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.

**OVERVIEW**

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

**PUBLICATIONS**

- Gámara E, Almendros A, Rodríguez-Milla MA, Muñoz F, Hernández ST, Rodríguez H, Navarro S, García-Castro JR. Role of activator protein-1 complex in the phenotype of human osteosarcoma generated from mesenchymal stem cells. *STEM CELLS* 36, 1487-1500.

**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 CFIEMAT group, granted by the BBVA Foundation, in which we will develop a nanobody produced by cameldids that is labelled with ⁶⁸Ga. 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.