The Breast Cancer Clinical Research Unit (BCCRU) focuses on the translational interface of therapeutic development. Breast cancer is a heterogeneous disease and, thus, there are large inter-patient variations in terms of disease course, prognosis, relapse, and resistance to conventional or targeted therapeutics. Our activities are directed towards personalised treatment and range from preclinical models to correlative studies and clinical trials.

Our current research areas are:

- Studying the implications of hypoxia for immunotherapy.
- Understanding the individual factors regulating the response to immunotherapy in breast cancer.

“At the Breast Cancer Clinical Research Unit, we focus on individualising therapy for advanced breast cancer.”

This year, we established a collection of 24 patient-derived tumoroids from breast cancer patients. We call a tumoroid a mix of a patient-derived organoid (a well-established model for cancer research, which perpetuates the tumour material from a given patient, preserving its mutations and general features, and is highly reliable for drug screening and predictive purposes) and the patient’s own immune cells. This sophisticated model allows us not only to screen conventional drugs, but also to understand their impact on the ability of the immune system to reject the tumour, a feature that is absent in common patient-derived mouse models of cancer. Tumoroids enable us to improve our understanding of immunotherapy and to better understand the impact of other drugs on the immune system, allowing for personalised synergistic treatment combinations. This collection is expanding, and we expect this to be the core of our research in the coming years.

Next-generation sequencing panels have become widely used tools to try to allocate and individualise treatments in advanced breast cancer. However, considerable controversies exist regarding their usefulness and the specific niches in which they should be used. We issued practical guidelines for the indication of these tests in advanced breast cancer on the basis of our results with 140 patients analysed using NGS and followed-up for clinical outcomes, proving that there are very few clinical niches that justify the use of these panels for now.

Finally, we completed our work regarding predictive factors of sensitivity to paclitaxel in early breast cancer from the perspective of phospho-proteomics. ACDK4-Filamin A axis that converges in the regulatory machinery of tubulin acetylation is responsible for making cancer cells sensitive to this drug. This pair of markers is highly accurate in predicting sensitivity in the clinical setting.

**REFERENCES**


**ACKNOWLEDGMENTS**

- **CNR and Applied Biological Materials Inc. (ABM) license agreement for the commercial sale of HCTi-FAN1-knockout cells (developed in our laboratory). For non-human research purposes. December 10, 2021.**