INSTITUTE FOR CELLULAR ENGINEERING

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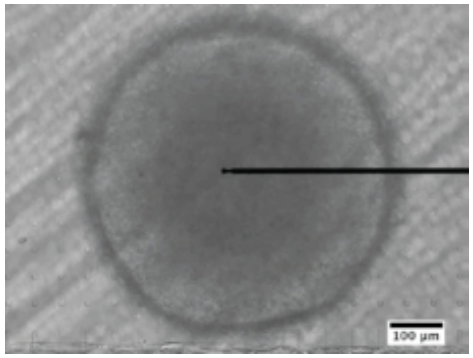
Quantifying the Effects of Precise Oxygen Delivery to Hypoxic In-vitro Tumor Tissue



Hypoxia is one of the major characteristics of tumors. In an attempt to better understand and quantify the effects of hypoxia/oxygenation on tumors, we developed a device that allows spatial as well as temporal control of local oxygen deliveries within in-vitro tissues. The device employs electrolysis of water as the means of generating oxygen. It can be used to study the effects of localized oxygen delivery on a wide range of tissues and cell samples. Preliminary data generated using this device shows that oxygen is a strong determinant of cell viability in tumors.

Developing tumor-mimicking microfluidic bioreactors to study therapeutic bacteria

Poor penetration, lack of selectivity, and excessive cytotoxicity are some of the limitations of current chemotherapeutics used to treat tumors. Therapeutic bacteria have the potential to overcome these limitations, as they possess the ability to actively migrate into the tumor tissue and can be genetically modified to have an enhanced selectivity towards tumors. In-vitro 3-D tumor models provide a quick and effective way of testing therapeutic bacteria for their efficacy. We have developed a microfluidic device that allows tumor cell mass to be grown within a micron-scale chamber and experience linear nutrient gradients within, that mimic the gradients that exist in in-vivo tumors. My current work focuses on using such a device to evaluate the efficacy of various therapeutic bacteria.

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