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Rapid and Low-Cost Nucleic Acid Detection Platform

Because genetic information is used in pathogen detection, human genotyping, determining and detecting mutations which cause disease and for monitoring and treatment of infectious diseases, it is imperative that new methods for detecting nucleic acids are developed that are rapid, inexpensive and easy to implement. PCR-based methods for detecting nucleic acids are the current gold standard, however, they require expensive equipment and trained technicians thus their portability is limited.

Researchers at the Biodesign Institute of Arizona State University have developed a novel, rapid, low-cost platform for nucleic acid detection. This platform amplifies the target nucleic acid without the need for thermal cycling equipment with subsequent expression in a cell free system to provide results based on easily read out signals such as color or fluorescence. The amplified product enables easy detection of viruses as well as single-nucleotide variants. As a demonstration of utility, this platform has been successfully used to detect SARS-CoV-2, BRCA1, BRCA2, single nucleotide mutation in hemochromatosis related gene and single nucleotide mutation related to an HIV drug resistance gene.

This platform could provide individuals with easier and more private access to genetic information that can give disease and treatment guidance.

Potential Applications

- Nucleic acid detection for POC, infrastructure-poor or in-home settings
 - o Pathogen detection
 - o Distinguish between closely related viruses
 - o Detect mutations associated with diseases
 - o Detect genetic disorders
 - o Detect drug-resistance
 - o Can differentiate homozygous and heterozygous mutations

Benefits and Advantages

- Rapid, low cost (~\$3/test) and widely applicable
- Can be used in POC, in-home and infrastructure-poor settings
- Easy to read results
- Does not require thermal cycling equipment
- Can detect single-nucleotide variants that produce stop codons, frame altering (nonsense, frameshift, etc.) mutations and more
- Can distinguish SARS-CoV2 from other closely related SARS-CoV viruses
- Depending on sample concentration and cell-free reaction speed, test can be completed in ~ 1 hour
- The amplified product enables easy detection of viruses
- Compatible with paper-based cell-free reactions to provide directly visible results

For more information about this opportunity, please see

Wu et al - In Preparation

For more information about the inventor(s) and their research, please see

[Dr. Green's Boston University Webpage](#)