Development of novel ONT algorithms and library preparation strategies to study the epitranscriptome in liquid biopsy

Centre for Genomic Regulation (CRG), Barcelona, Spain

PhD project description

Screening liquid biopsy (LB) samples has been proposed as a promising approach to diagnose cancer in earlier stages, since it is a minimally invasive approach that can be applied to the whole population. The discovery of relatively stable, extracellular RNAs in blood plasma has generated much interest in their potential use as non-invasive biomarkers. Most efforts have so far focused on capturing the dysregulation in the abundance of specific RNA molecules. However, RNA modifications **remain largely unexplored as potential biomarkers, despite their information-rich nature and their well-documented dysregulation in cancer samples**. Here we propose to take advantage of native RNA **nanopore sequencing**, to quantify small RNA abundances and modifications from RNA molecules present in liquid biopsy samples.

The Doctoral candidate will develop novel bioinformatic algorithms and tools to capture RNA modification information from liquid biopsy samples, as well as alignment-free classification methods of nanopore current intensity signals. The candidate will also optimize library preparation for small RNA sequencing from circulating and exosomal RNA samples from plasma. Once these tools have been established, the PhD candidate will train novel machine learning algorithms to classify and stratify samples based on different characteristics (disease, exposure to stress, cancer, metastasis, etc).

Objectives:

1. Optimise direct RNA nanopore sequencing library preparation for small RNA populations;
2. Develop novel algorithms and AI-based techniques for the analysis of nanopore sequencing data, including the detection of RNA modifications and bulk nanopore data analyses;
3. Apply existing algorithms and those developed in Objective 2 to study the dysregulation of RNA modifications in liquid biopsy samples sequenced using nanopore direct RNA sequencing.

Expected Results:

1. A novel direct RNA nanopore sequencing library preparation method, optimised for small RNA populations, such as those present in liquid biopsies
2. Novel and/or improved algorithms to identify RNA modifications are present in small RNAs
3. Comprehensive and reliable wet lab + dry lab pipeline to study RNA populations present in liquid biopsy samples (including their modifications) using nanopore sequencing.

This project has received funding from the European Union's (EU) Horizon Europe research and innovation programme under the Marie Skłodowska-Curie grant agreement No. 101226733.

MSCA and EURECA:

Are you a highly motivated early-stage researcher with a passion for molecular biology, RNA, and cancer research? Do you aspire to work in a dynamic, international, and interdisciplinary research environment?

EURECA – The European Epitranscriptomics of Cancer Academy invites applications for 14 doctoral positions across Europe, offering a unique opportunity to be part of a cutting-edge training network in cancer epitranscriptomics, the study of RNA modifications and their and their impact on cancer initiation, progression, and treatment.

EURECA is an innovative and interdisciplinary Marie Skłodowska-Curie Actions Doctoral Network (MSCA-DN) funded by the European Union. Coordinated by Erasmus University Medical Center (Rotterdam, The Netherlands), the network brings together 21 academic, clinical, and industrial partners from across Europe. Each doctoral candidate will undertake a cutting-edge research project, receive structured training, and benefit from international mobility through secondments at partner institutions to acquire the skills, knowledge, and entrepreneurial mindset needed to drive breakthroughs in cancer biology and contribute to the development of novel diagnostic tools and therapeutics. For more information visit us at eureca-dn.com

General information

- **Researcher profile:** First Stage Researcher, R1
- **Position:** PhD Position
- **Funding Programme:** Horizon Europe – MSCA
- **Application deadline:** November 2025
- **Type of Contract** – Work contract for 4 years.
- **Job Status** - Full-time
- **Hours Per Week:** 38,5h / week
- **Offer Starting Date:** June – September 2026
- **Marie Curie Grant Agreement Number:** 101226733

Eligibility requirements

- Eligible candidates must not have resided or carried out their main activity (work, studies, etc.) in the country of their host institution for more than 12 months in the 3 years immediately prior to their recruitment by the host institution (i.e. the starting date indicated in the employment contract/equivalent direct contract).

- Eligible candidates shall at the date of recruitment by the host institution (i.e. the starting date indicated in the employment contract/equivalent direct contract), be in the first 4 years (full-time equivalent research experience) of their research careers and not have been awarded a doctoral degree.

- Eligible candidates must have a master's degree relevant for the chosen position (including biology, medicine, biochemistry, bioinformatics, or a related discipline, depending on each PhD project), or must hold an official university qualification from

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a country of the European Higher Education Area with a minimum of 300 ECTs of official university studies.

Skills/Qualifications

- Master Degree in life sciences, biomedical sciences, molecular biology, bioinformatics, or related fields.
- Experience in at least one of the following areas: cell and/or molecular biology, biochemistry, biotechnology, bioinformatics.
- Demonstrated interest in cancer research and RNA biology
- Demonstrated academic excellence is a pre.
- Practical experience in laboratory environment is a plus (optional for bioinformatics).
- Basic knowledge of Microsoft office, statistics, graphical data presentation.
- Excellent organisation and communication skills and a collaborative mindset
- Willing to travel for short or longer periods.
- Flexible and co-operative with a well-structured and autonomous working style.
- Fluency in written and spoken English is a must.

Where to apply

Please submit your application form in the CRG PhD international Call 2026 webpage.

Contact

Contact – CRG Training & Academic office – training@crg.eu

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Equal opportunities statement

Recruitment will be carefully executed and monitored in accordance with the principles of the European Charter for Researchers and Code of Conduct for the Recruitment of Researchers and in the DN mobility rules, establishing open and efficient recruitment procedures, which are tailored to the type of positions advertised. The recruitment procedures will be open, efficient, transparent, supportive and internationally comparable.

EURECA aims for a representative gender balance amongst the researchers to be recruited, based on an equal opportunity policy during the recruitment phase. The vacancies description will explicitly encourage the application of female researchers. Moreover, female candidates will be selected in preference should a female and a male candidate achieve the same evaluation results.

Code of Conduct for the Recruitment of Researchers

- Recruitment should be open, efficient and transparent
- Selection should be by gender balanced and trained panels
- Transparency of procedure for candidates
- Merit should be judged both qualitatively and quantitatively, balancing a good range of criteria
- Career breaks and other multidimensional career tracks should not be penalised
- Recognition of mobility experience
- Recognition of qualifications
- Seniority ('the levels of qualifications required should be in line with the needs of the position and not be set as a barrier to entry')

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Benefits

The 14 doctoral positions (DC1,2,3 etc.) are funded by the Marie Skłodowska Curie Action Doctoral Network EURECA (HORIZON-MSCA-2024-DN-01-01). The 36-month[1] employment contract will follow the conditions and salary adapted to the life cost in each host country, set by the Horizon Europe Work Programme 2023-2025, Marie Skłodowska-Curie Actions (European Commission Decision C(2025) 2779 of 14 May 2025).[2]

The monthly gross salary will comprise a gross living allowance, mobility allowance (€710/month) and if applicable a family allowance (€660/month).

Living Allowance: This gross amount is EUR 4010 per month corrected with the country of employment factor and minus all compulsory deductions under national legislation such as employer and employee social security contributions and direct taxes). The correction coefficient is applied to ensure equal treatment and purchasing power parity for all employed researchers.

Mobility allowance: This monthly gross amount of EUR 710 is an addition to the living allowance and should normally be paid at the same time. It is intended to cover the costs associated with the fact that the DC has moved to a different country to take up the position. Furthermore, it is for private use; therefore, it is not meant to cover any expenses related to the project (such as secondment costs, travel costs for attending a conference, etc.).

Family allowance: If the DC has or will acquire family obligations during the action duration, it is entitled to an additional gross "family allowance" of EUR 660 per month. For the purposes of the MSCA, family is defined as "persons linked to the researcher by marriage (or a relationship with equivalent status to a marriage recognised by the legislation of the country where this relationship was formalised) or dependent children who are actually being maintained by the researcher".

Amounts indicated for living allowance, mobility allowance, and family allowance are gross amounts before taxation and compulsory deductions. Additional information can be found in Information Note for MSCA doctoral networks.

[1] Or 48-month if the organization has secured funding for the forth year.

[2] https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/wp-call/2023-2024/wp-2-msca-actions_horizon-2023-2024_en.pdf ; page 118

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