A simple, portable, electrochemical biosensor to screen shellfish for vibrio parahaemolyticus

ABSTRACT

An earlier electrochemical mechanism of DNA detection was adapted and specified for the detection of Vibrio parahaemolyticus in real samples. The reader, based on a screen printed carbon electrode, was modified with polylactide-stabilized gold nanoparticles and methylene blue was employed as the redox indicator. Detection was assessed using a microprocessor to measure current response under controlled potential. The fabricated sensor was able to specifically distinguish complementary, non-complementary and mismatched oligonucleotides. DNA was measured in the range of $2.0 \times 10^{-8}$–$2.0 \times 10^{-13}$ M with a detection limit of 2.16 pM. The relative standard deviation for 6 replications of differential pulse voltammetry (DPV) measurement of 0.2 µM complementary DNA was 4.33%. Additionally, cross-reactivity studies against various other food-borne pathogens showed a reliably sensitive detection of the target pathogen. Successful identification of Vibrio parahaemolyticus (spiked and unspiked) in fresh cockles, combined with its simplicity and portability demonstrate the potential of the device as a practical screening tool.

Keyword: Vibrio parahaemolyticus; Food-borne pathogens; Electrochemical DNA sensor; Shellfish; Portable biosensor