DC1: An integrated multi-omic and spectroscopic approach to the identification of novel blood CAR-T biomarkers by ML analyses (BIOCART)

Host institution: IIS Biogipuzkoa Health Research Centre, Donostia-San Sebastián, Spain

Supervisor: Prof. Charles Lawrie

Co-Supervisors: Dr. María Armesto, Biodonostia Research Institute (Academic); Dr Carlo Vascotto, University of Udine (Academic); Dr Marc Weber, Flomics Biotech SL (Industrial)

Project description: CAR-T therapy has transformed the treatment of patients with relapsed or refractory B-cell lymphomas. However, resistance and toxicities such as cytokine release syndrome and neurotoxicity limit its broader application. This creates a clinical need for biomarkers to better identify and manage toxicities, as well as to monitor disease progression. While previous projects have used genomic or transcriptomic approaches to study biomarkers in CAR-T patients, these have typically relied on a single "omic" method and small patient cohorts.

The aim of this project (BIOCART) is to identify new blood-based biomarkers in CAR-T–treated patients through a prospective, international, multicenter study using a comprehensive multi-omics strategy (cfDNA, miRNA, methylomics, glycomics, and spectroscopy). Blood samples are collected from patients treated with axi-cel, with blood drawn before leukapheresis, at days 2, 4, 6, 8, and 10 post-infusion, and again at 3, 6, and 12 months. The resulting omic data will be used to develop and train novel machine learning pipelines capable of integrating and harmonizing multi-omics datasets in order to identify biomarkers of (1) early treatment response, (2) disease progression, and (3) therapy-related toxicities. The resulting algorithm and biomarkers will then be tested in an independent validation cohort of 120 patients.

This PhD project will focus on the bioinformatics analyses of data from the multiple-techniques, fusion of this data and development of new computational tools to analyse and harmonise data.

Host laboratory: IIS Biogipuzkoa is a dedicated biomedical research centre that forms part of the provincial teaching hospital (University Hospital of Donostia) located in the Basque country of Spain. Dr. Lawrie's Molecular Oncology research group uses a multidisciplinary approach to combat cancer, integrating the discovery and validation of clinically relevant biomarkers with the development of novel diagnostic tools, advanced drug delivery systems, and innovative therapeutic technologies.

As part of the provincial teaching hospital our laboratory has enviable access to clinical samples and a very strong connection with oncology medical services. The laboratory itself has full access to laboratories for handling mammalian and human cell cultures; flow cytometry facility; microscopy facility, genomics and histology platforms, clinical trials unit etc.

Secondments: This project is carried out in 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. Lei Zhang, Sino-Swiss Institute for Advanced Technology (SSIAT), Shanghai University, China
- Dr. Marc Weber, Flomics Biotech SL, Barcelona, Spain

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.

Funded by the European Union

Eligibility conditions:

- Master's degree in Bioinformatics, Computacional Biology, Mathematics, Biotechnology or related field.
- 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:

- Bioinformatics and/or computacional biology experience (e.g. through Master thesis work or research internships) with large-scale *omics* datasets would be an advantage.
- Intermediate level in at least one programming language (Python, R, C++) and basic knowledge of machine learning and/or deep learning algorithms would be beneficial.
- 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 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. Charles Lawrie (Charles.lawrie@bio-gipuzkoa.eus).

How to apply

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

Required documents:

- 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.
- Curriculum vitae et studiorum.
- A certificate of University examinations taken (with marks).
- 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.

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.**