

Internship Proposal

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Project Title:

Development of a nanostructured living therapeutic hydrogel for the post-operative eradication of glioblastoma multiforme tumours

Level:

Master Student

Project Summary:

Hydrogels are three-dimensional network structures composed of hydrophilic polymers able to absorb and retain large amounts of water. Their biocompatibility, porous structure, and tunable mechanical properties make them ideal extracellular matrix-like materials suitable for a wide range of biomedical applications.

This MSc Thesis project aims to generate self-assembling hydrogels based on self-assembling peptides with time-dependent mechanical and degradation properties. These hydrogels will serve as vehicles for delivering living therapeutics (generated in situ) for the post-operative treatment of glioblastoma multiforme (the most aggressive malignant brain tumour), with the ultimate goal of enhancing therapeutic options and patient quality of life.

Work to be developed by the student:

Possible tasks:

- Chemical characterisation of peptide/enzyme hydrogel formulations using fluorometry and RP-HPLC/LC-MS methods.
- Mechanical characterisation of peptide/enzyme hydrogel formulations using oscillatory rheology.
- Culture of human malignant glioma cells (derived from glioblastoma multiforme) into spheroids and in contact with hydrogels.
- Assessment of hydrogel's tumour clearance performance via:
 - oCytotoxicity (LIVE/DEAD, MTT)
 - oCell proliferation (dsDNA quantification)
 - oCell cycle and apoptosis by FACS

oGenetic profiling expression by RT-PCR (tumour cell cycle, propensity of recurrence, immunoregulation, and response to metabolites will be monitored).

References:

<https://pubs.acs.org/doi/10.1021/acs.biomac.9b00224>

<https://pubs.acs.org/doi/10.1021/acs.bioconjchem.1c00441>

<https://pubs.acs.org/doi/full/10.1021/acsbiomaterials.9b00941>

