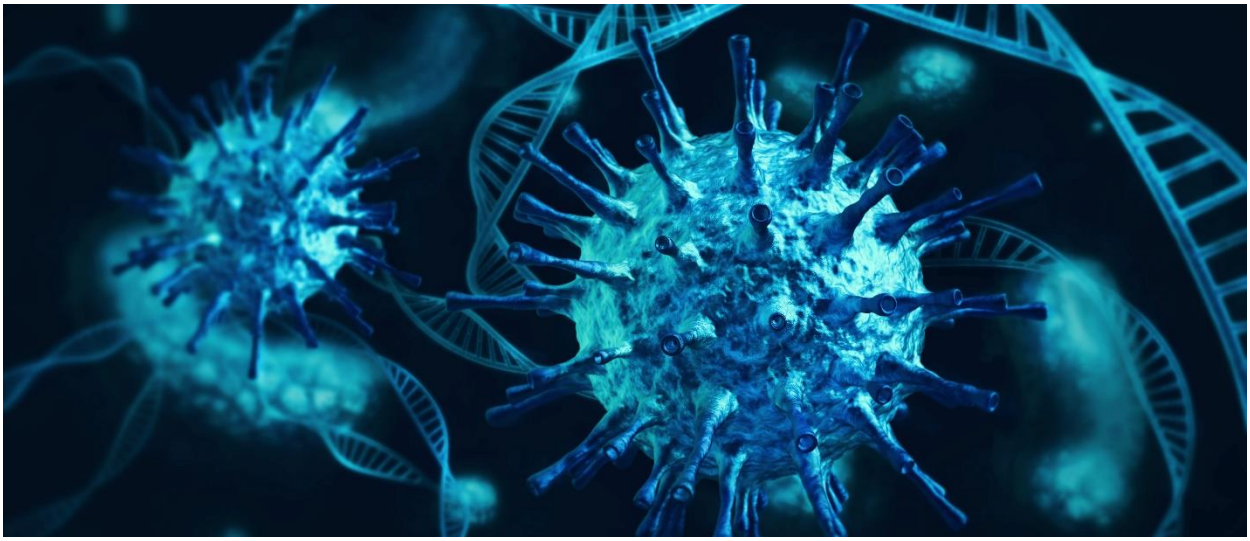
GenomeQuébec

Funding Opportunity

Genomic Solutions for the Identification, Characterization and Surveillance of Antimicrobial Resistance and Emerging Pathogens



Guidelines and Evaluation Criteria

February 2023

GenomeQuébec

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Overview

The COVID-19 pandemic has taken Québec and the rest of the world by surprise. The way countries responded in the early stages of the pandemic had not only a large impact on citizen health and well-being, but also major social and economic repercussions. The risk of epidemics caused by emerging pathogens is only expected to increase. Growth and expansion of human populations into new geographic areas will increase contact with wild and domestic animals, providing more opportunities for zoonotic disease transmission. Changes in climate and land use, such as deforestation and intensive farming practices, which cause disruptions in environmental conditions and habitats could provide new opportunities for diseases to pass to animals. Moreover, increase in international travel and trade would accelerate the spread of diseases across borders and around the globe.

The phenomenon of antimicrobial resistance (AMR) is an additional growing concern. According to the Council of Canadian Academies[1], about 26% of infections are now resistant to the drugs typically used to treat them. By 2050, the resistance rate is projected to increase to 40%. As of 2019, the World Health Organization identifies antimicrobial resistance as one of the 10 biggest public health threats facing humanity. In the long term, its economic and public health impacts are expected to be even worse than those incurred during the current COVID-19 health crisis (see Canadian statistics by the Canadian Antimicrobial Innovation Coalition[2]).

The fight against pathogens is a cross-sectoral challenge. A comprehensive multidisciplinary and multi-sectoral approach (One Health approach) must be fostered to address the growing threat of emerging pathogens and antimicrobial resistance. In this context, the structuring of a critical mass of experts in microbial genomics and building capacity would equip Québec to anticipate large-scale health crises, and thus support its competitiveness in terms of innovation (new antimicrobials, and diagnostics, surveillance and prevention tools, implementation of evidence-based public policies, etc.).

Génome Québec conducted a consultation in the fall of 2021 and the spring of 2022 to gather the opinion of provincial experts regarding surveillance and the fight against pathogens and antimicrobial resistance. Experts identified priority elements and provided four recommendations summarized in a report published in 2022.

Based on these recommendations, Génome Québec is launching a Funding Opportunity to support multidisciplinary research teams looking to develop innovative genomic solutions for the identification, characterization and surveillance of emerging pathogens and antimicrobial resistance.

[1] Council of Canadian Academies | CCA | When Antibiotics Fail (cca-reports.ca)
[2] Antimicrobial Resistance – Canadian Antimicrobial Innovation Coalition (amrinnovation.ca)

Objective

This Funding Opportunity aims to bring researchers and actors from different disciplines (genetics, microbiology, bioinformatics, artificial intelligence, public health, ethics, engineering, chemistry, etc.) and sectors (academic, industry, environment, agriculture, animal and human health) to develop **innovative genomic[3] solutions** that support:

- Investigation of infections of unknown etiology
- Identification and characterization of emerging pathogens and antimicrobial resistance (AMR)
- Investigation of zoonotic diseases, including animal reservoirs
- Surveillance of pathogens (virus, bacteria, fungi, and parasites) and AMR propagation

Solutions issued from different disciplines and having a cross-sectoral impact are encouraged.

Activities

The proposals must outline a list of activities deemed essential to develop a genomic tool or solution that will have an impact on detection, characterization, investigation, and prevention of emerging pathogens and AMR. The proposals should make a case for prioritizing specific activities, describe what details constitute them, outline how they will be implemented and propose a timeline with specific milestones and deliverables.

Topics of research that could be addressed include, but are not limited to:

- Development of genomic tools that are easy to use and interpret in different conditions of use (laboratories, medical clinics, hospitals, farms, food production line, etc.) for detection, identification, and analysis of pathogens
- Improvement of laboratory methods to increase the performance of pathogen detection in different samples (blood and other clinical specimens, food, water, soil, etc.)
- Development of bioinformatics tools to identify and characterize pathogens
- Development of methods and tools to automate the analytic process and facilitate the interpretation, use and sharing of data
- Development of tools to accelerate innovation in the prevention, prediction, diagnosis of AMR and of pathogen infections
- Identification of biomarkers associated to pathogen infections and AMR
- Studies to improve understanding of transmission modes of new emerging pathogens and AMR
- Epidemiological modelling of pathogen and AMR transmission based on rich-omics data
- Analysis of social context and development of strategies to promote accessibility and uptake of the newly developed genomic tools at individual, population and systemic levels
- Investigation of economic, cultural and social premises underlying current practices and definition of ways to promote change as it relates to genomic implementation of the developed solutions

[3] The term genomics is defined here as the comprehensive study of the genetic information of a cell or organism and its functions. The definition also includes related disciplines such as epigenomics, metabolomics, metagenomics, proteomics, transcriptomics, bioinformatics and synthetic biology as long as the link to genetic information is clear.

The following research topics are excluded from this call:

- Creation of data repositories
- Development and implementations of clinical trials
- Development and assessment of vaccines and clinical therapies (human or animal)

Genomic innovations have the potential for significant societal impacts. For these innovations to be effective, actions aimed at the implementation of genomic tools in AMR and pathogen surveillance (such as policies, programs, costs, and change in practices) will need to be informed by insights and evidence from social sciences encompassing a broad variety of disciplines, such as economics, political science, law, psychology, anthropology, and sociology. Projects are therefore encouraged to include GE[3]LS[4] elements as well as equity, diversity and inclusion (EDI) considerations in their proposal with the aim of informing and helping the implementation of these tools and changes in policies and practices.

Available Funding and Term

- A total funding envelope of $2M is available from Génome Québec
- Each project may request a minimum total budget of $300,000 and a maximum of $800,000
- Génome Québec will fund 50% of all eligible expenses for activities occurring in Québec
- A co-funding of at least 1:1 is required (for co-funding eligibility criteria please consult Génome Québec Funding Guidelines)
- The duration of the projects is of 2–3 years (to be determined by the applicant)

Team Composition and Expertise

- The applicant team must be led by a researcher with an academic or research appointment at an eligible public research institution in Québec (university, college, or an institution with a research mandate) and who is autonomous regarding his/her research activities within that institution. A researcher may only submit one application as a lead applicant.
- Teams that are multidisciplinary and multisectoral are encouraged but not mandatory.
- Researchers from social sciences are encouraged to be part of the team to undertake research into the applications and implications of genomics in society — specifically, genomics and its ethical, environmental, economic, legal, and social aspects (GE[3]LS)[5]. This collaboration between genomic and social scientists from various disciplines is encouraged to help anticipate unintended consequences of action and achieve significant social impacts.
- Project teams need to include end users (government, private partners, associations, public institutions, etc.) to ensure alignment, acceptability, and adoption of the outputs of their research to the benefit of the broad community.

[4] We use the acronym GE3LS that stands for "Genomics and its Ethical, Environmental, Economic, Legal and Social aspects" as defined by Genome Canada. It should be understood broadly as research into the implications of genomics in society from the perspective of the social sciences and humanities.

[5] The GE3LS research is not strictly limited to the disciplines that comprise the acronym, but rather encompasses all those that rely on quantitative and qualitative methodologies to investigate the implications of genomics in society and to inform applications, practices, and policies.

Equity, Diversity and Inclusion (EDI)

The research landscape in Canada is experiencing a shift in its understanding and implementation of equity, diversity, and inclusion (EDI) values. The Canadian government, funding agencies, universities, research institutes and CEGEPs have committed to support and take action to increase EDI at the heart of their communities and promote it at each stage of the research process.

At Génome Québec, we understand that the quality of genomic research and the solutions provided by it become richer and superior when different perspectives and expertise are brought to work together, providing room for a variety of views and ideas.

The present Funding Opportunity offers the multidisciplinary teams an opportunity to bring different voices to the table and work on EDI principles to enhance the impact of the research proposal, not only on the deliverables to be produced, but also on the people working on these solutions and on those who will implement and benefit from them. We therefore expect teams to integrate EDI values in the research plan and experimental design, as well as in the composition of the team, and choice of end users and stakeholders consulted and impacted by the project. If one or many EDI considerations do not apply to their research, applicants may be asked to explain why they are not relevant in the application.

We recommend all applicants consult the FRQ and NSERC guidelines on EDI, the Funding Opportunity evaluation criteria in Appendix 1, as well as the Génome Québec EDI Guiding Principles in Appendix 2.

We also encourage applicants to complete the training module on *Bias in Peer Review*

To support applicants, Génome Québec will organize EDI workshops open to those interested in getting more information on EDI and how to advance EDI values in their research proposals.

Application Process

This Funding Opportunity consists of a two-stage application process:

Registration: Applicants must provide information on the objectives of the proposed project by completing a one-page form. This form will be assessed for eligibility.

Full application: Eligible applicants will be invited to submit a full application consisting of the following documents:

- Application Form
- Budget Form

The request for funding must be submitted to Génome Québec.

Applicants may submit the forms in the language of their choice (French or English). The full application will be reviewed by an evaluation committee composed of independent experts to assess the effectiveness of the proposed plan to advance the objectives of this Funding Opportunity and for overall excellence as determined by factors such as scientific merit, degree of innovation, quality of the genomic-based solution, potential for implementation, inclusion of EDI principles and management and finances (see Appendix 1). Following the review, the evaluation committee will provide its recommendations to Génome Québec for funding decisions.

Timeline

The following timeline outlines the key steps of the application process and their respective deadlines. No extensions will be granted.

Date	Process Step
February 8, 2023	Launch of Funding Opportunity
March 15, 2023	**Deadline for submission of Registration to Génome Québec by email at ram-amrpath@genomequebec.com**
March 30, 2023	Notification on eligibility by Génome Québec
Mid-April 2023	EDI workshops
May 11, 2023	**Deadline for submission of Full Application to Génome Québec by email at ram-amrpath@genomequebec.com**
June 2023	Peer Review
July 2023	Funding Decision and Notification

Please contact Génome Québec for all questions pertaining to the application process and deadlines.

Additional Information

Conditions of Release of Génome Québec Funds

The following are the minimum requirements to allow for the disbursement of funds by Génome Québec:

i. Signed agreement between Génome Québec, the academic institution and the researchers that establishes the resolution of major areas, such as contributions, funding terms, termination policy, financial policies, etc.
ii. Approved budget, updated objectives and milestones in accordance with the recommendations of the Génome Québec review panel
iii. Appropriate certification for proposals involving research with human subjects, human stem cells, animals, biohazards, radioactive materials, or possible effects on the environment.

Project Readiness

All applicants must demonstrate that they will be able to meet all conditions of the release of Génome Québec funds within three (3) months following the notification of approval. **Génome Québec reserves the right to withdraw its funding for any approved project that is not ready to receive funding, or for which signed agreements have not been secured, within three months following the notification of approval**.

Accountability and Reporting

Génome Québec must meet the evaluation, auditing, responsibility, and accountability requirements stipulated by the ministère de l'Économie, de l'Innovation et de l'Énergie. These requirements can only be met through access to information that allows Génome Québec to evaluate the ongoing performance of projects and their related activities. It is the responsibility of the funded researchers to participate in this process and provide the necessary information on the project's performance and progress as required by Génome Québec. As part of its responsibilities, Génome Québec will implement mechanisms to evaluate, on an ongoing basis, the performance and productivity of funded projects to determine whether funding must be continued, reduced, suspended or withdrawn. These mechanisms include a final report and a closing meeting, as well as any other form of review that is deemed necessary.

Contact

For more information, contact:

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Appendix 1 — Evaluation Criteria

Applications will be evaluated by an independent peer review panel to assess the scientific merit and effectiveness of the proposed plan to advance the objectives of this Funding Opportunity based on the criteria below. The descriptors following each criterion are not all-inclusive.

Quality of genomic-based innovation (20%)

- Degree to which the proposed solution addresses the current needs of end users in prevention, prediction, and diagnosis of emerging pathogens and AMR in different sectors (environment, animal and human health)
- Versatility, affordability, applicability, and simplicity of genomic solution

Scientific merit of research proposal (45%)

- Scientific quality of the proposed research as assessed by peer review; particularly the extent to which the proposed research will contribute to the development of **innovative genomic solutions**
- Project is directed towards applied genomics or related research areas (proteomics, metabolomics, bioinformatics, genetic engineering, synthetic biology, etc.)
- Clarity and pertinence of the objectives proposed
- Feasibility of the milestones and the critical path table, proposed objectives, and goals
- Team composition:
    - Competence and experience of participating research partners
    - Participation of an end user in the project
    - Extent of multidisciplinary and multisectoral approach
    - Complementarity of expertise
- Extent to which the proposed research reflects creative thinking
- Originality and robustness of the genomic tool or process to be developed

Potential for implementation (30%)

- Project has the potential to have a major impact on pathogen surveillance and AMR
- Potential for technology integration by the user is high
- Promotion of coherence, best practices, and cost effectiveness across relevant sectors
- The implementation and knowledge plan are well described and have high potential for success

Inclusion of EDI principles (5%)

- Extent to which the research plan applies to the needs or experiences of various groups (beneficiaries)
- Extent to which the genomic solution is to be conducted with relevant and impacted communities, how knowledge will be accessed and shared
- Extent to which the proposal considers the different forms of support required (e.g., financial, logistical, cultural, linguistic) to ensure that the individuals or communities involved in the research can meaningfully participate in it (as research participants or end users)

- Extent to which the findings of the research project will be disseminated and applied to the population as a whole or be limited to certain groups
- EDI considerations to the constitution of the team (composition of the research team [recruitment and retention], roles of team members in research design and research execution, transfer of knowledge and training, etc.)

This section will be evaluated by EDI experts. They will base their evaluation on the overall proposal and the actions or methods planned by the research team to address EDI principles.

Management and finance

- Budget and financial control processes
    - The budgeted costs are aligned with the proposed research plan and activities; the relationship between the proposed costs and potential benefits of the research proposed is evident.
    - The budgeted costs of the project are reasonable.
- Co-funding
    - A demonstrated relationship between the proposed co-funding and the objectives of the project.

Appendix 2 — Equity, Diversity and Inclusion Guiding Principles

Génome Québec is committed to integrate Equity, Diversity and Inclusion (EDI) in its funding opportunities. It is understood that the quality of genomic research and the solutions provided by it become richer and superior when different perspectives and expertise are brought to work together, providing room for a variety of views and ideas. Projects are expected to integrate EDI concepts and principles and showcase active steps taken to promote an inclusive research environment, to diversify the team composition, and to consider and include the individuals that will be impacted by the research and making it accessible afterwards to diverse audiences.

EDI principles are transversal and should be reflected throughout your full application by incorporating them into your project design. We have listed below five areas and some guiding questions to help you address EDI considerations and design concrete actions to be integrated into your research proposal. Some might not apply to your project.

1) **Community Engagement:** Thoughtful interactions with end users can help build solutions that will be quickly adopted and meaningfully impact the community. The "user-driven" aspect brings depth and weight to the project and acts as a selling point of the proposal. Here are some key items to consider:

    a. Engagement and consultation with users and stakeholders
        i. Did stakeholders participate in the development of research questions or objectives?
        ii. Is the diversity of relevant stakeholders involved enough? Are we missing key parties?
        iii. How will stakeholders be involved throughout the project?
    b. Relevance
        i. Are research questions and solutions **addressing the needs** of stakeholders? Were they defined or refined following consultation with stakeholders?
        ii. Is the project informed by the community?
        iii. Is the developed technology useful and practical for users?
    c. Inclusion
        i. How will you integrate diversity in the selection of participants during consultations (surveys, meetings, round tables, workshops)?
        ii. Do you plan to consult with marginalized groups or communities?
    d. Result sharing
        i. Are the dissemination strategies of results adequate for various stakeholders and communities impacted by the research?
        ii. Will results, data generated, and technologies developed accessible to the various participants of the research project? Will participants be automatically informed of the project outputs?

2) **Team Composition and environment:** Building a strong research team is paramount to the completion and success of the project. Skill, expertise, and proficiency are essential, but EDI considerations can also help establish and maintain a high-performing, diverse team. Consider:

    a. Creating a diverse team and an inclusive environment

i. It is not recommended to add statistics regarding the diversity of your research team as it could be interpreted as "tokenism" of underrepresented groups within your research team.
ii. Not be discouraged by international hires because of immigration procedures.

b. Adopt and describe best practices for recruitment and human resources management
   i. Unconscious bias training (See Unconscious Bias and Recruiting)
   ii. Following the institution's HR policies and following EDI principles for selection (criteria, postings, selection committee is diverse, the candidates are diverse, etc.)
   iii. Establishing conflict management guidelines
c. Early-stage researchers, receptors, and trainees
   i. What type of support and mentorship will be provided to each group?
   ii. Does the institution have specific programs for trainees?
   iii. How will you encourage trainee recognition and promote inclusive excellence?
      1. Scholarships (implication, parental support, excellence, diversity, travel, publishing, etc.)
      2. Participation at student competitions (conferences, "Ma Thèse en 180 secondes", etc.)
d. Clarifying the roles within the research team for accountability
   i. Responsibility of the research design
   ii. Executing and analysis of research activities
   iii. Dissemination of results
   iv. Interaction with stakeholders
e. Training
   i. EDI training for all your team (resources from your institution, Dimensions charter, workshops, consultants, etc.)
   ii. Ensure equity in training opportunities within the team

3) Barriers and benefits: This section pertains to the project's experimental design and could help refine the genomics and its ethical, environmental, economic, legal and social aspects (GE^3LS) portion of your proposal. The goal is to increase the likelihood of success of the project by:

a. Limiting unintended consequences to the innovation
b. Addressing systemic barriers (policies, procedure, practices) and proposing concrete actions to mitigate them
c. Proposing risk mitigation strategies
   i. Are there barriers to the change of practice? How will they be handled?
   ii. How will delays impacting the research plan and team be addressed?
d. Putting forth EDI elements into the research plan is essential for successful implementation. This could include but is not limited to:
   i. Elaborating a strategy to engage a diversity of users and stakeholders
   ii. Determining if social or demographic data will be collected and if analyses will be disaggregated according to key identity factors
   iii. Research that relies on animals or living organisms that are either male or female should include a note on disaggregated sex analysis

iv. Carefully selecting research methodologies (participatory methods, sampling strategies, participant profiles, consultation, co-creation of collection tools, etc.)

4) **Accessibility:** Defined as "the combination of aspects that influence a person's ability to function within an environment", it refers to the openness to put in place specific accommodations (logistical, financial, technical, linguistic, cultural, physical, related to work-family balance, etc.) for your research personnel to thrive in your laboratories and participate efficiently to the research effort. It could also refer to accessibility of your research deliverables, outputs, and datasets. Your proposal could elaborate on:

   a. How can you provide a safe, inclusive and barrier-free environment? How will this type of support be managed? Who will be responsible for this?
   b. Management of parental or other types of leave policies and work-family or study-family balance measures
   c. Accessibility and sharing of research data within the team, especially in a decentralized context or within a network. Are there barriers to the sharing of data?
   d. Considering not only accessibility in the context of lab work, but potentially field research, while travelling and with users or stakeholders
   e. Are the research results accessible in lay terms? Are there intentions to present the research to a broader audience (i.e., people outside of the field)?

5) **Research with Indigenous communities**: If your project plan includes research with indigenous communities, it is essential to read and be aware of the different protocols and guidelines related to indigenous collaboration (see links below). Teams should carefully consider if and how this aspect should be addressed. For instance, consider:

   a. Co-creation principles, including engaging with the communities and identifying their needs, interests, expectations, to elaborate research objectives or formulate research questions
   b. The First Nations principles of ownership, control, access, and possession (OCAP)
   c. Aligning with reconciliation principles from the Canadian Government or other recommended action towards reconciliation
   d. Referencing the Tri-Council Policy Statement, Chapter 9, on Research involving the First Nations, Inuit and Métis peoples of Canada. This is considered a staple guide for research in Canada.
   e. Adopting the Assembly of First Nations Québec-Labrador research protocols
   f. Favoured methods for dissemination of results inside and outside the community
   g. Intellectual property principles within indigenous communities could differ, requiring discussions and mutual agreement on the methods to be used
   h. Decolonization principles

Other references

BAKER Jocelyn et VASSEUR Liette « Inclusion, diversité, équité et accessibilité (IDEA) — Pratiques exemplaires à l'intention des chercheurs », Commission canadienne pour l'UNESCO, Ottawa, Canada, août 2021

Chaire pour les femmes en sciences et en génie au Québec – Outils pour l'ÉDI en recherche

Commission de la santé et des services sociaux des Premières Nations du Québec et du Labrador, UQAT, UQO, Réseau de recherche et de connaissances relatives aux peuples autochtones — Boîte à outils des principes de la recherche en contexte autochtone

Réseau québécois pour l'équité, la diversité et l'inclusion (RQÉDI) — Ressources

The Natural Sciences and Engineering Research Council of Canada —"NSERC guide on integrating equity, diversity and inclusion considerations in research"

Appendix 3 — Génome Québec Funding Guidelines

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FINANCIAL GUIDELIN