Development of Aptamer Screening System Using High-Density Microarray Platform

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Aptamers are oligomers which can bind to wide variety of targets from small ion molecules to large cells with very high specificity and binding affinity. In recent years aptamers have evolved as potent replacement of antibodies due to the ease of their production & modification, chemical properties and substantially low production and maintenance cost. Aptamer's advantages over antibodies have resulted in significant increase of their commercial demand.

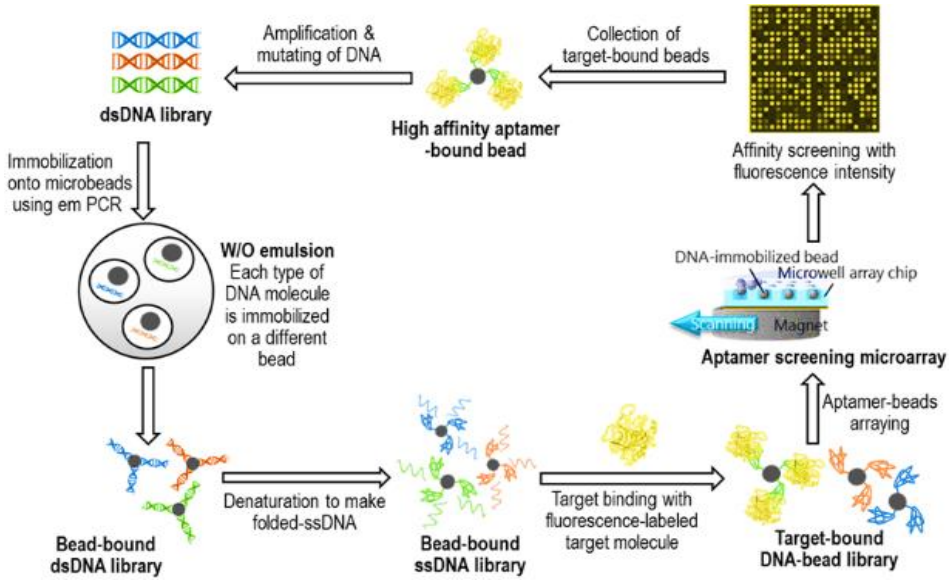

Figure 1: Screening of higher affinity aptamer candidates using high-density microarray with self-assembling beads.

In our study we have proposed an alternative approach for screening high binding affinity and qualitatively more specific aptamers using high-density (10^6-10^7 aptamers/cm^2 of substrate) microarray platform. In this scheme each aptamer candidate will be screened individually against the target molecule thereby overcoming the drawbacks associated with the traditional method such as restricted amplification of high-binding affinity aptamers, often amplification of rare high binding affinity aptamer sequences was restricted due to the presence of high number of low affinity aptamer sequences in the same reaction column. Also, in traditional method unspecific binding between aptamer candidates often restrains the screening of high binding affinity aptamer. However, in proposed scheme aptamer candidates are completely separated from each other in microwells, thereby enabling individual screening of aptamer candidates. Successful proof-of-concept has been achieved using thrombin binding aptamer (TBA) is used as the positive aptamer candidate and Lysozyme binding aptamer (LBA) is used as a negative aptamer candidate with human alpha thrombin as target protein. For future work large DNA libraries with the diversity of 10^6 molecules will be used for the screening of TBA.