Microtubule-Mediated Behavior of Vinculin Knockout Breast Cancer Cells in Confined Migration

Jonathan Gonzalez[1], Jenna Mosier[2*], & Emily Fabiano[3*]
**Department of Biomedical Engineering, Vanderbilt University, Nashville, TN 37235, USA*

Abstract

Cancer is the second leading cause of death in the United States. Cancer progression requires the migration of tumor cells away from the primary tumor into the surrounding microenvironment to form tumors throughout the body. Migration is a dynamic process that requires the coordination of multiple cytoskeletal elements. Microtubules, a key cytoskeleton component, aid in the structure of the cell body, as well as trafficking key components of the cell throughout the cell body. On the other hand, the focal adhesion protein, vinculin, acts as a mechanical linker between the surrounding matrix and the cell cytoskeleton. While the individual roles of microtubules and vinculin has been studied thoroughly, how they interact to contribute to cancer cell migration and behavior is still not fully understood. To assess this relationship, we generated a vinculin knockout cell line with CRISPR/Cas9 and will use these cells with a live cell microtubule probe to measure microtubule dynamics when vinculin is disrupted. When vinculin is disrupted, while cell migration speed in confinement is not significantly decreased, migration directionality is disrupted. Using nocodazole and taxol, pharmacological inhibitors of proper microtubule activity, we plan to study how cells navigate confined spaces without the use of vinculin or microtubules to determine their coordinated role in cancer cell migration. Because microtubule inhibiting cancer treatments on the past have shown little clinical success, we aim to understand if compensatory mechanisms, or other cytoskeletal components, contribute to cancer cell behavior, to improve the development and success of cancer therapeutics targeting microtubules.

Biography of Presenter

My name is Jonathan Gonzalez, and I am a rising junior at the University of Puerto Rico at Mayagüez studying mechanical engineering. Through my education journey, I have had the opportunity to join the research team IDDEAS and optimize patient waiting time at a cardiologist's office. We collected and analyzed 514 samples at 20-min intervals to improve patient waiting time by 25% and reception utilization by 75%. Further, I shadowed the creation of A3B, an emergency ventilator with the aim of being the first FDA-approved ventilator in Puerto Rico. I am currently an REU student at the Vanderbilt VINSE program where I investigate microtubule-mediated behavior of vinculin knockout breast cancer cells in confined migration. After completing my degree, I aspire to become a Ph.D. in biomedical engineering to further my contributions to healthcare.