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A Nanocoaxial-Based Electrochemical Sensor for the Detection of Cholera Toxin[1] MICHELLE M. ARCHIBALD, BINOD RIZAL, TIMOTHY CONNOLLY, MICHAEL J. BURNS, MICHAEL J. NAUGHTON, THOMAS C. CHILES, Boston College — Sensitive, real-time detection of biomarkers is of critical importance for rapid and accurate diagnosis of disease for point of care (POC) technologies. Current methods do not allow for POC applications due to several limitations, including sophisticated instrumentation, high reagent consumption, limited multiplexing capability, and cost. Here, we report a nanocoaxial-based electrochemical sensor for the detection of bacterial toxins using an electrochemical enzyme-linked immunosorbent assay (ELISA) and differential pulse voltammetry (DPV). Proof-of-concept was demonstrated for the detection of cholera toxin (CT). The linear dynamic range of detection was 10 ng/ml - 1 μg/ml, and the limit of detection (LOD) was found to be 2 ng/ml. This level of sensitivity is comparable to the standard optical ELISA used widely in clinical applications. In addition to matching the detection profile of the standard ELISA, the nanocoaxial array provides a simple electrochemical readout and a miniaturized platform with multiplexing capabilities for the simultaneous detection of multiple biomarkers, giving the nanocoax a desirable advantage over the standard method towards POC applications.

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