Electrochemical Detection of DNA Using Redox Active Compounds that Bind to ssDNA and dsDNA

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A great deal of interest has recently been focused on use of microarrays, microchips and microfluidic devices in various analytical schemes, especially for detecting biological targets. An important analytical target for these devices is DNA. In several of the more common analytical formats that use such devices, small oligomers of DNA (e.g. 15- to 25-mers) are detected by virtue of their binding to complementary strands that previously had been immobilized at various locations on the device. To accomplish this detection electrochemically, one requires a simple way of detecting the hybridization of the target DNA strand to the immobilized complementary strand.

This presentation describes an electrochemical method for detecting the hybridization of single strands of DNA with complementary strands of surface-immobilized DNA. The detection strategy involves use of a redox-active viologen compound that binds to duplex DNA. This binding can be measured directly by electrochemical methods, allowing a means of assaying the amount of DNA duplex present on the surface. The figure below shows the surface wave for the viologen compound obtained at a surface derivatized with dsDNA. The presentation will focus on the design and synthesis of a novel redox compound that binds to duplex DNA and the demonstration of its use to detect DNA hybridization at Au electrodes.