MOLECULAR IMAGING CORE UNIT

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OVERVIEW

Molecular Imaging can be defined as the ability to visualise, characterise and quantitatively measure biological and cellular processes and functions *in vivo*. One of the main advantages of *in vivo* molecular imaging is that it enables characterisation of the pathology of tissue diseases without the need of invasive biopsies or surgical procedures; with this information at hand, a more individualised treatment-planning approach can be applied. Molecular imaging encompasses a range of imaging techniques that rely on the utilisation of probes exogenously added to target and detect specific cellular or molecular processes in a living organism.

"Molecular imaging provides the ability to make visible what would otherwise be invisible, uncovering deeply hidden truths about the mouse/human body."

Technicians
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Silvia Leal, Cristina Penalba(TS)*,
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**Titulado Superior* (Advanced Degree)

RESEARCH HIGHLIGHTS

The Molecular Imaging Unit provides CNIO researchers with state-of-the-art molecular imaging equipment and human resources in order to guarantee the highest quality studies, to develop and update protocols and imaging techniques that serve to optimise visualisation of tumours in both the preclinical and clinical fields, and also to assess and advise researchers on the best-suited imaging modality for their research projects (FIGURE).

We continue to test and incorporate new applications to the ImmunoPET strategy in the context of a new collaborative project with *CIEMAT* group, granted by the *BBVA* Foundation, in which we will develop a nanobody produced by camelids that is labelled with ^{68}Ga. By adopting this novel approach, we expect that the antibody, due to its small size, will be able to better cross the blood-brain barrier and detect brain metastases. The ImmunoPET technique combines the high specificity and selectivity of the antibodies with the high sensitivity and quantitative capabilities of PET. This combination makes this technique suitable to conduct an *in vivo* non-invasive, quantifiable, 3D immunochemistry for the diagnosis and monitoring of tumours.

This year, the Molecular Imaging Unit participated in a Network Programme for Developing Imaging Probes funded by the *Comunidad de Madrid* (*RENIM-CM*). This programme is mostly focused on the use of nanoparticles to perform optical imaging and multimodality (optical-MRI or PET-MRI) for the detection of primary tumours and distant metastasis. The results of this research will directly benefit the CNIO scientists who will be able to use and test these new imaging probes. ■

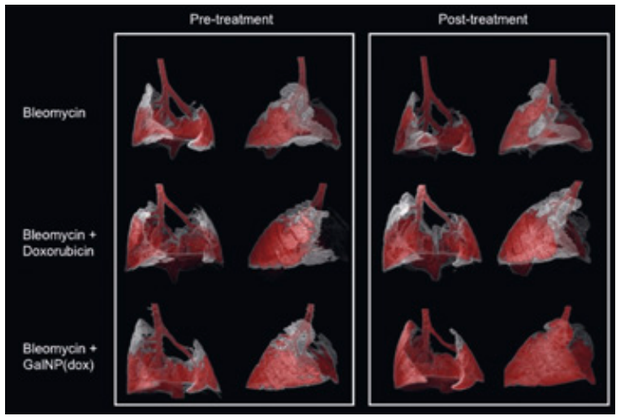

Figure CT images of the evolution of lung fibrosis before and after treatment. Healthy lung tissue is shown in red; fibrotic lung lesions are shown in grey. Note the practically complete recovery of the lung after treatment with the new drug delivery system based on Galactose encapsulated nanoparticles. One of these images was featured on the cover of the September issue of *EMBO Molecular Medicine*.

PUBLICATIONS

- Jimenez V, Jambrina C, Casana E, Sacristan V, Muñoz S, Darriba S, Rodó J, Mallol C, Garcia M, León X, Marcó S, Ribera A, Elias I, Casellas A, Grass I, Elias G, Ferré T, Motas S, Franckhauser S, Mulero F, Navarro M, Haurigot V, Ruberte J, Bosch F (2018). FGF21 gene therapy as treatment for obesity and insulin resistance. *EMBO Mol Med* 10, e8791.
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- Gambera S, Abarrategi A, Rodríguez-Milla MA, Mulero F, Menéndez ST, Rodriguez R, Navarro S, García-Castro J. Role of activator protein-1 complex on the phenotype of human osteosarcomas generated from mesenchymal stem cells (2018). *Stem Cells* 36, 1487-1500.
- Cussó L, Musteanu M, Mulero F, Barbacid M, Desco M (2018). Effects of a ketogenic diet on [^{18}F]FDG-PET imaging in a mouse model of lung cancer. *Mol Imaging Biol*. PMID: 29968182.
- Morcillo MÁ, García de Lucas Á, Oteo M, Romero E, Magro N, Ibáñez M, Martínez A, Garaulet G, Arroyo AG, López-Casas PP, Hidalgo M, Mulero F*, Martínez-Torrecuadrada J* (2018). MT1-MMP as a PET imaging biomarker for pancreas cancer management. *Contrast Media Mol Imaging* 2018, 8382148. eCollection 2018. * Corresponding authors.

AWARDS AND RECOGNITION

- Academic Editor, *PLoS ONE* Journal.