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Exploring tissue engineering

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Exploring Tissue Engineering

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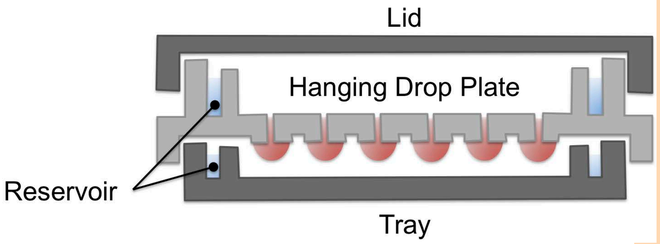
Cell Spheroids

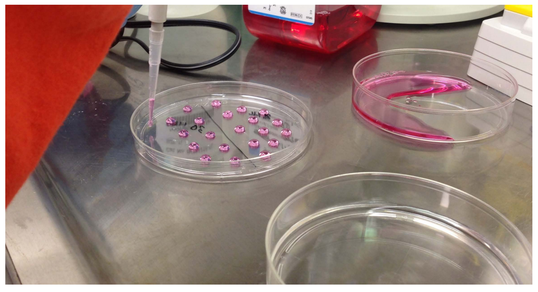
Objectives

In order to mimic the cancer environment and gain insight into cancer biology, a reliable method of constructing 3D cell cultures must be developed. 3D spheroids of cells provide a more accurate representation of in vivo conditions and retain more of the cell to cell interactions that 2D monolayer cultures lack. Our research is focused specifically on trying to mimic the human breast cancer environment by co-culturing human breast cancer cells (MCF7) with fibroblasts.

Materials and Methods

Over the past several months, the team developed cell cultures using 2-dimensional techniques to build experience in cell culturing techniques and methods. 3-dimensional culturing cells via the upside-down culturing technique on a petri dish and the hanging drop plate followed to determine which culturing technique produced the best spheroids. After determining the best procedure for creating spheroids, cell density was altered to develop an understanding of the relationship between spheroidicity and cell starting cell density. In the near future, the team will test new ideas and modifications to spheroid culturing techniques to improve predictability of spheroid and develop ideas for maintaining inner-cell viability while also exploring culturing techniques to co-culture human breast cancer cells and fibroblasts to mimic breast cancer environment.





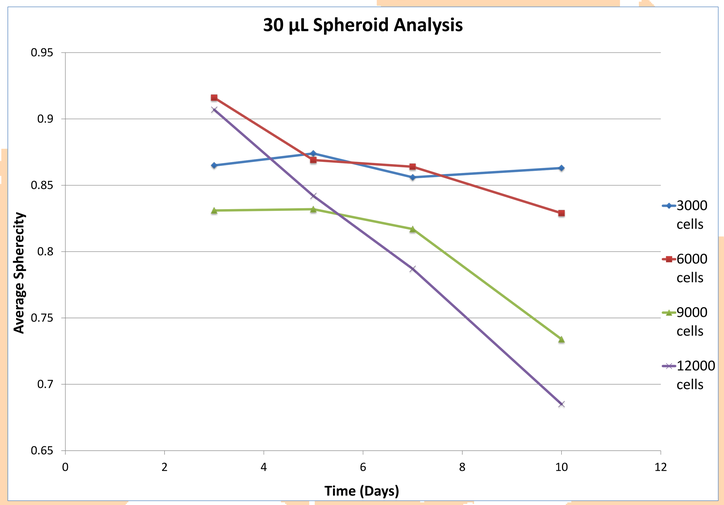


Figure 1: This graph displays the average sphericity of 30 µL spheroids over a 10 day period at various cell densities

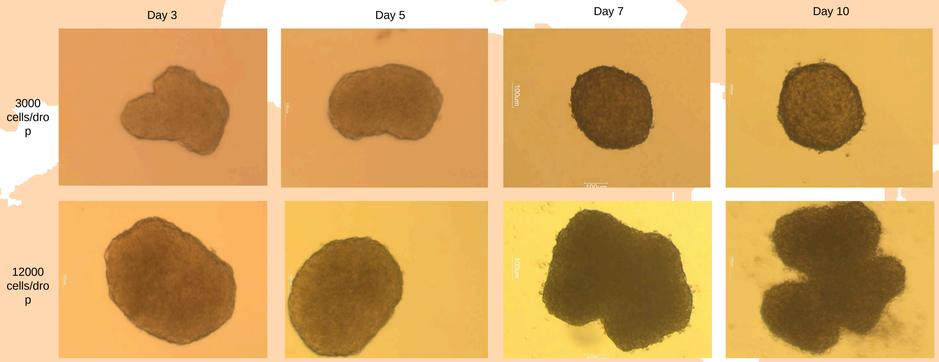


Figure 2: These images display a timeline of the formation of spheroids at the cell densities of 3000 cells and 12000 cells over a 10 day period

Future Direction

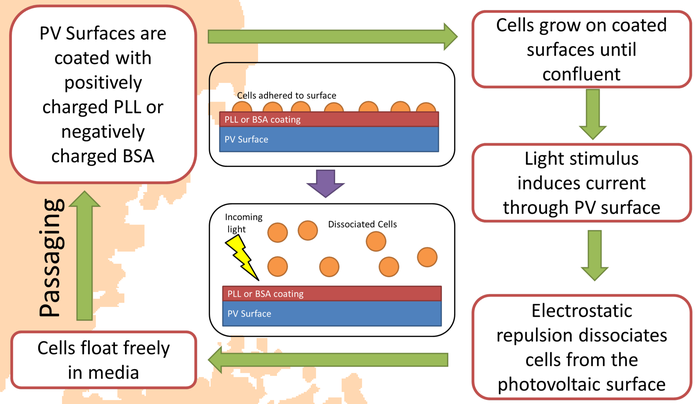
In the near future, we plan to continue our research with spheroids by co-culturing several different cell lines that are common in human cancer tumors. By mimicking the microenvironment and applying the known physiology of human cancer tumors, we can attempt to recreate the tumors *in vitro* and test anti-cancer treatments. The next step for photovoltaic devices is sterilization for culture, then coating with PLL and BSA. The devices will then be prepared for cell culture.

Culture on Photovoltaic Surfaces

Objectives

Eliminating the need for trypsin in cell culture would allow the study of living cells without subjecting them to enzymatic degradation. Culturing cells on protein coated photovoltaic surfaces and dissociating them using electrostatic repulsion of charged proteins from an induced current could replace trypsinization in cell culture procedure.

Materials and Methods



When the photovoltaic devices were originally submerged in media, the liquid permeated to the electronic layer and compromised the electric current producing elements of the device. To overcome this problem, devices were sprayed with Krylon Crystal Clear Acrylic Spray Coating. The open circuit voltage was compared between coated and uncoated cells.

Figure 4: Solar Cells from RadioShack. Coated with Acrylic Spray Coating(left) and uncoated.(right).

Open Circuit Voltage:

Acrylic Coated	344 mV
Uncoated	384 mV

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