The AptaReport™
Newsletter
FALL 2018

Ions and Cell-capturing Graphene Oxide Aptamer Sensor

The biochemical sensor market is growing at a compound annual growth rate at 14.6% due to the increasing demand for those sensors that could perform rapid clinical diagnostics and quality control. Ion selective electrodes (ISEs) are a type of well understood electrochemical sensor common in biomedical applications. In this study, a porous graphene oxide (PGO)-based ISE was combined with an anti-nucleolin aptamer probe to be used as a cancer cell detector.

Microscope images verified that the PGO layer successfully captured the target cancer cells. The resulting sensor produced from the workflow (depicted in the figure) can detect both Iodide ion and non-small lung cancer cells (A549) up to 10 cells per milliliter. Also, the readings could be sent out to mobile phone via Bluetooth in the form of digital display of the voltage output. This aptamer-based sensor proof-of-concept could potentially be optimized for various biomedical applications like medical laboratory.

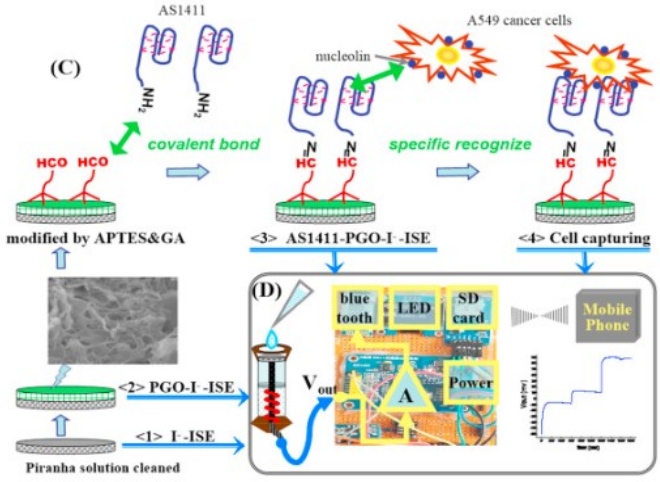


Figure (adapted) Setup for electrochemical measurements on modified PGO surface using AS1411 aptamer to capture non-small lung cancer cells (A549). (D) Electronic schematics to process analog signals from the sensor into digital readout to allow Mobile phone reception using Bluetooth*

-M.M.

*Reference: Apta-Index™ ID #639

Aptamers for Precision Therapy of Acute Myeloid Leukemia

Acute myeloid leukemia (AML) is one type of hematological malignancy whose current treatment is chemotherapy. While chemotherapy has been effective for many patients, it can cause severe side effects due to lack of specificity. Aptamers are highly specific and bind tightly to their targets giving them great potential in clinical applications. Recent studies have demonstrated that aptamer-mediated precision therapy has considerable efficacy in the treatment of AML.

Aptamers can function as effective vehicles for carrying drugs and target biomarkers on hematopoietic cells. CD117 is a biomarker which is highly expressed by certain AML cells. Zhao et al. has developed a DNA aptamer that can specifically target CD117. The aptamer was conjugated to the chemotherapeutic drug methotrexate to generate Apt-MTX conjugates. Cell proliferation assays showed that Apt-MTX treatment resulted in 80% growth inhibition of the AML cell line HEL with limited effects on control cells. The treatment also significantly induced HEL cell apoptosis while having no toxicity on the control cells. And Lastly, cell cycle analysis showed that Apt-MTX treatment induced G1 phase arrest of more than 90% HEL cells with minimal effect on CD117 negative cells. These results suggest that aptamer-mediated chemotherapies have high potential to selectively deliver cytotoxic agents to target cells.

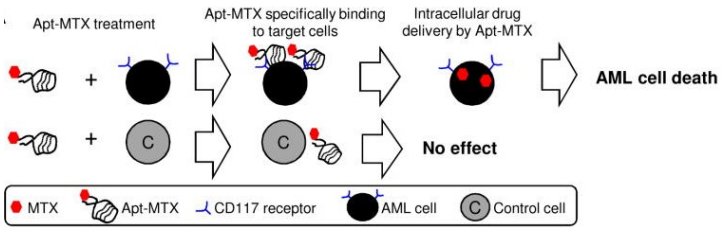


Figure (adapted) Zhao, N, Pei, S-N, Qi, J, Zeng, Z, Iyer, SP, Lin, P, et al. (2015). Oligonucleotide aptamer-drug conjugates for targeted therapy of acute myeloid leukemia. Biomaterials 67: 42-51.*

-L.S.

*Reference: Apta-Index™ ID #636

The AptaReport™

Newsletter

G-Quadruplex-Forming DNA Aptamers Inhibit the DNA-Binding Function of HupB and Mycobacterium Tuberculosis Entry into Host Cells

Mycobacterium tuberculosis (Mtb) is a bacterium that kills millions each year, but recently drug resistant variants have arisen indicating the need for new alternatives. HupB is an essential protein for Mtb's infectivity because it regulates entry into host cells and nutrient transport into the bacteria; therefore, it serves as an ideal drug target. Unfortunately, HupB has a highly disordered structure which makes it difficult to design drugs against it. One benefit of aptamer development is that knowing the structure of a protein is not needed to develop an effective aptamer.

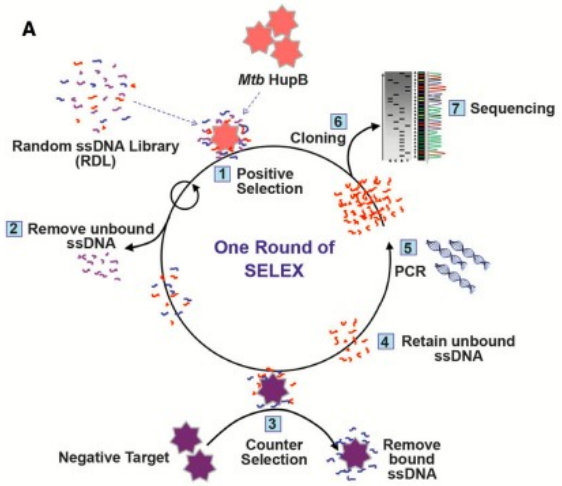


Figure (adapted) SELEX steps that were taken to isolate relevant aptamers candidates that bind to HupB*

By using Systematic Evolution of Ligands by Exponential Enrichment (SELEX) against a HupB protein target, Kalra et al. were able to develop two high-affinity DNA aptamers that bound to HupB and inhibit Mtb infectivity by ~40%-55%. They have also observed both aptamers form a G-quadruplex structure that may be necessary for the high-affinity binding and could lead to future advances in anti-disease research.

-J.S.

*Reference: Apta-Index™ ID #637

Man-made Antibodies Put Forth to Tackle Cancer

According to Centers for Disease Control and Prevention, cancer is the second leading causes of death in the United States. In this invention, a sophisticated aptamer design was used to target prostate cancer by delivering cytotoxic agent monomethyl auristatin F (MMAF), the second deadliest cancer and which antibody conjugates have proven to be ineffective treatment and highly toxic.

Aptamers are selected by cell-internalization SELEX method to obtain only aptamers that cancer cell would uptake through receptor-mediated endocytosis. After 14 rounds of toggling between the target and counter-targets, E3 aptamer was verified to be suitable to be a drug delivery agent for MMAF. The result is a targeted killing of cancer cells by the aptamer-drug conjugate that could provide an adjustable toxicity since a complimentary aptamer antidote could be used to 'neutralize' the E3 aptamer drug and render it inactive.

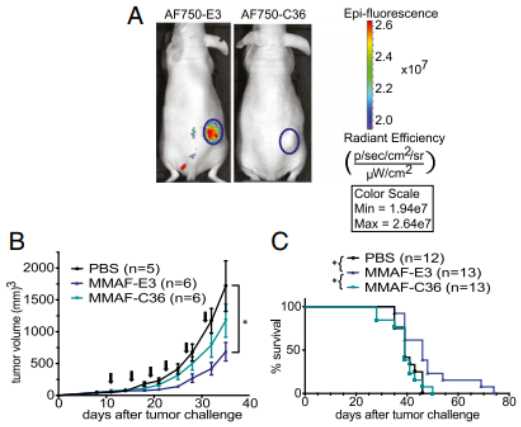


Figure (adapted) (A) The aptamer-drug conjugate is retained at the right flank of the mouse where prostate cancer xenografts was implanted prior to drug administration. (B) Tumor growth is inhibited by the drug conjugate and significantly increased the survival of mice compared to those without treatment.*

-M.M.

*Reference: Apta-Index™ ID #638

See the APTA-BEACON™ Difference

NO CAPTURING. NO WASHING. JUST READ....IN MINUTES!

Aptagen's "No Capturing. No Washing. Just READ" assay is a radical advancement in diagnostic technology. Aptagen, LLC has developed a sensitive diagnostic platform that can detect virtually any target or antigen (from small molecules to protein biomarkers and cells) in a variety of sample matrices. Unlike current diagnostic formats, such as the traditional ELISA method and the more recently popular Luminex® approach, Aptagen's Apta-Beacon™ assay eliminates the need for multiple target manipulation steps.

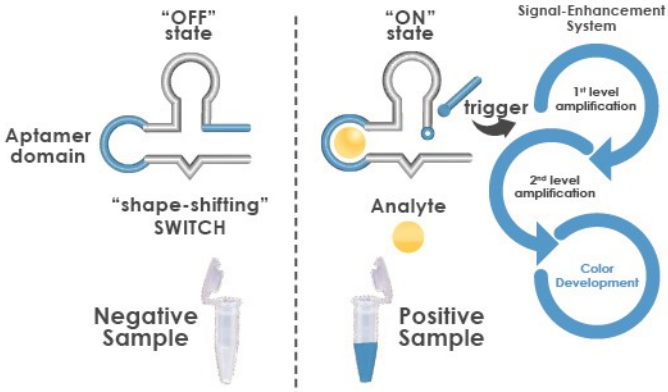
The Apta-Beacon™ platform requires neither capturing nor washing of sample(s), streamlining the analysis to quickly provide results with higher sensitivity.

Actual Results

Contact Us To Order The Apta-Beacon™ Demonstration Kit!

No More "Sandwich" Assays

Apta-Beacon™ Diagnostic Assay



Distinguish just a few atoms, free in-solution!

Technology Comparison Chart

	Antibodies	Aptamers	Apta-Beacons™
Stability/ Refolding		++++	++++
HIGH Affinity	++++	++++	++++
HIGH Selectivity	+	++++	++++
Unknown Biomarkers		++++	++++
Small Target Selectivity	+	++++	++++
Difficult Target Selectivity		++++	++++
One-Step Detection			++++
In-Solution Detection			++++

717-APTAGEN | 717-278-2436 | www.aptagen.com

Aptagen

"Forget Antibodies. Use Aptamers!"™

Aptagen, LLC
250 North Main Street
Jacobus, PA 17407

PRSRT STD
U.S. Postage
PAID
Aptagen, LLC

- COMPANY CONTACT –
- COMPANY NAME -
- COMPANY ADDRESS -
- COMPANY ADDRESS -

Antibody problems? Have difficult targets to develop effective ligands or antibodies?
What if an antibody doesn't exist for your target or antigen? No problem. Let Aptagen provide you with an alternative - the next evolution of an aptamer. You've heard about this new technology. Now, try it.

HIGH Affinity. HIGH Specificity.
Contact Us today for details.

Apta-Beacon™ Advantages:
- Large dynamic range of sensitivity.
- Binding to target analyte produces an output signal (fluorescent or colorimetric)
- No need for the cumbersome multi-step approach of ELISA assays.

Advancements at Local Biotechnology Company

Aptagen, LLC is a biotechnology company offering DNA and RNA, R&D services for use in diagnostics, drug discovery and therapeutics.

Aptagen was formed in 2004. Operations began in 2006. Aptagen is located in Jacobus, PA, a suburb of York, beautifully surrounded by Lake Redman and conveniently situated off of Interstate 83. The facility is a forty minute drive from Johns Hopkins University and Hershey Medical Center.

www.aptagen.com

Aptagen

Aptagen, LLC
250 North Main Street
Jacobus, PA 17407

717-APTAGEN
717-278-2436