A Quartz Crystal Microbalance Sensor for the Detection of RSV

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Abstract

Respiratory syncytial virus (RSV) can cause serious lower respiratory tract illness in infants and young children. In infants and young children, the immune response to a RSV does not engender a fully protective immune response, as repeat infections with same or different strains of RSV are common. These indications suggest that RSV may modulate or evade the immune response to promote virus infection and replication. Our laboratories are addressing a variety of RSV disease intervention strategies. The ability to detect low levels of virus is critical for determining treatment approaches and evaluating drug or vaccine efficacy. In this study we demonstrate a rapid, label free QCM sensor for the specific detection of RSV. A self-assembled monolayer of dithiobis-succinimidyl propionate (DSP) and Protein-G were used for immobilization of the RSV-specific monoclonal antibody/RSV complex to the quartz crystal surface. The change in frequency of the crystal upon binding of RSV-specific monoclonal antibody/RSV complex compared to isotype control antibody reveals that RSV can be detected by QCM at very low levels. A heterologous respiratory virus, parainfluenza virus 3 (PIV3), produced no significant frequency change suggesting the QCM assay is specific for RSV. The long-term goal of this study is to use a quartz crystal microbalance (QCM) biosensing device to detect RSV particles in a variety of cells and tissues to elucidate persistence, and provide insights required for development of vaccine and therapeutic intervention strategies to protect public health.