regional Specializations

The life sciences industry in Metro Vancouver has specialization in biotechnology; medical devices and diagnostics; drug discovery, delivery, and pharmaceuticals; and digital health. Specializations are based on the region's strengths, such as where

academic research is focused and where firms have excelled. This is separate from the industry components (as described previously) that are based on the NAICS codes.



Biotechnology companies use biology to develop new products, methods and organisms intended to improve human health and society.

Medical Devices and Diagnostics companies develop and manufacture devices for a range of medical purposes including assessing and diagnosing medical conditions, collecting and monitoring vital signs, and patient rehabilitation or therapy.

Drug Discovery, Delivery, and Pharmaceuticals companies are involved in the research and development of new drugs, novel medication delivery methods, and established pharmaceuticals.

Digital Health companies build hardware and software solutions that improve healthcare efficiency and productivity in the areas of patient communications, monitoring, and treatment. They also let patients track and manage their own health.

Figure 2: Snapshot of Firms in the Metro Vancouver Region

Biotechnology

Abattis Bioceuticals (PINX: ATTBF)
AbCellera (NAS: ABCL)
ABM (Canada)
ACGT Corporation
Acuitas Therapeutics
Advectus Life Sciences
Alectos
Allon Therapeutics
Alpha 9 Theranostics
Altum Pharmaceuticals
Amgen (NAS: AMGN)
Aspect Biosystems
Aurin Biotech
Aurora Biomed
Avivo (Canada)
Biocure Technology (CNQ: CURE)
Biogen Sciences
Biopep Solutions
Bold Therapeutics
Boreal Genomics
Bovacor
Brigene Biosciences
Callitas Health
Chromos Molecular Systems
Curastem Biomedical

Cytapex Bioinformatics
Cytiva
Delta-Fly Pharma (TKS: 4598)
Derm-Biome Pharmaceuticals
EGF Theramed Health (CNQ: TMED)
Extem Bioscience
First Venture Technologies
Fusion Genomics
Gemina Laboratories (CNQ: GLAB)
HAVN Life Sciences (CNQ: HAVN)
HTuO
ICO Therapeutics
ImStar Therapeutics
Inception Sciences
Innovative Targeting Solutions
Insception Lifebank
IRI Separation Technologies
Kairos Therapeutics
Lipont Pharmaceuticals
Med Biogene (TSX: MBI.H)
Meiogenics
Mesintel Therapeutics
Methanogenesis
Naegis
Nanosphere Health Sciences (CNQ: NSHS)

NervGen Pharma (TSX: NGEN)
New Beta Innovation Canada
Nova Mentis Life Science (CNQ: NOVA)
Novelogs Biotechnology
Novobind
Novoheart
OCION Water Sciences Group
Pebble Labs
PharmAla Biotech
PharmaPlanter Technologies
Phyton Biotech
Protiva Biotherapeutics
Renaissance BioScience
RhYme Biotechnology
ScopeSys
Sierra Oncology Canada ULC
SignalChem Lifesciences
StemCell Technologies
Stressgen Biotechnologies
Synergenetics Bioscience
TerraGen Discovery
The Emmes Company
Willow Biosciences (TSE: WLLW)
Xenomix
Yes Biotechnology
Zymeworks (NYS: ZYME)

Digital Health

Ayogo Health Inc
BugSeq
Canary Medical
Clarix Healthcare
Coastal Genomics
Epiphany360
Flöka

GenXys
Grantek
healthQb
HealthTech Connex
MacroHealth
Medical Cytometrix
MetaOptima
Molecular You

myDNA
NZ Technologies
PHEMI Systems
Strata Health
Tenzr Health
Thrive Health
ViewsIQ
Vital Mechanics

Drug Discovery, Delivery and Pharmaceuticals

Abdera Therapeutics
Aequus Pharmaceuticals (TSX: AQS)
Algenon Pharmaceuticals (CNQ: AGN)
Amphorax Life Sciences
AnorMED
Arbutus Biopharma (NAS: ABUS)
Avicore Health (TSX: AVCR)
BetterLife Pharma (CNQ: BETR)
BioVaxys Technology (CNQ: BIOV)
BriaCell Therapeutics (TSE: BCT)
Bright Minds (CNQ: DRUG)
Celator Pharmaceuticals
Chinook Therapeutics (NAS: KDNY)
Clairvoyant Therapeutics
Clearmind Medicine (CNQ: CMND)
CLOV Biopharma
CUPROUS Pharmaceuticals
CureImmune Therapeutics
Entheon Biomedical (CNQ: ENBI)
Essa Pharma (NAS: EPIX)
Evonik Industries (ETR: EVK)
Eyam
Gandeeva Therapeutics
GeneMax Pharmaceuticals
Genevant
Genix Pharmaceuticals (TSX: GENX)
Genomica (Vancouver)
Incisive Genetics

InMed Pharmaceuticals (NAS: INM)
IonsGate Preclinical Services Inc
Kinetek Pharmaceuticals
Kintara Therapeutics (NAS: KTRA)
KOP Therapeutics
L9 Bioscience
Me Therapeutics
Medna Biosciences
Mesentech
Microbion
MindMed (NEOE: MMED)
MSI Methylation Sciences
Mydecine Innovations Group (NEOE: MYCO)
N-Zyme Biomedical
Nash Pharmaceuticals
Neoleukin Therapeutics (NAS: NLTX)
Network Immunology
Nirvana Life Sciences (CNQ: NIRV)
Notch Therapeutics
Novation Pharmaceuticals
Numinus (TSE: NUMI)
OncoGenex Pharmaceuticals
Optigo Biotherapeutics
Pacific Pharma Technologies
Pharmagreen Biotech (PINX: PHBI)
Phoenix Molecular Designs
Pike Therapeutics
Pramana Pharmaceuticals Inc.
Precision Nanosystems
Qing Bile Therapeutics

Qu Biologics
Rakovina Therapeutics (TSX: RKV)
Replicel Life Sciences (TSX: RP)
SaNOtize
Santa Marta Life Sciences
Shackelford Pharma Inc.
Sirona Biochem (TSX: SBM)
Sitka Biopharma
Starton Therapeutics
SureNano Science (CNQ: SURE)
Sustained Therapeutics
Sycamore Entertainment Group (PINX: SEGI)
Symvivo
Synapse Technologies
Trait
Transferra Nanosciences
Trianni
Twinstrand Therapeutics
Variational AI
Veritas Pharma
viDA Therapeutics
Virogin Biotech
Vitaeris
Welichem Biotech
WEX Pharmaceuticals
WN Pharmaceuticals
Xenon Pharmaceuticals (NAS: XENE)
Zalicus Pharmaceuticals
Zomanex
Zucara

Medical Devices and Diagnostics

Apteryx Imaging
Arbutus Medical
ARC Medical Devices
ARTMS
Artron BioResearch Inc.
Augurex
Biomark Diagnostics (CNQ: BUX)
Bionic Power
Canexia Health
Corcym Canada Corp.
CTF Systems

Decipher Urologic Cancers
Evasc
Gene Bio Medical
GenomeMe
IKOMED Technologies
Imagin Medical (CNQ: IME)
IUVOX
Izotropic (CNQ: IZO)
Kardium
Libang Surgical Technologies
Masimo (NAS: MASI)
Novelion Therapeutics (Visudyne)

Ocumetics (TSX: OTC)
Ondine Biomedical (LON: OBI)
PFS Genomics
Response Biomedical
Rostrum Medical
Sonic Incytes
Sulzer Mitroflow
Tel.-Array Diagnostics
Verisante Technology (TSX: VER.H)
Vesalius Cardiovascular
ZellChip Technologies
Zennea Technologies



The Metro Vancouver Life Sciences Industry – North American Comparisons

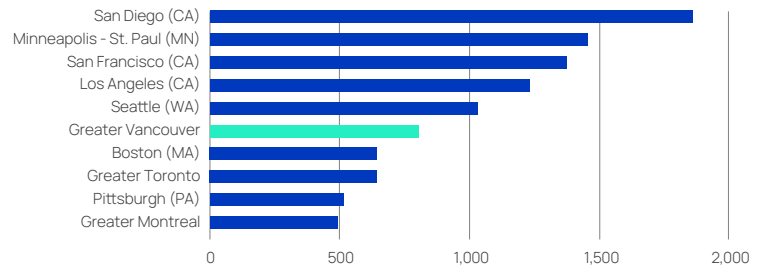
To get a sense of scale, we compared the number of life sciences companies in Metro Vancouver⁷, Toronto, Montreal, and six American cities with vibrant life science industries. These rankings, based on firm counts in 2021, are the type of comparisons considered by firms in the initial stages of a location search.

Metro Vancouver is sixth among these metropolitan regions (and first in Canada) based on the number of companies engaged in research and development, as shown in Figure 3. The firm counts are not a perfect match with the life sciences, as those numbers also include research and development in the physical sciences but do provide a consistent basis for comparison.

Figure 4 provides the same comparison for the number of companies engaged in biotechnology and pharmaceuticals. Metro Vancouver ranks 8th by this measure, with 109 companies in 2021. This compares favourably with the number of firms in Los Angeles (119), Seattle (111), and Montreal (105). Toronto (166) is the leading Canadian city.

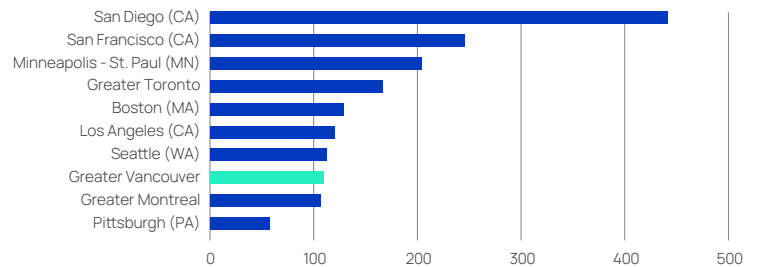
Metro Vancouver has 264 companies in medical devices, and ranks fourth, just behind Toronto (279) (Figure 5).

Figure 3: Research and Development Companies (2021)



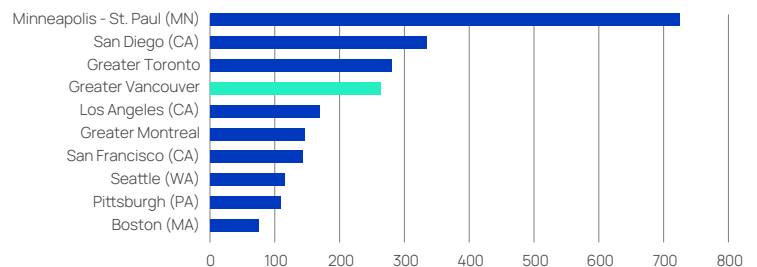
Source: fDi Intelligence from the Financial Times based on Dun & Bradstreet Global Reference Solution

Figure 4: Biotechnology and Pharmaceuticals Companies (2021)



Source: fDi Intelligence from the Financial Times based on Dun & Bradstreet Global Reference Solution

Figure 5: Medical Devices Companies (2021)



Source: fDi Intelligence from the Financial Times based on Dun & Bradstreet Global Reference Solution

⁷ The data from fDi Benchmark is for 'Greater Vancouver', which includes Vancouver, Surrey, Burnaby, Richmond, Coquitlam, Langley, Delta, North Vancouver, Maple Ridge, New Westminister, and Port Coquitlam.

Data Reveal a Growing Life Sciences Industry

A few quarters of contraction in an industry can make it easy to overlook a long-term pattern of growth. Here we look at trends in contribution to GDP, employment, labour hours, and total capital stock in the Metro Vancouver life sciences industry, from 2001 to 2020/2021. As described previously, this data was collected as part of the Invest Vancouver *Strategic Industries Analytics Project*. It is an imperfect match with the life science industry due to the way firm-level data is aggregated using NAICS codes, but is the best available.⁸

The four NAICS *national industries* included here, which we are calling 'components of the life sciences industry', are **pharmaceuticals and medicine manufacturing; measuring, medical and controlling devices; medical equipment and supplies; and research and development in the physical, engineering and life sciences**.⁹ The data reveals:

- In each of the four components, contribution to regional GDP has increased by at least 2.5 times, with the strongest growth occurring over the past five years.
- In the Metro Vancouver region, approximately 15,500 people (78% of the BC total) were employed in these four export-oriented industry components in the fourth quarter of 2021.
- Employment gains since 2001 have been greatest in pharmaceuticals and medicine manufacturing (measured as percentage change in number of workers) and in research and development (when comparing percentage change in total labour hours).

- Total capital stock has been essentially flat in pharmaceuticals and medicine manufacturing; fell slightly in measuring, medical and controlling devices; roughly doubled in medical equipment & supplies; and almost quadrupled in research and development.
- Research and development, a core regional strength and the largest of the four components, is the real standout: contribution to GDP increased 2.6 times; employment climbed 3-fold; labour hours were up 6.5 times; and total capital stock rose 3.8-fold.¹⁰
- While the life sciences industry is often described it as "cyclical", particularly with respect to the ease of access to capital, long-term contribution to GDP is rising, and employment growth has been particularly strong in research and development, and pharmaceuticals and medicine manufacturing.

The data below on investment activity in the life sciences industry, covering the years 2018-2022, is from PitchBook and is reported by area of specialization: biotechnology; medical devices and diagnostics; drug discovery, delivery, and pharmaceuticals; and digital health.

- There has been a wave of recent investment in life sciences firms headquartered in the Metro Vancouver region, with almost \$3.5 billion in activity since the start of 2018. AbCellera accounts for 30% (\$1.05 billion) of the activity.
- Activity peaked in 2021, with 57 deals worth a total of \$1.02 billion, but declined sharply in 2022 to \$137 million as investors turned cautious ahead of the next recession.

8 See [page 5](#) and the [appendix](#) for more explanation.

9 Because we focus on firms producing exportable goods and services, population-serving components, such as medical laboratories, are not included in the analysis.

10 As described in the appendix, research and development in the physical, engineering and life sciences includes non-life sciences activity.



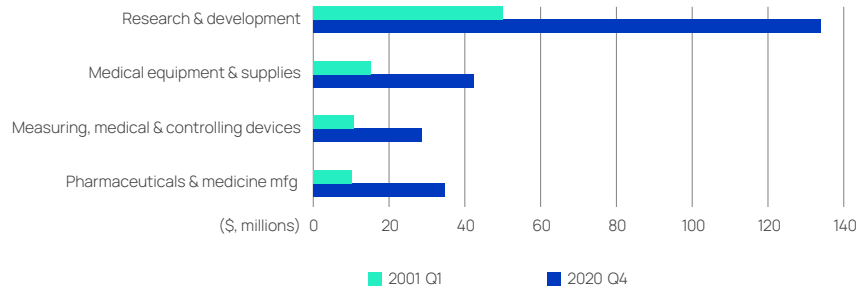
Economic Data Series: Trends in Contribution to Regional GDP

GDP measures total industry output, i.e. the expenditures or “value added” during the production of goods and services over a specific time period within an economy. The change in GDP over time is a widely used indicator of the general health of the economy: growing GDP suggests the economy is doing well; two consecutive quarters of contraction indicates a recession. Figure 6 shows the inflation-adjusted values for contribution to GDP in the Metro Vancouver region from each of the four export-oriented components of the life sciences industry starting in 2001 Q1 and ending in 2020 Q4.

The contribution to regional GDP rose in all four components: from \$10.5 million to \$34.9 million in pharmaceuticals and medicine manufacturing; from \$11.0 million to \$28.5 million in measuring, medical and controlling devices; from \$15.5 million to \$42.7 million in medical equipment and supplies; and from \$50.4 to \$134.1 million in research and development. The rising output indicates a growing life sciences industry.

The next chart, Figure 7, presents the quarterly data for contribution to GDP with the starting value for each

Figure 6: Contribution to Regional GDP by Industry Component

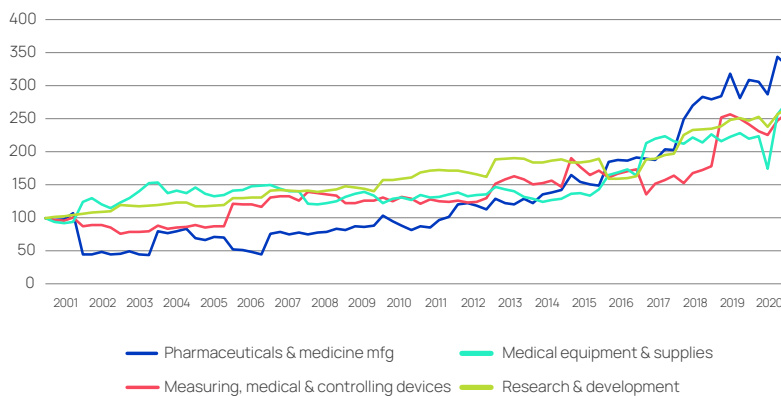


Source: Invest Vancouver Strategic Industries Analytics Project

data series set to 100. This normalization of the data makes it easy to compare the relative (percentage) change over time.

The contribution to regional GDP increased by at least 2.5 times in all four industry components. Pharmaceuticals and medicine manufacturing shows the greatest increase (almost 3.5 times), but also exhibits the most volatility. Its contribution to GDP drops 50 percent starting late in 2001, stays flat for three years before rising more than 50 percent, only to revisit the earlier lows in 2007 before finally recovering and surpassing previous highs ten years after the initial drop. The industry is often described as cyclical, but the long-term trend is rising output.

Figure 7: Change in Contribution to Regional GDP by Industry Component (2001 Q1 = 100)



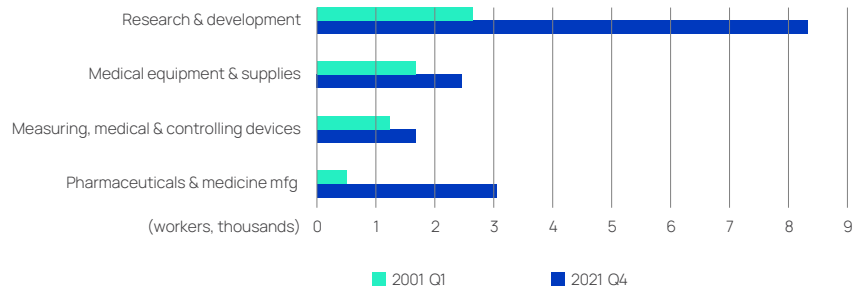
Economic Data Series: Employment Trends

Rising output suggests the industry is growing. For the region to prosper, that growth needs to translate into jobs. The employment data series tracks the number of individuals currently employed in each industry component. It is a count of people working in the sector, without distinguishing among part-time and full-time workers, or compensation type, i.e. hourly versus salaried workers. Figure 8 shows the actual employment in each industry component in the first quarter of 2001 and the fourth quarter of 2021.

Employment increased in all four industry components between 2001 and 2021: from 514 to 3,044 in pharmaceuticals and medicine manufacturing; from 1,237 to 1,670 in measuring, medical and controlling devices; from 1,692 to 2,475 in medical equipment and supplies; and from 2,661 to 8,330 in research and development. The rising employment suggests the life sciences industry is contributing to regional prosperity.

The next chart, Figure 9, presents the quarterly employment data with the starting value for each industry component set to 100. This normalization of the data makes it easy to compare the relative (percentage) change over time.

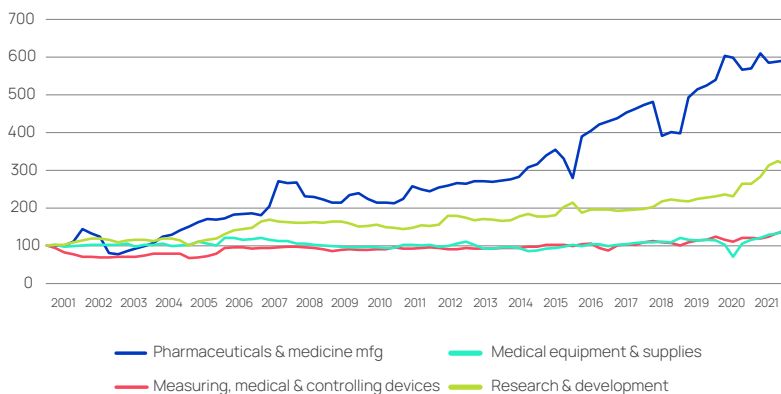
Figure 8: Regional Employment by Industry Component



Source: Invest Vancouver Strategic Industries Analytics Project

Measuring, medical and controlling devices and medical equipment and supplies were relatively flat during the 20-year period, but an uptick that started in 2020 increased employment by 35% and 46%, respectively, compared to 2001. Research and development, which employed the most people at the start of the period, more than tripled, with half of the gains occurring from 2018 through 2021. From a much smaller starting point, pharmaceuticals and medicine manufacturing employment increased almost 6-fold. (During the 10 years from 2001-2011, when output dropped by half before eventually recovering, employment doubled.)

Figure 9: Change in Regional Employment by Industry Component (2001 Q1 = 100)



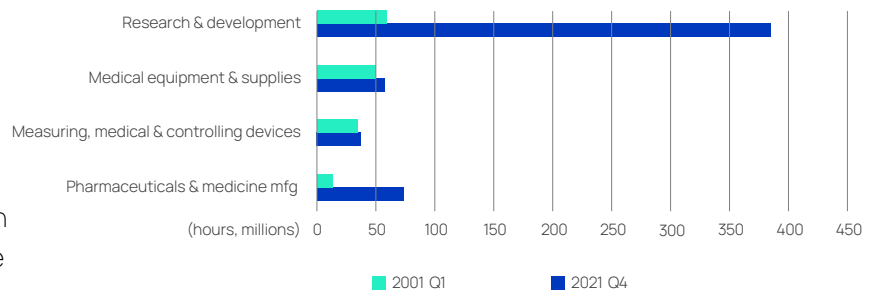
Economic Data Series: Trends in Total Labour Hours

The number of workers doesn't always tell the whole employment story in an industry. The next two figures present total labour hours, which is a measure of labour input using the weighted average of the weekly hours worked by both hourly and salaried employees, multiplied by 52 weeks in a year.

Figure 10 shows that total labour hours (in millions) increased, 2001-2021, from 14.2 to 74.3 in pharmaceuticals and medicine manufacturing; from 35.8 to 38.5 in measuring, medical and controlling devices; from 48.7 to 58.2 in medical equipment and supplies; and from 60.1 to 385.0 in research and development. Figure 11, represents the quarterly data with the starting value for each industry component set to 100. This normalization of the data makes it easy to compare the relative (percentage) change over time.

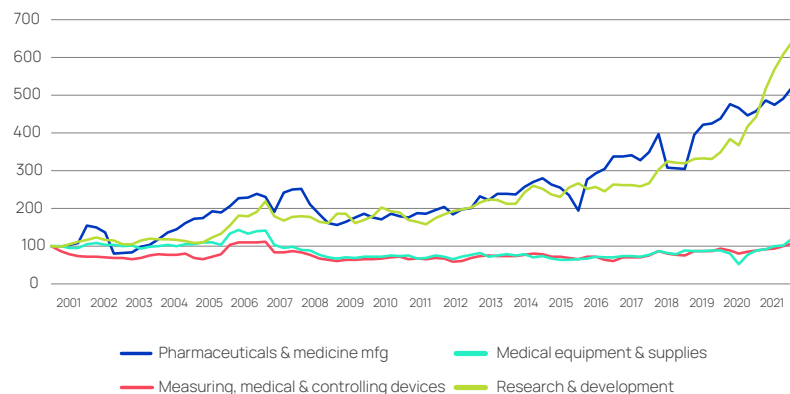
Medical equipment and supplies, and measuring, medical and controlling devices, which were relatively flat in employment, show long stretches with lower total labour hours. They recover by the end of the period, but the 20-year change in total hours is less than the employment, suggesting a greater reliance on part-time workers. Pharmaceuticals and medicine manufacturing, which had the greatest increase in employment, also saw a huge increase in total labour hours. The most striking employment case is research and development, which saw employment more than triple and labour hours increase more than six-fold.

Figure 10: Regional Labour Hours by Industry Component



Source: Invest Vancouver Strategic Industries Analytics Project

Figure 11: Change in Regional Labour Hours by Industry (2001 Q1 = 100)



Source: Invest Vancouver Strategic Industries Analytics Project

Economic Data Series: Trends in Total Capital Stock

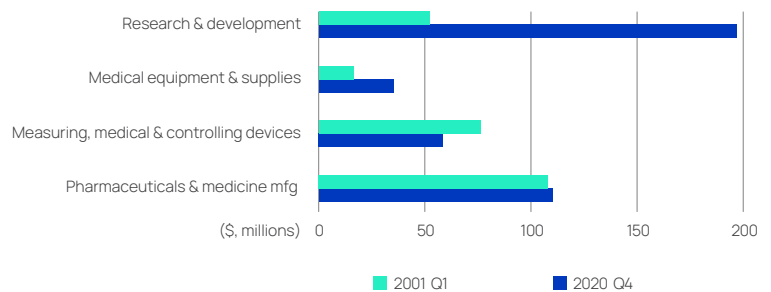
The next two figures (Figures 12 & 13) show total capital stock, a measure of total real and intellectual assets possessed by a firm that are used during the production of goods and services. Total capital stock includes non-residential buildings, engineering construction, and machinery and equipment, as well as intellectual property¹¹. Capital is important because of its link to productivity. In general, adding capital is expected to translate into increased output; if the amount of capital per worker increases then it should make the labour more productive.

Capital stock in pharmaceuticals and medicine manufacturing was largely unchanged, 2001-2020, increasing slightly from \$107.4 million to \$109.7 million. In measuring, medical and controlling devices, total capital stock fell from \$76.0 million to \$58.1 million. Total capital stock in medical equipment and supplies roughly doubled, from \$16.3 million to \$34.9 million. In research and development, total capital stock nearly quadrupled from \$52.3 million to \$196.9 million.

Figure 13, presents the quarterly data, again, with the starting value for each industry component set to 100 to allow for the comparison of the relative (percentage) change over time.

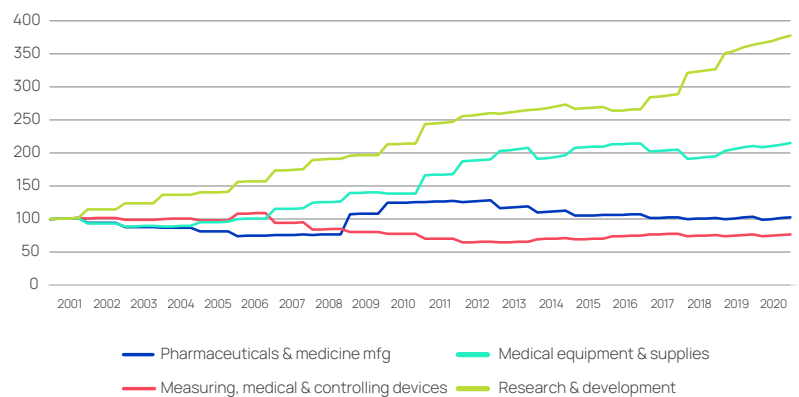
Total capital stock in pharmaceutical and medicine manufacturing did not change much throughout the 20-year period and finished approximately where it started. This suggests the large gains in output were more closely related to the large increases in employment and labour hours. In medical equipment and supplies, total capital stock increased in tandem with output, while employment and total labour hours were essentially flat. In measuring, medical and controlling devices, output increased, employment and total labour hours increased slightly, and total capital stock declined. In research and development, all indicators – output, employment, total labour hours, and total capital stock, showed large gains during the period.

Figure 12: Regional Capital Stock by Industry Component



Source: Invest Vancouver Strategic Industries Analytics Project

Figure 13: Change in Total Capital Stock in the Region by Industry (2001 Q1 = 100)



¹¹ Capital is one of the major factors of production, i.e. the building blocks used to produce goods and services. (The others are land, labour, and entrepreneurship.) In this context money does not count as capital, though money can be used to acquire capital, which depreciates over time.



Tracking Investments in Life Sciences Firms: A Surge of Activity in 2020 and 2021

From capital stock, i.e. the real and intellectual assets used in production, we turn to financial capital, i.e. the flow of investment dollars into life sciences firms. Financial capital matters because it can be expensive to take a firm from one milestone to the next, such as the move from a working prototype to small-scale production, the completion of a clinical trial, or an increase in production volume.

Sometimes macroeconomic conditions can make it hard for everyone to raise financial capital, and shifting investment trends can leave particular industries out of favour. While the life sciences industry is not immune to shifting investment winds (industry participants used

apocalyptic terms such as “nuclear winter” to describe particularly trying periods), the industry has recently benefitted from heightened investor interest. Figure 14 shows the wave of investment in life sciences firms headquartered in the Metro Vancouver region during the past five years.

There were almost \$3.5 billion in investments in firms headquartered in the region, 2018 through 2022, with total activity exceeding \$1 billion in both 2020 and 2021. AbCellera accounts for 60% of total investment in 2020 (see box) and 30% of the five-year total. There was a steep drop in completed investments in 2022, as the region and industry were affected by global macroeconomic conditions. Investors curtailed their activities amid heightened worries about a recession due to high inflation, rising interest rates, and supply chain disruptions.¹²

Figure 14: Investment in Life Science Firms Headquartered in Metro Vancouver, 2018-2022
(\$ millions)



Source: PitchBook 2023

¹² The curtailment in investment extended far beyond life sciences and the region. For example, the Logic reports the number of initial public offerings (debut stock market listings) for firms in tech, clean tech and life sciences companies on the Toronto Stock Exchange plummeted in 2022 after a blockbuster year in 2021. (Aleksandra Sagan, “IPO Outlook 2023: Will more Canadian tech companies brave the markets in the year ahead?” December 29, 2022)

AbCellera in 2020

AbCellera Biologics Inc. is a Vancouver-based biotechnology company that develops antibodies to treat infectious and various other diseases. The company's AI-powered technology sources, searches, decodes and analyzes antibody responses to engineer new antibody drug candidates for its partners. AbCellera, in partnership with Eli Lilly, developed the first monoclonal antibody (Bamlanivimab) to receive emergency use authorization from the US Food and Drug Administration (in November 2020) for treatment of COVID-19.

The company raised almost \$1 billion CAD in grants and investments in 2020. On May 3rd, 2020, AbCellera received **CAD 175.6 million** in grant funding from Innovation, Science and Economic Development Canada for use in the discovery of antibodies to treat COVID-19, and to build technology and manufacturing infrastructure for antibody therapies against future pandemic threats.

On May 27th, AbCellera raised **\$105 million USD** of Series B venture funding for use in "creating and aggregating novel tools to propel the development of new biological modalities, from monoclonal, multi-specific, and single-domain antibodies, to bioconjugates, gene-encoded biologics, and cell therapies".

In December, AbCellera raised a further **\$555.5 million USD** in its initial public offering on the Nasdaq stock exchange. This amount includes the selling of 24,150,000 shares for \$20 each, as well as the company's underwriters exercising in full their option to purchase 3.6 million additional common shares. This valued the firm at more than \$5 billion USD.

Source: PitchBook 2022

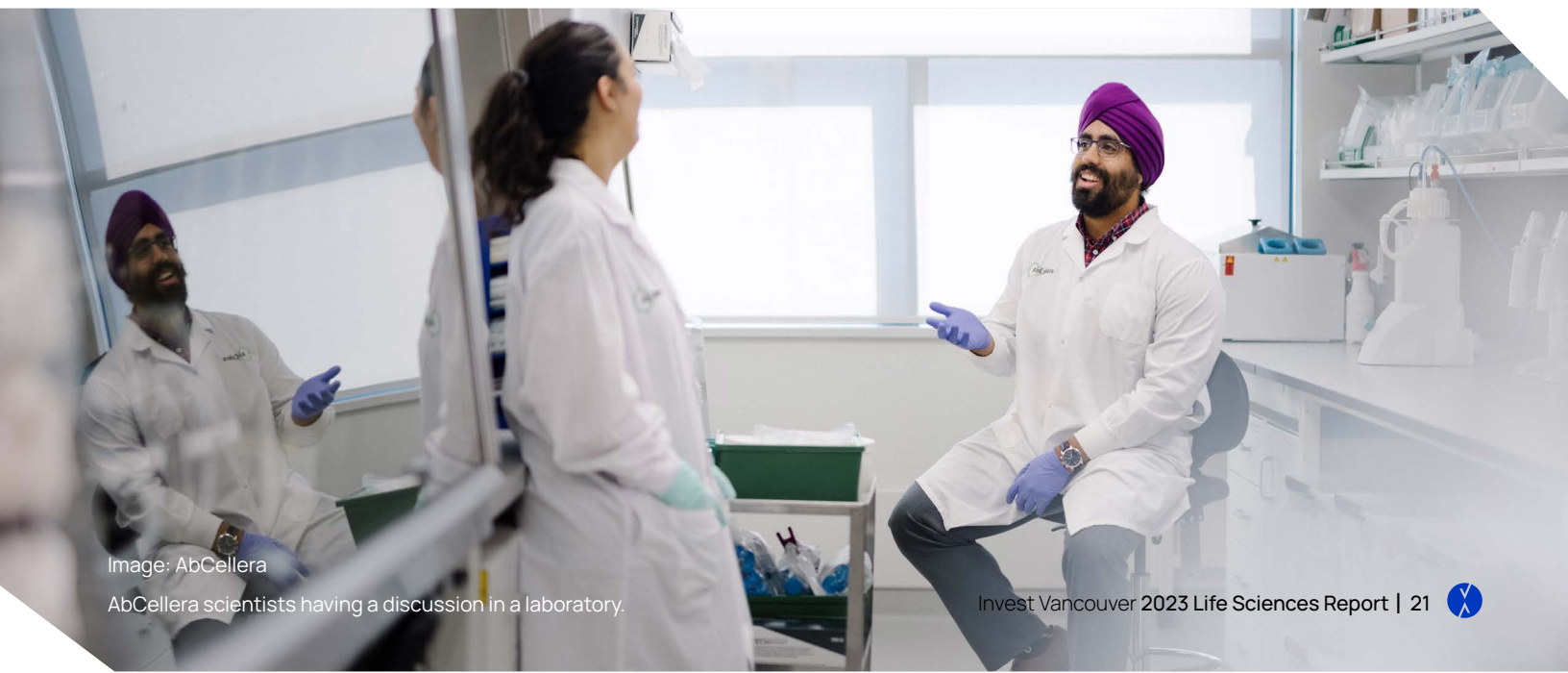


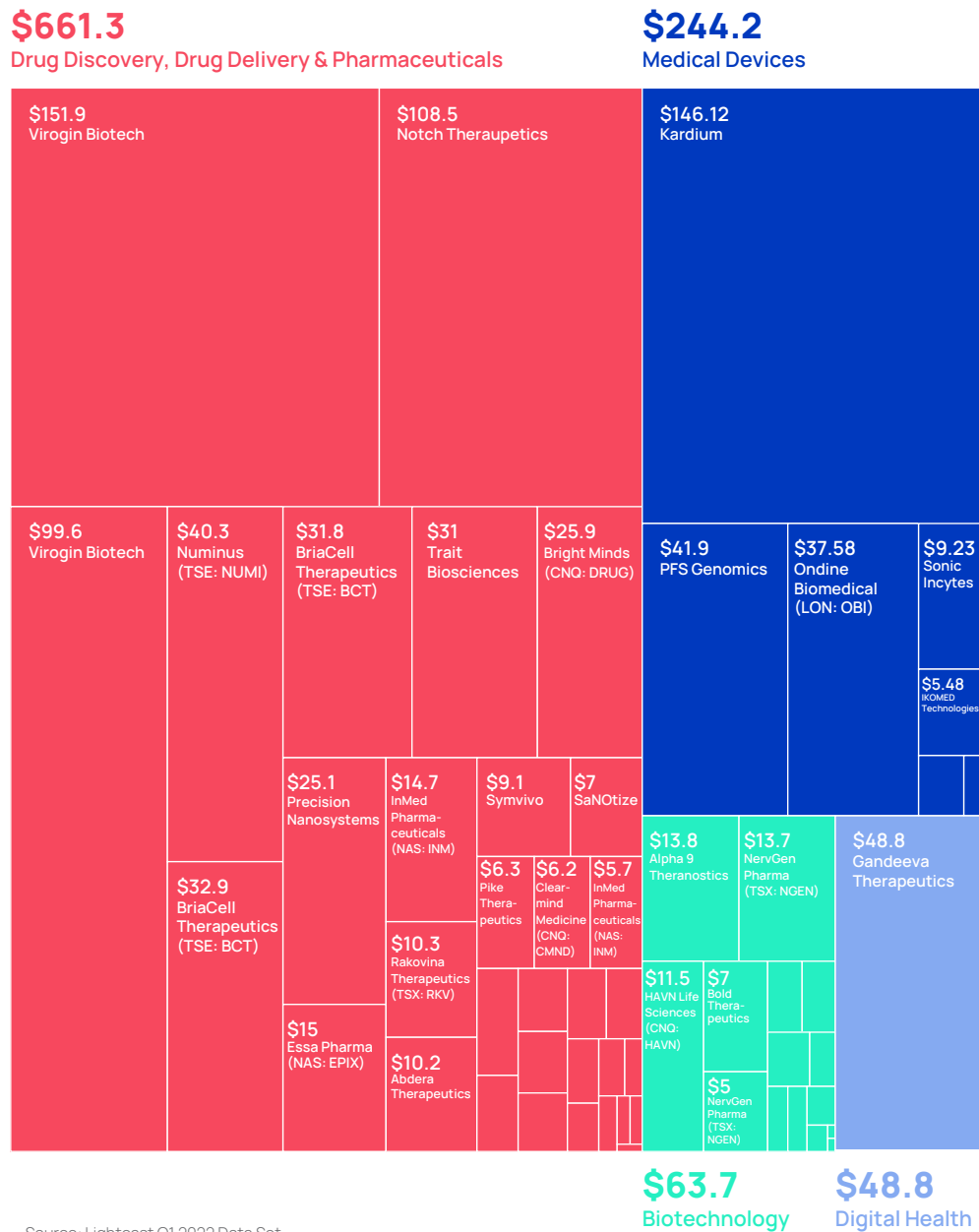
Image: AbCellera

AbCellera scientists having a discussion in a laboratory.



While investment activity in 2020 was dominated by biotechnology and AbCellera, 2021 was notable for the scale and diversity of investment activity: there were 57 separate deals which are presented by area of industry specialization in Figure 15.

Figure 15: Investments in the Life Sciences in Metro Vancouver in 2021
(\$ millions)



Source: Lightcast Q1 2022 Data Set

In 2021, drug discovery, drug delivery & pharmaceuticals moved to the forefront, with 33 deals worth a combined \$661.3 million (representing 65% of the total annual activity by value). Virogin Biotech, with 2 deals totaling \$251.5 million, Notch Therapeutics (\$108.5), BriaCell (\$64.7 million in 2 deals), and Numinus (\$40.3) accounted for the largest deals in this area of specialization. Medical devices had seven deals worth a total of \$244.2 million, representing 24% of the life sciences industry activity by value. Kardium (\$146.1 million), PFS Genomics (\$41.9 million) and Ondine Biomedical (\$37.6 million) attracted the largest investments in this specialty. Biotechnology (15 deals worth a combined \$63.7 million) and digital health (2 deals totaling \$48.8 million) together accounted for 11% of the total investment activity by value.

A Dynamic and Nurturing Ecosystem

Metro Vancouver's life sciences industry benefits from a robust supporting ecosystem. Significant investments from the federal and provincial governments, universities, health authorities, and the private sector mean that the life sciences industry outlook remains bright. This section provides an overview of the region's life sciences ecosystem, and briefly describes the geographic clustering of life science firms and upcoming projects and initiatives.

The Supporting Life Sciences Ecosystem

Figure 16 lists the organizations that make up the dynamic and nurturing enabling environment in the Metro Vancouver region. We have included two research categories: *academic research*, which covers research at post-secondary institutions,

and *research institutes*, which are affiliated with academic institutions or health authorities that advance scientific discoveries. In some cases, such as the Djavad Mowafaghian Centre for Brain Health at UBC, the research is combined with patient care. The *industry builders* are organizations that help grow and support individual firms and the industry as a whole. Funding and support for the industry is provided by *provincial and federal governments and agencies*, and by the organizations and funds in *research support and funding*. Some of the included players, such as Michael Smith Health Research BC, provide multiple layers of support. It includes BC SUPPORT (Support for People & Patient-Oriented Research & Trials) which advances patient-oriented research; Clinical Trials BC, which helps clinical trial investigators, sites and institutions; and Research Ethics BC, which provides a harmonized provincial system for research ethics reviews.

Figure 16: The Metro Vancouver Life Sciences Industry Supporting Ecosystem

Ecosystem Players

Industry Builders

- adMare Biolnnovations
- Life Sciences BC
- BC Tech Association
- Creative Destruction Lab (CDL) - Vancouver
- entrepreneurship@UBC
- SFU Venture Labs
- New Ventures BC
- TRIUMF Innovations
- Invention to Innovation (i2I)
- Circle Innovation

Research Institutes

- Providence Health Care Research Institute
- Vancouver Coastal Health Research Institute
- BC Children's Hospital Research Institute
- BC Cancer Research
- Women's Health Research Institute

Provincial and Federal Governments and Agencies

- BC Ministry of Jobs, Economic Development and Innovation
- Innovate BC
- Innovation, Science and Economic Development Canada
- The Canadian Trade Commissioner Service
- Pacifican
- National Research Council of Canada

Research Support and Funding

- Michael Smith Health Research BC
- Genome BC
- The BC Knowledge Development Fund
- The Canada Foundation for Innovation
- The Canadian Institutes of Health Research

Academic Research

- University of British Columbia
 - School of Biomedical Engineering
 - Faculty of Medicine
 - The Life Sciences Institute at UBC
 - Michael Smith Laboratories
 - UBC's Djavad Mowafaghian Centre for Brain Health
- Simon Fraser University
 - 4D Labs
 - ImageTech
 - eBrain Lab
 - WearBioTech Centre
 - Bio3 Lab
 - Molecular Biology and Biochemistry
 - Biomedical Physiology and Kinesiology
 - Faculty of Health Sciences
 - Institute for Neuroscience & Neurotechnology
- British Columbia Institute of Technology
 - Department of Biotechnology



Upcoming Investments: The Ongoing Expansion of the Supporting Ecosystem

Existing physical clusters of life science activity in the region are expanding, and new ones are being established. Figure 17 shows clusters of life science activity in the region. Below we have highlighted new public and private research and development and wet lab space planned in the coming years. The mix of new projects run the gamut from those that are currently under construction to those that are still in the earliest planning stages.

New Public and Private Life Sciences R&D and Wet Lab Space Planned in the Coming Years

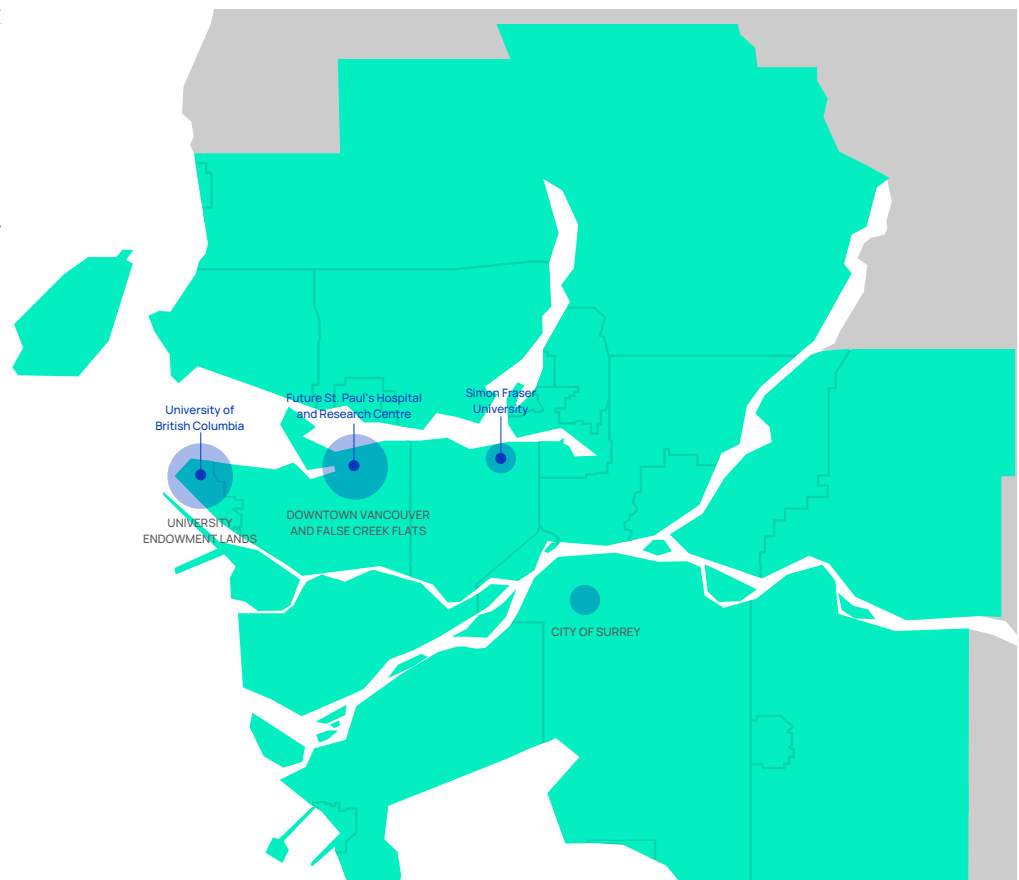
- **University Endowment Lands:**
 - **The School of Biomedical Engineering (SBME)** is a partnership between the Faculties of Applied Science and Medicine that is building Western Canada's new hub for transformative biomedical engineering education and research. The SBME is UBC's first inter-faculty school and is a living laboratory for new models of convergent research and education in Canada. The SBME is exploring the potential for expansion past 2025.
 - **adMare BioInnovations**, Canada's Life Sciences industry builder, currently operates their 35,000-square-foot Vancouver Innovation Centre on the main UBC campus. This facility, though small-in-size relative to their Montreal Innovation Centre (roughly 170,000 square feet), includes state-of-the-art industrial drug development labs, shared service facilities and houses key members of adMare's R&D, legal, business development and academy teams. In order to meet the needs of the BC life sciences community, they are seeking to expand their footprint in Vancouver with a focus on providing additional space and resources for emerging life science ventures.
- **City of Vancouver:**
 - **AbCellera** anchors Mount Pleasant's growing tech neighbourhood, where you will also find firms such as **Zymeworks**. AbCellera has 130,000 square feet of lab and office space, and a new, 380,000-square-foot global headquarters and biotech campus that is under construction and slated for completion in 2023/2024. Separately, at the eastern end of the flats, AbCellera is also building its 130,000-square-foot Good Manufacturing Practices (GMP) facility for the production of therapeutic antibodies to complement its Mount Pleasant headquarters. The GMP is slated to open in 2024.
 - The new 18.4-acre **St. Paul's Hospital** development (currently under construction) includes a state-of-the-art research and development platform integrated with the hospital. This unique innovation hub will enable development of complex health solutions by providing space and expertise to support life. Planned facilities include wet labs, a Phase I-III Clinical Trial and Biomanufacturing Unit, and a Data Access and Services Centre. **Masimo**, the global medical technology firm, will be opening a 100,000-square-foot research hub, joining the bustling biotech False Creek Flats neighbourhood near the new hospital. The neighbourhood is already home to companies such as **STEMCELL Technologies**, **Chinook Therapeutics**, and **Variational AI**.

• **City of Surrey:**

- The City of Surrey's **Innovation Boulevard** is the home of **SFU's Quantum Algorithms Institute** that will be British Columbia's centre for innovation and commercialization of quantum technologies. Quantum applications in health technology and life sciences include the development of new pharmaceuticals and the study of genetics and genomics.
- Adjacent to the Surrey Memorial Hospital, is the **Health & Technology District**. The fourth of a planned eight towers in the district is under construction and will include 75,000 square feet of wet lab space over five floors. Future phases of this development could add up to a million square feet of wet lab space. The project will provide enough capacity to accommodate up to 15,000 jobs.
- Joining the district is the **UBC Master of Physical Therapy** program that will expand to a new teaching and research space in the district in 2023.
- Presenting many future opportunities for innovation, the new **SFU Medical School** located in the district will train healthcare and medical professionals and contribute to regional efforts to recruit 9,000 health-care workers through the health-career access program. The school is aiming to accept students starting in 2026.

The federal and provincial governments are also contributing to the expansion of the life sciences ecosystem in Metro Vancouver. In 2021, the federal government released its *Biomanufacturing and Life Sciences Strategy*, which commits \$2.2 billion "towards growing a vibrant domestic life sciences sector, securing pandemic preparedness, and creating good high-skilled jobs for Canadians."¹³ The strategy has five priorities, including coordinated governance; strengthening research systems and the talent pipeline; investing in existing and emerging areas of strength; building public capacity; and designing regulation that encourages innovation.

Figure 17: Geographic Clustering of Life Science Activity in Metro Vancouver



13 *Canada's Biomanufacturing and Life Sciences Strategy* https://ised-isde.canada.ca/site/biomanufacturing/sites/default/files/attachments/1098_01_21_Biomanufacturing_Strategy_EN_WEB.pdf

The \$2.2 billion in federal funding includes:

- \$1 billion over seven years to be invested in domestic life sciences and biomanufacturing firms, with an emphasis on closing capabilities gaps, strengthening emerging areas and augmenting supply chains
- \$500 million over four years to support bioscience infrastructure at post-secondary institutions and research hospitals
- \$250 million over four years for biomedical research funding plus \$45 million to support stem cell and regenerative medicine research
- \$250 million to establish a new Clinical Trial Fund to support a mix of research investments, projects, and platforms related to clinical trials (including up to \$18.2 million to help Vancouver's Precision NanoSystems advance a COVID-19 vaccine candidate through preclinical trials plus \$25.1 million towards a project to expand Canadian capabilities in the production of ribonucleic acid (RNA) vaccines)
- \$92 million allocated to adMare BioInnovations (adMare) to support company creation, scale up, and training activities

The biomanufacturing and life sciences strategy funding supplements commitments made during the early phase of the pandemic. For example, the federal government invested \$175.6 million (May 2020), through its Strategic Innovation Fund, in AbCellera's GMP facility for antibody therapies (described above).¹⁴

The Province of British Columbia is developing its own *Life Sciences and Biomanufacturing Strategy* to position the province "as a worldwide life sciences hub by nurturing new talent, developing new lab space, leveraging the research capacities of B.C.'s post-secondary sector and supporting employment across the sector".¹⁵ Ahead of the release of the strategy (expected in 2023), the province is providing \$116.6 million in funding to Michael Smith Health Research BC (Health Research BC) and another \$78 million to Genome BC.

In February 2023, as the first action of the forthcoming *BC Life Sciences and Biomanufacturing Strategy*, the Government of BC and PacifiCan announced a \$7.2 million investment to create a BC National Biomanufacturing Training Centre at the British Columbia Institute of Technology (BCIT). The training centre plans to offer biomanufacturing training aligned with industry needs. Expected to begin operations by spring 2024, the centre is expected to provide training for 700 people annually by 2026.¹⁶

The announced investments and new facilities coming online in the Metro Vancouver region point to a strong commitment from the government and from large life science firms based within the region and internationally.

14 Biomanufacturing: Projects underway, Innovation, Science and Economic Development Canada. (May 5, 2022) <https://ised-isde.canada.ca/site/biomanufacturing/en/biomanufacturing-projects-underway>

15 New life sciences investment helps build stronger B.C., Province of British Columbia. (March 2, 2022) <https://news.gov.bc.ca/releases/2022JERI0007-000280>

16 B.C. building talent pool to support life sciences, biomanufacturing. (February 14, 2023) <https://news.gov.bc.ca/releases/2023JEDI0010-000186>

The Microeconomic Perspective: What We Heard from Firms in the Industry

To develop a firm-level understanding of the industry, we interviewed chief executives, founders, and senior executives of regional life sciences firms. These interviews are an important research tool. Economic statistics such as contribution to GDP, employment, labour hours, and total capital stock, can reveal long-term industry trends. Investment activity can indicate areas of strength where people see genuine opportunity. Government commitments and an expanding ecosystem are grounds for optimism. Yet, only the people with day-to-day experience running firms can explain their view of the region's competitive advantages and which shortcomings most urgently need to be addressed. Several themes emerged from our interviews:

- The dynamic nature of the life sciences industry produces ups and down on multiple fronts. Individual firms deal with scientific risk and the entire industry deals with fluctuations in the relative availability of financial capital.
- The region excels at early-stage research, with strengths in drug delivery (lipid nanoparticles), antibody discovery, and precision health (genomics).
- Lack of wet lab space is a bottleneck constricting growth. With the local industry concentrated at the front end of the life sciences value chain, the region needs access to additional wet lab space, particularly for the earliest stage firms.
- A growing life sciences industry will require more (and more specialized) talent. To meet the demand, the region will need to develop and attract more talent.
- The government of Quebec is perceived as doing a good job supporting the life sciences industry.
- The implications of macroeconomic uncertainties are top of mind.

The dynamic nature of the life sciences industry produces ups and down on multiple fronts

The life sciences industry is laden with scientific, macroeconomic, and other risks. Firms in the industry are subject to reversals of fortune based on scientific progress (or lack thereof); financial capital access fluctuates with macroeconomic conditions and investing fashions; and mergers and acquisitions are commonplace.

Due to the nature of scientific research, many firms have uncertain futures that depend heavily on whether the science “works out”. (In the earliest stages, scientific risk is predominant since there is generally demand for viable therapeutics. The risk shifts from scientific to business risk as the firms scale up and products move closer to commercialization.) The uncertainty stemming from the scientific risk can complicate leasing office and lab space, for example, since success might mean a sudden need to triple the firm's physical footprint, while failure might bring the entire operation to a crashing halt.

Apart from challenges inherent in running a firm based on scientific discovery and innovation, there are also ups and downs from an investment standpoint. Many of our interviewees have been in the industry long enough to remember at least one “nuclear winter” for funding, when it was virtually impossible to raise capital. In contrast, 2020 and 2021 were described as a “crazy time” with large funding rounds, public offerings, and sky-high valuations in the wake of pandemic-fueled public and private sector interest in the life sciences industry.



The Metro Vancouver region has seen the rise and fall of many life sciences companies, and it has been rare to see larger life sciences firms that have endured. Typically, firms reach a certain size before being acquired by a larger firm, usually one based in the United States. This should not necessarily be seen as a negative. An acquisition may lead to capital being recycled in the region as former owners and employees start new firms. Also, for some companies, being acquired may be the most viable path to successfully scale up their innovations.

These ups and downs highlight the challenges of this unique industry, where the risks are pronounced and the returns (both in terms investment and benefits for human health) are great.

The region excels in early-stage research

Metro Vancouver's life sciences industry is powered by the quality of research being produced in the region's universities and research institutes. (It is difficult to imagine a successful life sciences industry where this would not be true.) In an earlier section, Figure 16 showed the depth and breadth of the regional life sciences innovation ecosystem, which serves as the foundation for the industry. This activity is especially important in the Metro Vancouver region because our leading areas of specialization, notably biotechnology and drug discovery, are concentrated at the beginning of the value chain (e.g. research and development, and clinical development). This contrasts with Montreal, for example, where the focus is on the later stages of the value chain (e.g. pharmaceuticals and contract manufacturing organizations).

WORLD LEADING SCIENCE In the Metro Vancouver region

Drug Delivery: Discovered in Vancouver, lipid nanoparticles are a ground-breaking innovation in drug delivery. A crucial component in mRNA therapeutics, lipid nanoparticle technology was used in the Pfizer-BioNTech and Moderna COVID-19 vaccines.

Antibody Discovery: combining its competencies in artificial intelligence and therapeutics, Vancouver is a world-leader in antibody discovery. Notably, AbCellera used its antibody discovery engine to deliver two antibody treatments to combat COVID-19.

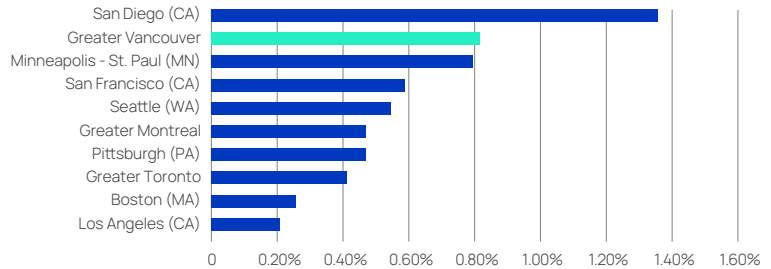
Precision Health: Metro Vancouver is an international leader in genomics, proteomics and bioinformatics for precision medicine. Through the use of cutting-edge genomics, firms and research institutions are creating novel strategies to prevent and diagnose cancers and other diseases, and uncovering new therapeutic targets.

The prominence of research and development in the region is apparent when comparing the number of researchers as a share of total employment in Metro Vancouver¹⁷ and nine other life sciences centres in North America. Figure 18 (on the previous page) shows that the region ranks second using this measure.

Another indicator of the importance of research activities is the number of patents issued to inventors by the U.S. Patent and Trademark Office. Figures 19 and 20 compares the number of patents granted in selected North American life sciences centres since 2003, per 100,000 population.

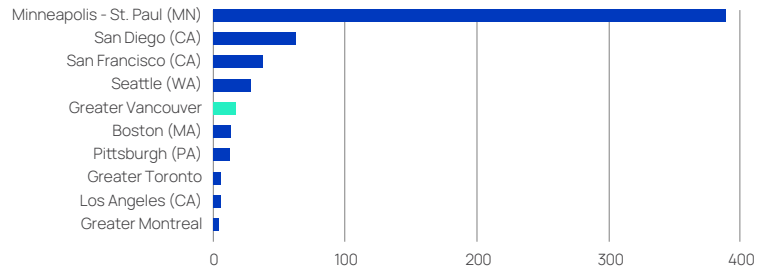
Figure 19 reveals that the Metro Vancouver region ranks sixth in per capita patents related to biotechnology, bioinformatics, healthcare, and pharmaceuticals, while Figure 20 shows that the region is fifth in patents per capita related to medical devices. In all of these fields, the region ranks highest in Canada in patents issued per capita. These comparisons all demonstrate that Metro Vancouver's life science industry is an attractive investment prospect for early-stage research, particularly when comparing with other Canadian life science hubs.

Figure 18: Researchers as a Share of Total Employment



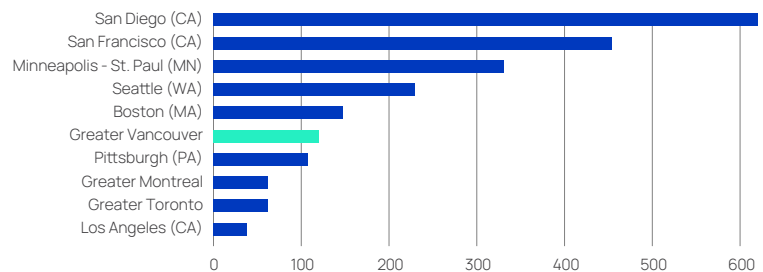
Source: Invest Vancouver, using data from fDi Benchmark, a service from the Financial Times of London

Figure 19: Patent Specialization in Medical Devices
(Patents per 100,000 population since 2003)



Source: Invest Vancouver, using data from fDi Benchmark, a service from the Financial Times of London

Figure 20: Patent Specialization in Life Sciences*
(Patents per 100,000 population since 2003)



*Patents in biotechnology, bioinformatics, healthcare, and pharmaceuticals.
Source: Invest Vancouver, using data from fDi Benchmark, a service from the Financial Times of London

¹⁷ As mentioned earlier, the data from fDi Benchmark is for 'Greater Vancouver', which includes Vancouver, Surrey, Burnaby, Richmond, Coquitlam, Langley, Delta, North Vancouver, Maple Ridge, New Westminister, and Port Coquitlam.



Lack of wet lab space is a bottleneck constricting growth

We heard, repeatedly, that the most critical need in the region is wet lab space. The problem is not unique to the Metro Vancouver region, but the deficit of wet lab space has only recently begun to be addressed after decades in which viable spaces were put to other uses. For early-stage life science firms, buying and outfitting space is not financially feasible and for developers, there is insufficient incentive to build, maintain and lease these types of spaces. The general lack of lab space also affects mature firms and hurts the ability to develop a larger industry. International firms attracted by the regional excellence in research and development may split their investments, putting money into research in the region, and developing the results elsewhere.

Given the prominence of early-stage research in the region, we expected the commercialization of intellectual property (IP) developed in local universities to be raised as a prominent issue. And, some of our interviewees did recount frustrating experiences working with university transfer offices. They made a persuasive case for re-orienting the transfer offices' incentives to make the entire process less onerous, faster, and more responsive. (When asked, other interviewees rated the universities favorably in this area.) For now, however, the issue is moot. The lack of access to wet labs for early stage firms is the metaphorical kink in the garden hose when it comes to increasing the industry's rate of growth. Until it is resolved, removing all IP-related barriers would not change the current growth trajectory.

Many life science firms need specialized laboratory spaces (or wet labs). These spaces must be customized for the specialized and regulated nature of the work being undertaken. These requirements can include custom heating, ventilation and air conditioning requirements, electrical systems, plumbing, and equipment such as lab benches and fume hoods. Access to wet lab space outside of academic and research institutions is extremely challenging. As ventures spin out of research institutes and successful life sciences firms seek to scale up, they need a physical space to turn their research into a viable commercial success. Since these firms are pre-revenue, buying and outfitting spaces is often not a viable option. Additionally, the risky nature of the work means that the firm may need double the space or shutter the business entirely within a year.

For private developers, building and leasing lab space, especially to the earliest stage firms, is not an attractive proposition. As described by Colliers, from an ownership perspective, life sciences "isn't for everyone," citing high costs, high risks, but potentially high rewards.¹⁸ The costs are clear: building office buildings in Vancouver (at \$245 - \$295 per square foot) is a far more attractive proposition than a pharmaceutical lab, which is over double the price (at \$605 - \$855 per square foot).¹⁹ For landlords these prospective tenants are not attractive, their revenues are unproven, and they need more flexibility than other tenants. If landlords can look past the instability of the client, there can be a gain in terms of an additional 50% premium on rents.²⁰

18 <https://www.cbre.ca/insights/articles/life-sciences-sector-gets-a-big-boost-from-covid-19>

19 <https://www.altusgroup.com/reports/canadian-cost-guide/>

20 Ibid



Image: adMare Bioinnovations

The critical shortage of wet lab space was consistently raised as an issue by interviewees and the planned construction of wet lab space will not be enough to meet demand. Adding to the availability of flexible wet lab space is the minimum required to keep up with other life science jurisdictions.

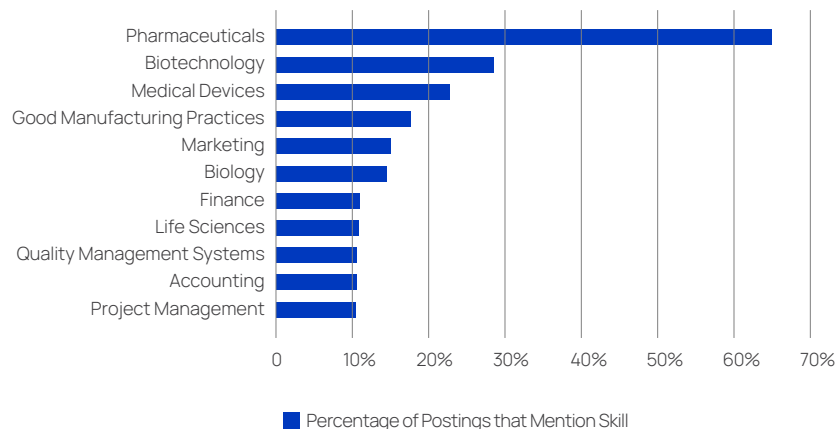
Developing into a globally prominent life sciences hub will require more (and more specialized) talent

The future of the life sciences industry in the region will be determined in large part by the supply of highly educated, skilled workers. Interviewees consistently identified talent development and attraction as a significant area of concern. Their firms need particular skillsets, many of which are in short supply in the region and in Canada. They expect

the demand for talent will intensify as individual companies scale and the overall industry grows. Raising the global profile of the local industry would help firms recruiting talent from outside the region. The supply of workers was characterized as the potential rate-limiting step in the industry's growth.

Interviewees frequently mentioned the need for skill development and expressed a desire for more workers with pharmaceutical expertise. This sentiment is corroborated by job posting activity in the region over the past two years. Figure 21 shows the most frequently requested skillsets, with pharmaceuticals (appearing in 65% of job postings) at the top. Firms are struggling to meet this need.

Figure 21: Frequently Mentioned Skills in Life Science Industry Job Postings in Metro Vancouver



Skills related to manufacturing will also be in demand, as Canada moves to improve its ability to produce vaccines domestically, and AbCellera's GMP facility comes online. Yet, BioTalent Canada predicts severe labour shortages in biomanufacturing and processing, and suggests that only 25% of job openings will be filled between 2021 and 2029.²¹ Firms mentioned the lack of "seasoned, experienced" workers with pharmaceutical manufacturing experience in the region. The recently announced biomanufacturing training facility will help to fill this gap, but it will take many years to accumulate the pool of seasoned, experienced workers that the industry requires.

Interviewees also brought up recruiting from outside the region. They described needing to hire people with specific skills or backgrounds that are comparatively common in U.S. life sciences centres and much rarer in Canada. For example, we heard frequently about the importance of hiring people with experience navigating the regulatory requirements of the United States Food and Drug Administration (FDA) in order to access the enormous U.S. market. Some interviewees reported that their firms have been using "work from anywhere" remote work policies to make sure they have the right people in place.

Convincing people to relocate was identified as a challenge. The cost of housing plays a role, and it is particularly hard to recruit workers with ten to fifteen years of experience who have established themselves elsewhere. Interviewees indicated a willingness to offer competitive salaries but explained that the larger issue is reputational in nature. Due to the nature of the work and the risks involved, prospective employees are reluctant to relocate unless they are confident there will be suitable employment opportunities in

the future. The industry needs to continue to expand and to be promoted internationally so that Metro Vancouver earns a higher profile as a leading life sciences centre.

Life Sciences BC will be releasing (fall of 2023) a labour market analysis for the life sciences industry that will capture the needs of the industry and identify the jobs and skills sought by employers. The report will provide an up-to-date workforce profile, including five-year labour demand and supply forecasts, a skills training assessment, gender-based analysis plus data, and recommendations for sector-led strategies.

Also on the training side, UBC's School of Biomedical Engineering is partnering with the Canadian Alliance for Skills and Training in Life Sciences (CASTL) to deliver a 17-week intensive Introduction to Biopharmaceutical Manufacturing. In addition to university offerings, CASTL also delivers online learning options on all aspects of biopharmaceutical manufacturing. CASTL will also partner with BCIT on the training for the forthcoming National Biomanufacturing Training Centre (NBTC).

Training is one piece of the puzzle. Interviewees stressed that training and recruitment are both necessary since there is no substitute for industry experience.

²¹ Close-up on the bio-economy, BioTalent Canada (2021), <https://www.biotalent.ca/wp-content/uploads/BioTalent-Canada-LMI-National-Report-13OCT2021.pdf>

The government of Quebec is perceived as doing a good job supporting the life sciences industry

The Government of Quebec's support for the life sciences industry was brought up in various contexts across multiple interviews. We heard praise for their promotional efforts at the BIO International Convention (a leading biotechnology and pharma industry event); their "serious" life sciences policy and its coordinated delivery; their spending on industry development; and their commitment of additional capital to support investment attraction. In some cases, interviewees also used Quebec as an example to illustrate a perceived gap in our region. They told us that "[Quebec] has someone to play a coordination role and we need [someone to act as] glue for the sector"; "Ontario and Quebec are far ahead in support of start-ups". Interviewees noted the strong engagement and coordination of the Government of Quebec, contrasting it with a lack of similar engagement by the BC government.

The Quebec Life Sciences Strategy, 2017-2027, was launched with a five-year, \$205 million commitment and the goal of making the province a top five life science hub in North America by 2027.²² The strategy increased investment in research and innovation; fostered creation and growth of new firms; supported private investment projects; promoted the life sciences industry; and integrated innovation into the health network. Based on consultations and working

groups, the strategy was renewed for 2022-2025 with an additional \$110 million in funds.²³ The current priorities are addressing health challenges through innovation; developing human capital and attracting talent; strengthening infrastructure support; attracting investment projects; and supporting commercialization of innovations.

Stimulating private investment in the entire sciences value chain is a major goal of the strategy and the province is investing heavily in making it a reality. During the 2022-2025 period, life science companies will be able to access financial support estimated at \$569 million, including \$375 million financed by contributions from the Fonds du développement économique du Québec and \$70 million for the Impulsion PME and BioMed Propulsion programs. A further \$200 million will be available through Investissement Québec (Invest Quebec, IQ), which has a dedicated life sciences team. IQ provides development (equity) capital to develop strategic partnerships and launch projects in Quebec; loans and loan guarantees to finance refundable tax credits; other loans, interest-free loans and loan-guarantees; and financial assistance for workforce development.²⁴

Any inter-provincial comparison should take into account Quebec's considerable size advantage: relative to BC it is 1.63 times larger by population, and 1.45 times larger by provincial GDP.²⁵ Size differences notwithstanding, the impressive characteristic of the Quebec life sciences effort is its overall coordination. Additional examples from Quebec model are discussed later in the report.

22 The original 2017-2027 plan is no longer available on the Quebec government website. A summary can be found here: <https://www.thecoolerhotspot.com/news/quebecs-sciences-strategy/#:~:text=2017%E2%80%932027%20Qu%C3%A9bec%20Life%20Sciences%20Strategy%201%20Ambitious%20goals,...%204%20Growth%20in%20two%20cross-cutting%20niches%20>

23 For the 2022-2025 Quebec Life Sciences Strategy, see: https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/economie/publications-adm/politique/PO_strategie_sciences_vie_2022-2025_MEI_EN.pdf?1654528370

24 <https://www.investquebec.com/international/en/industries/life-sciences/customized-financial-products.html>

25 Statistics Canada. Table 17-10-0009-01 Population estimates, quarterly and Table 36-10-0402-02 Gross domestic product (GDP) at basic prices, by industry, provinces and territories, growth rates (x 1,000,000)





Image: adMare BioInnovations

The implications of macroeconomic uncertainty are top of mind

The prospects for investment activity over the next several years came up in almost all of our interviews. As discussed previously, global macroeconomic conditions and the prospect of a recession translated into a steep decline in investment activity in the regional life sciences industry in 2022. The memory of some particularly lean years when it was exceptionally difficult to raise financial capital has many industry participants taking a careful look at their budgets and growth plans.

Investors, financial institutions, and other capital providers have signalled clearly that uncertain times will translate into tighter access to financial capital. Yet, the sky is not falling. Compared to 2008, when the financial crisis made it seem as if almost no one had access to financial capital, 2022 was less about scarcity and more an overabundance of caution, as investors waited to see how the contest between rising inflation and interest rates would play out. Venture capitalists still have “dry powder” (i.e. cash) available, and the most promising firms with the most compelling business cases will still be able to find investors.

For life sciences companies, the continued macroeconomic uncertainty means ensuring costs are contained, milestones are clear, and capital is raised cautiously.

Investments in infrastructure and the development of strategies to strengthen the life sciences industry are vital components to keep the industry stable in uncertain economic times. To further build on these positive actions, it is important to undertake steps to enable further growth. Direct discussions with CEOs, founders and senior executives of firms reveal the competitive advantages of the Metro Vancouver region, but also the areas for improvements to allow the firms to thrive as well as to facilitate additional investments. The next section of the report discusses actions to support further expansion of the life sciences industry in the region.

Recommendations to Advance Metro Vancouver's Life Sciences Industry

Metro Vancouver has a vibrant life sciences industry that could grow faster and add even more employment with coordinated action to build industry capacity. The overarching goal should be to elevate the regional industry to the point that it is regarded as a globally significant life sciences hub with a critical mass of skilled workers and firms. This self-reinforcing pool of workers and firms, each drawn to and anchored in a specific geographic area by the presence of the other, is the distinguishing feature of world-leading life sciences centres. The framework for taking the industry to the next level can be borrowed from Quebec, which has a focused, coordinated effort to advance the life sciences industry across multiple entities.

The life sciences industry in Quebec is supported (among others) by BIOQuébec, the provincial industry association; Investissement Québec, which leads international investment attraction for the province; Montreal International, an economic development agency; and InVivo, a non-profit economic development agency focused exclusively on the life sciences and health technologies. As an example of the formal coordination among the industry supporters, "The Coolest Hotspot" campaign was established by 15 partners as an umbrella initiative to represent the ecosystem and promote investment attraction in the partner regions (Montreal, Quebec City and Sherbrooke). The combination of the Quebec Life Sciences Strategy and the coordinated efforts such as "Coolest Hotspot" demonstrate a seriousness of purpose and commitment to the industry that is producing results and could be emulated in BC.

The life sciences industry would benefit from coordinated action on specific challenges related to talent, cost control, and lab space. Specifically, elected leaders, government officials and other decision makers should consider:

- **Actively promoting talent attraction for the life sciences industry.** The industry relies on a pool of highly trained, specialized workers. Increasing the size of the talent pool will be critical as the overall industry grows, and additional skill sets will be needed as more firms scale up. There needs to be a two-pronged effort to add people to the talent pool through training and attraction. Talent attraction efforts could incorporate elements of the Montreal International strategy.
- **Looking for opportunities to help firms control costs through economies of scale.** Cost containment is always an issue, particularly for start-ups, and looms larger when the economy (and access to investment dollars) slows. BIOQuébec offers an example of how to help firms contain costs and maintain the region's cost-competitiveness.
- **Building public sector-supported wet lab space for young firms.** There is an acute shortage of wet lab space, especially for young firms emerging from the region's universities and accelerators. The market will not provide a solution since developers can make more money with less risk with alternative approaches. A lower (and still positive) return may be acceptable to the government, because unlike private developers, it benefits from the long-term gains from greater employment and tax revenue generation. The government could copy models from Montreal, Halifax, and Toronto to unlock growth in the life sciences industry.



Actively Promote Talent Attraction for the Life Sciences Industry

Life sciences firms depend on talent. For the industry to thrive in the region, new workers will need to be trained in sufficient numbers, and local firms will need to recruit senior level people with highly-specialized skillsets from outside the region. The industry association, Life Sciences BC, has initiated work on the talent development part of the equation through the labour market analysis project they are leading (report due fall of 2023). The study will look at the demand for specific occupations, skills needed and where they can be acquired, as well as the number of prospective new workers graduating from local post-secondary institutions. Our focus here is specifically on the talent attraction piece.

Two factors outside a firm's control profoundly affect their ability to recruit specialized and senior talent from outside the country: lifestyle and industry perception. The Metro Vancouver region is well positioned in terms of lifestyle, particularly when it comes to recruiting Europeans, who may find Canada a better cultural fit than the U.S. The region's high cost of living is less of an issue, since these positions are well compensated. The industry perception issue boils down to whether the region is perceived as a viable life sciences hub. Given the risky nature of the industry, people are understandably reluctant to relocate unless they believe there will be many other opportunities available if things don't work out with their initial employment.

AbCellera's GMP manufacturing facility for antibody therapies, scheduled for completion in 2024, illustrates the push-pull nature of the challenge. The company needs to attract specialized talent to the facility, since its operation requires people with skills that are not otherwise in demand in the region. Yet,

as the region continues to add such facilities, they bolster the region's attractiveness to people with pharmaceutical experience.

While the regional industry is much smaller than some of the world-leading U.S. hubs, it is growing rapidly and would benefit from a more vigorous, Quebec-style approach to talent attraction. Montreal International has a talent attraction department that supports the life sciences industry with a variety of programs and initiatives. Jointly with companies, they conduct foreign talent recruitment missions, which are patterned after the more familiar export promotion and investment attraction missions. They run multiple talent recruitment websites. They have standard job posting boards where companies solicit workers, as well as the "I choose Montreal" and "Talent Montreal" websites which specifically target foreign audiences and actively solicit resumes from qualified people who would be willing to relocate to Montreal. They also try to match international students in relevant programs at Quebec universities with local life sciences firms, to the mutual benefit of both. And they have an established network of HR firms to help international companies looking to get established in Montreal. These efforts are possible because Montreal International has dedicated staff supported by funding and a strong strategic commitment from the Province of Quebec.

Talent Attraction Strategies

- ✓ Dedicated talent attraction staff
- ✓ Recruitment missions
- ✓ Solicit qualified professionals prepared to move to the region
- ✓ Retention of international students

Look for Opportunities to Help Firms Control Costs Through Economies of Scale

Controlling costs and stretching dollars can be a matter of survival for early-stage, pre-revenue firms at the best of times. The life sciences industry is expensive and capital intensive. Developing novel medical treatments and devices and gaining regulatory approval is a lengthy, expensive process. The industry relies on highly educated, well paid people. Land prices are high in Metro Vancouver, and the physical spaces such as wet labs required for life sciences firms are costly to build and outfit. When investment capital becomes scarce because macroeconomic conditions sour or investment trends shift, finding ways to cut expenses takes on an extra degree of urgency.

The region would benefit from finding ways to use economies of scale (through pooled buying power) to help individual firms lower their costs. The potential extends beyond the need for industry-specific equipment and services and could include routine expenditures for non-core services, such as payroll and accounting. BIOQuébec, the industry association representing the life sciences industry in Quebec, is a Canadian example using pooled purchasing power to improve the value proposition local firms. Their program covers **operations** (laboratory equipment, biostatistical analysis services, pharmacokinetic studies in animals, and postings on the BioTalent Canada job board); **administration** (group insurance, pharmaceutical training, payroll services, travel); **business development** (memberships with Innovative Medicines Canada, MassBio, and Pharmabio

Development activities and events); and **information and media** (including press release distribution through Business Wire and communication, marketing and management consulting services).

Build Public Sector-Supported Wet Labs for Early-Stage Firms

The lack of wet lab space in the region, particularly for the earliest stage firms that have outgrown a university lab or accelerator, is a market failure.²⁶ The private sector lacks sufficient financial incentive to provide these facilities. Given the strong demand for industrial land (and persistent low vacancy rates), developers can make a larger return with less hassle by redeveloping light industrial with multistory light industrial and office space. There is room for government intervention to provide these much needed spaces, since the public sector could accept less-than-the-maximum-possible profit, particularly given the added benefits of anchoring valuable intellectual property and well paid jobs here.

Beyond the job creation spurred by removing a serious barrier to growth, an investment in infrastructure such as wet labs could attract additional private and public dollars. The income stream produced by renting the labs could be used to cover ongoing operation costs and contribute towards the long-term repayment of initial capital. The impact would be long-lasting since the lab space could serve multiple vintages of firms. And the government would retain the option of recouping the initial outlay by selling the asset.

There are many ways to structure governmental involvement in wet labs. Here are examples from Montreal, Halifax, and Toronto.

²⁶ A market failure is an economic term describing inefficient allocation of resources in the free market.



Innovation Spaces and Centres with Wet Labs

adMare BioInnovation's (adMare) Montreal Innovation Centre currently houses 27 companies, ranging from emerging start-ups through to industry leading pharmaceutical/biotechnology companies, alongside contract research organizations and specialized commercialization support service organizations. Construction of the Montreal Innovation Centre was supported by the Government of Quebec, the City of Montreal, and Canada Economic Development for Quebec Regions (CED).

adMare is a non-profit organization that receives support from various levels of government, as well as revenue from its activities. The organization provides infrastructure, programming, and access to additional support and resources, to enable domestic companies the opportunity to grow and maintain their operations in Canada. The innovation centre has turn-key, state-of-the-art dedicated laboratories designed to support chemistry, biology, and preclinical animal studies, as well as shared specialized drug development facilities, equipment, and services to support analytical chemistry and in vivo pharmacology. adMare is currently exploring expanding their Innovation Centre in Vancouver.



adMare's Montreal Innovation Centre



Invest Nova Scotia's The Labs at Innovacorp

Invest Nova Scotia's The Labs at Innovacorp are a state-of-the-art life sciences facility located at Halifax's knowledge hub. The facility is a part of the newly created provincial crown corporation that combines two provincial agencies, Nova Scotia Business Inc. (NSBI) and Innovacorp, into one entity. For clarity, this section describes the activities of Innovacorp and will refer to it by that name, which was still in use at the time of writing.

Innovacorp is focused on early-stage investments and makes equity investments directly in start-ups and in privately managed funds. Innovacorp also runs several innovation spaces for young firms including The Labs at Innovacorp, which offers wet and dry lab space, IT support, and most crucially of all, flexible leasing arrangements that allow firms to increase or decrease space without penalty. The labs are currently home to 14 firms. As a provincial agency (and now crown corporation) Innovacorp receives its funding from the Province of Nova Scotia. In addition, as Innovacorp makes equity investments in early-stage companies, they receive some revenues when divesting from companies. With a current portfolio of over 80 companies and some significant returns (one deal provided a 35-fold return on investment), this model provides early-stage companies with physical supports, as well as addressing the lack of early-stage capital in the ecosystem.²⁷

²⁷ <https://innovacorp.ca/news/innovacorp-wins-venture-capital-deal-year-award-cvca>

MaRS Discovery District in Toronto is a 1.5-million-square-foot innovation hub in downtown Toronto serving a diverse community of more than 120 tenants, including research labs and global tech companies. A registered charitable organization, MaRS is supported by the governments of Ontario and Canada (35% and 22.5% of total funding in the 2021/22 fiscal year, respectively).²⁸ The remaining funding comes from grants, donations, sponsorship revenue, and other fees. MaRS Health supports nearly 300 high potential health start-ups that span the full industry spectrum, from health monitoring and disease treatment to information storage and sharing. Located within the Discovery District is JLABS, a life sciences incubator, hosting up to 50 companies across the life sciences spectrum, including therapeutics, medical devices, and consumer health solutions. JLABS is the first Johnson & Johnson Innovation Lab to open outside of the U.S.

In a risky and investment-intensive industry like life sciences, government investment is needed to provide essential innovation spaces that are crowded out of the market by alternatives that offer private developers greater short-term profits. Other jurisdictions in Canada have successfully set up models to support wet lab facilities to serve multiple generations of life science firms.



MaRS Discovery District in Toronto

Talent attraction, industry savings and physical infrastructure are common life science industry challenges that need to be addressed in the Metro Vancouver region. Whatever model is adopted, overcoming these common challenges would elevate the region's life science industry to greater global prominence, bring increased positive economic benefits to the region, and advance human health.

28 https://www.marsdd.com/wp-content/uploads/2021/07/MaRS_Discovery_District_Audited_Financials_March_2021.pdf

Conclusion

The Metro Vancouver region has a flourishing life sciences industry powered by a concentration of highly skilled people and backed by an extensive and expanding innovation ecosystem. Our investigation into the life sciences industry sought to answer two fundamental questions to guide the work of Invest Vancouver and key decision makers in the ecosystem.

1. Why do firms in the life sciences industry invest in Metro Vancouver?

Investing in the life sciences industry in Metro Vancouver is an attractive prospect due to the enviable combination of research competencies, talent, supporting institutions, and emerging and established firms in the region. With its research competencies, Vancouver would be high on the list of any investor seeking to open a life sciences research and development facility, particularly one in Canada.

2. What actions would unlock additional growth and investment in the life sciences industry?

Unlocking additional growth and investment is possible with focused, coordinated support from public and private stakeholders. Elevating the industry's growth trajectory will require matching the supply of talent to the needs of a rapidly expanding industry; ensuring early-stage firms have access to wet labs; and keeping the cost of doing business in the region competitive. Overcoming these common challenges would elevate the region's life science industry, helping it rise to become a specialized globally prominent hub on the world stage, bringing with it increased positive economic benefits to the region, and advancing human health.

Appendix: NAICS Codes Used to Track the Life Sciences Industry

The North American Industry Classification System (NAICS) codes the government uses to collect and organize firm-level statistical data do not include the life sciences industry as a distinct category at any level of the hierarchy.²⁹ The export-oriented parts of the life sciences industry are scattered across the manufacturing; professional, scientific, and technical services; and information sectors.

The most specific 6-digit national industries that capture export-oriented life sciences activity are:

- Pharmaceuticals and medicine manufacturing (325410)
- Measuring, medical and controlling devices (334512)
- Medical equipment and supplies (339110)
- Research and development in the physical, engineering and life sciences (541710)

Measuring, medical and controlling devices (339110) and research and development in the physical, engineering and life sciences (541710) each encompass activities of firms unrelated to the life sciences industry, but these are the narrowest possible categories. (In the US, biotechnology research and development is tracked separately as 541714.) Some digital health firms are grouped in

computing and software-related NAICS categories, and cannot be isolated from non-medical software firms. Since we are interested in the underlying trends, and not an accounting of all possible life sciences-related activity, these limitations are not a concern. Because this report focuses on firms producing exportable goods and services, we do not include population-serving components, such as medical laboratories.³⁰

Data at the national industry level is sometimes suppressed by Statistics Canada for privacy reasons, and is not always available quarterly or for the Metro Vancouver region. Invest Vancouver undertook its Strategic Industries Analytics (SIA) project and worked with a consultant to fill in missing values using statistical techniques to extrapolate from data sets that are reported less frequently and with less granularity in geography (i.e. federal versus provincial) and industry coverage (i.e. transportation and warehousing vs. scheduled freight air transportation).

²⁹ The NAICS hierarchy, from broadest to most specific, is sector (2-digit code), subsector (3-digit code), industry group (4-digit code), *NAICS industry* (5-digit code), and national industry (6-digit code). For example, the sector (2-digit NAICS code) "retail trade" narrows to multiple national industries (6-digit NAICS codes), such as "motorcycle dealers", and "beer, wine and liquor dealers".

³⁰ Firms in medical and diagnostic laboratories (621510) provide analytic or diagnostic services to the medical profession or to patients on referral from a health practitioner.



The SIA project starts from the following
Statistics Canada tables:

GDP:

Table 36-10-0402-01 GDP at basic prices, by industry
(BC Annual GDP by industry)

Table 36-10-0434-01 GDP at basic prices, by industry,
monthly (Canada Monthly GDP by industry)

Employment:

A Statistics Canada custom tabulation of
employment data

Labour hours:

Table 14-10-0211-01 Standard work week for salaried
employees, by industry (BC salary employee hours
worked by industry)

Table 14-10-0255-01 Average weekly hours for
employees paid by the hour, by industry (BC hourly
employee hours worked by industry)

Table 14-10-0201-01 Employment by industry, monthly
(BC hourly and salary employment by industry at the
4-digit NAICS level)

Capital Stock:

Table 34-10-0163-01 Flows and stocks of fixed non-
residential and residential capital, by sector and asset
(BC Quarterly Capital)

Table 36-10-0096-01 Flows and stocks of fixed non-
residential capital, by industry and type of asset
(BC Annual Capital by industry)

Prepared by Invest Vancouver

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Invest Vancouver is the economic development leadership service for the Metro Vancouver region, representing 21 municipalities and one Treaty First Nation. The service was created to advance equitable opportunity and more broadly shared prosperity for all residents of the region. This report has been prepared to enhance our region's global competitiveness and inform investment attraction efforts.

Invest Vancouver supports investment attraction and job creation in key export-oriented industries, conducting research, discerning the factors driving their growth, identifying gaps along product-service value chains, and articulating the underlying competitive advantages of the Metro Vancouver region. Through the identification of opportunities and challenges faced by firms in these industries, Invest Vancouver develops recommendations to inform policy and to influence decision-makers in strengthening the regional value proposition across key industries in order to increase the region's global competitiveness. Our data-driven, objective research aims to provide actionable intelligence to position the 2.7 million residents of this regional economy for success in a rapidly evolving global landscape.

For any questions about the report contact: info@investvancouver.ca

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