



**Evaluation of Circulating Tumor Cell Technology (CellSearch®) to Detect PD-L1 Expression in Metastatic Non-small Cell Lung Cancer Patients with Malignant Pleural Effusions**  
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With grant support from the spring 2016 Pincus-Magaziner Family Undergraduate Research and Travel Fund through the College Alumni Society Grant, I conducted research under Dr. Erica Carpenter, Research Assistant Professor of Medicine in the Division of Hematology/Oncology and Director of the Circulating Tumor Material Laboratory of the Perelman School of Medicine at the University of Pennsylvania. This has been the second summer I have spent in the Carpenter Lab, and my primary project focusing on non-small cell lung cancer (NSCLC) under the guidance of Dr. Jeffrey Thompson, pulmonary fellow at the Perelman School of Medicine, has been a continuation of my work during the 2015-2016 academic year.

In many cancers such as non-small cell lung cancer (NSCLC), tumors shed intact, often viable tumor cells known as circulating tumor cells (CTCs) into the bloodstream that can seed distant metastatic sites in the body. Using the CellSearch CTC enrichment system, these cells can be isolated from blood and analyzed for specific genetic biomarkers that could potentially predict therapeutic efficacy of treatments in patients.

The PD-1 (programmed cell death 1) receptor is found on a subset of white blood cells called T-cells. When PD-1 is ligated by the PDL-1 receptor found on tumor and some white blood cells, T cell anti-tumor activity is down-regulated, thus thwarting the patient's immune response to cancer. By blocking this receptor with certain novel drugs, T-cells are activated and can actively kill tumor cells. While PD-L1 expression on tumor cells has been correlated with higher response rate to these drugs, conventional procedures of PD-L1 detection from primary NSCLC tumor biopsies suffer from limited reliability and surgical inaccessibility. These obstacles necessitate the development of a more accurate and standardized methodology to non-invasively predict therapeutic efficacy in patients.

CellSearch offers a potentially more specific and less invasive alternative detection method for PD-L1, especially through characterization of CTCs present in malignant pleural effusions (MPE), or excess lung fluid which is often a complication of advanced stage lung cancer. Lung cancer CTCs have a significantly greater rate of detection in MPE, when compared to blood samples. We hypothesize that CellSearch can be used for the effective detection of PD-L1 expression on CTCs present in MPE of patients with metastatic

NSCLC and represents an accurate surrogate for determination of tumor PD-L1 levels in malignant cells present in pleural effusions and in the primary lung tumor.

My experience this summer helped me expand my understanding of clinical cancer research and proved rewarding with the integral roles I was responsible for on this project and in the lab. I look forward to continuing my work in the Carpenter lab in the upcoming school year, and I am grateful to Dr. Carpenter, Dr. Thompson, and CURF for their support and for providing this great opportunity.