PhD week 15-19 Aprile 2024

UNIVERSITÀ DEGLI STUDI DI BRESCIA

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GENETICA MOLECOLARE, BIOTECNOLOGIE E MEDICINA SPERIMENTALE

Bioprinting of mammary tissue derived from induced pluripotent stem cells (iPSCs) wild type or with BRCA1/2 mutations.

Introduction to Breast Cancer

Breast cancer, a prevalent health concern worldwide, is characterized by the uncontrolled growth of cells in breast tissue. This disease, commonly affecting women, can develop in milk ducts or glands and has various risk factors including genetics, hormonal influences, and environmental exposures. Our research at the "Angelo Nocivelli" Institute for Molecular Medicine, Department of Molecular and Translational Medicine, University of Brescia explores innovative ways to combat this disease. We aim to enhance our understanding of breast cancer and pave the way for new, effective treatments.

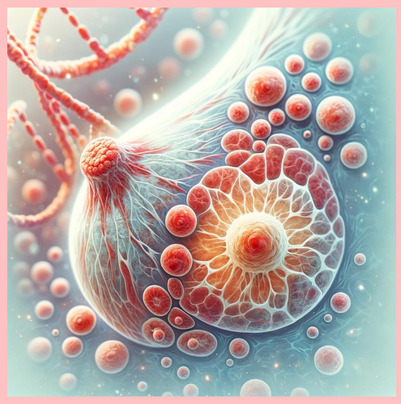
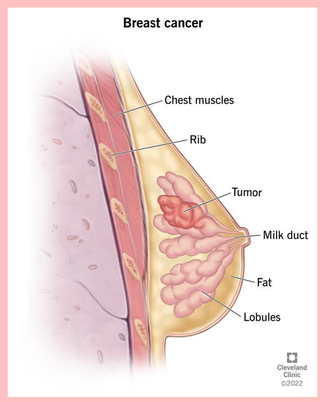
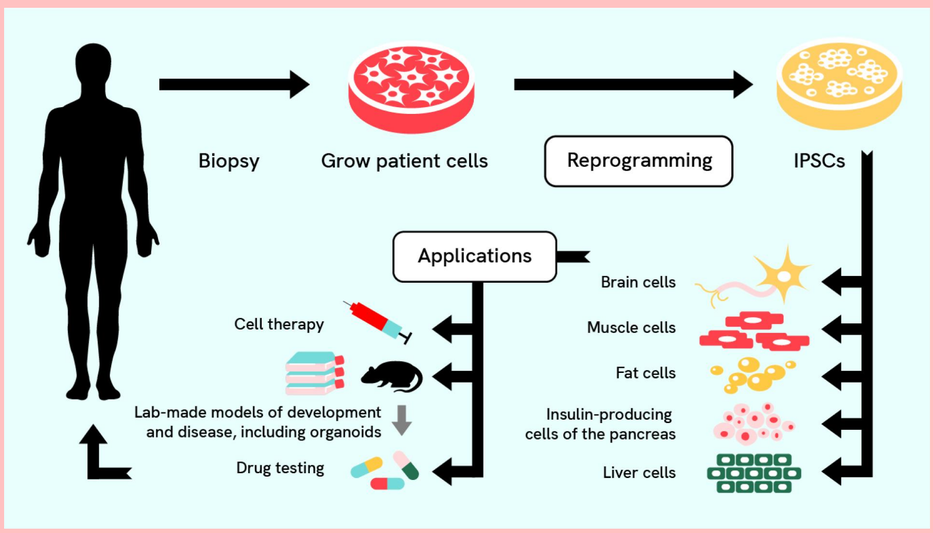


Illustration of Biological Cells and Vascular Structures in Detail. Generated by AI



Anatomical Illustration of Breast Cancer Development in Human Tissue Cleveland Clinic 2022



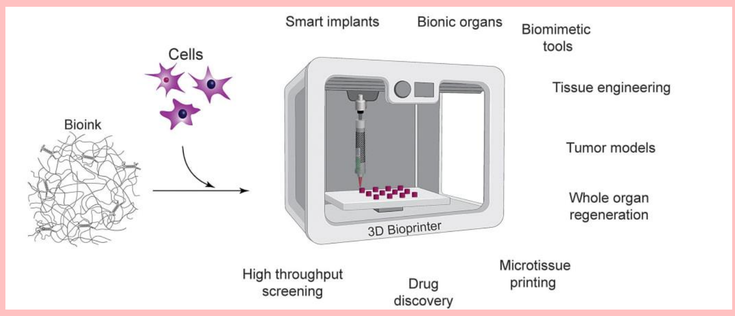
The Process and of Induced Pluripotent Stem Cells (iPSCs) in Regenerative Medicine Applications. Beike Biotechnology, 2023

The Role of Stem Cells in Research

The Role of Stem Cells in Research," we delve into the fascinating world of stem cells, particularly focusing on induced pluripotent stem cells (iPSCs), which are at the forefront of revolutionary medical research. These unique cells are derived from adult cells and possess the remarkable ability to transform into any cell type in the human body. Imagine having the power to create any kind of cell needed for health and treatment – that's the promise of iPSCs! In the context of breast cancer, these cells open up new possibilities for understanding the disease and developing targeted therapies.

From Cells to Tissue

From Cells to Tissue," we explore the fascinating process of transforming stem cells into mammary tissue, a cutting-edge development in medical research. This journey begins with special cells known as induced pluripotent stem cells (iPSCs), which are remarkable for their ability to morph into any type of cell in the human body. By carefully manipulating these cells, scientists can coax them to develop into breast tissue, mimicking the complex structures found within the human body. This technique, known as bioprinting, uses advanced technology to precisely arrange cells in three-dimensional structures, crafting tissue that closely resembles natural mammary glands. This breakthrough holds tremendous potential for understanding breast cancer and developing new treatment strategies.



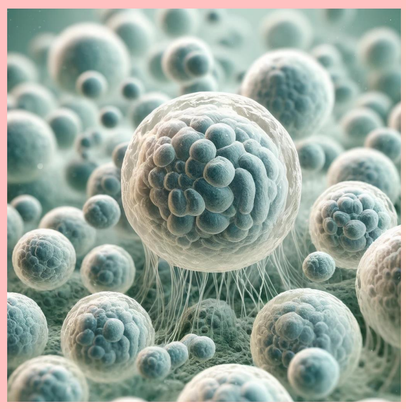
Applications and Technologies in 3D Bioprinting for Biomedical Research Modified from Kaivalya A et al., 2020

Diverse Applications of Induced Pluripotent Stem Cells in Medical Science Global Induced Pluripotent Stem Cell (iPSC) Industry, 2023 Report

Understanding Genetic Mutations

In our journey to understand breast cancer, one crucial element stands out: genetic mutations, specifically in the BRCA1 and BRCA2 genes. These genes, when functioning normally, play a significant role in suppressing tumors by repairing DNA. However, mutations in these genes can lead to a higher risk of developing breast and ovarian cancers. Our research delves into how these mutations influence the development of breast tissue.

By using advanced techniques to study cells derived from induced pluripotent stem cells (iPSCs), we are exploring how these genetic changes can affect breast tissue development and cancer risk.



Microscopic View of Stem Cellular Structures: A Cluster of Cells and Their Interconnections
Generated by AI

Potential Impact of the Research

This research carries significant potential to revolutionize our approach to breast cancer treatment. By exploring the capabilities of induced pluripotent stem cells (iPSCs) in developing mammary tissue, especially with specific genetic mutations like BRCA1/2, we're stepping into a new realm of personalized medicine. Imagine a future where therapies are tailored to an individual's genetic makeup, drastically improving the effectiveness of treatment. This isn't just about creating laboratory models; it's about paving the way for groundbreaking therapies that could one day turn the tide against breast cancer. The work being done here could lead to earlier detection methods, more targeted treatments, and a deeper understanding of how breast cancer develops and progresses. Ultimately, this research isn't just a scientific endeavor – it's a beacon of hope for millions affected by breast cancer, promising a future where this disease can be managed more effectively and treated more successfully.