An Early Tri-Biomarker Sputum Diagnostic for Cystic Fibrosis in the Developing World

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Cystic Fibrosis (CF) is a common fatal genetic disease. Mutations in the CFTR gene often lead to drastically reduced lifespans, which can be greatly increased after diagnosis. Because current diagnostic tests are either expensive or require refrigeration, CF is under-diagnosed in developing countries where few patients live past age ten. I created a rapid, low cost, and temperature independent CF diagnostic for the developing world. My tri-biomarker test strip simultaneously tests infant's sputum for abnormal levels of chloride, amylase, and phosphate. My procedure involved 36 steps, summarized as: creation of the tri-biomarker test strips, creation of a colorimetric guide, transfer of chemicals to test strips, and testing with synthetic sputum. Data were collected from tri-biomarker test strips for both control and synthetic CF sputum. In the control data, trial 5 resulted in a false positive for one of the three bio markers. Since the test requires all three biomarkers to be beyond threshold, the test is deemed negative. For this reason, trial 5 was correctly recorded as an overall negative. The data was analyzed with three statistical tests: sensitivity (1.0), specificity (1.0), and accuracy (1.0). The data shows that with high accuracy, the tri-biomarker test detects the presence of the synthetic Cystic Fibrosis and reliably distinguishes between the control sputum and the 'diseased' sputum. This novel, yet effective diagnostic for above threshold levels of chloride and amylase and below threshold levels of phosphate outperforms the sweat test and genetic mutation test counterparts in terms of sensitivity, specificity, and accuracy.

Awards Won:
Third Award of $1,000
Drug, Chemical &amp
Associated Technologies Association (DCAT): First Award of $3,000.