West Virginia University

C. EUGENE BENNETT
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Electrophysiological Characterization of Cancer Immune Cells for Non-invasive Diagnostics

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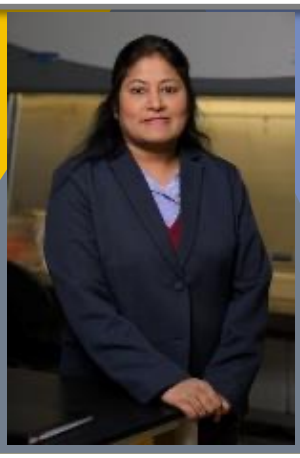
Electrokinetics, the phenomenon of using electric fields to direct the motion of particles, has been a useful tool in microfluidics. Combining this phenomenon with dielectrophoresis, the induced motion of particles under electric field gradients has not only proven to be capable of identifying disease conditions in humans and animals but has also been found to be a portable, quick, and high throughput disease diagnostic device for other allied applications including environmental biotechnology. At MESA lab, we specialize in designing, fabricating, testing, and validating such micro platforms. Prior to developing these platforms, we obtain the intrinsic dielectric property data experimentally of the particles in interest. These electrophysiological properties are unique to each cell type and state, which form the basis of our detection platforms. An example is the stage-wise characterization of breast cancer immune cells using dielectrophoretic frequency measurements to quantify the properties of membrane and cytoplasm in a murine PyMT+/- model. The performance of the device platform is validated with the obtained theoretical/numerical results and the results from other diagnostic methodologies. This lab-on-a-chip technology will ultimately yield a platform that could be applied to concentrate/enrich and detect/characterize any particle of interest with high selectivity and sensitivity that is minimally invasive, label-free, and less expensive compared to the current state-of-the-art technologies.



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