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## Amplified label-free electrical detection of DNA hybridization

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A new protocol is described for amplifying label-free electrochemical measurements of DNA hybridization based on the enhanced accumulation of purine nucleobases in the presence of copper ions. Such electrical DNA assays involve hybridization of the target to inosine-substituted oligonucleotide probes (captured on magnetic beads), acidic dipurination of the hybrid DNA, and adsorptive chronopotentiometric stripping measurements of the free nucleobases in the presence of copper ions. Both amplified adenine and guanine peaks can be used for detecting the DNA hybridization. The dramatic signal amplification advantage of this type of detection has been combined with efficient magnetic removal of non-complementary DNA, use of microliter sample volumes and disposable transducers. Factors influencing the signal enhancement were assessed and optimized. A detection limit of 40 fmol (250 pg) was obtained with 10 min hybridization and 5 min adsorptive-accumulation times. The advantages of this procedure were demonstrated by its application in the detection of DNA segments related to the BRCA1 breast cancer gene. The copper enhancement holds great promise not only for the detection of DNA hybridization, but also for trace measurement of nucleic acids.