MicroMCED: A Novel PoC SERS PNA-Probe Multicancer Early Detector

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MicroMCED is designed to bring routine multicancer screenings to more people with an accessible point of care blood test. Current screening tests require expensive specialized equipment that isn't always available, and often drives up costs, making routine population screenings hard, missing many cancer cases. MicroMCED uses surface-enhanced Raman spectroscopy combined with a peptide nucleic acid probe system to detect miRNAs linked to cancer in serum samples. This system is currently set up to detect biomarkers associated with lung cancer, breast cancer, and colorectal cancer. To test the efficacy of this approach, simulated serum samples were used, with a baseline simulated serum with biomarkers spiked in at concentrations similar to what is seen in serum samples for patients with and without the cancers. This was run for 200 trials, 50 for each cancer and 50 for the control case. The device had an 86.67% sensitivity and a 72% specificity. The total cost of the device is $970. This surpassed my goals of 80% sensitivity and 70% specificity at under $2000. This shows that the concept of practical affordable point of care methods to detect miRNA biomarkers is feasible, particularly with a multi-cancer early detection system. This could bring early cancer detection screenings to many more people, if brought to the real world. To further this, some more research is needed with human serum samples to tackle further real world concerns.

Awards Won:
International Council on Systems Engineering - INCOSE: Certificate of Honorable Mention, a 1-year free student membership to the INCOSE, and free virtual admission to the 2022 International Symposium of the INCOSE
NC State College of Engineering: Scholarship to attend NC State Engineering Summer Camp