Detection of Mass, Growth Rate, and Stiffness of Single Adherent Cells Using Silicon Pedestal Sensors

Elise A. Corbin, Mechanical Science and Engineering

Co-Advisers: Rashid Bashir, Electrical and Computer Engineering/Bioengineering

Hyun Joon Kong, Chemical and Biomolecular Engineering

Key Research Aims and Goals

To study and characterize the mass of an individual cell.

Research Highlights and Results

- Recently, our group developed an improved MEMS resonator sensor that can be used to directly measure the biophysical properties, mass, and growth rate of single adherent cells (Fig. 1).
- Decoupling the relationship between the cell's dynamics and the apparent mass reported by the sensor is of utmost importance. Hydrogels with tunable stiffness and mass are used to achieve higher understanding of our measurement system.

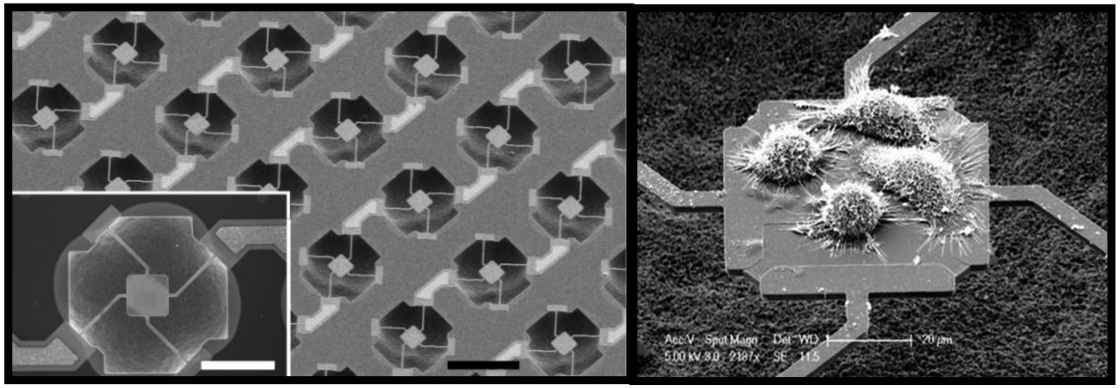

Fig 1 (left) SEM image showing a sensor array; an individual sensor is shown in the inset.[1] (right) HT-29 (Human Colon Cancer) cells are captured on a pedestal sensor.[1]

Future Research Plans

- To investigate how a neuron's mass changes with the rate of cell growth through the cell cycle. Such measurements have the potential of elucidating the cellular growth patterns.
- Explore the cell mass of different cell lines, before and after fixation. As the previous work has shown that the measured apparent mass in human colon cancer cells (HT29) is greater for fixed cells than for the corresponding live cell.[1] This demonstrated that the measured apparent mass is a function of the stiffness.

[1] K. Park, R. Bashir et al. Measurement of adherent cell mass and growth . PNAS. 2010;107:20691–6