Improving Aptamer Selection Efficiency through Volume Dilution, Magnetic Concentration, and Continuous Washing in Microfluidic Channels.

Journal: Anal Chem

Publication Year: 2011

Authors: S S Oh, K M Ahmad, M Cho, S Kim, Y Xiao, H T Soh

PubMed link: 21774453

Funding Grants: Training Program in Stem Cell Biology and Engineering

Public Summary:
The generation of nucleic acid aptamers with high affinity typically entails a time-consuming, iterative process of binding, separation, and amplification. It would therefore be beneficial to develop an efficient selection strategy that can generate these high-quality aptamers rapidly, economically, and reproducibly. Toward this goal, we have developed a method that efficiently generates DNA aptamers with slow off-rates. This methodology, called VDC-MSELEX, pairs the volume dilution challenge process with microfluidic separation for magnetic bead-assisted aptamer selection. This method offers improved aptamer selection efficiencies through the application of highly stringent selection conditions: it retrieves a small number (<10^6) of magnetic beads suspended in a large volume (>50 mL) and concentrates them into a microfluidic chamber (8 μL) with minimal loss for continuous washing. We performed three rounds of the VDC-MSELEX using streptavidin (SA) as the target and obtained new DNA aptamer sequences with low nanomolar affinity that specifically bind to the SA proteins.

Scientific Abstract:
The generation of nucleic acid aptamers with high affinity typically entails a time-consuming, iterative process of binding, separation, and amplification. It would therefore be beneficial to develop an efficient selection strategy that can generate these high-quality aptamers rapidly, economically, and reproducibly. Toward this goal, we have developed a method that efficiently generates DNA aptamers with slow off-rates. This methodology, called VDC-MSELEX, pairs the volume dilution challenge process with microfluidic separation for magnetic bead-assisted aptamer selection. This method offers improved aptamer selection efficiencies through the application of highly stringent selection conditions: it retrieves a small number (<10^6) of magnetic beads suspended in a large volume (>50 mL) and concentrates them into a microfluidic chamber (8 μL) with minimal loss for continuous washing. We performed three rounds of the VDC-MSELEX using streptavidin (SA) as the target and obtained new DNA aptamer sequences with low nanomolar affinity that specifically bind to the SA proteins.

Source URL: https://www.cirm.ca.gov/about-cirm/publications/improving-aptamer-selection-efficiency-through-volume-dilution-magnetic