

### Selecting DNA Aptamers Against Airway Mucin Protein for Therapeutics and Diagnostics

Mucus is a viscous bodily fluid whose primary protein makeup is composed of the mucin proteins MUC5AC and MUC5B. Elevated levels of MUC5AC in airway mucus is implicated in diseases such as asthma, cystic fibrosis (CF), and chronic obstructive pulmonary disease (COPD). Current treatments to clear mucus use enzymes or chemical agents; however, they are nonspecific and can cause adverse side effects. Our research aims to select and characterize DNA aptamers that strongly and specifically bind to MUC5AC for diagnostic and therapeutic applications. Aptamer selection is done via One-Pot SELEX, in which the MUC5AC is immobilized on the walls of a PCR tube, incubated with a guanine and cytosine rich DNA library, and then amplified using a 5' phosphorylated reverse primer. The current aptamer selection pool is binding to both MUC5AC and MUC5B samples, indicating the need for increased negative selection steps during One-Pot SELEX. We are using thrombin and its aptamer to optimize gel shift assays and nitrocellulose filter assays, with the end goal of characterizing the binding affinity of aptamers candidates to MUC5AC. In the future, we aim to identify and characterize DNA aptamers with strong affinity and specificity for airway mucin proteins to support therapeutic strategies that deliver engineered proteases to cleave them.