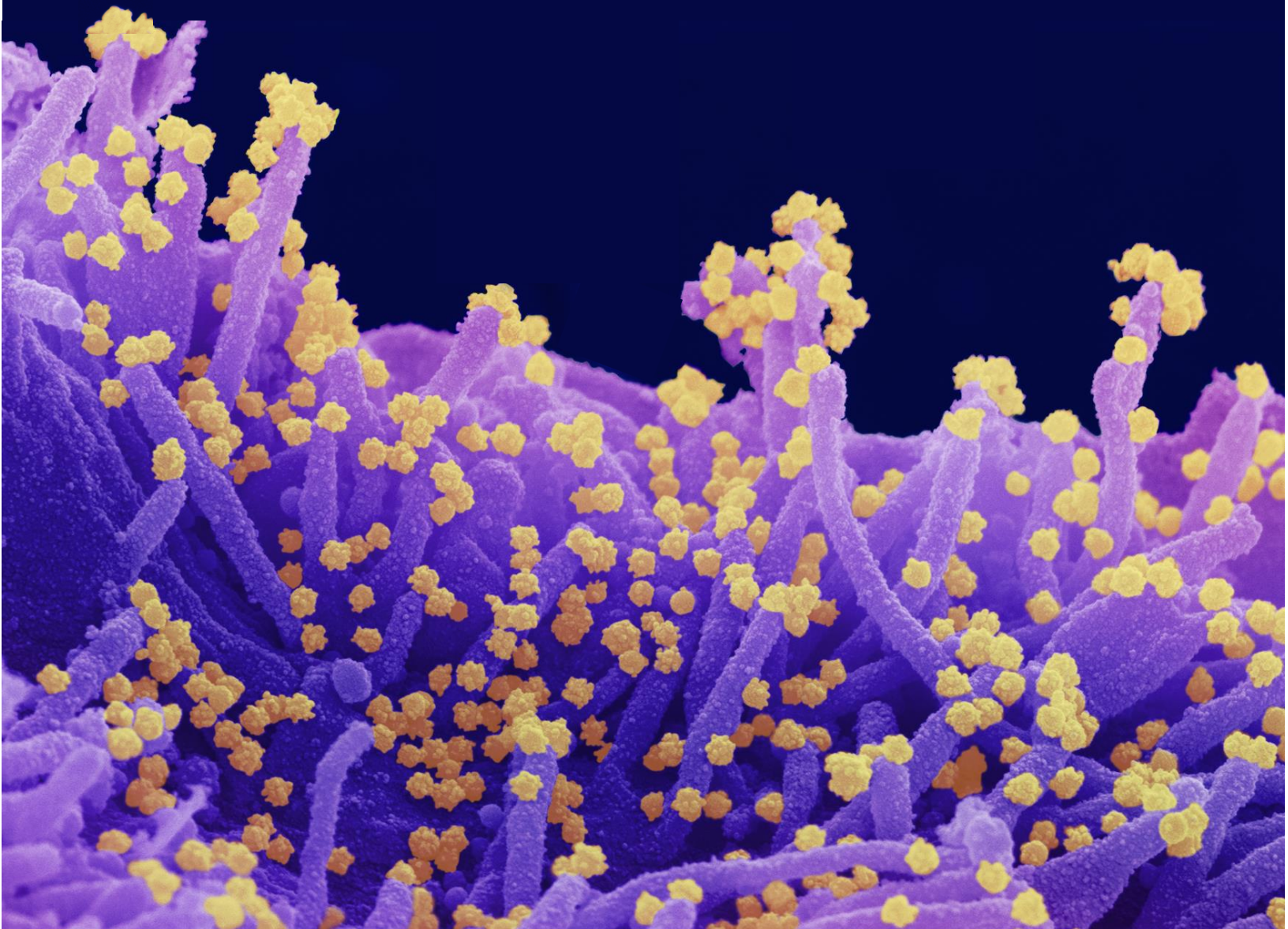




Empire State
Development

Life Science Initiative

ANNUAL REPORT: 2023



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Life Sciences Division**

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Cover Art: Scanning electron microscope image of SARS-CoV-2 (round gold particles) emerging from the surface of a cell cultured in the lab. SARS-CoV-2, also known as 2019-nCoV, is the virus that causes COVID-19. Image captured and colorized at Rocky Mountain Laboratories (RML) in Hamilton, Montana. Credit: NIAID – RML.

Introduction

In the six years since legislative authorization of Empire State Development's (ESD) Life Science Initiative in April 2017, New York has seen a remarkable increase in life science activity, as evidenced by increased venture investment, new company formation, and job growth. The Initiative was designed to boost and expand the state's life science industry, with an initial focus on addressing historical gaps in the ecosystem that hindered growth. With the progress the Life Science Initiative has made in overcoming many of the identified impediments, New York has seen growth in life science investments, regional clusters and launch of new initiatives not only by New York State but by New York City and others. This document reports on the activity and progress of the New York State Life Science Initiative during FY 22/23 (April 1, 2022 through March 31, 2023) and including activity through October 31, 2023, as well as on programs and impact since authorization of the Life Science Initiative through October 31, 2023.

Working with the Life Science Initiative budget of \$320 million for strategic programs, \$95.5 million in funding was committed for new programs during the period April 1, 2022 through October 31, 2023. These new grants are expected to leverage matching funds and additional investments of \$724.62 million. During the same period, \$3.66 million in life science Research and Development (R&D) tax credits were issued against total qualified expenses of \$34.68 million.

The total funding commitment for strategic programs since the start of the Initiative, through October 2023, is \$221.53 million. In addition, \$18.2 million in R&D and Excelsior Job Program tax credits have been funded in total as part of the Life Science Initiative since the start of these programs. The combination of matching funds and additional investments leveraged since the start of the initiative through October 31, 2023 total \$3.89 billion, much more than the \$100 million in matching funds originally anticipated when the Life Science funding was first authorized.

Although the benefits of investment in life science development can often take years to materialize, even in the short time since the launch of the Life Science Initiative, substantial progress is evident. Specifically, ESD-funded programs alone have resulted in:

- 32 new companies formed or retained in New York
- A total of 181 new patents have been filed or granted
- 613 new jobs created

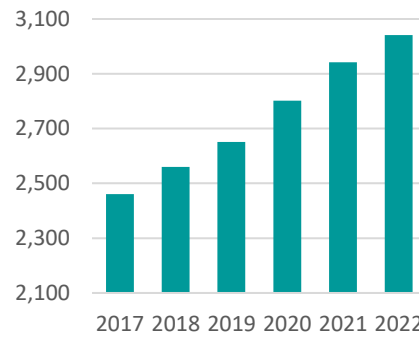
The growth in New York's life science sector as shown by key indicators of economic development – such as new companies, jobs, new lab space, talent and investment dollars – has been driven by funding from multiple sources, including:

- The \$520 million investment from New York State (which encompasses the previously mentioned \$320 million for strategic programs, as well as \$200 million for tax credits),
- Investments of more than \$1.0 billion from New York City, and

- The large influx of matching funds and leveraged investment from private and other public sources.

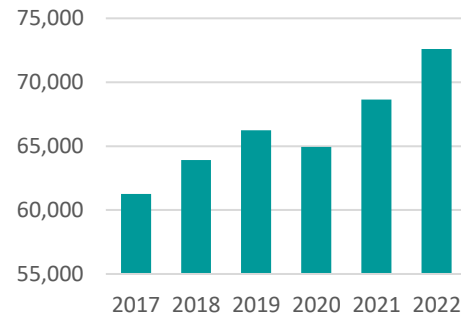
These investments have engendered a 27.1% growth in the number of life science companies and a 18.5% increase in the number of life science jobs in the state between 2017 and 2022ⁱ (Figures 1 and 2). The job growth rate is 18.5% greater than in the state’s private sector overall, and 13.3% greater than the national private sector job growth rate during that same periodⁱ. And there are now more than 3.1 million ft² of laboratory space in New York Cityⁱⁱ, which is considered a key measure of life science activity.

Figure 1. Life Science Companies in New York Stateⁱ



An important part of strengthening New York’s life science ecosystem has been the bolstering and expansion of life science clusters, such as the cell and gene therapy hubs to be located upstate and downstate (see page 6), as well as collaborative efforts that foster sharing of resources and knowledge exchange. Through such efforts, the collective capabilities and competitiveness of all participants are amplified.

Figure 2. Life Science Jobs in New York Stateⁱ



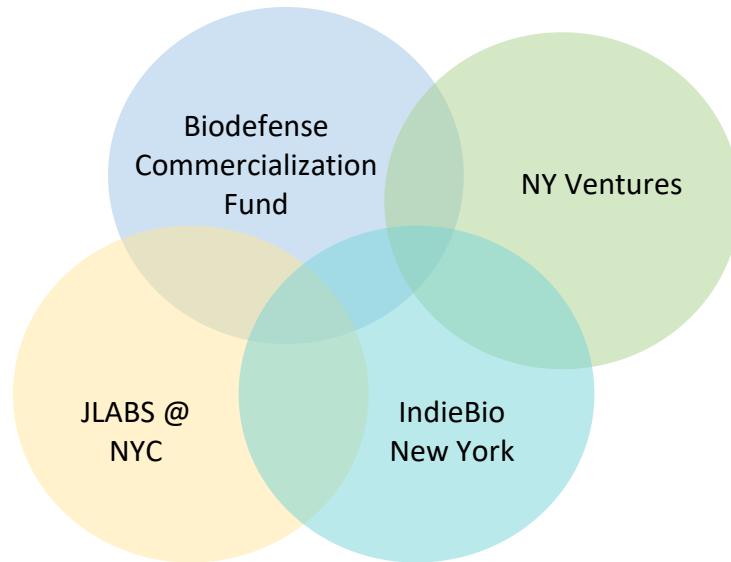
The value of New York’s focus on collaborative science was recently recognized by the Chan Zuckerberg (CZ) Biohub Network, which is providing long-term funding of \$250 million to locate its fourth research institute in New York City. CZ Biohub New York (see page 9) is a collaborative effort by three stellar institutions (Rockefeller University, Columbia University, and Yale University) contributing a “dream team” of exceptional scientists. It is anticipated that CZ Biohub New York will not only create innovative technologies to detect and resolve diseases before they become untreatable but will also cement life science in New York as a powerful economic driver. Governor Kathy Hochul has also committed \$10 million for this exciting project.

There are several early indicators of success regarding the grant funding on cluster creation, including the formation of new startups and increased private equity investment. Another early indicator of success is enhanced collaboration and resource-sharingⁱⁱⁱ. New York State has seen this network effect spontaneously occur across several of the state-funded programs (Figure 3), in which recipients of one ESD grant program are also benefitting from one or more other ESD programs.

- Four Biodefense Commercialization Fund startup grantees reside at JLABS @ NYC
- Three Biodefense Commercialization Fund startup grantees are IndieBio New York graduates

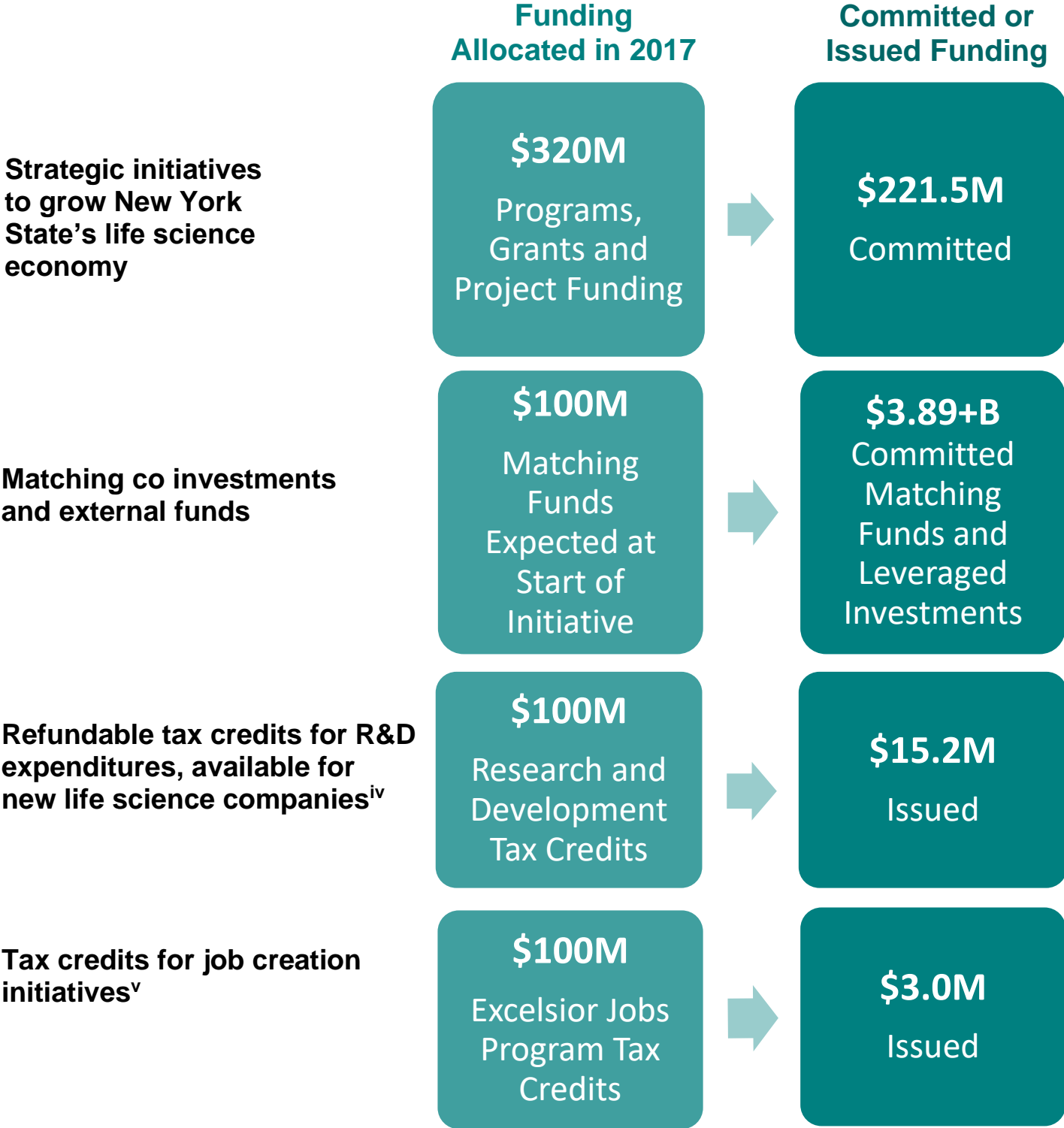
- One IndieBio New York graduate relocated from the U.K. to New York and now resides at JLABS @ NYC
- One Biodefense Commercialization Fund startup grantee is also an IndieBio New York graduate and is receiving funds from ESD’s NY Ventures’ New York State Innovation Venture Capital Fund

Figure 3. Crossovers in New York State Programs



With cluster creation firmly established, ESD is now focusing on creating landmark programs that capitalize on critical strengths and connect key regions of the state. As these programs, such as a statewide cell and gene therapy initiative and applications of artificial intelligence in drug discovery, take root, ESD anticipates a blossoming of new companies, investment, and new technologies that will even more firmly place New York State as a leader in life science development.

New York State Life Science Initiative (as of October 31, 2023)



New Programs (April 1, 2022 and Beyond)

Looking to the Future of Medicine **Cell and Gene Therapy Manufacturing at** **Roswell Park Comprehensive Cancer Center**

Cell and gene therapy (CGTx) is considered to be the most potentially transformative therapeutic advancement in medicine in the last two decades^{vi,vii}. In her 2023 State of the State address, Governor Hochul announced New York would create two CGTx hubs – one upstate to expand CGTx manufacturing capacity and leverage existing R&D at New York institutions focused on the creation of CGTx and one downstate to create a facility with world-class laboratory space providing cutting-edge technologies and services necessary for CGTx development. This multi-phase, statewide initiative is envisioned to ensure that New York State becomes the leading center for CGTx research, development, and patient care in the nation.

In October 2023, the Governor [announced](#) the first phase of this initiative – the creation of the first CGTx hub at Roswell Park Comprehensive Cancer Center (RPCCC) – with a \$30 million grant from ESD towards a \$97.9 million expansion of its cell and gene therapy manufacturing facility. With this expansion, RPCCC will have in place both the infrastructure and critical brain trust to establish itself as the number one destination for cell and gene therapy – nationally and globally.

Importantly, RPCCC has recruited Dr. Renier Brentjens, co-founder of Juno Therapeutics and a cell therapy pioneer whose research helped establish CAR T-cell therapy as a major step forward in the treatment of various forms of leukemia and lymphoma, to lead its efforts to develop CGTx for solid tumors like breast, colon and lung cancers. Dr. Brentjens and his team of solid tumor researchers with world-class CGTx research experience will continue this groundbreaking work to lead Roswell’s research and manufacturing effort in CGTx for solid tumors. Dr. Brentjens, who came to RPCCC from Memorial Sloan Kettering (MSK) Cancer Center and has an international reputation in cell therapy research and development, shares the organization’s vision of making RPCCC the premier cell therapy discovery and production facility in the nation. Recognizing the value of this expertise, the state has developed a multifaceted, statewide strategy to become a global leader in CGTx, of which this investment at RPCCC is the first.

New York has a strong advantage in CGTx, ranking in the top three states for NIH grants, number of patents, and number of clinical trials in CGTx^{viii}. Additionally, RPCCC is the only NCI-designated Comprehensive Cancer Center in the Western New York region and is world-renowned for its cancer care and research.

Expanding CGTx R&D and manufacturing in Western New York also will capitalize on the existing early drug development infrastructure already established through the state’s support

of the Empire Discovery Institute (EDI). EDI partner institutions – RPCCC, the University of Rochester (UR), and the University at Buffalo (UB) – enhance the region’s research capabilities and access to patients, while EDI provides a highly efficient path to move therapies toward commercialization.

CGTx Growing Rapidly

The global cell and gene therapy manufacturing market is expected to exceed \$90 billion by 2030, up from a \$16 billion valuation in 2020^{ix}. More than 2,000 clinical trials are ongoing globally, with 200 in Phase III^x. The U.S. Food & Drug Administration (FDA) has already approved 32 CGTx products as of June 2023^{xi} and estimates 10-20 new therapies will be approved every year by 2025^x. The explosive growth of CGTx has caused a shortage in cGMP (current Good Manufacturing Practices) capacities, causing delays across the development value chain^{xii}.

ESD’s \$30 million grant to RPCCC will assist in expanding the CGTx cGMP facility at its Therapeutic Cell Production Facility (TCPF) in Buffalo, Erie County. RPCCC’s current cGMP facility is expected to reach capacity by 2025, reflecting the rapidly growing size and number of new trials.

Program Overview

The five-year grant from ESD will assist in construction and outfitting of 14 new cGMP-certified clean rooms in the existing facility, bringing the total number of rooms to 20. All 14 new rooms will be used for the manufacture of CGTx for Phase I and/or II clinical trials. Current planning is for two of the 14 rooms to be used for vector production for cell manufacturing, and the remaining 12 rooms to be used for clinical cell production, i.e., CAR-T cells. Construction of the expanded cGMP facility is expected to be completed by September of 2024 and fully operational by early 2025. Up to 61 new full-time hires will be employed to support operation of the expanded cGMP facility.

Roswell Park Comprehensive Cancer Center CGTx R&D and Manufacturing:

Total ESD Grant Commitment: \$30 million for a five-year period to support construction and operation of an expanded cGMP CGTx facility at Roswell Park Comprehensive Cancer Center

Program Start date: May 2023

Accelerating Preclinical Drug Discovery & Development Lab of the Future

Hardly a day goes by when there isn’t a new application of Artificial Intelligence (AI) and Machine Learning (ML) in the news. AI is now being used in almost every aspect of our lives, including entertainment, finance, education, driving, fraud prevention, and agriculture, to name just a few^{xiii}. One area in which AI has the potential to be revolutionary is in drug discovery,

converting it from a notoriously slow, tedious, and expensive process to one that is highly efficient.

Recognizing the potential of AI to speed identification of potential new drug candidates, in November 2022, ESD funded a grant of \$25 million to Deerfield Discovery & Development (3DC), a Deerfield Management Company subsidiary, to establish a \$50 million “Lab of the Future”, a pilot drug discovery and development lab utilizing AI/ML and robotics to make the preclinical drug discovery process faster, more data-driven, and cost-effective.

Application of AI and ML will revolutionize drug discovery in several ways. During the past decade, pharmaceutical companies have typically sent pre-clinical drug development offshore, primarily to India and China, where the cost of labor needed to conduct the traditionally arduous process of discovery, has been less expensive than in the United States. Large and small life science companies now recognize that the future of successful drug discovery will be dependent on the ability to use and understand large amounts of data to create predictive algorithms that can accelerate drug discovery and make it more efficient.

Not only will automated drug discovery leveraging AI and ML be able to overcome the aforementioned cost differential and bring the full drug discovery process back to the U.S., but it will also enable rapid, efficient generation of high-quality data. And, while many large companies have established their own substantial data libraries to create such algorithms, small companies, academics, and government laboratories have not and are at a distinct disadvantage in their drug discovery capability. This pilot lab will enable New York companies to capture the commercial potential of these advanced technologies, enhance New York's capabilities and capacity for drug development, and reverse the decades-long trend of outsourcing critical drug discovery research overseas.

In parallel with establishment of the lab, Deerfield plans to make substantial, continuous investments in research projects that will leverage the 3DC discovery platform and generate large amounts of robust data that will drive the Lab's AI-driven functionalities. These investments will fuel the Lab's capabilities and facilitate the advancement of drug discovery and development. The continued input of new data from future collaborations will result in an ever-expanding and better-informed data set, which will eventually exceed that of large pharmaceutical companies.

The pilot “Lab of the Future” is expected to bring profound benefits to academic researchers collaborating with Deerfield, to the incubator companies resident in Deerfield's Cure® Innovation Labs, and ultimately to life science companies throughout New York State and across the nation. Deerfield also intends to spin out NewCos leveraging lead compounds identified through the Lab. The long-term goal is to make this technology broadly available across the drug development and health care spectrum.

Program Overview

ESD's \$25 million grant to 3DC will help support the buildout of a 6,000 ft² lab at Deerfield's innovation campus. The grant will assist in the construction of the lab, purchase and creation of the software required to develop the AI algorithms, procurement of capital equipment, and for working capital. Select components of the lab's technology platform, including software services, are expected to be operational by 2024. A fully functioning and integrated prototype of the pilot lab is expected to be available by 2027. Twenty new hires are expected by 2027 to fully operate the pilot lab.

Upon successful completion of the five-year pilot program, Deerfield plans to replicate the lab's synthesis, screening, and software services through a full-scale commercial operation located elsewhere within New York State. By serving as an ever-growing drug-discovery resource for large and small life science companies, the Lab of the Future will attract companies from across the state and the nation, and potentially from around the globe, to utilize its services. The Lab will serve as a magnet for innovation-driven life science companies and will encourage continued growth of the state's life science ecosystem.

Lab of the Future/Deerfield Discovery & Development (3DC)

Total ESD Grant Commitment: \$25 million for a five-year period to help support construction of lab space, purchase of software and capital equipment, and working capital expenses

Program Start date: November 2022



Collaborative Research to Engineer Immune Cells **Chan Zuckerberg Biohub NY**

The Chan Zuckerberg Biohub (CZ Biohub) Network, a groundbreaking collaborative model for scientific research to solve grand scientific challenges, has chosen New York City as the location for its fourth research institute. The CZ Biohub New York brings together experts from Columbia University, The Rockefeller University, and Yale University to create new technologies to characterize and bioengineer immune cells, with the goal of creating disease-specific "cellular endoscopes" that can detect early stages of disease. The CZI Network is providing funding of \$250 million, which New York State is further enhancing with a commitment of \$10 million, as is New York City.

Being part of the CZ Biohub Network sends a strong message that New York is a center of innovation and leading science. It also will create incredible opportunities for New York's research community that will have ripple effects across the state, further cementing life science in New York as a powerful economic driver and a global destination for life science translation and innovation.

CZ Biohub NY

Diseases are often diagnosed only after symptoms manifest. The human immune system is the first line of defense against disease and may suggest a path to developing novel approaches and technologies to identify and harness functions that will transform how human health can be tracked and preserved. Importantly, immune cells and the molecules they secrete or present on their surface, such as cytokines and antibodies, recirculate in the blood and can thus be isolated and characterized with minimal impact on the human body.

Through investigation and interrogation of these cells, CZ Biohub NY will focus on developing a programmable platform for early detection and treatment of incipient abnormalities before serious disease may arise. In particular, the Biohub will apply these novel, technology-driven approaches to hard-to-detect cancers such as ovarian and pancreatic cancers, and neurodegenerative diseases, including Parkinson's and Alzheimer's. Through cross-disciplinary collaboration, it is anticipated that CZ Biohub New York will achieve groundbreaking science that will have real implications for human health.

The CZ Biohub NY will be led by Professor Andrea Califano of Columbia University and will catalyze collaboration between researchers from the Rockefeller University, Columbia University and Yale University. This new biomedical research hub in New York will galvanize multidisciplinary research and become known as the place where discoveries are made and fields are transformed.

The Chan Zuckerberg Biohub is a non-profit medical research organization that was created to support the Chan Zuckerberg Initiative's (CZI) goal of curing, preventing or managing all disease by the end of the century. CZI focuses on facilitating collaboration between physicians, scientists, and engineers from partner institutions in the pursuit of grand scientific challenges on a 10- to 15-year time horizon. It is organized as both a research institute and a network for researchers in different areas and disciplines to help accelerate research. The CZ Biohub NY is the newest and fourth research institute in the CZ Biohub Network. The network includes the first biohub, in San Francisco, a second in Chicago, and the Chan Zuckerberg Institute for Advanced Biological Imaging in Redwood City, California.

Program Overview

ESD's \$10 million grant, combined with CZI's investment of \$250 million and an additional \$10 million from New York City, will help provide needed support for the establishment and operations of the CZ Biohub NY.

Chan Zuckerberg Biohub NY:

Total ESD Grant Commitment: \$10 million

Program Announcement: October 2023

Ongoing Programs



Creating a Home for New York Startups

IndieBio New York – Early-Stage Biotech Investor

Since selecting its first cohort of companies in 2020, IndieBio New York has continued to attract companies at the forefront of innovation, ensuring that New York’s life science ecosystem is both diverse and unique. By amplifying the buzz about New York City as a life science destination, IndieBio has helped expand the number of startups making New York their home, increased venture capital investments in New York companies, and established a coveted program for which, each year, hundreds of companies are vying for entry.

Importantly, not only has IndieBio New York attracted companies focused on more traditional life science outputs, such as therapeutics and diagnostics, it also has attracted companies developing sustainable solutions to meet an existential climate crisis. These companies have expanded the opportunities for New York to establish its leadership in life sciences.

With six cohorts completing IndieBio New York’s intensive four-month training program and one cohort currently in session as of October 2023, IndieBio New York’s impact is clear:

- 52 startup companies graduated
- 18 companies locating in New York State, including eight companies that have relocated from elsewhere (6 international companies and 2 U.S. companies)
- \$118.03 million in total funding across seven cohorts (as of October 19, 2023)
- 66 new direct jobs created in New York
- 32 patent applications in progress and 9 patents granted, since launch of the program

IndieBio New York also serves as a gathering place for the life science community by hosting meetings to encourage conversations and collaborations within different players in New York’s life science ecosystem. Just in 2023, the IndieBio New York office has hosted 86 events in New York with 20 venture capital firms, 9 non-profits, 7 startup development programs, 20 academic institutions, 5 service providers, and 16 entrepreneurship, biotech, and climate-focused associations, communities, and networks.

Spotlight on Cayuga Biotech

A valuable addition to the life sciences ecosystem in New York due to its pioneering approach to bleeding control and healing, Cayuga Biotech is an early-stage platform biotechnology company harnessing the body’s innate ability to halt bleeding and heal wounds. A participant in IndieBio New York’s 1st cohort, its technology leverages a recently discovered modulator of the coagulation response and holds promise across a wide spectrum of medical conditions.

Cayuga's discovery stage programs span rare inherited bleeding disorders, platelet dysfunction, traumatic brain injury, severe burns, and wound healing. Of note, Cayuga is working with the Department of Defense (DoD) and the U.S. Army to test the potential benefit of its lead compound on the battlefield. This has led to non-dilutive grants from DoD and others totaling approximately \$3 million to test its ability to treat traumatic hemorrhage.

Cayuga's participation in the IndieBio New York program marked a pivotal moment. The company's decision to relocate from New Jersey to New York exemplifies its commitment to growth and innovation in New York State. Cayuga has nearly completed its \$5 million Seed funding round. Coupled with the additional \$3 million in grant funding they received, Cayuga is now well-equipped to advance its technology through Phase 1 clinical trials.

Program Overview

In 2019, ESD signed a \$25 million contract with SOSV, a leading life science venture capital firm, to establish IndieBio New York. IndieBio New York selects approximately 10 start-ups twice yearly from applicants from across the globe for an intensive four-month training program. The program provides investment, laboratory space, mentoring, and vital skills necessary to thrive in the dynamic life science industry. The startup companies selected focus on diverse sectors of the life science industry such as therapeutics, diagnostics, food technology, synthetic biology, cell and gene therapy, and climate technology.

IndieBio provides an initial investment ranging from \$275,000 to \$525,000 to each participating startup. Additionally, a \$65 million fund, which includes \$10 million in funding from The Partnership Fund for New York City, provides additional funding, primarily for select companies that graduate from an IndieBio cohort and relocate to or remain in New York. Of the \$8.6 million that has been deployed from this fund as of September 6, 2023, \$4.6 million was awarded to 11 New York-based IndieBio graduates. IndieBio also continues to support select alumni, providing financial and experiential assistance for sustained growth. This program has been instrumental in creating a robust and diverse pipeline of vetted life science technologies, attracting venture capital, and fostering the formation of new companies across the state.

IndieBio's commitment to developing the New York life science ecosystem was further evidenced by taking occupancy in 2023 of 25,000 square foot space at 7 Penn Plaza in New York City, which serves as IndieBio New York's headquarters. The state-of-the-art facility is equipped with multiple wet labs, open office areas, and a 140-person capacity event space. IndieBio is taking full advantage of this space to host programs with investors, current and past founders, and other members of New York's life science community. By reinforcing partnerships with companies and research institutions throughout the state, IndieBio is contributing further to New York's thriving life science ecosystem.

IndieBio New York:

Total ESD Contract Commitment: \$25 million over a period of 5.5 years for SOSV to operate IndieBio New York

Program Start date: December 2019

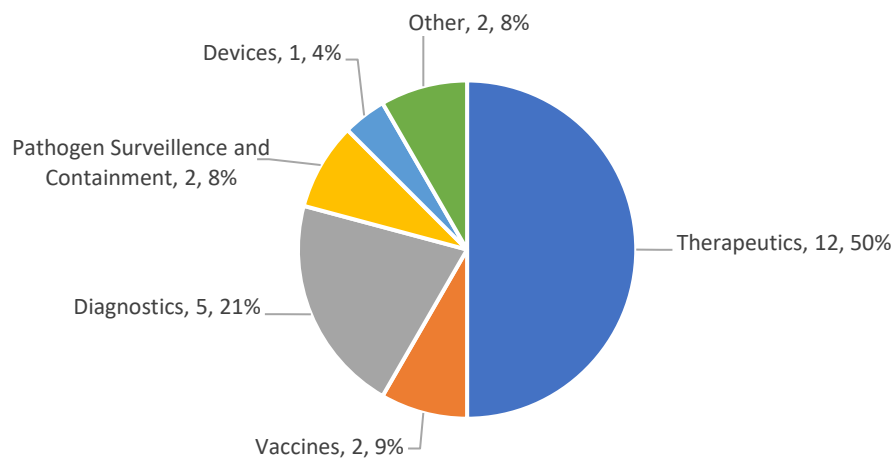


Accelerating Innovation to Improve Resiliency Biodefense Commercialization Fund

The ongoing fight against COVID-19, Respiratory Syncytial Virus (RSV), the viral disease known as Mpox, and other infectious diseases are reminders of continued and constant threats posed by infectious diseases and the need to be ready to respond and contain these threats^{xiv}. New York’s \$40 million Biodefense Commercialization Fund, now in its third year, continues to encourage the commercialization of innovative solutions for severe infectious disease, while improving New York’s resiliency and preparedness against these threats. The importance of addressing infectious disease was reinforced in April of 2023 when the World Health Organization (WHO) launched PRET – a Preparedness and Resilience for Emerging Threats Initiative – to improve pandemic preparedness by developing systems and capacities to speed management of emerging threats, with initial focus on respiratory pathogen pandemic preparedness^{xv}.

The Fund has a diverse portfolio of grantees developing solutions for infectious diseases with projects ranging from next-generation antiviral drugs, to addressing drug development and delivery challenges, and creating diagnostic tests that are easy to use. (Figures 4)

Figure 4. Portfolio of Biodefense Grantees by Research Focus Area (Round 1 & 2)



The first Biodefense Commercialization Fund application round opened in September 2021, and awards for that application round were made in March 2022. A second application round was opened in September 2022, with awards for that round announced in March 2023.

- Awarded a total of \$25.3 million over two application rounds
 - Round 1: \$11.2 million awarded to eight startups and \$3.8 million awarded to nine academic institutions. Another \$1.45 million was awarded to two startups from Round 1 who qualified for additional funding.
 - Round 2: \$6.9 million awarded to three startups and \$2.0 million awarded to four academic institutions

Round 1 awardees have only recently completed the first year of their grant and are already showing progress and delivering benefits to the state:

- As of September 2023, Round 1 grantees have:
 - Secured \$13.2 million in external funding
 - Created 15 new direct jobs in New York
 - Filed 10 patent applications
 - Executed three licensing agreements

Round 2 awardees were announced in May 2023 and have only recently started their projects under the Fund. Yet, CastleVax, one of the startup awardees, has already received an award valued at up to \$338 million from the federal Biomedical Advanced Research and Development Authority (BARDA) to advance its intranasal COVID-19 booster vaccine into Phase 2b clinical efficacy testing.

Spotlight on Calder Biosciences Inc. – Round 1 startup grantee

Working under a \$750,000 Biodefense Fund Grant to support its efforts to develop vaccines that provide better immunity and protection against infectious diseases, Calder Biosciences, Inc. has benefitted from the focus ESD has given to cluster development. The company's primary focus has been to develop a vaccine for the respiratory syncytial virus (RSV), along with a universal influenza vaccine. Within one year after receiving its Biodefense Commercialization Fund grant, Calder had progressed its research substantially closer to being able to file an Investigational New Drug Application (IND), and therefore a second round of Biodefense Commercialization Funding, in the amount of \$850,000, was awarded. The second award not only recognizes the company's progress toward commercialization but also the continued potential commercial value of the project to develop a second-generation RSV subunit vaccine.

Calder also has capitalized on ESD's support of IndieBio NY, being one of only eight companies out of 363 applicants accepted into IndieBio NY's sixth cohort. This accomplishment is a testament to Calder's exceptional potential and capabilities. With the mentoring provided by the Biodefense Commercialization Fund and the rigorous entrepreneurial training provided by IndieBio NY, Calder is obtaining the essential support and resources required to navigate the path to commercialization. This support also will bolster Calder's appeal to venture capital investors, a pivotal element for thriving within New York's dynamic life science ecosystem.

Program Overview

The Biodefense Commercialization Fund provides grants of up to \$4 million to startup companies working on innovations that address infectious disease threats and up to \$500,000

to academic institutions to expedite advanced intellectual property. Projects that are closer to commercialization are given priority. All grant recipients must remain in New York State for three years after the grant is completed. Awardees who receive \$2 million or more must provide a 100% match to the grant. Each grantee is paired with two or more industry experts to ensure they make appropriate and timely progress. Mentors provide guidance to advance projects to commercialization and connect grantees with key industry stakeholders.

Information about applications, eligibility requirements, and program guidelines are available on ESD's website at: <https://esd.ny.gov/biodefensefund>.

Biodefense Commercialization Fund:

Total ESD Grant Commitment: \$40 million to fund startups and academic institutions developing solutions to infectious diseases

Number of grants made (as of October 2023): 24

Program Start date: September 2021



Enhancing Translational Research Strength New York Fund for Innovation in Research and Scientific Talent (NYFIRST)

Translational research plays a crucial role in growing a life science ecosystem by facilitating the transformation of scientific discoveries into practical applications, fostering innovation, attracting investment, and nurturing collaborations among researchers, industry partners, and healthcare practitioners. Ensuring the involvement of a diverse and accomplished array of exceptional scientists is paramount, as they bring unique expertise and a track record of success to New York institutions.

The \$15 million New York Fund for Innovation in Research and Scientific Talent (NYFIRST) aims to strengthen the translational research capabilities of medical schools in New York State by attracting and retaining exceptional talent. This support to recruit and retain exceptional translational life sciences researchers serves to elevate the intellectual foundation needed to generate commercially viable discoveries, attract investment capital, and foster the creation of startups, thereby advancing the state's translational research strength.

Since the first call for applications in 2018, 12 NYFIRST awards have been made, committing a total of \$11.7 million in grant funding. The impact of these 12 awards demonstrates the importance of attracting and retaining top talent through programs like NYFIRST:

- Approximately \$63.8 million in public and private funding raised by these grantees, as of September 2023
- 138 direct jobs created
 - 76 were new direct hires from outside New York State
- Seven patent applications filed by NYFIRST grantees
- More than 277 scientific articles published by recruited/retained investigators
- One startup company formed

Spotlight on SUNY Upstate Medical University

In 2019, ESD awarded SUNY Upstate Medical University (“UMU”) a NYFIRST award of up to \$1 million for the retention of Dr. Juntao Luo, a well-funded researcher working on novel treatments for sepsis and other diseases. Dr. Luo had received offers from two institutions from outside of New York State: Loyola University Medical Center in Chicago and Wayne State University in Detroit.

The grant from ESD enabled UMU to purchase eight pieces of specialized scientific equipment needed to support Dr. Luo’s work, retain five jobs, and assure continued funding from two National Institutes of Health grants totaling \$1.83 million. This NYFIRST investment to support Dr. Luo’s lab has generated multiple returns: since receiving the award, Dr. Luo’s lab at UMU has hired or retained nine staff (including five new hires from outside New York State), raised more than \$5.6 million in external funding in the past year, and filed six patent applications. Dr. Luo also has registered a startup company, Tentargo Therapeutics LLC, aiming to translate his patented technology for disease treatment.

Program Overview

NYFIRST is a highly competitive grant program, awarding medical schools in New York State up to \$1 million per qualified application. The funds allocated by NYFIRST are utilized to support capital expenditures, including major equipment purchases and laboratory construction, as well as to provide working capital for researchers employed by the recruited investigator. Each NYFIRST grantee is required to provide matching funds of \$2 for every \$1 received through NYFIRST assistance.

Information regarding the application process, eligibility requirements, and program guidelines can be found on the ESD website at: <https://esd.ny.gov/ny-first-program>

New York Fund for Innovation in Research and Scientific Talent (NYFIRST):

Total ESD Grant Commitment: \$15 million, in grants of up to \$1.0 million each to selected New York medical schools, to support research needs of recruited/retained translational researchers

Number of grants awarded (as of September 2023): 12

Program Start date: September 2018



Developing Life Science Entrepreneurial Talent

Life Science Entrepreneur Development Grant Program

While New York has excelled in life science discoveries, it has faced challenges in attracting venture capital investments to drive the commercialization of these discoveries within the state. One often-cited reason for difficulty attracting VC funding has been the lack of entrepreneurial talent needed for innovation-driven companies. To address this issue, ESD launched the Life Science Entrepreneur Development Grant program in 2020 with the aim of bridging the talent gap that has hindered life science commercialization in the state.

The Life Science Entrepreneur Development Program is designed to cultivate a critical mass of entrepreneurial talent capable of effectively managing innovation-driven startups. This program supports development and implementation of integrated curricula from business schools and life science graduate programs. These groundbreaking graduate business programs in life science entrepreneurship are the first of their kind in New York State and will play a pivotal role in strengthening the talent pipeline for life science companies in the state. Additionally, they contribute to the retention of local talent and research expertise, fostering a thriving environment for home-grown innovation.

In 2021, five schools qualified to receive Entrepreneur Development grants of up to \$500,000 each to implement their programs.

- Cornell University, SC Johnson College of Business (Regions: Southern Tier & New York)
- Rensselaer Polytechnic Institute, Lally School of Management (Capital)
- Rochester Institute of Technology, Saunders College of Business (Finger Lakes)
- Stony Brook University, College of Business (Long Island)
- University at Buffalo, School of Management (Western New York)

Although still in early stages, these programs have been making progress in attracting and enrolling students. As of September 2023:

- Four schools have initiated their programs, with some starting their programs as early as spring of 2022.
- To date, a total of 106 students have enrolled in the programs, with approximately 150 more students anticipated to join the programs in the upcoming fall and spring semesters.
- As of September 2023, 32 students have graduated.
- These programs have begun to forge strategic partnerships with such life science firms and organizations as Simplified, Pfizer, NanoPharmaceuticals, MedTech, and Women in Bio. Such partnerships are important because they provide practical industry knowledge to students and allow for engagement with life science leaders in specific New York State regions as students look to advance their careers.

- When the programs are fully implemented, the number of enrolled students is expected to graduate an estimated 250 life science entrepreneurs annually, thus contributing to the growth and success of the life science ecosystem in the state.

Spotlight on Cornell University

Through its Johnson Graduate School of Management, Cornell University has fully embraced the value of life science entrepreneurship training by launching its Life Science Technology Innovation Fellows Program, a 12-credit certificate program for MBA students, PhD candidates, Post-Doctoral Fellows, MD candidates and DVM candidates. Fellows from the management program are encouraged to take electives focused on life sciences, technology, innovation and entrepreneurship, while Fellows from the life science programs include business-focused elective courses.

To date, Cornell has welcomed its first two cohorts, comprising a total of 59 Fellows. A handful of students have received internships with participating industry partners; one of these internships has already been converted into a full-time position. In August 2023, a post-doctoral scholar from the first cohort successfully incorporated his business. Two other students, one with an MBA and the other with a PhD, from the first cohort launched their venture in the program, then promptly won \$1,000 in May 2023 at a Nucleate pitch competition in New York City. A fourth student is pursuing her venture in the Runway program on Roosevelt Island in New York City.

The success of this program would not have been possible without unprecedented cross-campus collaboration, with participation from the S.C. Johnson College of Business, College of Engineering, College of Veterinary Medicine, Cornell Institute of Biotechnology, Weill Cornell Medical College, and Cornell Tech. In addition, creating this program has established a new model of collaboration between the Ithaca and New York City campuses for future initiatives.

Program Overview

This grant program was created to encourage as many business schools as possible to consider developing life science entrepreneur educational programs by including two stages: the first offered planning grants of up to \$50,000 each to business schools collaborating with a medical school or life science graduate program to develop a specialized graduate curriculum to equip students with the essential skills required by life science startups. Of the 18 schools that applied in the first stage, seven were selected to receive a planning grant. Five of the seven business school/life science graduate program collaborations then qualified for implementation grants of up to \$500,000 each.

The selected schools encompass a diverse range of life science capabilities and offer various graduate business education programs, accommodating the needs of students across different stages of their lives, and include in-person, remote, and online learning options. As a condition of these ESD awards, schools are required to form partnerships within the life science ecosystems for their respective regions. These partnerships provide valuable exposure and

networking opportunities for both students and companies, along with pitch competitions that provide students with experience, exposure, and early funding opportunities.

Entrepreneur Development Grant Program:

Total ESD Grant Commitment: \$2.85 million awarded (\$350,000 to seven business schools for planning grants and \$2.5 million total (up to \$500,000 each) to five business schools for implementation grants) to create graduate programs in life science entrepreneurship

Start date: August 2019

An Incubator for Innovation JLABS @ NYC

ESD's capital grant of \$17 million to Johnson & Johnson Innovation and the New York Genome Center to build and establish JLABS @ NYC was the very first grant issued by ESD's Life Science Initiative in 2017. The program was designed to meet the dual goal of keeping life science talent in New York while simultaneously growing the state's economy. JLABS @ NYC, part of Johnson and Johnson's global life science network for innovation, provides startups with capital-efficient lab space, resources, expertise, and industry connections. JLABS offers a supportive incubator environment for emerging companies aiming to transform scientific discoveries into breakthrough healthcare products, as well as valuable space for companies as they grow.

Since its inception, JLABS @ NYC has proven its commitment not only to providing lab and office space, but also to serving as a convener within the life science community, bringing together startups, entrepreneurs, researchers, and investors, under one roof to exchange ideas and learn from each other. JLABS @ NYC enables startups to connect with other life sciences organizations they may not otherwise have access to, fostering a diverse and collaborative environment that fuels innovation in the life sciences sector. Of note, JLABS has served as a starting point for some of ESD's other grantees, such as LAB11 Therapeutics, AACT, and CastleVax (Biodefense Commercialization Fund grantees), and Sequential Skin, a graduate of the IndieBio New York program.

A quick look at the lasting impact JLABS @ NYC has had on the life science landscape in New York since its launch in 2018^{xvi}:

- 42 current resident companies in life sciences
- 43 Life science companies graduated
- 22 of the 43 graduate companies remained in New York after exiting JLABS @ NYC (regardless of originating location)
- 410 new direct jobs created in New York by companies while residing at JLABS
- \$1.1 billion in total external funding (public and private) secured by companies while residing at JLABS
- \$2.8 billion total funding secured by all residing and graduate companies since 2018

A hallmark of JLABS @ NYC has been its active involvement in the community, including hosting a variety of programs and events to help enhance and expand the life science ecosystem in New York State. Since its opening, the incubator has hosted 105 educational events and 78 networking events, with more than 8000 participants from JLABS and the broader community participating in these events.

Spotlight on mPOD, Inc.

mPOD, Inc. is a next-gen diagnostics company based at JLABS @ NYC as a BlueKnight company, which is a joint BARDA (Biomedical Advanced Research and Development Authority)/JLABS initiative. mPOD is committed to improving global health equity innovation through scalable Point of Care/over-the-counter (OTC) tools & platforms that transform accessibility. mPOD has developed DxTrack, a low-cost, machine learning (ML)-powered reader for rapid, OTC and point-of-care diagnostic tests that enable end-to-end independent testing for multiplex COVID-19, FluA/FluB, women's health, cancer or cardiac markers, or drugs of abuse by all individuals, including those with visual and dexterity impairments. mPOD's proprietary machine-learning engine enables DxTrack's objective and accurate interpretation of test results at home with an accessible cost point.

JLABS@NYC has provided technical and business support to mPOD, giving access to world-class facilities, equipment, programming, personnel, and access to strategic partners. According to the mPOD team, it has been incredibly beneficial to have a world-class facility to demonstrate our legitimacy and maturity even as we're just starting to put our legs under us.

The past three years at JLABS have given mPOD a home, enabling the team to mature its technology platform so that it is now attracting an influx of interested strategic partners. mPOD is now focused on completing development with these partners in anticipation of entering clinical trials in the next six to nine months. The mPOD team claims they would not have made it to this point if not for the support of JLABS and the Blue Knight program – and absolutely would not be able to keep up our breakneck growth trajectory toward commercialization without the continued support of JLABS @ NYC.

Program Overview

JLABS @ NYC provides dedicated lab and office space for 60 life science companies, fostering a vibrant ecosystem of innovation. Residing companies have access to modular lab units, office space, and shared core laboratory equipment. In addition to the physical infrastructure, JLABS @ NYC serves as a hub for sharing of expertise and experience by providing a wide range of resources, including funding opportunities, educational events, and access to industry experts and capital funding. Awardees from the QuickFire Challenge, a crowdsourcing platform for cross-sector solutions for diseases, and participants from the BLUE KNIGHT™, a joint initiative between JLABS and the Biomedical Advanced Research and Development Authority (BARDA) to address public health threats and emerging diseases, are some of the residing companies at JLABS @ NYC. The diverse mix of companies within JLABS @ NYC enables resident companies to form valuable connections and establish critical industry networks at an early stage.

On the fifth anniversary of its grand opening in 2023, JLABS @ NYC celebrated the launch of the “Science in the City QuickFire Challenge”. This initiative invites global innovators to contribute groundbreaking ideas and solutions across the healthcare spectrum, with an aim to positively influence patient health outcomes. Successful participants are receiving one year of residency at JLABS @ NYC, providing them a unique opportunity to directly tap into and contribute to the New York innovation ecosystem.

JLABS @ NYC:

Total ESD Grant Commitment: \$17 million to the New York Genome Center for renovations, machinery and equipment to prepare space for JLABS @ NYC

Program Start date: July 2017



Converting Basic Research into Commercial Opportunity

Empire Discovery Institute

Faced with the "valley of death," a funding challenge that threatens many life science start-ups during early-stage research, Empire Discovery Institute (EDI) was conceived as a solution to bridge this gap and expedite the journey from discovery and pre-clinical research to commercial viability. Founded in 2018 with the support of a \$35.4 million grant from ESD, this not-for-profit is a partnership of three prominent upstate New York research institutions – University of Rochester, University at Buffalo, and Roswell Park Comprehensive Cancer Center (RPCCC). EDI was created to overcome the key hurdles typically faced by academic life science researchers – a lack of external funding for translational R&D efforts and limited industry expertise to navigate the path to product commercialization. EDI's mission to identify and support development of medically important pathways related to human disease, focusing on research conducted by its founding partner institutions, will ultimately act as a catalyst for high-value biotechnology spin-outs, job creation, and pharmaceutical licensing transactions.

To foster early-stage drug discovery and development, each year EDI identifies the most promising projects from its partner organizations to receive scientific and financial support through its Medicines Discovery Award Program (MDAP), with each project receiving a minimum of \$250,000 and, contingent on the progress of research towards commercialization, potentially up to \$7.5 million over a five-year span.

Since launch, MDAP has achieved the following:

- 13 awardees across 3 application rounds (total of 53 applications submitted)
- 2 patents filed
- 1 spin-off created – Emprime Therapeutics

- 18 new jobs created
- \$800,000 external private investment attracted (National Multiple Sclerosis Society)

EDI also has developed collaborations with pharma and other research organizations to capitalize on the potential of the partners' groundbreaking research. Two partnerships have been developed since launch of EDI:

- Empire Deerfield Discovery & Development LLC (ED³) – a partnership with Deerfield Management Company
 - Investment of up to \$65 million committed by Deerfield for projects selected for further development
- Novo Nordisk (NN) for the formation of LeapRx, to accelerate drug discovery in cardio-metabolic diseases and rare blood disorders
 - NN investment of up to \$10 million over five years
 - Four awards made (of six applications submitted)
 - Four jobs created
- Total funding/investment secured or committed (\$75.9 million)
 - \$65 million from Deerfield for ED3
 - \$10 million from Novo Nordisk
 - \$800,000 from the National Multiple Sclerosis Society to MDAP grantee
 - \$141,000 from licensing evaluation for NewCo creation (expected in Q4 2023)

Spotlight on Multiple Sclerosis

Multiple sclerosis (MS) affects nearly one million Americans^{xvii}. While several treatments are available, none of them provide the kind of benefit that physicians and MS patients are seeking. Dr. Laura Feltri's research at the University at Buffalo offers the potential for a new approach to MS treatment and has been supported in several ways by EDI and through its efforts. Dr. Feltri first received an MDAP award in the amount of \$506,000 in May 2021, and based on the strong scientific progress of her research, a second MDAP award in the amount of \$750,000 was made in November 2022.

Because of the progress that Dr. Feltri was able to make because of the MDAP awards, EDI submitted a grant application to the National Multiple Sclerosis Society, which resulted in an award of \$800,000 in August 2023. This funding will be used to further advance Dr. Feltri's work. EDI collaborated with Dr. Feltri to apply to UB's technology commercialization Accelerator program for a UB Innovation Hub Accelerator Award. EDI was awarded \$100,000 on August 9, 2022, which EDI has used to expand the scope of this work at two NY-based CROs and complement the workplan currently funded by the second MDAP award. EDI's support of Dr. Feltri's early research and facilitation of its advancement has played a critical part in enabling this research to progress. To date, total realized and projected funding into the Feltri MS Program is \$2,156,000.

Program Overview

EDI is an integrated drug discovery and development accelerator located in upstate New York, formed as an equal partnership between the University at Buffalo, the University of Rochester, and RPCCC and represents a nimble and transformative approach to the creation of new medicines. EDI creates a bridge between academia and the pharmaceutical industry at an interface that has traditionally hindered innovative academic research from maturing into viable drug candidates and life-saving medicines. By coupling scientific innovation, pharmaceutical industry expertise and funding, EDI facilitates the efficient transformation of fundamental scientific discoveries into important new medicines.

EDI aims to identify medically important pathways and targets related to human disease that will serve as the basis for the discovery and development of novel, highly differentiated therapeutics to address critical, unmet needs for patients. Selected programs get infused with financial support and pharmaceutical industry expertise from EDI's world-class Scientific Advisory Board, and its extensive network of experienced consultants, contract research organizations and strategic partners.

Programs progress in a milestone-directed process using quantitative metrics and predictive biomarkers for decision making. EDI helps researchers design and conduct pre-clinical testing of promising compounds discovered in their laboratories. Investigators receive expert assistance through the various phases of pre-clinical testing to first-in-human (IND stage) clinical trials.

Empire Discovery Institute (EDI):

Total ESD Grant Commitment: \$35.4 million over a five-year period for operational expenses

Start date: May 2018



Expanding Expertise

Masonic Medical Research Institute

An internationally recognized biomedical research institute focused on unraveling the mechanisms causal to cardiac disease, Masonic Medical Research Institute (MMRI) is further enhancing this expertise with the expansion of lab space and addition of expert faculty to create an interdisciplinary, translational research facility. Thanks to a \$6 million capital grant from ESD, MMRI has completed the second phase of an expansion project to renovate and modernize 5,500 square feet of space.

MMRI has increased the amount of laboratory space to accommodate 4-5 additional research faculty, each with the ability to recruit 4-8 additional scientists to their laboratories. Further, MMRI has built a state-of-the-art surgical suite for large animals (pigs, rabbits, sheep, etc.), that

will allow them to continue their translational research efforts and facilitate therapeutic approaches that can more quickly move into human clinical trials.

MMRI has also struck up partnerships with multiple area colleges, including Hamilton College, Utica University, SUNY Poly, SUNY Upstate, Syracuse University, and most recently, with Mohawk Valley Community College (MVCC). Their goal is to train the next generation of scientists, bringing these area college students into the lab setting through apprenticeships and internships. MMRI's expanded research scope, which now also encompasses autoimmunity and neurocognitive disease in addition to cardiology, will attract a number of students with diverse interests, which benefits not only MMRI, but its partner institutions and the entire region.

Since start of facility modernization, MMRI has:

- Retained 32 positions
- Added 28 new direct hires to the project location
- Received \$19.6 million in grants for scientific research from federal agencies and foundations
- Initiated 22 new research projects
- Filed three patent applications

Program Overview

ESD's \$6 million grant supported the successful completion of construction and modernization of MMRI's research facility.

Masonic Medical Research Institute:

Total ESD Grant Commitment: \$6 million for capital expenditures

Start Date: January 2019

Conclusion

Since its inception in 2017, the Life Science Initiative has successfully overcome obstacles to attract venture investments and foster robust life science clusters across New York State. The strategically diversified programs launched as part of this Initiative have effectively addressed investment gaps, attracted companies and talent, established regional clusters, and revitalized New York's life science landscape. And while growth of jobs and new companies has steadily been increasing, additional investment leveraged by ESD's program has been explosive – with additional investment from public and private sources totaling more than \$3.89 billion.

The Life Science Initiative is now expanding its support of emerging life science technologies while continuing to sustain previously launched programs. This evolution, which is described in the Life Science Initiative's recently published [strategic plan](#)* has begun to target investments in areas where New York has distinct advantages, such as cell and gene therapies, the application of machine learning in drug discovery, and advancements in food technology, nano, and organoid technologies. The Life Science Initiative also is promoting cross-pollination and collaboration not only throughout the life science sector but also within the various ESD programs to ensure that businesses throughout the state can access and capitalize on the unique, high-value resources available to companies located throughout New York State.

Through these efforts, the Life Science Initiative aims to further elevate New York's position at the forefront of scientific innovation, fostering a dynamic and diverse life science ecosystem that gives rise to new companies, increased investment, and cutting-edge technologies. This commitment ensures that New York State remains a leader in the rapidly evolving field of life sciences, with ESD playing a pivotal role in supporting the state's innovation bioeconomy.

* <https://esd.ny.gov/sites/default/files/Life-Science-Initiative-Strategic-Plan-2023.pdf>

Summary of Life Science Initiative Operations

April 2022 – October 2023

Funding Source	Appropriated	Committed	Uncommitted
Project Funding and Commitments	\$320,000,000	\$221,526,211	\$98,473,779

Total Life Science Project Commitments*			
Project	Total Project Cost	Life Science Initiative Funding Commitment	Disbursed
Roswell Park Comprehensive Cancer Center	\$ 97,939,585	\$ 30,000,000	\$ 0
Lab of the Future	\$ 50,000,000	\$ 25,000,000	\$ 0
Chan Zuckerberg Biohub New York	\$ 270,000,000	\$ 10,000,000	\$ 0
IndieBio New York [†]	\$ 35,100,000	\$ 25,000,000	\$ 15,750,000
New York State Biodefense Commercialization Fund [‡]	\$ 40,000,000	\$ 40,000,000	\$ 4,019,378
NYFIRST	\$ 45,000,000	\$ 15,000,000	\$ 2,700,795
Life Science Entrepreneur Development Grant Stage I	\$ 350,000	\$ 350,000	\$ 288,215
Life Science Entrepreneur Development Grant Stage II	\$ 7,500,000	\$ 2,500,000	\$ 0
JLABS @ NYC	\$ 17,000,000	\$ 17,000,000	\$ 17,000,000
University of Rochester (EDI Planning Grant)	\$ 1,650,000	\$ 1,650,000	\$ 1,650,000
Empire Discovery Institute (EDI) [§]	\$ 47,400,000	\$ 35,400,000	\$ 14,100,000
Masonic Medical Research Institute	\$ 15,000,000	\$ 6,000,000	\$ 3,000,000
NeuroCuresNY Working Capital	\$ 9,581,732	\$ 5,000,000	\$ 1,500,000
Burke Neurological Institute (NeuroCuresNY Planning Grant)	\$ 795,000	\$ 500,000	\$ 500,000
IDC/Merck-Wadsworth Partnership	\$ 59,883,000	\$ 8,126,221	\$ 8,126,221
Total	\$697,199,317**	\$221,526,221	\$ 64,327,016

Other State Life Science Incentives				
Incentive	Total Available	Status	Credits Allocated	Description
Excelsior Jobs Program	\$100,000,000	Life science industry allocation implemented in April of 2017. Currently accepting rolling application submissions.	From inception through September 2023, there are four active projects that have received awards, totaling \$3,015,789 in credits. These companies are anticipated to create 161 net new jobs.	Information about the program, regulations, eligibility and how to apply can be found at: https://esd.ny.gov/excelsior-jobs-program
Life Sciences R&D Tax Credit Program	\$100,000,000 (capped at \$10,000,000 per year)	Applications accepted on a rolling basis as long as funds are available.	From inception through September 2023, tax credits totaling \$15,197,226 have been issued to 69 applicants with total qualified expenses of \$129,851,157.	Information about the program, regulations, eligibility and how to apply and an application can be found at: https://esd.ny.gov/life-sciences-tax-credit-program
Total	\$200,000,000			

* Total committed since start of Life Science Initiative

** Does not include required matches that may increase depending on the awarded grant amount. For example, Biodefense Commercialization Fund requires a 100% match for grants over \$2 million.

† In addition to providing a minimum of \$275,000 to each company in a cohort, IndieBio has raised a \$65 million fund primarily to benefit IndieBio graduates with plans to operate in New York. Investment from a \$10 million fund raised by the Genesis Consortium also may be offered to all qualified startups graduating the IndieBio programs in New York and San Francisco.

‡ Total Project Cost does not include required matching funds or additional investments for each project funded \$ EDI garnered an additional investment of \$65 million from Deerfield Management for a five-year collaborative research investment agreement and \$1.25 million from Novo Nordisk, with the potential of up to \$10 million, for a five-year research partnership.

|| The first phase of this project to create a sustainable reporting, tracking and surveillance network for use in New York State hospitals to fight the spread of infectious diseases successfully piloted a software solution at several hospitals in the NYU Langone and Northwell Health hospital systems that connects these hospitals to the Wadsworth Lab. For various reasons, it was decided, as of September 2021, that a longer-term project to expand use of this software to hospitals across the state would not be pursued.

Endnotes

- ⁱ Lightcast: Quarterly Census of Employment and Wages (QCEW). This data set defines the life science sector as comprising biopharmaceutical, device and diagnostic research, development, and certain manufacturing occupations. This is a more narrow definition of the life science sector than had previously been reported, as it more accurately reflects the life science sector.
- ⁱⁱ Cushman & Wakefield “Life Sciences Update: North American Report” Q1 2022. 15.
- ⁱⁱⁱ Autio, E., Hameri, A. P., & Vuola, O. (2004). A framework of industrial knowledge spillovers in big-science centers. Research Policy.
- ^{iv} Information about the program, regulations, eligibility, how to apply and an application can be found at: <https://esd.ny.gov/life-science-tax-credit-program>
- ^v Information about the program, regulations, eligibility and how to apply can be found at: <https://esd.ny.gov/excelsior-jobs-program>
- ^{vi} Cell & Gene. “Cell & Therapy Investment Outlook in 2022 & Beyond” (February 21, 2022).
- ^{vii} McKinsey & Company “How Could Gene Therapy Change Healthcare in the Next Ten Years?” (July 28, 2021).
- ^{viii} Alliance for Regenerative Medicine. U.S. Food & Drug Administration. Bloomberg.
- ^{ix} Bloomberg, “Global Cell and Gene Therapy Market to Surpass US\$ 90,984.2 Million by 2030 - Coherent Market Insights” (August 24, 2022).
- ^x Hunt T. January 2023. The Cell And Gene Therapy Sector In 2023: A Wave Is Coming – Are We Ready? <https://invivo.pharmaintelligence.informa.com/IV146781/The-Cell-And-Gene-Therapy-Sector-In-2023-A-Wave-Is-Coming--Are-We-Ready>.
- ^{xi} FDA. June 2023. Approved Cellular and Gene Therapy Products <https://www.fda.gov/vaccines-blood-biologics/cellular-gene-therapy-products/approved-cellular-and-gene-therapy-products>.
- ^{xii} BioPharm International “Cellular and Gene Therapies Face a Manufacturing Capacity Crunch” (Sep 1, 2020).
- ^{xiii} Avijeet Biswal. “AI Applications: Top 18 Artificial Intelligence Applications in 2024” <https://www.simplilearn.com/tutorials/artificial-intelligence-tutorial/artificial-intelligence-applications#what-are-the-applications-of-artificial-intelligence> (updated July 28, 2023).
- ^{xiv} The White House “FACT SHEET: Biden-Harris Administration Announces Expansion of Global Health Security Partnerships and Releases Annual Progress Report” (Nov 2022).
- ^{xv} WHO “WHO launches new initiative to improve pandemic preparedness” (April 26, 2023).
- ^{xvi} All statistics cover period starting at JLABS launch in 2018 through 10/31/2023.
- ^{xvii} National Multiple Sclerosis Society (2020), “Updated Atlas of MS Shows over 2.8 People Worldwide have Multiple Sclerosis – with Nearly 1 Million in the US,” <https://www.nationalmssociety.org/About-the-Society/News/Updated-Atlas-of-MS-Shows-Over-2-8-million-People>.