HepaEase: Development of an Instigating Risk Assessment Tool and xLFIA Validating Potential Urinary Biomarkers for Early Detection of NAFLD

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Non-alcoholic fatty liver disease (NAFLD) has emerged as a significant cause of chronic liver disease globally, affecting 25% of the population. The condition is characterized by an excessive accumulation of fat in the liver of individuals who consume little or no alcohol. As the disease progresses to its advanced stages, the risk of hepatocellular carcinoma (HCC) increases sevenfold. Due to the lack of early detection methods, most cases are diagnosed only at the later stages when the condition becomes incurable. In this study, we have identified the potential urinary biomarkers of NAFLD via meta-analysis and based on it, developed a sensitive and reliable at-home test for the precise detection of markers in individuals with NAFLD using a multiplexed lateral flow immunoassay. The test is based on the principle of the binding of detection antibodies with their respective target markers, which inhibits a red ruby color. By utilizing two test lines in the strip, we can target multiple analytes, increasing the chances of detection. The intensity of the test line after the binding of reagents depends on the quantity of the metabolite in urine, providing specific results. The developed kit can help in minimizing the odds of fibrosis, cirrhosis, and liver cancer by enabling individuals to conduct the test at intervals within the comfort of their homes. We have also developed an ensemble learning-based risk assessment toolkit that can help individuals determine their quantitative risk of developing NAFLD and encourage them to use our developed test strip. Our work thereby improves the overall prognosis of the disease.

Awards Won:
Second Award of $2,000
U.S. Agency for International Development: Second Award Global Health