IBEC-SJD INTERNATIONAL PhD PROGRAMME

Position

1. Project Title/ Job Position title:
   Fostering Aptamer-Led Advancements for Personalized Therapies in Neuroblastoma (FALCON)

2. Research project/ Research Group description:

The FALCON Project develops innovative, patient-specific therapies for neuroblastoma (NB), a highly aggressive pediatric cancer with limited treatment options, especially in metastatic stages. Current treatments face challenges like non-specific targeting, off-target effects, and tumor heterogeneity. FALCON addresses these issues by combining patient-derived models, hybrid nanocarriers, and multidisciplinary expertise to enhance efficacy, reduce toxicity, and advance scalable, personalized therapies for pediatric oncology.

Using NB samples from the Sant Joan de Déu (SJD) Research Institute, three-dimensional tissue engineered (TE) models are created at IBEC to replicate critical tumor biology, ensuring clinical relevance. Extracellular vesicles (EVs) isolated from these models reflect the tumor's molecular profile, offering biocompatibility, immune evasion, and natural targeting capabilities. However, natural EV cargo can interfere with therapeutic payloads, and scalability challenges limit their clinical use.

To overcome these limitations, FALCON develops hybrid nanocarriers by fusing aptamer functionalized nanoparticles with EVs, enabling precise targeting of key NB markers involved in metastasis. These hybrid nanocarriers undergo rigorous in vitro testing in TE models and in vivo validation in spontaneous metastasis mouse models, generating data on specificity, biodistribution, and efficacy.

The project leverages expertise from IBEC, SJD, the International Iberian Nanotechnology Laboratory (INL), and Aptadel Therapeutics/IDIBELL. The Ph.D. student will primarily train at IBEC and SJD. At IBEC, the focus is on TE models, EV isolation, and hybrid nanocarrier validation in vitro, while SJD training emphasizes work with patient samples, mouse models, and in vivo validation. A stay at INL's Nanomedicine Lab in Portugal will provide training in nanoparticle fabrication and EV functionalization, and a second placement at Aptadel/IDIBELL will focus on scalability and regulatory strategies for aptamer-functionalized nanocarriers.

3. Job position description:

The PhD candidate will play a central role in the FALCON project, which focuses on developing and characterizing aptamer-functionalized extracellular vesicle (EV) nanocarriers for neuroblastoma therapy. This cutting-edge translational research aims to advance patient specific, precision treatments for aggressive pediatric cancers. The candidate's key responsibilities will include:

• Design, develop, and optimize experimental 3D Tissue-engineered (TE) tumor models of neuroblastoma using patient-derived cells
• Isolating EVs from TE-models and ensuring high-quality preparation by applying advanced purification and characterization techniques
• Preparing and characterizing aptamer and hybrid nanocarriers
• Conducting in vitro studies using the TE models to assess nanocarrier targeting specificity, cellular uptake, and therapeutic efficacy.
• Performing in vivo validation in spontaneous metastasis neuroblastoma mouse models to evaluate biodistribution, safety, and therapeutic impact.
• Analyze experimental data, interpret results, and contribute to scientific publications and presentations.
• Collaborate with multidisciplinary teams within the research group and external partners to advance the project's objectives.
• Participate in research stays
• Participate in regular lab meetings, progress reports, and contribute to grant writing and project dissemination efforts.
• Stay up-to-date with relevant scientific literature and emerging technologies in the field of bioengineering, nanomedicine and cancer research.
The ideal candidate will have a strong academic background in bioengineering, chemistry, or molecular biology. Prior experience in nanomedicine, tissue-engineered models or in vivo models is highly desirable. Experience in culturing and maintaining pediatric cancer cell lines and

Experience in confocal microscopy and imaging is advantageous.

Group Leaders at IBEC

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4. Research Group: Nanobioengineering

Group Leader at SJD

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