DC11: Harnessing genome editing for development of effective oligonucleotide therapeutics

Host institution: University College Dublin, Ireland

Supervisor: Prof. Rory Johnson
Co-Supervisors: Dr. Francesco Nicassio, Istituto Italiano di Tecnologia (Academic); Dr. Thomas Frischmuth, baseclick GmbH (Industrial).

Project description: Antisense oligonucleotides (ASOs) are the foundation of RNA therapeutics, offering the ability to selectively modulate gene expression by binding to complementary RNA sequences. Despite their promise, a central challenge remains: only a minority of designed ASOs show strong activity, while most are ineffective due to poorly understood factors such as RNA folding and accessibility. Current approaches to identify potent ASOs are laborious, costly, and inefficient, requiring iterative synthesis and testing of hundreds of candidate molecules. This PhD project will address this bottleneck by developing a new strategy for ASO optimisation, harnessing genome editing technologies to create an in-cell platform to rapidly identify potent ASOs. The project is inherently interdisciplinary, combining molecular biology, functional genomics, RNA biology, and computational analysis, with applications to cancer and other disease contexts. It will involve close collaboration with both academic and industry partners, including secondments to gain complementary expertise. The expected outcome is a powerful methodology for rapidly identifying highly effective ASOs, thereby accelerating the translation of RNA therapeutics from discovery into the clinic. This project is ideally suited to a motivated candidate interested in innovative RNA technologies, genome engineering, and therapeutic development, and will provide training at the cutting edge of molecular medicine and biotechnology.

Host laboratory: The Laboratory for Genomics of Long Noncoding RNAs and Disease (GOLD Lab) is a multidisciplinary, multinational research team focussed on developing advanced RNA-based therapeutics for unmet medical needs. GOLD Lab is presently composed of 13 full-time members, including 3 postdocs, 9 PhD students and 1 Lab Manager. We integrate genomic, bioinformatic and disease biology methods to target disease processes such as non-small cell lung cancer and neurodegeneration. In particular we develop tools for the discovery of novel non-protein-coding disease genes by means of parallelised CRISPR-Cas pooled screening, to the point where we have end-to-end in-house screening pipelines. Since 2019 we have been located at the School of Biology and Environmental Science (SBES), a nationally-leading research-intensive School within University College Dublin. We are also members of the Conway Institute for Biomolecular and Biomedical Research comprising >150 faculty. We actively participate in international research consortia, namely GENCODE, Genomics England and FANTOM. We regularly organise international conferences, most recently the EMBO Workshop 'Non-Coding RNA Medicine' (Poznan, 2023).

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:

- Dr. Francesco Nicassio, Istituto Italiano di Tecnologia, Italy;
- Dr. Thomas Frischmuth, baseclick GmbH, Germany;

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Eligibility conditions:

- Master's degree in Organic chemistry, Chemical Engineering, Biotechnology, Biochemistry, 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:

- Research experience – Molecular biology (plasmid design and cloning), genome editing (CRISPR-Cas), human cell line culture, bioinformatics (intermediate level in at least one of python / BASH).
- 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. Carlo Vascotto (carlo.vascotto@uniud.it).

How to apply

To learn more about the application process, visit the INT2ACT recruitment web page (www./int2act/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.**