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# Low-Cost Detection of Norovirus and other Infectious Agents

Noroviruses are the leading cause of gastroenteritis and foodborne illness, affecting millions and causing nearly $60 billion in societal costs each year. They are highly contagious and persist in the environment, resulting in frequent outbreaks in healthcare facilities, hospitals, schools and cruise ships. Further, these viruses can lead to severe symptoms and prolonged illnesses in vulnerable populations such as young children and the elderly. qRT-PCR is currently the gold standard for norovirus detection, however, it requires thermal cycling equipment and a centralized laboratory, which can delay test results and limit use in remote settings. Inexpensive and rapid tests for norovirus that do not require sophisticated laboratory equipment are needed for ensuring timely treatment for patients and containing the spread of outbreaks.

Researchers at the Biodesign Institute of Arizona State University have developed a low-cost, cell-free colorimetric assay that detects norovirus from clinical samples by using a paper-based, cell-free transcription-translation system in combination with isothermal amplification and virus enrichment by synbodies. This system does not require sophisticated equipment or a centralized laboratory and can be directly read by eye. Without an enrichment step, the assay enables detection of norovirus target RNAs down to concentrations of 270 attomoles/liter. Enrichment of the virus with norovirus-binding synbodies provides a further 1000-fold increase in assay sensitivity (270 zM) for the prevalent GII.4 Sydney norovirus genotype in stool samples.

These results demonstrate the utility of a rapid, paper-based, cell-free diagnostic system for low-cost identification of foodborne pathogens and provide a versatile diagnostic assay that can be applied to the detection of a broad range of infectious agents.

Potential Applications

- Norovirus detection
- Could be applied to the detection of a broad range of infectious agents

Benefits and Advantages

- Low-cost - $8.73 total cost in materials (based on retail prices)
- Can be read by eye within a few hours
- Low-equipment requirements
- Provides viable test results
- Sensitivity - integrates an effective concentration technique
- Eliminates false positives caused by non-specific amplification products
- The system preserves activity for over a year at room temperature

o Easily reactivated using water

- Can be implemented in decentralized contexts such as remote clinics or cruise ships

For more information about this opportunity, please see

Ma et al - Synth Biol - 2018

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

Dr. Green's departmental webpage