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Biology of human breast adipose stromal cells

Kevin Campbell*

Department of Biology, Pace University, New York, United States

*Corresponding author. E-mail: kevincamp@pau.edu

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ABOUT THE STUDY

Breast cancer is primarily initiated and progressed by the tumour microenvironment, which is influenced by a variety of factors including macrophages, endothelial cells, and immune cells. The significance of adipose tissue in the aetiology of breast cancer is poorly understood, despite the fact that many of these contributions are well known. Adipose tissue, an endocrine organ, makes up the majority of the breast's stroma. Adipose Stromal Cells (ASCs), which are stem cells, are crucial for the development of adipocytes, chondrocytes, and osteocytes. ASCs can also play harmful activities, such as releasing inflammatory cytokines, causing tumour cell migration, and shielding components of the extracellular matrix.

Senescence-Associated Secretory Phenotypes, a growth-arrested condition accompanied with these pro-tumorigenic activities, are frequently seen during cellular senescence. Obesity and metabolic diseases have been recognised as the main causes of senescence in previous studies on abdominal adipose tissue, but the effects of these conditions on breast ASC biology have largely gone unstudied. The Deoxyribonucleic Acid (DNA) repair enzymes Ricinus Communis Agglutinin (RCA1) and Breast Cancer gene (BRCA2) increase a woman's lifelong chance of developing breast cancer when they are mutated. In a prior study, we found that BRCA1 mutations damage DNA not just in breast epithelial cells, which, when converted, promote the establishment of tumours, but also in Breast Adipose Cells (BASCs)(bASC).

A growing area of study is the relationship between adipose tissue and the development of cancer. Leading theories suggest that inflammatory cytokines released by ASCs and persistent inflammation may act as a catalyst for the spread of breast cancer. The majority of earlier research has solely described the biology of ASCs from the abdomen. However, adipose tissue from various body regions can exhibit incredibly diverse biologies. Although patients undergoing weight loss surgery can easily collect abdomen ASCs, our lab has placed a higher priority on isolating and characterising breast ASCs from women undergoing mastectomies.

Transforming growth factor (TGF) and IL-6 have both been linked to the inhibition of adipogenesis. Even though patient G's bASCs released the most IL-6, they were still able to differentiate into adipocytes. Similar to this, only patient E's bASCs showed an adipogenesis deficiency despite secreting the highest quantities of TGF. These results do not suggest a connection between a deficiency in adipogenesis and bASC secretion of a particular cytokine.

There are numerous risk factors for breast cancer during the course of a person's lifetime. Race and post-menopausal women's obesity are both strongly linked to an increased risk of breast cancer. Depending on age, obesity has been linked to either an increased or decreased risk of breast cancer. Additionally, African American women have a higher lifetime chance of acquiring breast cancer than women of other races. The majority of research has been on finding elements of the immune microenvironment or factors that affect the biology of breast epithelial cells and are linked to an increased risk of breast cancer.

Adipose biology has a large potential to increase the risk of breast cancer given that the breast contains a sizeable amount of adipose tissue. Only five samples from obese women and two samples from women of African American descent were in our bASC repository. We were unable to find any correlations between racial-driven bASC aberrant biologies or obesity due to insufficient power. Investigating disparities in the biologies of bASCs from AA and Caucasian women that may contribute to racial differences in breast cancer risk will be a top goal as we expand the size of this bASC repository.

The biology of breast adipose tissue from women who are at a greater risk of breast cancer could potentially provide new targets for breast cancer treatment. Senolytic drugs, for instance, may lower the risk of breast cancer by concentrating on pathogenic senescent breast adipose tissue in high-risk patients. Breast adipose tissue may be an active, potentially modifiable component of the breast cancer microenvironment and a novel risk marker as well as a future prevention target for breast cancer, despite the fact that numerous aberrant signalling pathways in mammary epithelial tissue contribute to cancer development.