



MIRO: MICRO IMMUNE RESPONSE ON-CHIP



CHALLENGE

Immunotherapies have been touted as the most important improvement in oncology of this century. In the past decade, new breakthroughs in immuno-oncology have slowed down dramatically for several reasons:

- New targets have not been as promising as hoped for.
- **Long-term response rates remain at 20–40%.**
- Better biomarkers to guide treatment decisions remain elusive.

Increasing evidence indicate that the tumour microenvironment (TME) may influence the prognosis and outcome of immunotherapies. The TME is a highly complex ecosystem that includes cellular and non-cellular components and is highly heterogeneous among patients. The composition and organisation of immune cells within the TME are strongly associated with the clinical outcome of cancer patients. Recent studies on the impact of TME composition on immunotherapy resistance offer a glimmer of hope to clinicians and patients alike, who have high hopes for the potential of immune system modulation in cancer treatment. However, the lack of models to analyse the complex scenario of tumour composition clearly limits progress in this field.



MARKET

The global cancer immunotherapy market size reached USD 96.6 billion in 2021. It includes drug development, but also platforms and models for meaningful drug testing. MIRO technology is of interest to companies testing immunotherapy drugs or commercialising models for drug testing. Its microstructured insert is also useful for cell co-culture and allows the expansion of the portfolio of micro-structured cell culture devices or even microfluidic chips for cell co-culture.



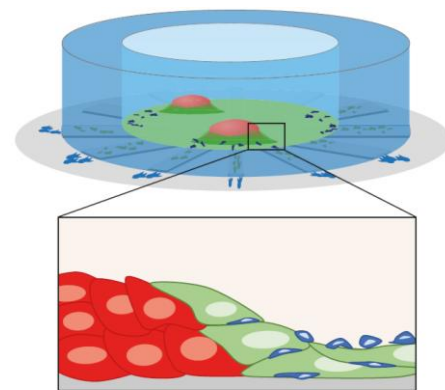
ASSET

IBEC researchers have developed MIRO, a multicellular platform that allows to replicate *ex vivo* structure of the tissue or organ/stroma interface. It consists of a microstructured insert for cell co-culture that mimics the tumour microenvironment, allowing studies on tumour cells or complex tumour structures such as patient-derived tumoroids. Tumour cells can be co-cultured with cancer-associated fibroblasts (CAF) that can be infused from the periphery of the insert and produce the ECM and immune cells.

The system is a platform to assess the effect of immune-related treatment (e.i. immunotherapy, immunomodulators, CAR T-cells, CAR NK-cells) on the tumour, tissue or organ /stroma interface (composition, biomechanical properties and organization).

ASSET VALUE

- Reliable model for the interface between stroma and tumour, organs or tissues.
- Multi-cellular drug testing platform, particularly suited to studying the interface between tumour cells, TME and immune cells.
- Compatible with many microscopy techniques to track immune cells trajectories at the tumour margin.
- Versatile set-up allowing to test solid breast cancer types that create spheroid structures.
- Full compatibility with multi-well plates.



CAF Immune cell Cancer cell Glass

Team

Xavier Trepas – Scientific Leader
 Alice Perucca – Scientific and Business Leader
 Bruno Santos – Tech Transfer Manager
 Eduardo Salas - Head of Tech Transfer

Stage of Development

- Insert microfabrication protocol.
- Testing with breast cancer models established.
- Pilot testing with immunomodulatory drugs.

Exploitation Plan

Patent available for out-licensing.

Intellectual Property Status

Patent pending in the USA, Europe and Canada (priority year: 2022).

USES

- Drug screening/testing to assess immune-related treatments.
- Multicellular complex platform for cancer drug testing focusing on tumour/microenvironment interface.
- Fundamental research on tumour/microenvironment interactions.
- Personalised medicine platform.