Monitoring drug action in amyotrophic lateral sclerosis with luminescent particles

About the Project

Amyotrophic lateral sclerosis (ALS) is a mortal neuromuscular rare disease in which motoneurons suffer a progressive degeneration. It provokes a continuous loss of muscle strength and coordination in the patients that progresses until they die in 3-5 years from diagnosis. The origin of the disease is unknown and thus makes drug research a highly complicated task.

In our group we work with cellular models derived from patients to test several drug candidates and study the cellular effects and more concretely the extracellular vesicles secreted by cells, which have been shown to have a key role in the progression of the disease and could serve as future biomarkers retrievable from blood.

For this study, we use novel nanoparticle tools that outperform traditional assays Quantum Dots (QDs). These nanoparticles show unique photophysical properties able to monitor and characterize EVs. In combination with Nano tracker devices, and their use in time resolved Förster resonance energy transfer (TR-FRET) experiments make them ideal devices for a thorough characterization of EVs.

In this project the student will perform an extensive study of EVs in human models and plasma from ALS patients utilizing QDs technology, to search for biomarkers of disease and monitor the effect of potential pharmacological agents, mainly TDP43 modulators. The identification of validated biomarkers of pharmacological therapy would hugely impact clinical drug development, which is currently extremely challenging due to the inability to accurately monitor drug action. The combination of EVs and QDs could pave the way for a more precise monitoring of disease and therapies.

We look for a highly motivated student with experience in cell culture experiments and bioconjugation. The candidate will be in charge of conjugating commercially available

“la Caixa” INPhINIT PhD fellowship expression of interest
nanoparticles that will serve to characterize extracellular vesicles and keep and maintain cell cultures derived from patients and treat them with different drug candidates. Different pathological features will be monitored and correlated to the information obtained in the secretome. Different techniques such as nanoparticle bioconjugation and characterization, analyte quantification, immunofluorescence, and nanoparticle tracking will be employed. For cell cultures, the student will be trained to work with cellular models from patients and analyze the pathological features using fluorescence microscopy cytometry or cell viability assays.

During the PhD at least one international short stay will be planned for the student to perform research in a foreign laboratory expert on either Quantum Dots or cellular models from patients. We are a young and motivated team that utilises nanoparticle tools to decipher the mechanisms of neurodegeneration for a future cure.

https://nanociencia.imdea.org/es/Biosensorsinneuroscience/home

How to apply

This is a competitive fellowship opportunity, funded through “la Caixa” INPhINIT programme. Interested candidates should get in contact (valle.palomo@imdea.org) for an informal discussion about the project and how we can support your application.

About IMDEA Nanociencia

IMDEA Nanociencia is an interdisciplinary research centre dedicated to the exploration of basic nanoscience and the development of applications of nanotechnology in connection with innovative industries. Our purpose-built building was inaugurated in 2014 and the institute has since been consecutively awarded with the highest national recognition of scientific excellence and international impact. The institute has a high scientific output >2,000 indexed publications (~200 per year, >80% in Q1 journals) and counts with state-of-the-art facilities in over 40 operative laboratories.

We are located at the UAM-CSIC Cantoblanco Campus, a highly competitive world–class research environment with access to facilities from the Universidad Autónoma de Madrid (UAM), several Spanish Scientific Research Council (CSIC) centres and Madrid Science Park. The Cantoblanco Campus is just a few minutes away from Madrid’s lively city centre, connected by “cercanías” trains and several bus lines.

IMDEA Nanociencia hosts over 200 scientists in a true international and inclusive environment, who tackle complex multidisciplinary problems through scientific excellence and best practice. We are fully committed to equality and diversity in the workplace and we encourage applications from all candidates irrespective of their background.