A Novel Isothermal Microfluidic Device to Detect Salivary MicroRNAs in Breast Cancer

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A rapid, microfluidic microRNA test using saliva is proposed as a tool to diagnose breast cancer in its early stages. Current means of diagnosing this disease requires expensive, highly technical, equipment to analyze results that are not accessible on a global scale, and with new cases of breast cancer occurring every year, effective diagnostic screening is of vital importance. Herein is a low estimated cost ($5.00-$7.00), 3D-printed microfluidic device that utilizes a novel isothermal amplification assay for the quantification of nucleic acids, specifically microRNAs, to determine a microRNA profile specific to early breast cancer. The advantage of isothermal amplification is that it is carried out at a constant temperature—drastically reducing time and cost per assay. The assay successfully detected significant differences in microRNA expression against healthy controls in patient RNA-isolated samples through the means of a fluorescent signal. microRNA expression in the microfluidic device was compared to qPCR as a concurrent validation method; the qPCR assay was modified to quantify microRNA expression for the first time ever, creating a standardized approach for absolute quantitation of microRNAs. One of the main benefits of this platform lies in its universality, where this device can be modified to test for any particular microRNA profile, thus a range of different diseases. As the first proposed device to test salivary microRNAs in breast cancer, this system revolutionizes disease diagnosis not only for breast cancer, but virtually any disease that effects microRNA expression.

Awards Won:
Arizona State University: Arizona State University Intel ISEF Scholarship