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# Magnetic bead-based label-free electrochemical detection of DNA hybridization

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Magnetic bead capture has been used for eliminating non-specific adsorption effects hampering label-free detection of DNA hybridization based on stripping potentiometric measurements of the target guanine at graphite electrodes. In particular, the efficient magnetic separation has been extremely useful for discriminating against unwanted constituents, including a large excess of co-existing mismatched and non-complementary oligomers, chromosomal DNA, RNA and proteins. The new protocol involves the attachment of biotinylated oligonucleotide probes onto streptavidin-coated magnetic beads, followed by the hybridization event, dissociation of the DNA hybrid from the beads, and potentiometric stripping measurements at a renewable graphite pencil electrode. Such coupling of magnetic hybridization surfaces with renewable graphite electrode transducers and label-free electrical detection results in a greatly simplified protocol and offers great promise for centralized and decentralized genetic testing. A new magnetic carbon-paste transducer, combining the solution-phase magnetic separation with an instantaneous magnetic collection of the bead-captured hybrid, is also described. The characterization, optimization and advantages of the genomagnetic label-free electrical protocol are illustrated below for assays of DNA sequences related to the breast-cancer BRCA1 gene.