Rapid One-Step Selection Method for Generating Nucleic Acid Aptamers: Development of a DNA Aptamer against alpha-Bungarotoxin

Background: Nucleic acids based therapeutic approaches have gained significant interest in recent years towards the development of therapeutics against many diseases. Recently, research on aptamers led to the marketing of Macugen (R), an inhibitor of vascular endothelial growth factor (VEGF) for the treatment of age related macular degeneration (AMD). Aptamer technology may prove useful as a therapeutic alternative against an array of human maladies.

Considering the increased interest in aptamer technology globally that rival antibody mediated therapeutic approaches, a simplified selection, possibly in one-step, technique is required for developing aptamers in limited time period. Principal Findings: Herein, we present a simple one-step selection of DNA aptamers against alpha-bungarotoxin. A toxin immobilized glass coverslip was subjected to nucleic acid pool binding and extensive washing followed by PCR enrichment of the selected aptamers. One round of selection successfully identified a DNA aptamer sequence with a binding affinity of 7.58 μM. Conclusion: We have demonstrated a one-step method for rapid production of nucleic acid aptamers. Although the reported binding affinity is in the low micromolar range, we believe that this could be further improved by using larger targets, increasing the stringency of selection and also by combining a capillary electrophoresis separation prior to the one-step selection. Furthermore, the method presented here is a user-friendly, cheap and an easy way of deriving an aptamer unlike the time consuming conventional SELEX-based approach. The most important application of this method is that chemically-modified nucleic acid libraries can also be used for aptamer selection as it requires only one enzymatic step. This method could equally be suitable for developing RNA aptamers.

General information
State: Published
Organisations: Novo Nordisk Foundation Center for Biosustainability, Bacterial Cell Factories, Polymer Microsystems for Medical Diagnostics, University of Queensland
Number of pages: 6
Pages: e41702
Publication date: 2012
Peer-reviewed: Yes

Publication information
Journal: P L o S One
Volume: 7
Issue number: 7
ISSN (Print): 1932-6203
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.01 SJR 1.164 SNIP 1.111
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 3.11 SJR 1.236 SNIP 1.101
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 3.32 SJR 1.427 SNIP 1.136
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 3.54 SJR 1.559 SNIP 1.148
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 3.94 SJR 1.772 SNIP 1.153
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 4.15 SJR 1.982 SNIP 1.156
Web of Science (2012): Impact factor 3.73
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 4.58 SJR 2.425 SNIP 1.233
Web of Science (2011): Impact factor 4.092
ISI indexed (2011): ISI indexed no
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Scopus rating (2010): SJR 2.705 SNIP 1.178
Web of Science (2010): Impact factor 4.411
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 1
Scopus rating (2009): SJR 2.614 SNIP 1.046
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 1
Scopus rating (2008): SJR 2.506 SNIP 1.006
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 1.379 SNIP 0.537
Web of Science (2006): Indexed yes
Original language: English
Keywords: MULTIDISCIPLINARY, RNA INTERFERENCE, EMERGING CLASS, IN-VITRO, SELEX, EVOLUTION, LIGANDS, THERAPEUTICS, RECOGNITION, MICRORNAS, MOLECULES
Electronic versions:
journal.pone.0041702.pdf
DOIs:
10.1371/journal.pone.0041702
Source: dtu
Source-ID: n:oai:DTIC-ART:isi/372352893::20521
Research output: Research - peer-review › Journal article – Annual report year: 2012