Spatially Multiplexed Gold Leaf Electrodes for Affordable Pathogenic Detection

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Socioeconomically disadvantaged individuals suffer disproportionately from vaccine preventable diseases. This is due, at least in part, to a lack of accessible screening tools for such illnesses. By creating an affordable, specific, and sensitive point-of-care diagnostic for tuberculosis, access to detection methods for a broader subset of the global population can occur. Herein, an inexpensive, easy-to-produce, multiplexed electrochemical biosensor for tuberculosis detection is reported. This diagnostic functions by integrating spatially-multiplexed gold leaf electrodes with loop-mediated isothermal amplification (LAMP) and CRISPR-Cas12a. Resulting changes in DNA on the gold leaf surface translate to detectable changes in signal that enable identification of tuberculosis genetic material and thus signal change. This experimental work was coupled with computational simulations in MATLAB to optimize experimental parameters. This study represents an advancement in affordable POC diagnostics for vaccine-preventable diseases.

Awards Won:

U.S. Agency for International Development: USAID Science for Development First Award - Global Health