Development of DNA aptamers against human heart type fatty acid binding protein for early detection of acute myocardial infarction

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Cardiovascular diseases are the single greatest cause of adult mortality globally, constituting about 31% of all global deaths. Detection of cardiovascular diseases has thus emerged as not only a social and clinical issue but also as an economic one. e current investigation is centered on the development of speci c aptamers against human heart type fatty acid binding protein (FABP3), a novel early marker for detection of acute myocardial infarction (AMI). It also encompasses the detection of FABP3 using the developed aptamers on a specially designed paper based micro uidic device (µPAD). Two ssDNA aptamers, N13 and N53 were isolated through Systematic Evolution of Ligands by Exponential Enrichment (SELEX) against human heart-type fatty acid binding-protein (FABP3). e aptamers bound to FABP3 with dissociation constants 0.0743±0.0142 µM and 0.3337±0.1485 µM, respectively. e aptamers displayed stable behavior at di erent pH, temperature and ionic strength. Considering the large sizes of the aptamers, limited proteolysis of the aptamer-protein complex was performed to map the amino acids involved in binding, which was then used to screen docked structures. e N13 led interaction with stronger a nity, involving more salt bridges and fewer hydrogen bonds, whereas N53 had less number of salt bridges with higher number of hydrogen and hydrophobic interactions. e greater footprint of N53 incited synergistic conformational changes in N53 and FABP3 leading to decrease in binding a nity during the recognition. e aptamers so developed and characterized were then used to detect FABP3 on a paper based micro uidic device designed for the same with leak proof property and low cost. An aptamer modi ed gold nanoparticle aggregation assay was used as the Yes/No format for the detection of FABP3 with a minimum detection limit of 54 ng per ml.

Biography

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