University of Hawai'i at Manoa Study Center
Chip-based biosensor for cardiac troponin I from blood

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Introduction. The development of a mobile device that can perform highly sensitive laboratory assays on very small quantities of blood would be of benefit to pediatric clinical research studies like the National Children's Study.
Methods. Our novel biomedical biosensor is an ultra-sensitive, Silicon-based, integrated circuit compatible, high performance FET structure. Gate attached biochemical charge is sensed and measured. In the current phase of development we are using the biosensor to measure cardiac troponin I (cTI), as a representative sample protein. By attaching antibodies or ligands specific to cTI, we can "capture" the serum cTI, initially from samples spiked with cTI and ultimately from clinical samples. Additional optimizations of the assay that are being performed include; increasing sensitivity by varying the pH of the buffer, and designing synthetic ligands specific to cTI, replacing the need for expensive and unstable antibodies.
Results. We have completed initial testing and validation of the biosensors. Synthetic ligands have been designed and are currently being produced. Based on preliminary sensitivity testing, the theoretical level of this biosensor is 200 molecules or less of cTI, compared to current ELISA-based assays roughly 1 million molecules.
Conclusions. Our small, mobile biosensor provides a leveraged technology return since our same sensing approach can be applied to other targets (e.g., viruses, proteins, nucleic acids, etc.). In the next phase of development the device will be expanded to measure components of the newborn screening panel. The ability to measure proteins to a more sensitive level will enable us to perform laboratory assays on very small quantities of blood, which is important in parent acceptance of pediatric clinical research.