

PhD fellow in Biomedical applications of nanomaterials

IIT invites excellent candidates to apply to its PhD program organized in collaboration with the Open University; this international PhD program confers Doctorates in *Health, Sustainable and Human Technologies*.

In order to be admitted into the ARC program, the minimum requirements are

- i. a Masters-level degree, which broadly corresponds to a 4/5-year undergraduate MSc/MChem/Meng-style degree or to a postgraduate Masters in the British system, or to a second level University degree in Italy;
- ii. a grade corresponding to an upper second class (2.1) or a merit in the UK system or 100/110 in the Italian system. Candidates with lower grades but redeeming features (publications, specific expertise) are requested to contact the potential supervisors before applying;
- iii. where English is not the applicant's first language, a valid IELTS (International English Language Testing System) certificate. The minimum acceptable score is an overall 6.5, with no less than 6.0 in any of the four categories

One PhD fellow position **will be available from October 1st 2025** in the [Nanomaterials for Biomedical Applications](#) led by Dr. [Teresa Pellegrino](#).

Title of the project: Natural Killer cells as Trojan horses for magnetic nanoparticles delivery.

Background: The use of magnetic nanoparticles in various biomedical applications is gaining momentum thanks to their peculiar properties. Among them, the use of magnetic nanoparticles as tracers in Magnetic Particle Imaging (MPI), as contrast agents in magnetic resonance imaging (MRI) and as heat mediators in magnetic hyperthermia to selectively burn tumour cells represents some of the features to be exploited in cancer therapy for diagnostic or therapy purposes.

While the treatment of solid tumor by MHT is already in clinic, the treatment of metastasized tumour is difficult for the low dose of magnetic materials that can accumulate at the tumor. Here we aim at maximize the heating efficiency of magnetic nanoparticles under a time varying field of kHz-regime of clinical use and accumulate them to the tumor using natural killer (NK) cells as delivery tools.

Description: The PhD project aims at developing chimeric antigen receptor (CAR) NK cells and find methods to boost magnetic nanoparticle cell uptake such that the magnetically loaded CAR-NK cells can be used as Trojan horses to delivery magnetic nanoparticles at the metastasis. The PhD will focus on preparing CAR-NK cells, active against metastasis of breast cancer cells, setting up the in-test tube uptake protocols to optimize cell uptake by those cells, changing various magnetic nanoparticles parameters, monitoring the magnetic nanoparticles loaded cells by different imaging methods including MPI and MRI, quantify the amount of nanoparticles per cells and their physiological functions.

Accurate physical/chemical studies will be carried out to correlate the magnetic /structural parameters to the magnetic hyperthermia heat efficiency in cells not only in culture media but also under conditions that simulate the tumor microenvironment. Once those parameters are accurately studied and fixed, the best loading protocol will be used to prepare magnetically loaded NK cells for preclinical study to investigate biodistribution and tumor accumulation by MPI/MRI imaging modalities. Preclinical study of magnetic hyperthermia will be also conducted within the PhD. The ideal candidate should be able to develop his/her own ideas on the present topics while having a well-defined attitude to collaborate within an international and interdisciplinary team.

Main Supervisor: [Teresa Pellegrino](#) ([Nanomaterials for Biomedical Applications](#))

Essential expertise:

- i. A master's degree in biomedical engineering, biology or cognate discipline
- ii. Previous experience in manipulation and culturing of cells

- iii. Knowledge of water transfer protocols for nanoparticles and nanoparticle functionalization
- iv. Experience in structural and colloidal characterization of nanomaterials, such as Transmission Electron Microscopy (TEM), dynamic light scattering (DLS), X-Ray Diffraction (XRD), electrophoresis techniques, thermal gravimetric analysis, elemental analysis, etc.

Desirable expertise:

- i. Experience in calorimetric measurements and data processing for Specific Absorption Rate (SAR) determination, high frequency hysteresis measurements, etc.
- ii. Synthesis of polymers and their use for ligand exchange protocols
- iii. Any further characterization techniques needed for cell studies (cell sorting, FACS, immune staining etc),
- iv. Immune cell culturing and characterization
- v. Knowledge of biological scaffolds

How to apply. Prospective students must submit using the [online form](#) the following documents

- 1) 2-page CV, which includes studies, expertise and achievements.
- 2) 1-page research statement, which includes the choice of a project from the list above and a justification of the choice. Only if robustly justified, the student may signal their interest also for a second project, but there is no guarantee that this will be taken into account by the selection panel.
- 3) A transcript of undergraduate and postgraduate studies.
- 4) A valid IELTS certificate, obtained no more than two years before the proposed registration date.
- 5) Contact details of two referees.

Deadline for application: July 24th .

Istituto Italiano di Tecnologia, with its headquarters in Genoa, Italy, is a non-profit institution with the primary goal of creating and disseminating scientific knowledge and strengthening Italy's technological competitiveness. IIT's research endeavour focuses on high-tech and innovation, representing the forefront of technology with possible application from medicine to industry, computer science, robotics, life sciences and nanobiotechnologies.

Istituto Italiano di Tecnologia is an Equal Opportunity Employer that actively seeks diversity in the workforce.

Please note that the data that you provide will be used exclusively for the purpose of professional profiles' evaluation and selection, and in order to meet the requirements of Istituto Italiano di Tecnologia. Your data will be processed by Istituto Italiano di Tecnologia, based in Genoa, Via Morego 30, acting as Data Controller, in compliance with the rules on protection of personal data, including those related to data security.