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Low-cost and Simple Ebola Virus Test

-Ebola virus (EBOV) is a highly virulent pathogen, causing severe hemorrhagic fever in humans with a lethality rate of 45-90%. With such high lethality rates, it is imperative that EBOV is detected early and infected patients are isolated to reduce transmission and control outbreaks. While PCR is the gold standard for EBOV detection, it requires expensive equipment and trained technicians, thus it remains challenging to implement in resource-poor environments. Rapid and sensitive tests that can be utilized at the point of care (POC) level are needed so that EBOV can be detected in the areas where it is most devastating.

Researchers at the Biodesign Institute of Arizona State University and collaborators have developed a novel assay for rapid, low-cost and simple EBOV detection. This assay consists of gold nanoparticles (AuNPs) conjugated with high-affinity EBOV secreted glycoprotein (sGP) specific binding agent. These nanoparticles, when in the presence of EBOV, produce a visible change in solution color transparency with a detection dynamic range from 100 nM (11 µg/ml) to 10 pM (1.1 ng/ml), which overlaps with the sGP concentration level in patient's blood shown in clinic studies. This assay was integrated with a portable digital readout device that requires minimal training for end users, increasing usability. With additional but minor modifications, this technology could be widely applied to the POC testing of other infectious diseases.

This technology represents a simple yet ultra-sensitive colorimetric assay that could be the basis of a portable, fast and low-cost serum-based EBOV test.

Potential Applications

- POC diagnostic for Ebola
- May be applicable to other infectious diseases such as influenza, SARS-CoV-2, and more

Benefits and Advantages

- POC/portable – works in remote pandemic regions
- Low-cost and rapid–less than 20 minutes for results without compromised accuracy
- Quantitative with a dynamic range >5 logs
- Suitable for evaluation of patient viral loads
- Ultra-high sensitivity (detect sGP protein from 10pM to 100 nM)
- Able to distinguish sGP protein from a membrane-anchored isoform, GP1,2
- Better sensitivity (~19 fold) and dynamic range than ELISA
- Utilizes a portable digital colorimetric readout device
- Can be deployed at high frequencies and large volumes for in-time surveillance
- Binding agents (antibodies or nanobodies) can be selected against target antigens using an ultra-fast, animal immunization-independent phage selection method

For more information about this opportunity, please see

Chen et al - bioRxiv - 2021

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

Dr. Wang's departmental webpage

Dr. Wang’s Biodesign webpage