SMART-Screen: A Point-of-Care COVID-19 Active Replication Detection System

Goswami, Tista (School: Mamaroneck High School)

COVID-19 is caused by an RNA virus called SARS-CoV-2. PCR testing is a gold-standard method for COVID-19 diagnostic testing. However, there exists no COVID-19 diagnostic test that has the capability to detect infectivity. The Subgenomic mRNA Active Replication Test (SMART) is able to provide this insight. By detecting a specific type of viral RNA known as subgenomic RNA (sgRNA), the SMART Assay is able to accurately identify an active replicator of COVID-19. Subgenomic RNA indicates the presence of replicating intermediates within the virus. The SMART Assay has been developed as a laboratory-based test. By utilizing a portable real-time PCR machine, we converted the existing SMART Assay into a point-of-care test, hereby referred to as SMART-Screen. Using samples of purified RNA, qPCR was performed in the laboratory as well as in the point-of-care setup. The results were compared to see if SMART-Screen was equally sensitive and specific as the laboratory-based SMART Assay. This test has immense benefit as it can detect an active spreader of COVID-19 within an hour. SMART-Screen can provide for improved treatment for COVID-19 patients. SMART-Screen can provide for more accurate quarantining guidelines, as only actively spreading individuals and their immediate contacts must quarantine themselves. Onsite testing locations in places like airports and nursing homes can greatly benefit from this system for identifying individuals that should be isolated immediately. A non-contagious individual can test positive for COVID-19 in a traditional PCR test and will have to unnecessarily quarantine themselves, despite not contributing to the chain of infection. We found that SMART-Screen is equally sensitive and specific as the SMART Assay and can be administered within an hour.

Awards Won: