

# Internship Proposal

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Proposal At: 2026-02-03

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## **Project Title:**

Development of biomaterials designed at the nanoscale for application in the nervous tissue and beyond

## **Level:**

Master Student

## **Project Summary:**

The following research projects are proposed at the NanoBiomaterials for Targeted Therapies (nBTT) group:

Design of innovative and versatile biodegradable dendrimers as carriers (nucleic acids/proteins/drugs/contrast agents) to develop nanotherapeutics and nanotheranostics for nervous system nanomedicine.

Toxin-based conjugate platforms for targeted siRNA delivery to the spinal cord.

Development of engineered hydrogel coatings for electrode/brain interfacing.

Development of in vitro platforms for mimicking brain tissue in health and disease, and to study how the extracellular matrix and microbiota-derived factors influence brain cells' behaviour.

Assess the potential of polyamidoamine (PAMAM) dendrimers as carriers of mRNA to nucleus pulposus cells in the intervertebral disc (IVD).

If you're eager to learn, collaborate, and contribute to groundbreaking research, we'd love to hear from you! For more details about our projects, please reach out to the group leader Ana Paula Pêgo ([apecto@i3s.up.pt](mailto:apecto@i3s.up.pt)).

**Work to be developed by the student:**

Are you an enthusiastic MSc student passionate about innovative research and teamwork? The nBTT group might be the perfect fit for you! We're dedicated to developing "smart" biomaterials engineered at the nanoscale with controlled architectures and functionalities, to deliver precise, in situ signals that promote nervous tissue repair and restore function.

#### What We Do:

Innovative Research: We design advanced biomaterials aimed at targeted therapies.

Our work spans a diverse range of state-of-the-art and cutting-edge techniques, including:

- Physical & Chemical Analysis: DLS, rheology, FT-IR, NMR, MS, MPLC, HPLC, SEC
- Surface Characterization: AFM, ATR-FT-IR, SEM, XPS
- Biological Methods: Flow cytometry, molecular biology techniques, and bioimaging tools such as confocal microscopy, high content screening and imaging, micro CT, and IVIS lumina
- Biological Models: From cell culture (including co-cultures and microfluidic systems) to ex-vivo and in vivo models (mice and zebra fish stroke models) to assess biomaterial performance

#### Why Join Us?

- Interdisciplinary Collaboration: Work alongside experts from various fields and gain exposure to a broad spectrum of techniques.
- Team-Oriented Environment: We value collaboration and believe that great science is built on the foundation of strong teamwork.
- Hands-On Experience: Get involved in projects that push the boundaries of biomaterials science and have a tangible impact on health science.

#### References:

Rocha DN et al.. It takes two to remyelinate: A bioengineered platform to study astrocyte-oligodendrocyte crosstalk and potential therapeutic targets in remyelination. *Biomaterials Advances*, 2023, 151, 213429. DOI: 10.1016/j.bioadv.2023.213429.

Torrado M et al.. DETOX: An innovative dendritic nanosystem for the delivery of BoNT/A LC domain to ischemic neurons. *Biomaterials*, 2026, 326, 123684. DOI: 10.1016/j.biomaterials.2025.123684

Spencer AP et al.. Unveiling the potential of neuron-targeted dendriplexes for siRNA

delivery using a PNS-CNS-on-Chip. J Control Release, 2026, 389, 114422. DOI:

10.1016/j.jconrel.2025.114422



Leiro V et al.. Versatile fully biodegradable dendritic nanotherapeutics. Biomaterials, 2022, 281, 121356. DOI: 10.1016/j.biomaterials.2021.121356.

Barros D et al.. An affinity-based approach to engineer laminin-presenting cell instructive microenvironments. Biomaterials, 2019, 192, 601. DOI: 10.1016/j.biomaterials.2018.10.039.

Leiro V et al.. Biodegradable PEG-dendritic block copolymers: Synthesis and biofunctionality assessment as vectors of siRNA. J Mater Chem B, 2017, 5(25), 4901. DOI: 10.1039/c7tb00279c.