Measurement of serum prostate cancer markers using a nanopore thin film based optofluidic chip.

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Abstract
Currently used cancer marker for prostate adenocarcinoma (PC), serum prostate-specific antigen (PSA), greatly overestimates PC population. Patients with high PSA levels have to undergo unnecessary but physically painful and expensive procedure such as prostate biopsies repeatedly. The reliability of PC test can be greatly increased by finding a protein that is secreted selectively by malignant, but not normal, prostate cells. A recently discovered novel protein, referred as neuroendocrine marker (NEM), is secreted only by malignant prostate cells and released in blood circulation. Although NEM seems to be significantly more reliable based on the data obtained from a limited cohort, currently available NEM ELISA is not suitable for undertaking a large study. Therefore, the goal of the present study was to develop an alternative, label-free assay system that can reliably measure NEM and PSA in patient samples. Herein an optofluidic chip that can reliably detect PSA as well as NEM in patient samples has been developed. The optofluidic chip, which consists of arrayed nanopore-based sensors fabricated from anodic aluminum oxide (AAO) thin film, offers improved sensitivity upon the optimization of the concentration of the detector antibodies immobilized on the sensor surface. The results demonstrate that the chip is reliable, extremely sensitive and requires just 1 µl of patient serum (or even less) to measure PSA and NEM even in a non-cancer individual. Compared with the traditional ELISA for PSA, the nanopore-based sensor assay is 50-100 fold more sensitive, and offers many advantages such as elimination of labeled antigen, need for sophisticated equipment and highly trained individuals. These advantages, along with the low cost, should make the technology suitable for point-of-care application to screen elderly male populations for PC and to monitor the progress of patients undergoing PC treatment.