CONFOCAL MICROSCOPY CORE UNIT

Isabel Peset (since December)
Core Unit Head

Technicians
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Titulado Superior (Advanced Degree)

OVERVIEW

One of the main challenges in oncology research is the study of specific markers, expression patterns or individual cells in the tumour environment. Optical microscopy has traditionally been an indispensable tool in cell biology studies and has become essential for understanding cancer biology.

The Confocal Microscopy Unit (CMU) provides the CNIO research groups with the latest advances in optical microscopy, offering access to state-of-the-art equipment and image analysis software, including scientific advice and technical support. The Unit is also actively involved in developing and implementing new advanced imaging methods that could have an impact on the work of CNIO research groups. Advanced microscopy training and science disseminating activities are also an essential component of our mission. We organise courses, talks and visits, always with the aim of increasing our understanding of the cellular and molecular disorders that lead to cancer and the study of potential treatments.

"The CMU is committed to applying advanced microscopy methods to visualise at subcellular level different cancer markers simultaneously, providing a deep understanding of tumour progression and treatment responses."

RESEARCH HIGHLIGHTS

The CMU has continued developing automated imaging technologies applied to confocal and widefield microscopy to improve the high-throughput (HT) of highly resolved visualisation and analysis of different samples.

In 2022, the Unit has focused its efforts on implementing High Content Screening (HCS) methods using the new Opera Phenix Plus HCS microscope installed last year. This instrument is a high-end HCS system equipped with a robotic plate handler and an analysis software, which enables the monitoring of cells processes in multi-well plates of fixed and live samples. Together with CNIO Research Groups, the Unit has developed multi-well plate-based methods to analyse cell cycle profiles, cell viability and mitosis phenotyping studies at high-resolution using the PreciScan feature (object-of-interest-driven acquisition) provided by the system (FIGURE 1A). The platform will also allow 3D HT analysis of organoids or spheroids campaigns and live-cell imaging assays, boosting thereby the screening capacity at the CNIO.

In addition, the Unit implemented a sample navigation application integrated into the SP8 and SP5 confocal systems and Thunder imaging widefield system. This enables fast and semi-automated HT feeding of the instrument, both in multi-well plates (FIGURE 1B) and in tissue sections, including Tissue Microarrays (TMA) (FIGURE 1C). Through this automated acquisition, we can increase the imaging speed and the highly resolved information obtained from a sample.

The Unit is involved in developing image processing and analysis pipelines, including 3D and high content analysis, and helping its users with novel protocol development for sample handling and preparation.

In December, Isabel Peset has joined the CNIO as new Head of the Unit, bringing more than 10 years of experience in implementing optical microscopy methods in cell biology, oncology and drug discovery studies. ■

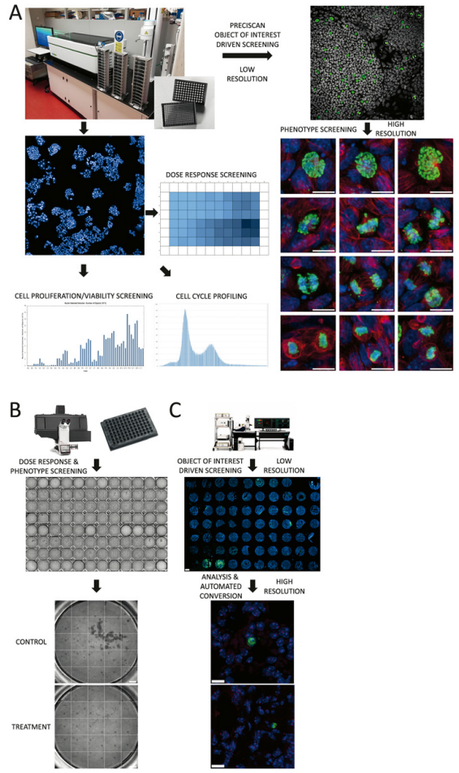

FIGURE 1 Developing automated imaging workflows. (**A**) Examples of HCS methods. Left. HT nuclei detection enables different cellular analysis. Right. Mitotic phenotypic screening using the PreciScan feature. (**B** and **C**) Examples of semi-automated HT feeding. (**B**) Dose response screening with complete well mosaic acquisition. (**C**) Tissue microarray screening with driven acquisition for high-resolution imaging. Data provided by MJ. Bueno, C. Sayago, A. El Bakkali and P. Martínez, respectively.

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