

MOLECULAR IMAGING CORE UNIT

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OVERVIEW

Molecular imaging techniques aim to characterise and quantify biological processes at the molecular and cellular levels, facilitating a repetitive, non-invasive, uniform, and relatively automated study of the same living subject using identical or alternative biological imaging assays at different time points. The statistical power of longitudinal studies is therefore harnessed, and the number of animals required and costs incurred are reduced. Combining techniques using multimodality (PET-CT, optical imaging-CT, and ultrasound) allows pathophysiological changes in early disease phases to be detected with high structural resolution. Other advantages include the ability to interrogate the whole body and to visualise the molecular target of interest in 3D space.

“Specific imaging of targets will allow a more fundamental understanding of the disease process.”

Sabador (TS)* (PEJ) **, Gloria
Visdomine

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Plan, until February)

RESEARCH HIGHLIGHTS

The services offered to CNIO researchers by the Molecular Imaging Unit cover different technologies to non-invasively and repetitively image targeted macromolecules in living organisms. We enjoy state-of-the-art technical equipment:

- A micro-PET-CT system (eXplore Vista) from GE to detect early tumour development was acquired, and it is now fully operational. We changed the flat panel to increase the resolution with less radiation.
- A CT system (CompaCT) from Sedecal for the follow-up of tumours and to phenotype different genetically modified mouse strains. Upgraded with the Advanced Bone Analysis Tool.
- Two ultrasound systems (Vevo 3100) from Fujifilm VisualSonics to obtain high-resolution abdominal and soft tissue tumour images.
- A densitometer system (Lunar PixiMus) from GE to perform bone and fat analysis.
- Two optical imaging devices (IVIS Lumina III) from PerkinElmer to acquire fluorescence and bioluminescence. One of them was installed in September 2022.

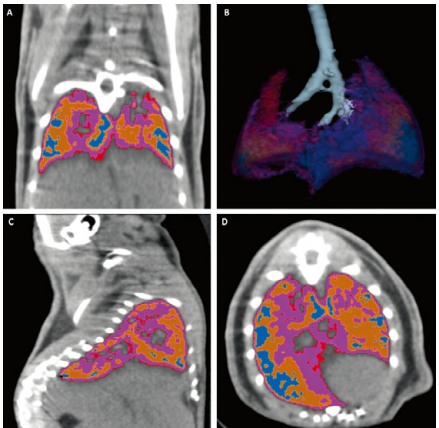


FIGURE 1 Computed Tomography of a mouse with fibrosis in the lungs. Density changes could be segmented and represented in different colours: normal lung (blue), infiltrated fibrotic tissue (orange), and collapsed lung (pink). (A) Coronal projection. (B) 3D rendering. (C) Sagittal projection. (D) Axial projection.

We continued our work on theranostic applications of radiolabelled antibodies, looking for the best-matched isotope pair for imaging and therapy, and employing the pre-targeting approach, in a project supported by a grant from the BBVA foundation. We also renewed our grant project with the *Red Madrileña de Nanomedicina en Imagen Molecular (RENIM 2)*, which focuses on developing and optimising molecular imaging probes and tools for oncology research.

During 2022, and as a result of our increasing expertise in ImmunoPET techniques, we published a special edition

entitled “ImmunoPET Imaging in Disease Diagnosis and Therapy Assessment” in the Nuclear Medicine section of *Frontiers in Medicine*. We also obtained a Next Generation EU infrastructures grant to buy an MRI (Magnetic Resonance Imaging) machine. With this system, we will have a complete set-up for imaging, including all the current techniques available. ■

PUBLICATIONS

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- Gerke C, Zabala Gutierrez I, Méndez-González D, Cruz MCI, Mulero F, Jaque D, Rubio-Retama J (2022). Clickable albumin nanoparticles for pretargeted drug delivery toward PD-L1 overexpressing tumors in combination immunotherapy. *Bioconjug Chem* 33, 821-828.
- Mulero F, Oteo M, Garaulet G, Magro N, Rebollo L, Medrano G, Santiveri C, Rome-

ro E, Sellek RE, Margolles Y, Campos-Olivas R, Arroyo AG, Fernández LA, Morcillo MA, Martínez-Torrecuadrada JL (2022). Development of anti-membrane type 1-matrix metalloproteinase nanobodies as immunoPET probes for triple negative breast cancer imaging. *Front Med* 9, 1058455.

- Francisca Mulero (2022). ImmunoPET in oncology. *Rev Esp Med Nucl Imagen Mol* (Eng Ed) 41, 332-339.

AWARDS & RECOGNITION

- Faculty and Mentor of *IDEA2* 2022 MIT linQ, Massachusetts Institute of Technology, USA.