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STUDYING THE NON-SPECIFIC SURFACE ADHESION OF CANCER CELLS: A NOVEL WAY TO CHARACTERIZE AND UNDERSTAND CANCER METASTASIS

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Cancer deaths are mostly caused by the metastasis of the malignant cells, not by the parent tumor itself. During metastasis, cancer cells detach from the parent tumor, spread to different tissues via blood circulation or lymph system, and reattach to invade new tissues and organs. Adhesivity plays a crucial role throughout the metastasis process.

In this project, we hypothesize that cancer cells manage their invasion by changing their surface adhesivity. To study the cell surface adhesivity, a novel and versatile microelectromechanical systems (MEMS) force sensor is developed to quantify the strength of adhesion between living cancer cells and a probe. The Silicon sensors consist of a probe with cross section: 5 um x 7.7 um, and 2 flexible cantilever beams with dimension: 2.1 um x 7.7 um x 3 mm. The probe is used to contact the cell and the flexible beams are used to measure the cell force response in the range from nN to uN. The spring constant of the sensor is 14 nN/ mm. The probe approaches the cancer cells horizontally and remains in contact with it for 2 minutes. The probe is then pulled back when the cell force is measured from the deflection of flexible MEMS beams, which is measured from optical images.

Our preliminary results demonstrate that the aggressive HCT-8 cells (from human colon adenocarcinoma) show high non-specific adhesivity when they aggregate into cell islands, and low surface non-specific adhesivity after they disassociate from the cell islands. The surface adhesivity of less aggressive Caco-2 cells (from human colon carcinoma) and normal MA104 cell (from monkey kidney) are found to be lower than that of before-disassociation HCT-8 cells.