

# MOLECULAR IMAGING CORE UNIT

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## OVERVIEW

Molecular Imaging enables the visualisation of cellular function and the follow-up of the molecular processes in living organisms without perturbing them. Molecular imaging offers significant advantages to the scientist over traditional research paradigms. While traditional studies of tumour response to a therapeutic agent involve a large cohort of animals analysed at multiple time points, molecular imaging allows characterisation of tumour development and response to a therapy within the same small set of animals imaged longitudinally at multiple time points. This reduces the number of mice used and increases the statistical power of the study because each animal serves as its own control. Other advantages include the ability to interrogate the whole body, and to visualise the molecular target of interest in 3-dimensional space. Finally, molecular imaging is becoming a key bridging technology for the

**“With the theranostics approach: we see what we treat, and we treat what we see.”**

translation of experimental preclinical findings into the clinical environment and, currently, with the theranostic strategy, we can treat the tumours with the same molecule used for PET visualisation by simply changing the isotope for the beta emitter pair.

Visiting Scientist  
Marta Oteo Vives (CIEMAT, Madrid, Spain)

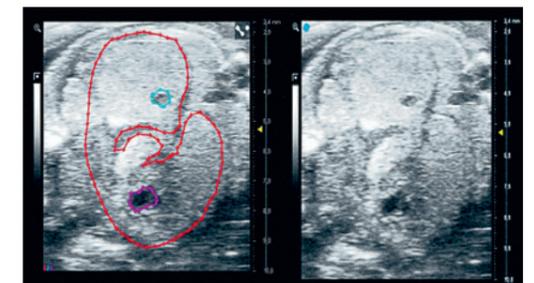
## RESEARCH HIGHLIGHTS

The Molecular Imaging Unit continues to provide CNIO researchers with state-of-the-art molecular imaging equipment and human resources in order to guarantee the highest quality studies and to develop and update protocols and imaging techniques to optimise tumour visualisation in both the preclinical and clinical fields. The Unit also assesses and advises researchers on the best-suited imaging modality for their research projects.

In 2021, the BBVA Foundation grant allowed us to work on theranostic applications of radiolabelled antibodies, looking for the best-matched isotope pairs for imaging and therapy and employing the pretargeting approach. We also continued with the rest of our ongoing grant projects. One of our projects, conducted in collaboration with CIEMAT, focuses on developing and labelling nanobodies produced by camelids following the ImmunoPET strategy, where we couple the high specificity and selectivity of the antibodies with the high sensitivity and quantitative capabilities of PET. Another grant project, the Spanish Network for Nanoparticles in Molecular Imaging for developing iron and silver-based nanoparticles for imaging, focuses mostly on optical imaging and multimodality (optical-MRI or PET-MRI) for the detection of primary tumours and distant metastasis.

The results of these research projects, in which the Molecular Imaging Unit is actively involved, will directly benefit CNIO scientists who will be able to use and test these new imaging tools in their own research. One example is a new NIR (near infrared) laser device bought with the RENIM budget.

In 2021, we installed a new ultrasound imaging system, VEVO 3100, to replace one of the old ones, to perform diagnosis and follow-up of tumours, as well as to phenotype different models and organs. The system improves throughput diagnosis by increasing the sensitivity and signal-to-noise ratio of the images. We are also helping to detect pregnancy at early stages, at only 6 weeks, to extract murine embryonic fibroblasts (MEFs) with better accuracy than only with abdominal palpation (FIGURE 1).



**FIGURE 1** Ultrasound imaging of a 13-week embryo where the heart (pink line) and the eye (blue line) are clearly observed.

We could detect pregnancy in the very early stages, at only 6 weeks.

## PUBLICATIONS

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- candida albicans* prosthetic joint infection. *Antibiotics (Basel)* 10, 711.
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- Shaikh F, Andersen MB, Sohail MR, Muleiro F, Awan O, Dupont-Roettger D, Kubassova O, Dehmeshki J, Bisdas S (2021). Current landscape of imaging and the potential role for artificial intelligence in

- the management of COVID-19. *Curr Probl Diag Radiol* 50, 430-435.

## AWARDS & RECOGNITION

- Faculty and Mentor of *IDEA2 MIT linQ* with Massachusetts Institute of Technology.
- COST Action evaluator, European Cooperation in Science and Technology (COST).
- Guest Associate Editor in Nuclear Medicine, *Frontiers in Medicine*.