Cell Growth and Viability on Silica Microtoroid Resonators

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Introduction

Understanding how cells react to the environment and interact with each other is a critical component to developing improved therapeutics. The conventional method of studying cell behavior is to use fluorescence microscopy, where dye molecules are attached to specific regions of the cell, allowing them to be imaged. However, this approach is very time consuming and can have unforeseen negative effects on the life and function of the cell. An alternative method uses silica microtoroid resonators to monitor the cells' behavior. These devices show promise for the application of observing and monitoring cell function, thus eliminating the need for dye molecules. The goal of this research project was to test the compatibility of silica microtoriod resonators with living cells, replace the current fluorescent microscopy method and provide researchers with an easier approach to observing living cells and bacteria.

Methods

The viability and proliferation of Pombe bacteria cells and Bovine Aortic Endothelial cells were tested after applied to a hydrogel coated silica wafer. These cells were used as an initial robust test before using a more fragile HeLa cell line. To ensure the cells' compatibility with the silica wafers, the cells had to adhere to the hydrogel coated surface, survive the incubation period with the supplied nutrient media, be uncontaminated by bacteria, and proliferate. Once the cells proved compatible with the silica wafers, the cells would be tested on the silica microtoroid resonators.

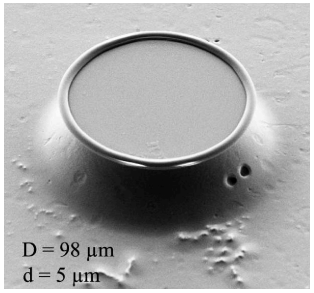

Figure 1: Image of a Toroidal Resonator

Results

The living cells died when applied to a hydrogel coated silica wafer. Most likely, the cells died due to starvation during the 48-hour incubation period. The cells did not adhere to the silica wafer indicating that they were not compatible with the wafer and the specific hydrogel used. Contamination of the Endothelial cells also occurred preventing isolation and proliferation of only the target cells.

Future Work

To prevent the starvation of the cells during the incubation period, a more nutrient rich surface media must be used. A rougher hydrogel should also be tested to provide the cells with more surface variation to adhere to the wafer. In order to prevent contamination of the Endothelial cells by bacteria, an antibiotic containing hydrogel can be used.

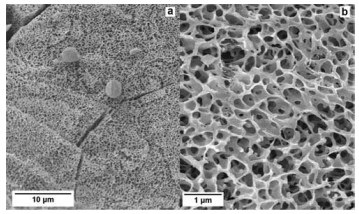

Figure 2: Image of Sample Hydrogel.

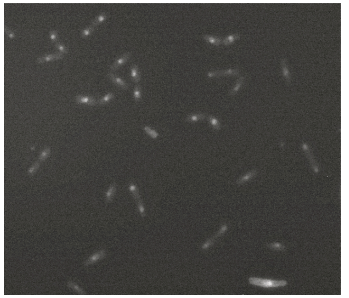

Figure 3: Image of Pombe Bacteria Cells applied to Hydrogel Coated Silica Wafer after 48 hours of incubation.

Acknowledgements

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