allied academies Joint Event on
International Conference on
STRUCTURAL BIOLOGY AND PROTEOMICS
&
International Conference on
STD-AIDS AND INFECTIOUS DISEASES
September 03-04, 2018 | Bangkok, Thailand
J Genet Mol Biol 2018, Volume 2

UTILIZING THE PHYSICAL, CHEMICAL AND STRUCTURAL PROPERTIES OF SYNTHETIC BIO-RECEPTORS (APTAMERS) FOR THE DEVELOPMENT OF BIO-SENSORS FOR DIAGNOSTIC APPLICATIONS

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Double stranded DNA plays a crucial role in information transfer and evolution. However, in single stranded form, the DNA molecule is unstable and prefers to stabilize itself by associating with available reactive groups. In 1990, Szostak and Gold labs independently developed techniques that enables *in vitro* evolution of nucleic acids capable of binding targeted compounds with high affinity and specificity. The process of generating these functional nucleic acid species (also known as aptamers) was termed systematic evolution of ligands by exponential enrichment (SELEX). Aptamers have been generated to target a plethora of molecules ranging from ions to whole cells. However, developing single stranded DNA aptamers capable of binding to small molecular targets pose some complexities. This talk will elaborate on the intricacies of developing highly selective ssDNA aptamers capable of binding a plethora of organic small molecules such as estradiol, bisphenol A, triclosan, and glyphosate for use in a variety of biological and environmental matrices. Once the target binding characteristics of the identified aptamers is determined, the aptamers unique physical, chemical and structural properties is utilized to develop a variety of sensing platforms such as Eastern blotting, dynamic light scattering-resistive pulse sensing, gold nanoparticle-based sensing, impedance spectroscopy, lateral flow, enzyme linked oligonucleotide assay (ELONA) and microfluidic applications. The developed assay formats reached detection limits as low as femtomolar levels demonstrating the important role aptamers will play in future diagnostic applications.