

Measuring Elastic Property of Primary Acute Lymphocytic Leukemia Cells with Integrin $\alpha 6$ Antibody Using Single Beam Acoustic Tweezers

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Background, Motivation and Objective

Mechanical interactions of cells are fundamental features of regulating various physiological processes and are associated with aggressive levels of malignant cells, so measuring cell mechanics plays a crucial role in quantitative cell biology. Single beam acoustic (SBA) tweezers is a powerful tool utilized to quantify global elastic properties of a single cell in a contactless manner. On the other hand, relapse of acute lymphocytic leukemia (ALL) is an unfortunate outcome for patients. The failure of treatment is typically a result of cell drug resistance. Adhesion of leukemia cells to bone marrow stromal cells has been shown to promote survival of ALL cells during chemotherapy treatment. We have shown previously that interruption of this cell-cell interaction using antibodies against adhesion molecules including integrin $\alpha 6$ can overcome this resistance mechanism; however, the mechanical properties of ALL cells resulting from antibody treatment are still unknown. In this pilot research, we investigated the elastic property, deformability, of a type of the primary ALL cell associated with an antibody against integrin $\alpha 6$ using SBA tweezers.

Statement of Contribution/Methods

A 30MHz single beam transducer with 1.08 of f-number was employed to the acoustic tweezers system. The signal generator was utilized to provide serial voltages of burst signals transmitted to an RF power amplifier to drive the transducer. The 1% of duty cycle and 1KHz of pulse repetition frequency (PRF) were selected to provide the range of 0 to 0.89MPa acoustic pressures exerting on the cells. The elastic property of ALL cells was observed by using an inverted microscope equipped with a 10X objective. The primary LAX56 ALL cells were co-cultured with murine stromal cells as a standard procedure. An antibody against integrin $\alpha 6$ was used to treat leukemia cells for 7 days. All the observed experimental results were recorded by CMOS camera and analyzed by ImageJ 1.51j8.

Results/Discussion

The preliminary results demonstrate that treated primary ALL cells with the anti-integrin $\alpha 6$ antibody can de-adhere ALL cells from the stroma cells, which lead to decrease the elastic property. These interesting results suggest that the adhesion-mediated protection from stroma cells associated with increased chemoresistance might be related to increased deformability of ALL cells. The elasticity of different types of ALL cells treated with chemotherapeutic agents and/or antibodies against integrins will need to be studied in the future by using SBA tweezers. Atomic force microscope (AFM) can also be applied to the experiment to obtain a reference dataset.