

Real breast cancer cells used to print 3D tumour models for clinical trials

A CIC biomaGUNE group creates tumour models to understand how they grow and behave under different conditions

The actual cells were donated thanks to a collaboration agreement with University Hospital Galdakao-Usansolo and Polyclínica Gipuzkoa

Donostia-San Sebastian. 24 September, 2025. A major difficulty in the fight against cancer is the huge heterogeneity of tumours; this is due to the diversity of the types of cells affected and the presence of mutations that give cancer cells different mechanisms to continue reproducing, escape the immune system and become resistant to different therapies.

To better understand how these tumours grow and behave under different conditions, researchers in the [Bionanoplasmonics](#) group at CIC biomaGUNE are creating *in vitro* 3D models of tumours in the most realistic environment possible; that way, the results obtained traditionally using cell culture plates (2D) can be significantly improved and animal experimentation can be reduced.

This line of research, which has received funding from the European Research Council (ERC) as part of a Proof of Concept, stems from the need to improve the success rate of preparations that are being explored and developed to fight different types of cancer. Only around 4% of preparations explored in human clinical trials as potential cancer treatments are ultimately launched as medicines. "We want to achieve greater efficiency in the preclinical *in vitro* phase so that the preparations that reach clinical trials using patients have a greater chance of success," said the Ikerbasque Research Professor Luis Liz-Marzán.

Advanced 3D printers

So the CIC biomaGUNE team uses its advanced equipment to print three-dimensional tumour models "that contain both cancer cells and other cell populations that are present in actual tissue, as we know that the tumour environment is highly significant", said research associate Malou Henriksen.

To run this project, CIC biomaGUNE is collaborating with University Hospital Galdakao-Usansolo to obtain material extracted from biopsies of women with breast cancer, and with Policlínica Gipuzkoa to obtain healthy breast tissue from women undergoing breast reduction surgery.

In the lab, "we isolate the cells from these biopsies and culture them in plates containing the nutrients they need to grow so that we can use them in the three-dimensional models", explained Henriksen. Then in the breast reduction samples "we remove all the cells from healthy breast tissue to end up with the extracellular matrix, which contains proteins such as collagen and hyaluronic acid and serves as a support for producing new tumours in 3D".

To mimic the tumour architecture, the CIC biomaGUNE team uses advanced 3D bioprinters: “The ‘toner’ is a blend of that extracellular matrix obtained from healthy breast tissue and other biomaterials that allow us to print with the characteristics needed to reproduce real tumours,” she added. Next, cancer cells obtained from biopsies are added to this support material and the 3D tumours are cultivated “in multi-well plates in order to obtain a large number of replicas and allow tests with different drugs and under different conditions to be conducted”, specified Henriksen.

The CIC biomaGUNE team succeeded in creating models using breast cancer tumour cells. The researcher stressed that “the aim is not to work with a tumour mass, but with what are known as ‘organoids’, which are small clusters of different types of cells”.

Going forward, in addition to being used to test different drugs and assess their efficacy, this technology could be used to test, before starting the therapy, whether a particular approved treatment may be valid for treating a patient, thus helping to provide a more personalised approach.

Right now, the CIC biomaGUNE team is working to “turn this project into a spin-off enterprise called Onkoreplica, so that these innovations can be used by other research groups and the pharmaceutical industry in the development of new therapies”, said the researcher Paula Vázquez-Aristizabal, who is in charge of developing the spin-off. She added that “in the future, the spin-off could explore other types of solid tumour models, in addition to breast cancer models”.

About CIC biomaGUNE

The Center for Cooperative Research in Biomaterials [CIC biomaGUNE](#), member of the Basque Research and Technology Alliance ([BRTA](#)), conducts state-of-the-art research at the interface between Chemistry, Biology and Physics, devoting particular attention to studying the properties of biological nanostructures at the molecular scale, and their biomedical applications. It was recognised in 2018 as a “María de Maeztu” Unit of Excellence for meeting requirements of excellence, which are characterised by a high impact and degree of competitiveness in its field of activity on the global scientific stage.