DNA intercalation-based electrochemical detection of Chlamydia trachomatis utilizing peroxidase-catalyzed signal amplification

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A sensitive electrochemical DNA detection method for the diagnosis of sexually transmitted disease (STD) was developed utilizing DNA-intercalating agent and enzymatic precipitation reaction by peroxidase. After the hybridization of target Chlamydia trachomatis gene as a model pathogen with immobilized capture probe on the gold electrode surface, the biotin-tagged DNA intercalator (anthraquinone) was inserted into the resulting DNA duplex. Subsequently, the polymeric streptavidin/peroxidase complex was applied to the biotin-decorated electrode, where the enzyme peroxidase catalyzed the precipitation reaction in the presence of 4-chloronaphthol and hydrogen peroxide. Resulting cyclic voltammograms exhibited decreasing peak current in proportion to increasing target DNA concentration due to the insulation of electrode surface by the growing insoluble precipitate. Using this strategy, we successfully detected pico-molar concentration of Chlamydia trachomatis with a sample from real patient.