

TITLE

Functional and Molecular MR imaging studies of tumour bearing mice for early diagnosis and monitoring of therapeutic treatments

DESCRIPTION

Cancer diagnosis, stadiation and treatment monitoring can be significantly advanced by imaging methods. The possibility of carrying out Functional and Molecular Imaging protocols by means of MRI is very attractive for the superb anatomical resolution that is attainable by this technique. However, MRI suffers from an intrinsic insensitivity (with respect to the competing imaging modalities) that has to be overcome by designing suitable amplification procedures involving the use of properly designed chemicals. This approach relies first on the development of paramagnetic contrast agents endowed with an enhanced sensitivity and on the identification of efficient routes of accumulation of the imaging probes at the sites of interest. In this context much attention will be devoted to the design and use of self-assembled systems based on amphiphilic molecules as well on the use of whole cells, where the imaging reporters are represented by highly stable paramagnetic Gd(III) complexes. Besides relaxation agents much attention is currently devoted also to the use of Paramagnetic Metal Complexes as CEST agents (CEST= Chemical Exchange Saturation Transfer). In these systems one exploits the paramagnetic perturbation in terms of its effect on the shift of the resonance of protons that are involved in a slow/intermediate exchange with water. Upon applying a second rf field at the absorption frequency of the exchangeable protons, a net saturation effect is detected on the water signal. These are frequency encoding systems that allow multiple agents detection in the same anatomical region as well as they offer the possibility of designing innovative responsive probes that report on specific parameters of the microenvironment in which they distribute. To overcome sensitivity issues, also for this class of agents, one may envisage the use of nano- and micro-size carriers, such as Liposomes (LipoCEST) and RBCs (ErythroCEST). Finally much attention will be devoted to link the several biomarkers (vascular volume, vascular permeability, extracellular pH, etc.) to get an accurate description of the actual tumour phenotype and to identify which of the proposed biomarkers (or their combination thereof) may be the most useful to monitor the therapeutic treatment.

SELECTION CRITERIA

Eligibility Criteria

- Academic degree: Applicants shall have a master degree in **Biochemical sciences, Chemistry, Pharmaceutical sciences, Biomolecular Sciences, Biological Sciences or Biotechnology Sciences, Biotherapeutics**, corresponding to the second level of studies.
- Mobility rule: There will be no nationality restrictions. Applicants can be from any Country. However, according to the mobility rule, at the time of the application deadline researchers should not have

resided or carried out their main activity (work, studies, etc.) in Italy for more than 12 months in the 3 years immediately prior to the reference date. Compulsory national service and/or short stays such as holidays will not be taken into account.

- Research experience: Applicants shall, at the time of the application deadline, be in the first four years (full-time equivalent research experience) of their research careers and not yet awarded a doctoral degree.

Full-Time Equivalent (FTE) Research Experience will be determined from the date when a researcher obtained the degree which would formally entitle her/him to embark on a doctorate, either in the country in which the degree was obtained or in Italy, irrespective of whether or not a doctorate is or was ever envisaged.

Evaluation Criteria

Step 1 -Evaluation of documentation provided by the candidate: a) Academic record and training b) Research activities c) CV/motivation letter; d) Level of English; e) Reference letters.

Step 2 - Interview: a) Scientific knowledge in the field of interest; b) Research experience in the field of interest c), Motivation; d) English proficiency.

Supervisor

Prof. Silvio Aime

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Web page of the supervisor

<http://www.cim.unito.it/website/staff.php>