BB 610
Team 3
Topic: ‘Lab-on-a-chip for cancer detection’

Motivation & Rationale

The goal of this project is to investigate a new and innovative method for the early detection of ovarian cancer using exosomes found in plasma. Ovarian cancer is a terrible illness that kills millions of women globally and is the fifth greatest cause of death from cancer among American women. Unfortunately, the present approaches for ovarian cancer diagnostics frequently lead to a diagnosis at a late stage, lowering the likelihood of effective therapy. This highlights how direly needed improved, non-invasive approaches for early diagnosis are.

Blood and ascites contain tumor-derived exosomes, which have demonstrated potential as diagnostic indicators for cancer early detection. These exosomes have a great deal of potential to offer a non-invasive method of early cancer detection. However, the sensitivity and specificity of the methods used to detect these markers are still inadequate, making them unreliable for early cancer diagnosis. There is an increasing interest in creating new instruments for the ultrasensitive detection of disease-specific biological particles in physiological fluids, particularly the detection of tumor-associated exosomes in plasma, in order to solve this problem.

In this study, our team uses a microfluidic device made of self-assembled three-dimensional Herringbone nanopatterns to examine the viability and potential of a novel approach for detecting low amounts of tumor-associated exosomes in plasma. The efficiency and speed of exosome binding are improved by these nanopatterns, which also increase surface area and encourage microscale mass transfer. This ground-breaking device can identify exosomes that would normally be undetected using conventional microfluidic systems because it encourages particle-surface interactions and lowers near-surface hydrodynamic resistance.

Our objective is to evaluate the viability and application of this method for the detection of exosome sub-populations in plasma samples from patients with ovarian cancer and healthy individuals. The results of this initiative may significantly advance ovarian cancer diagnosis techniques and aid in the fight against one of the world's deadliest diseases. We are aware of how terrible cancer is having lost family members to it. We want to learn more about non-invasive early cancer detection and make a contribution to it so that those who are affected can receive treatment as soon as possible without suffering negative effects on their general physical and mental health.

By successfully completing this study, we want to move closer to figuring out how to diagnose ovarian cancer early and accurately, which will improve the likelihood that patients who are diagnosed with the deadly disease can receive successful treatment and survive.