DC2: Identification and implementation of novel cell-free RNA-based biomarker types for early cancer detection using liquid biopsy

Host institution: Flomics Biotech SL, Barcelona, Spain

Supervisor: Dr. Marc Weber

Co-Supervisors: Dr. Phil Sanders, Flomics Biotech SL (Industrial); Dr. Esther Lizano, Universitat Pompeu Fabra (Academic); Dr. Carlo Vascotto, University of Udine (Academic); Prof. Barbara Uszczynska-Ratajczak, Institute of Bioorganic Chemistry of the Polish Academy of Science (Academic)

Project description: Flomics is developing a multi-purpose liquid biopsy, dynamic and capable of detecting multiple complex diseases, such as cancer, even before the first symptoms appear. Our blood-test combines optimized plasma cell-free RNA (cfRNA) profiling, based on Next-generation sequencing (NGS), with state-of-the-art machine learning data analysis implemented in the cloud to detect warning signs in an accurate, fast and minimally invasive way, before it's too late. Most liquid biopsy studies have focused on circulating tumour DNA (ctDNA) to find potential biomarkers. However, the amount of ctDNA molecules released into the bloodstream is very low in the early stages of cancer, making them more difficult to detect. Unlike ctDNA, cell-free RNA (cfRNA) is released from cancerous and non-cancerous cells. It can derive from stromal cells or from the immune system responding to the presence of tumors, both of which can be highly informative for the diagnosis. cfRNA represents a rich source of potential biomarkers, especially suited for early disease onset detection. Current approaches for discovering novel cancer biomarkers through the analysis of cfRNA have mainly focused on measuring expression of protein coding genes, possibly overlooking valuable information present in RNA-seq data.

The general aim of this project is to identify novel cfRNA-based biomarkers in blood plasma, with particular focus on mitochondria derived RNAs, and build an early cancer detection tool that shows unprecedented sensitivity and specificity. In this project, the candidate will take advantage of proprietary optimised protocols for RNA sequencing of cfRNA from plasma developed at Flomics, and an in-house dataset of ~1,100 samples from 5 types of cancer patients (colorectal, lung, breast, prostate, and pancreatic cancer) and healthy donors obtained within the framework of R&D projects led by FL in collaboration with the Andalusian Public Biobank and the Hospital Clinic of Barcelona biobank. The candidate will develop bioinformatics pipelines to analyze RNA-based signals in cfRNA data beyond gene expression, such as mitochondria derived RNAs, circular RNAs, single nucleotide variants, and novel transcripts. The tasks involved include advanced data normalization and unwanted variation removal methods, to overcome the challenges in cfRNA research. Moreover, the candidate will develop machine learning models to classify with high accuracy cancer patients vs healthy controls using the novel biomarker types in combination with global signatures of gene expression.

Host laboratory: Flomics Biotech, founded in 2018 and based in Barcelona, is a leader in genomics, bioinformatics, and RNA-based diagnostics. Led by founders João Curado (CEO) and André Guedes (COO), alongside co-founders and advisors Esther Lizano, Luis Korrodi, and Roderic Guidó, the company has a team of 20 employees. By combining Next-Generation Sequencing (NGS), artificial intelligence, and RNA biomarkers, Flomics is developing the next generation of cancer screening solutions, aiming to transform early disease detection and personalized medicine. Flomics operates a fully equipped genomics lab and office space in Barcelona, where it conducts cfRNA extraction, sequencing, and bioinformatics analyses. From samples to cancer detection, all are performed in-house with high quality standards. Flomics is a cool place to learn, grow, and produce great science.

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency. Neither the European Union nor the granting authority can be held responsible for them.

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Secondments: This project is carried out in strong collaboration with the following groups, and visits to their laboratories are expected during the project. A willingness to travel and spend time abroad is therefore essential:

- Prof. Barbara Uszczynska-Ratajczak, Institute of Bioorganic Chemistry, Polish Academy of Science, Poland;
- Dr. Carlo Vascotto, University of Udine, Italy.

Eligibility conditions:

- Master's degree in Biology, Biotechnology or related fields.
- Applicants must be doctoral candidates, i.e. not already in possession of a doctoral degree.
- Mobility rule: researchers must not have resided or carried out their main activity in the country of the recruiting beneficiary for more than 12 months in the 36 months immediately before their recruitment date.

Required Skills:

- Master in Bioinformatics, Biotechnology, or a related field.
- Basic knowledge in bioinformatics and RNA-seq.
- Basic knowledge in machine learning.
- Intermediate level in at least one programming language (Python, R, C++).
- Good command of Linux terminal.
- Desirable skill: Nextflow.
- Desirable skill: AWS.
- Proficiency in the English language is required, as well as good communication skills, both oral and written. Successful candidates will need to provide an English test (e.g. IELTS, TOEFL, Cambridge English). You may be exempt if you are a national of a majority native-English speaking country, or have qualifications / degree that has been taught and assessed in English. The supervisor can also confirm during the interview that a candidate has the required level of English.

Enquiries

For general information about the INT2ACT Doctoral Network visit the visit the project website (www.int2act.eu) or send an email to int2act@gmail.com.
For additional information on this project please contact Dr. Marc Weber (marc.weber@flomics.com).

How to apply

To learn more about the application process, visit the INT2ACT recruitment web page (https://int2act.eu/open-positions/).

Required documents:

1. Statement of interest (limit of 2,500 characters) explaining why you wish to be considered for the fellowship and which qualities and experience you will bring to the role.
2. Curriculum vitae et studiorum.
3. A certificate of University examinations taken (with marks).
4. A final degree certificate translated in English. If, at the time of application, candidates should not be yet in possession of a degree certificate, they can submit it at the time of the examination.

All documents must be merged into a single PDF file, in the order listed above.
A limited number of applicants will be invited for an interview and will be required to provide contact information of up to two contact person for reference letters.

Application deadline

The closing date for applications is **January 31 2026.**