CHARACTERIZATION OF APTAMER FUNCTIONALIZED GOLD ELECTRODES FOR HISTONE DETECTION

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ABSTRACT

Histones, aptamers, electrochemical sensors, surface plasmon resonance (SPR), and potentiometry have also been employed as therapeutics. Their use in the field of clinical medicine has been significantly improved with the introduction of aptamers as a functionalized chip for the purpose of verifying the presence of targets within a sample. The aptamer sequence 5' CUC GCC CGA CAG CGG GCG CTA TTA GAA GGG AGG UAC UGC AGA CGA 3' was synthesized by Sigma Aldrich [St. Louis, MO]. A thiocarbonyl disulfide (TCD) linker was used to immobilize the aptamer on the gold electrode. Through SPR, we showed a sensitivity of 7.8 pH/l M and a limit of detection (LOD) of 1.5 M NaCl, 0.03 M EDTA and 0.5% v/v Surfactant P20. The aptamer was received dried and resuspended according to a protocol published in the literature. The early recognition of patient mortality is critical for triaging and treating acute respiratory distress syndrome (ARDS) and multiple organ dysfunction syndrome (MODS). Serum levels of histones in patients are associated with mortality and can be part of an effective strategy, but no point currently exists. Here, the aptamers are the immobilized molecules to bind analytes from external solution. The objectives of this study are to characterize the behavior of aptamer binding to histones; however, this system was not developed with the intention of making an operable sensor, rather the sensor in this paper was created as a functionalized chip for the purpose of verifying the presence of targets within a sample. The reference electrode was used. An off-electrode Ag/AgCl reference electrode was used.

KEYWORDS

Histone, aptamer, electrochemical sensors, surface plasmon resonance, potentiometry.

INTRODUCTION

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METHODS

Materials

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Surface Plasmon Resonance
As noted above, a thiol modification was added to the 5’ end of the sequence end of the aptamer to tether it to gold surfaces. The SAM was formed overnight under ambient conditions in situ. Additionally, they limit potential non-specific adsorption (NSA) of analytes to bare gold surfaces and other proteins within the system. As noted above, a thiol modification was added to the 5’ end of the sequence end of the aptamer to tether it to gold surfaces. The SAM was formed overnight under ambient conditions in situ. Additionally, they limit potential non-specific adsorption (NSA) of analytes to bare gold surfaces and other proteins within the system.

Potentiometric Sensor Electrode Functionalization
Potentiometry
Potentiometry

**RESULTS & DISCUSSION**

**Surface Plasmon Resonance**

Figure 2: SPR sensogram for CTH from 1.35 to 43.3 nM. This is the aptamer only response, obtained by subtracting the signal produced by the control (MCH-only) surface from the signal produced by the active (aptamer + MCH) surface.

Figure 3: Graphs displaying baseline wander from cycle to cycle. The baseline was determined by the mean of the samples before the association phase begins on any given cycle.

Figure 4: Histograms of the gradient magnitudes at the beginning of the association phase. These demonstrated the distributions of the maximum gradient magnitude of the different channels.
We found that, while the response’s amplitude alone does not
nM was extracted (χ²). Given that it had the least

The PEG

The appreciable NSA response
to H4, and selectivity is highest to CTH.

Figure 5: SPR response of the control and active surfaces to 200 nM
of CTH, human histones (H3.2 and H4) and BSA. A differential
response is also calculated. The active channel exhibits the largest
response to H4, and selectivity is highest to CTH.

Potentiometric Sensing

to coat any exposed gold and that the aptamers will have sufficient

aptamer’s performance as a histone

Figure 6: Potentiometric differential voltage response data for
control surface of PEG, MCH, and bare gold. The dashed lines are
trendlines fitted to the experimental data.

The net electrostatic effect of the molecules’

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Figure 7: Potentiometric differential voltage response data for the active surface of RNA aptamer and PEG-thiol, the control response of PEG-thiol, and the subtracted voltage change (Apt. Response). The dashed lines are trendlines fitted to the experimental data.

CONCLUSIONS

This work was made possible by NSF [Award 154...].

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