



NYU



Paper-Based, Multiplexed Lamp Diagnostic for Pathogen Detection

Easy-to-use, inexpensive, accurate, and customizable pathogen detection devices.

Category

COVID-19

Life Sciences/Diagnostics

Life

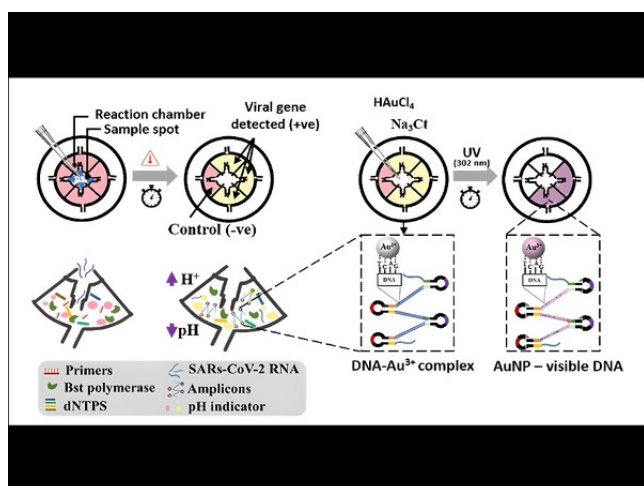
Sciences/Therapeutics/Infectious Disease/Coronavirus

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Technology

The [Qasaimeh Laboratory](#) at NYU Abu Dhabi has developed an innovative device for viral and bacterial pathogen detection (see figure below). This device uses loop-mediated isothermal amplification (LAMP) of viral mRNA in a customizable and multiplexable paper-based chip design. This chip incorporates multiple chambers for multi-primer probing of single pathogens or multiple pathogens simultaneously. In proof-of-concept experiments (unpublished), the Qasaimeh lab showed their device can detect synthetic SARS-CoV-2 RNA using colorimetric detection of the amplicon with a pH-based dye indicating qualitative positive/negative results. Furthermore, they demonstrated that their device could achieve rapid qualitative detection in a mere 2 minutes.

Background

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the etiological agent of Coronavirus Disease 2019 (COVID-19), caused a global pandemic resulting in millions of deaths worldwide. In the initial phase of the pandemic, there was an obvious shortage of quick, accurate, and portable pathogen detection devices which hindered medical progress. Similar shortages have also been observed in past epidemics and pandemics. Consequently, there is urgent need for the development of easy-to-use, inexpensive, accurate, and customizable diagnostic devices applicable to both current and future pathogen outbreaks.

Development Status

The device has been fully conceptualized and preliminary tests of sample loading and reaction chamber chemistry have been successfully performed with the envelope and nucleocapsid genes of SARS-CoV-2.

Applications

- Rapid detection of SARS-CoV-2 and other viral and bacterial pathogens, including:
 - Monkeypox
 - HIV
 - Hepatitis B
 - Hepatitis C
 - Dengue
 - West Nile virus
 - Malaria
 - Toxoplasma gondii

Advantages

- Rapid detection: The device can read out accurate test results in 2 minutes or less.
- Ease-of-use: LAMP technology permits quick and easy acquisition of results without complex protocols or device training.
- Customizability: The device can be tailored to detect any viral pathogen by utilizing pathogen-specific LAMP primer sequences.
- Multiplexable: The four reaction chambers allow for testing of single or multiple pathogens simultaneously via the use of multiple antigenic primers.
- Low-cost: Materials used in the device manufacturing are inexpensive and readily available.

IP Status

Non-provisional patent application pending