Real Time Diagnostic Point of Care by Amperometric Immuno-Biosensor Kit by Flow Technology

[1]*Harold E Braustein, [1]Klementiy Levkov, [2]Isabella E Braustein, [1]Yifat Bezalel, [1]Majeda Abo Zaid, [1]Gideon Fleminger, [1]Judith Rishpon

[1]The " George Wise" Life Science Institute, Molecular Microbiology and Biotechnology Department, Tel Aviv University, Tel Aviv, Israel
[2]Jerusalem District Health Office, Ministry of Health, Jerusalem, Israel
*E-mail: Harold.Braustein@Gmail.com

This oral presentation evaluates last decades progress in "On-site Biosensor Laboratory", at Tel Aviv Univesity, toward viable point-of-care protein biomarker measurements for cancer detection and diagnostics. The ability to measure panels of specific, selective cancer biomarker proteins in physicians' surgeries and clinics has the potential to revolutionize cancer detection, monitoring, and therapy. The dream envisions reliable, cheap, automated, technically undemanding devices that can analyze a patient's serum or saliva in a clinical setting, allowing on-the-spot diagnosis. Existing commercial products for protein assays are reliable in laboratory settings, but have limitations for point-of-care applications. A number of ultrasensitive immunosensors and some arrays have been developed, many based on nanotechnology. Multilabel detection coupled with high capture molecule density in immunosensors and arrays seems to be capable of detecting a wide range of protein concentrations with sensitivity ranging into the sub pg mL^{-1} level. Multilabel arrays can be designed to detect both high and ultralow abundance proteins in the same sample. However, only a few of the newer ultrasensitive methods have been evaluated with real patient samples, which is key to establishing clinical sensitivity and selectivity. Our research team recently used a 8 chanels-unit electrochemical immunoarray equipped with multi-wall carbon nanotube forest electrodes to simultaneously measure multiple prostate cancer biomarkers in cancer patient serum. The proteins were PSA, prostate specific membrane antigen (PSMA), platelet factor-4 (PF-4) and IL-6. Method sensitivity was tailored to analytical requirements of each protein by combining single and multiply labeled strategies. Biotinylated secondary antibodies (Ab_2) that bind specifically to streptavidin–HRP conjugates to provide 14–16 labels per antibody were used in a sandwich immunoassay format to give the necessary sensitivity to detect PF-4 (DL ≈ 1 ng mL^{-1}) and IL-6 (DL ≈ 30 pg mL^{-1}). Singly labeled Ab_2–HRP was used for PSA (DL ≈ 1 ng mL^{-1}) and PSMA (DL ≈ 10 ng mL^{-1}) in the ng mL^{-1} range. Immunoarray determinations of the four proteins in serum samples of prostate cancer patients and controls gave excellent correlations to standard ELISA assays.