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Final Report for Sloan Foundation Grant

PI: William D. Hunt, Ph.D.
Professor
School of Electrical and Computer Engineering
Georgia Institute of Technology
Atlanta, GA 30332
Phone: 404.894.2945
FAX: 404.894.1256
Email: bill.hunt@ece.gatech.edu

This grant supported our work in the detection of pathogenic whole cells. We used a surrogate for bacillus anthracis known as bacillus subtilis and detected is via an acoustic immunoassay. Antibodies for b. subtilis were obtained from Dr. J. Kearny of the University of Alabama at Birmingham and were immobilized onto the surface of a quartz crystal microbalance (QCM). The data from a series of experiments presented a detection of bacteria spores by utilizing monoclonal antibodies specific to the target spore. The target was instantly identified without time-consuming post processing by using a dual QCM sensor with an estimated detection limit of 450 spores. The QCM sensor was responding only to the target spores not to the negative controls, and could distinguish the form of the potential pathogen, discriminating between the relatively benign vegetative stage of *Bacillus* and the potentially virulent spore form. The results were further verified by taking optical microscope images of QCM surfaces that had just undergone the experiment. Also we discussed the non-Sauerbrey behaviors of the antibody coated QCM sensor by considering additional properties such as conformational changes of the antibody and resulting stiffness changes of the coating. We conclude that real-time detection of large molecules such as bacterial spores using a QCM liquid phase immunoassay is possible upon availability of the antibodies and proper setup of the sensor system. Two students were supported under this grant: Desmond D. Stubbs and Sang-Hun Lee. Both have received their doctorates and Dr. Stubbs is in post-doctoral training in a science public policy area with Oak Ridge National Labs and Dr. Lee is an engineer with Samsung, Inc. in Korea. The journal paper which resulted from this work is attached as an appendix[1].