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|  | **program Information** | | |
| **NO.** | |  | |
| **Program Type** | | Degree Based …………….....  Non degree-Based ……..…. | □  ■ |
| **Level of Study** | | Undergraduate ………..……  Master …………………..……...  PhD ………………………..…….  Post Doc …………………..…..  Specialty ………………..…….  Subspecialty …………………  Fellowship ……………..……..  Short term Course ………… | □  ■  ■  ■  □  □  □ |
| **School** | | School of Pharmacy | |
| **Department** | | Medicinal Chemistry | |
| **Major/ Name of Program** | | APTAMER BASED BIOSENSOR FOR TETRACYCLIN | |
| **Keyword(3 Words)** | | Aptamer, biosensor, Tetracycline | |
| **Language Requirement** | | English | |
| **Admission Requirement** | | MSc, PhD in Chemistry or Pharmacy | |
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| **Description (500 words)** | | Aptamer-based sensors, aptasensors, have been broadly used in analytical methods. Aptamers are short single-stranded DNA (ssDNA) or RNA molecules obtained by an in vitro process called SELEX (systematic evolution of ligands by exponential enrichment). They are able to selectively and sensitively bind to their pre-selected targets, ranging from small molecules to cells. Aptamers exhibit some advantages over the traditional antibodies including low cost, ease of synthesis and modification, excellent thermal stability and lack of immunogenicity and toxicity. Because of these advantages, aptamers have gained potential application in the fabrication of different sensors.  Electrochemical aptasensors have unique properties in comparison with other sensing methods like high sensitivity, simplicity, low cost and rapid response.  Colorimetry has commonly been applied for analytical applications since the readout requires only the naked eye. Fluorescence is one of the most powerful signal transduction mechanisms broadly used for design of aptasensors owing to its high sensitivity, ease of application and simplicity.  We have designed and analyzed all these kinds of aptasesnors.  Here is some of the findings of our last studies in the field of aptasensors:  1.  **Title:** A novel electrochemical aptasensor based on single-walled carbon nanotubes, gold electrode and complimentary strand of aptamer for ultrasensitive detection of cocaine (Biosensors and Bioelectronics, 2015, IF=6.4)  **Finding:** In summary, we designed an electrochemical aptasensor for ultrasensitive detection of cocaine, based on SWNTs, gold electrode, and complimentary strand of aptamer. The limit of detection for cocaine was calculated as low as 105 pM. Furthermore, the designed electrochemical aptasensor was useful and applicable for detection of cocaine in serum with a limit of detection as low as 136 pM.  2.  **Title:** A novel colorimetric triple-helix molecular switch aptasensor for ultrasensitive detection of tetracycline (Biosensors and Bioelectronics, 2015, IF=6.4).  **Finding:** In summary, we introduced an easy-to-build colorimetric aptasensor based on THMS and AuNPs for the selective, sensitive and fast detection of tetracycline. The presented aptasensor showed high selectivity toward tetracyclines. The limit of detection for tetracycline was calculated as low as 266 pM. Moreover, this aptasensor could well detect tetracycline in serum and milk. Moreover, the results readout is possible by visual observation without any need for specialized analytical equipment.  3.  **Title:** A novel colorimetric triple-helix molecular switch aptasensor based on peroxidase-like activity of gold nanoparticles for ultrasensitive detection of lead (II) (RSC Advances, 2015, IF=3.8)  **Finding:** In summary, we introduced a selective, sensitive and rapid colorimetric aptasensor based on THMS and peroxidase-like activity of AuNPs for detection of Pb2+. The limit of detection for Pb2+ was determined as low as 602 pM. Furthermore, this aptasensor could well detect Pb2+ in water and serum. It is expected that this approach could be extended for detection of other biomolecules and drugs in clinical practice regarding its high affinity and simplicity.  4.  **Title:** Colorimetric and fluorescence quenching aptasensors for detection of streptomycin in blood serum and milk based on double-stranded DNA and gold nanoparticles (Food Chemistry, 2016, IF=3.39)  **Finding:** In summary, we presented an easy-to-build fluorescence quenching and colorimetric aptasensors based on AuNPs and dsDNA for the sensitive and simple detection of streptomycin. The designed sensors showed high selectivity toward streptomycin. The limit of detection for colorimetric and fluorescence quenching aptasensors were determined as low as 73.1 and 47.6 nM, respectively. Moreover, both aptasensors could well detect streptomycin in milk and serum. | |
| **Complete Description** | | Preparation of an electrochemical aptasensor for ultrasensitive detection of cocaine  Fabrication of colorimetric and fluorescence quenching aptasensors for detection of streptomycin in biological fluids  Design of triple-helix molecular switch aptasensor detection of lead | |
| **Program Detail** | | * Definition of sensors and aptasensors * Preparation and selection of aptamers * Aptamer affinity and specificity * Different strategies in aptasensor design * Preparation of gold nanoparticles * Biosensing in biological fluids * Fabrication of colorimetric and fluorescence quenching aptasensors for detection of streptomycin * Design of triple-helix molecular switch aptasensor detection of lead * Electrochemistry and its application in biosensor design * Preparation of an electrochemical aptasensor for ultrasensitive detection of cocaine | |