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Aptamers selection methodology and strategy based on multiple modes of capillary electrophoresis

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Nucleic acid aptamers are short, single-stranded DNA (ssDNA) or RNA molecules that are selected for binding to a specific target. Aptamers can be used as recognition probes in biomedical, food and environment analysis. Moreover, they have great potential in disease diagnosis and treatment, drug discovery, medicine research, as well as bioimaging, which are expected to bring huge economic benefits. However, current aptamers application is far from satisfactory, and has not yet been fully developed. The complicated selection process with high cost and low efficiency is one of the bottlenecks of their application. Still universally accepted standard selection methods are not accepted. Capillary electrophoresis (CE) is one of the most powerful methods for aptamers sieving (known as CE-SELEX), which has the advantages of fast, high resolution, low sample consumption and smart separation modes of capillary zone electrophoresis (CZE), affinity capillary electrophoresis (ACE) and capillary isoelectric focus (CIEF). Moreover, the binding of target and synthetic single stranded DNA (ss-DNA) occurs in free solution, which eliminates the biases caused by stationary support and linker. Some important protein aptamers have been successfully obtained based on CE, which greatly improves the selection efficiency. In our group, we aim at selection strategy research of aptamers against multiple targets based on capillary electrophoresis, which has the characteristics of high efficiency, high speed, low cost and multiple available modes. We propose selection strategies including: the availability of randomly synthesized ssDNA libraries should be evaluated, the binding evaluation can be made based on fast CE analysis, which provides more information to guide further selection.

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