



AN INCLUSIVE CANADIAN APPROACH TO GENOMIC-BASED RNA THERAPEUTICS



McGill



For decades, researchers at McGill University have been studying the molecular biology and chemistry of RNA, including the exploration of RNA and its constituents as therapeutic modalities. Likewise, genetics, genomics and personalized medicine at McGill have foundational roots that date back over 50 years.

From genomics and RNA biology to medicine and biomanufacturing, these research strengths cover the range of expertise needed to discover gene targets and develop novel and innovative treatments for a variety of diseases. The **D2R Initiative** (DNA to RNA) leverages McGill's decades-long expertise in DNA and RNA research to develop the next generation of RNA medicines.

RNA-based therapies have emerged as powerful alternatives to classical small molecules with the potential to convert the “undruggable” targets (disease-associated genes and proteins) into clinically actionable targets. The

power of RNA technology is exemplified by the remarkable and rapid success of mRNA vaccines against SARS-CoV-2. Moreover, several RNA drugs targeting disease-associated genes have already been clinically approved to use in a clinical setting and many are currently in development. We are at the beginning of a revolution that will enable the rapid, low-cost development of genome-guided RNA-based medicines for a wide spectrum of diseases, such as those caused by emerging viruses that threaten our society with pandemics, high-burden diseases such as cancer, and rare diseases that are currently incurable or prohibitively expensive to treat.

ABOUT D2R



AN INCLUSIVE CANADIAN APPROACH TO GENOMIC-BASED RNA THERAPEUTICS

With a landmark \$165 million investment from the Canada First Research Excellence Fund and additional support from the Quebec Government and other philanthropic and industry partners, McGill's world-leading research initiative, **D2R**, will develop revolutionary genomic-based RNA medicines for all.

D2R brings together different disciplines and sectors to develop and ensure access to RNA therapeutics for all. It overcomes barriers in health research design by fostering a research environment where diversity is valued, and everyone has equal opportunities to contribute and benefit.

D2R's interdisciplinary approach challenges the traditional drug development paradigm by focusing on health outcomes for overlooked or marginalized populations and developing inclusive dialogue processes with these populations. By prioritizing the development of affordable personalized medicine, D2R aims to disrupt the status quo and recognize the diverse lived experiences and economic realities of people in Canada and beyond by ensuring that the therapies are accessible to all.



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EN RECHERCHE

CANADA
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FUND

Canada

Québec 



D2R VISION

To deliver genomic-based RNA therapies to benefit the health of different populations who are affected by infectious diseases, rare and neglected diseases, or common chronic diseases such as cancer.

D2R MISSION

To develop an internationally leading initiative in the discovery and development of genome-guided, RNA-based precision medicines, associated computational tools, along with a clinical accelerator to ensure application of its discoveries for all Canadians and for the world.

STRATEGIC OBJECTIVES



Enable discovery: D2R will overcome scientific and technical obstacles to realize the potential of genome-guided precision medicine and RNA therapies.



Engage partners: D2R will be a hub for world-leading “next-generation” drug development in Canada, bringing together Pharma and Biotech to accelerate regulatory approval of life-saving drugs. D2R’s scope and Canada’s competitiveness in these areas will be dramatically advanced through strong international links with leading biomedical research institutions in Europe, North America, Africa, and Asia.



Make an impact: To realize the potential of genomic discovery and capitalize on the flexibility of RNA therapeutics, D2R will implement an interdisciplinary research strategy to tackle priority disease areas.



Drive equitable practice: D2R will engage with patient associations and equity-deserving groups to guide research and policy recommendations. Equity, Diversity and Inclusion (EDI) lies at the very core of D2R, which promises to improve knowledge and advance health outcomes for diverse populations globally.



Champion Indigenous-Led Research Initiatives: D2R prioritizes the integration of Indigenous knowledge by actively promoting co-creation and ensuring that all engagements are culturally safe and respectful. This commitment involves building substantial partnerships that support the autonomy and leadership of Indigenous researchers and communities in directing research agendas.



D2R COMMUNITY

To implement its vision, D2R aligns outstanding expertise, talent, and state of the art infrastructure in the fields of population studies, genomic medicine, chemistry, biology and structural biology of RNA, formulation, bioprocessing and biomanufacturing of RNA, clinical research, data science and artificial intelligence, and social determinants of health and health policy, to tailor and deliver new RNA-based medicines in Canada and beyond.

The below partners have demonstrated their support for the Initiative. D2R would also like to thank our philanthropic donors for their generous contributions.

Partner Institutions:



Université de
Sherbrooke



THE UNIVERSITY
OF BRITISH COLUMBIA



uOttawa

Academic institutions

- Institut de recherches cliniques de Montréal
- Institut Pasteur International Network & Institut Pasteur de Dakar
- RIKEN Centre for Integrative Medical Sciences
- Institut Pasteur de Tunis
- Kyoto University
- University of Bordeaux
- Lambton College
- The Hospital for Sick Children

Private sector companies

- adMare Bioinnovations
 - Agilent Technologies
 - Amorchem
 - Amplitude Venture
 - Biodextris
 - BIOVECTRA
 - ChemGenes Corporation, Inc.
 - Deep Genomics
 - Eli Lilly & Co.
 - Flagship Pioneering
 - Haber Biologics
 - Illumina
 - Integra Biosciences
 - Integrated Nanotherapeutics Inc.
 - Intellia Therapeutics
 - LaunchWorks Manufacturing (Cryopak)
 - Lavery, de Billy, L.L.P.
 - MEDEloop
 - Merck & Co., Inc.
 - MiNA Therapeutics Limited.
 - Moderna
 - Molecular Forecaster Inc.
 - NanoVation
 - Norton Rose Fulbright Canada L.L.P.
 - Oxford Nanopore Technologies
 - Pacific Biosciences of California, Inc.
 - Quantoom Biosciences S.A.
 - Two-Photon Research Canada Inc.
 - Ultima Genomics
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Public sector, funding agencies, and knowledge mobilization organizations

- Canadian Organization for Rare Disorders
 - Quebec Consortium for Drug Discovery (CQDM)
 - Fonds de Recherche du Québec
 - Government of Quebec, Ministère de l'Économie et de l'Innovation
 - MEDTEQ+
 - Mitacs
 - National Research Council
 - Public Health Agency of Canada
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Indigenous organizations

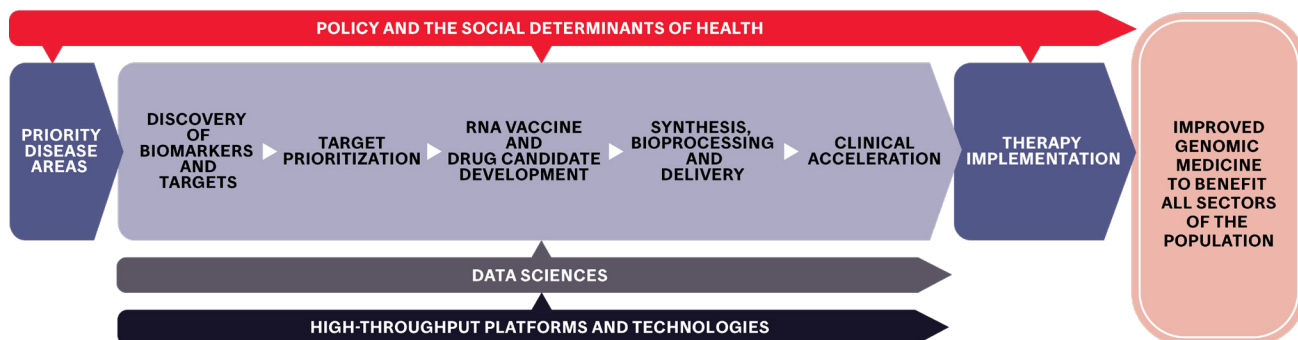
- Tahatikonhsontóntie Quebec Network Environment for Indigenous Health Research
- First Nations of Quebec and Labrador Health and Social Services Commission

SCIENTIFIC STRATEGY

D2R builds on a series of Foundational Axes that represent cutting-edge research and development in genomics, RNA therapeutics and other supporting pillars of strength at McGill. These axes guide our search for scientific breakthroughs.

D2R's axes form a dynamic and comprehensive framework (see figure below), carefully designed to encourage interdisciplinary collaborations. Within this framework, the Foundational Axes include those that are discipline-driven and vertical (e.g., genomics, RNA

biology, bioprocessing), and others that are cross-cutting and interact with all axes (e.g., data science, social sciences). Each axis, with its distinct focus and expertise, collectively contributes to improving genomic medicine to benefit all.



D2R FOUNDATIONAL AXES

D2R is structured around six Foundational Axes that drive cutting-edge research in genomics and RNA therapeutics. These axes foster interdisciplinary collaborations and aim to advance genomic medicine for the benefit of all.

1. Population Studies and Genomic Medicine:

- Innovating genomic methods to identify biomarkers and guide health determinants in prioritized areas.
- Promoting genomic medicine for improved health care and equitable research.

2. RNA Therapeutics:

- Studying RNA biology to enhance therapeutic profiles for novel RNA-based drugs.
- Creating platforms for pre-clinical and clinical RNA research.

3. Bioprocessing, Biomanufacturing, and Nanotechnology:

- Developing and testing nanotechnology for targeted RNA delivery.
- Providing platforms for designing and testing novel RNA delivery systems.

4. Clinical Research, Acceleration, and Implementation:

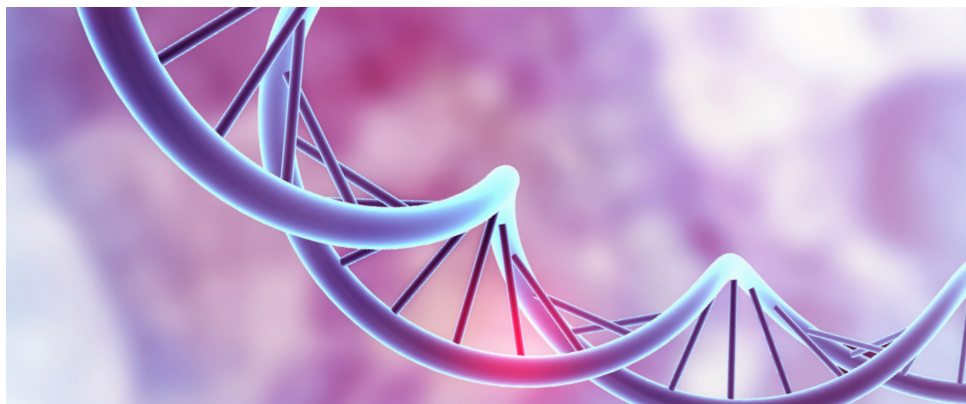
- Expanding genomic and personalized medicine approaches for diagnostics and patient care.
- Conducting clinical investigations on disease markers, environmental modulators, and drug repurposing.

5. Data Science, Bioinformatics, and Computing in Personalized Medicine:

- Developing integrative omics analysis methods and computational tools for biomarker discovery.
- Ensuring inclusive genomic studies and robust data governance.

6. Ethical, Socioeconomic, and Cultural Dimensions in Genomic Research:

- Promoting responsible research and effective data governance.
- Engaging with equity-deserving groups and patient organizations to ensure equity in research.



PRIORITY DISEASE AREAS

D2R focuses on key priority disease areas where RNA-based therapeutics can have a transformative impact. By targeting **Oncology**, **Rare Diseases**, and **Infectious Diseases**, D2R leverages McGill's expertise to develop innovative RNA-based therapies and diagnostics, addressing critical health challenges and improving patient outcomes.

1. Oncology:

- Developing RNA-based therapies for personalized cancer treatment and prevention.
- Implementing clinical pipelines for tumor characterization and guided interventions.

2. Rare Diseases:

- Supporting RNA therapeutic development for rare and ultra-rare diseases.
- Prioritizing interdisciplinary research and partnerships for rapid translation.

3. Infectious Diseases:

- Prioritizing RNA-based diagnostics and treatments for infectious microbes.
- Developing vaccines against bacterial, viral, fungal, and parasitic diseases.



FUNDING PROGRAMS

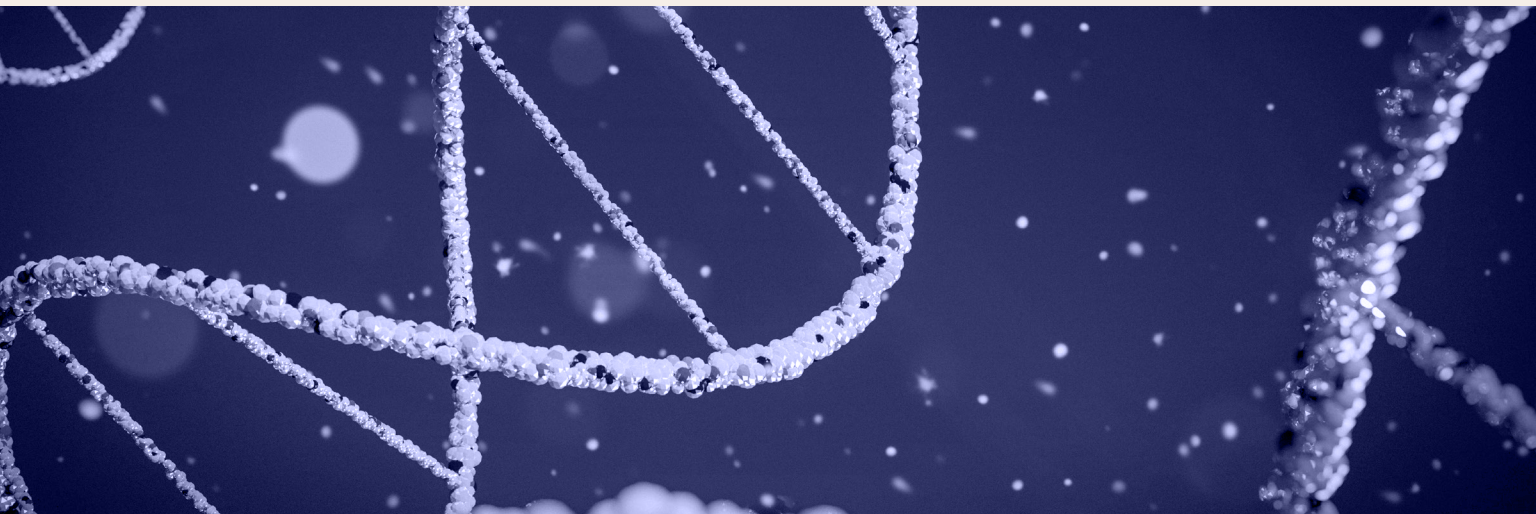
D2R is implementing funding programs that support research at interdisciplinary interfaces and facilitate horizontal integration of research activities in large, disease-specific, translational packages.

D2R supports commercialization activities with matched funding by industry partners to promote knowledge translation in the commercial space. D2R fosters cross-disciplinary training of highly qualified personnel by funding research rotations in academic and government partner facilities, but also in partner industries to train the next generation of skilled workers in RNA therapeutics and manufacturing.

D2R funding programs aim to foster an ecosystem that nurtures diverse ideas. D2R funding programs address

gaps and needs from basic biomedical research to clinical research, to social determinants of health, to data science and commercialization efforts. The funding programs are tailored to align with D2R's vision of advancing genomic medicine to benefit all.

D2R will distribute funding over four cycles from 2024 to 2030. Each cycle will span 12-18 months and will feature calls for proposals. Some programs will accept applications on a rolling basis and others will be launched as needed.



LIST OF D2R FUNDING PROGRAMS

Fundamental & Interdisciplinarity

1. Foundational Projects
2. Research in Motion
3. Translational Impact Research
4. Training Awards

Centres & Core Facilities

5. Core Platform Sustainability
6. Centres and Institutes Support

Industry & Commercialization

7. Commercialization Priming
8. Major Partnerships
9. Clinical Research and Development

Targeted Programs

10. New Faculty Start-Up
11. Indigenous Health
12. International Partnerships
13. Rapid Response

CONTACT US

Discover how D2R is revolutionizing genomic-based RNA therapies and find out how you can get involved!

Visit our website to explore D2R's vision, open funding opportunities, funded projects, researchers, partners, news, events, and more. For any inquiries or additional information, the D2R Support Office is here to assist scientific and community partners.

For more information, visit: mcgill.ca/D2R
Questions? D2R@mcgill.ca





