Early Diagnosis of Pancreatic Cancer via Urinary Biomarkers with a New, Rapid, and Simple Lateral Flow Assay

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Less than 20% of patients' Pancreatic Cancer (PC) is discovered before spreading to other organs, making it nearly impossible to surgically remove, and attributing to a 7% five-year survival rate. Surgery can increase patients' survival rates to 70%; however, without an available early detection method, the cancer is rarely diagnosed in time to remove it. This research sought to devise a rapid, one-step, and inexpensive PC lateral flow assay, to be performed during routine exams, based on a current study first highlighting the presence of three protein biomarkers, LYVE-1, TFF1, and REG1A, at high concentrations in the urine of PC patients. Presence of these proteins diagnoses patients with PC at over 90% accuracy. To detect these proteins, a three-channel configuration was designed, testing for each protein separately. Following a sandwich assay format, the protein is conjugated to both a reporter (Au-nanospheres bound to antibodies), and an immobilized test line (antibodies held in place with bovine solution). For a positive result, the protein binds to both the reporter and the immobilized test line showing a highly concentrated, colored line. If the urine protein is absent, the colored reporters don't accumulate on the test line, showing a negative result. This assay card, made from nitrocellulose and filter paper, at $20/test, requires the application of 200µl of urine on the sample pad, where it flows simultaneously outward to all channels. Three colored test lines are formed within 2 minutes, without intervention, confirming the presence of PC proteins, and therefore a positive PC diagnosis.

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