Medical-grade microbubbles can be utilized as biomarkers to identify the onset and cellular proliferation of certain invasive diseases. For example, diabetic kidney disease, if left untreated, leads to the accumulation of harmful toxins in the bloodstream. This research project, inspired by the apparent differentiation of endothelial cells lining blood vessels during disease, sought to verify microbubbles as a biomarker that would adhere to diseased cells and provide a means for a more proactive diagnosis.

This semester's research efforts involved learning how to create fluorescently tagged microbubbles, understanding their behavior in fluidic conditions, and analyzing the initial relationship between untagged microbubbles and unmodified endothelial cells. Human umbilical vein endothelial cells, as well as an Ibidi flow chamber, were employed to mimic physiologically relevant blood vessel conditions. Suitable concentrations of both microbubbles and cells in media were verified to ensure compatible and favorable microbubble-cell interactions.

Future directions for this project will involve modifying the microbubbles with ligands and developing an interaction assay to determine how efficiently microbubbles adhere to endothelial cells that express receptor proteins for these ligands. Additionally, the methods utilized in this project could apply to the diagnosis of certain cancers.