Ultra-sensitive and multiplexed detection of protein biomarkers using Mecwins technology

V. Pini[1], A. Thon[1], V. Cebrián[1], A. Salvador-Matar[1], C. Rodríguez[1], A. Diaz[1], N. Marina[1], T. Ramon[1], O. Ahumada[1]

[1]Mecwins SA, Ronda de Poniente 15 2D, Tres Cantos, Madrid, Spain

vpini@mecwins.com

AVAC technology is an innovative biosensing platform for the ultra-sensitive and multiplexed detection of protein biomarkers. The fundamental principle of this innovative technology is based on the optical detection of plasmonic nanoparticles amplified by the multi-dielectric substrate underneath [1,2].

The immunoreactions take place on a multi-dielectric substrate coated with antibodies specific to the biomarker of interest. Once the sample has been incubated, a specific antibody tethered to the surface of plasmonic nanoparticles recognizes the biomarkers of interest (see Figure 1). As each plasmonic nanoparticle binds specifically to the biomarker of interest, counting the number of nanoparticles allows to quantify the number of biomarkers immobilized on the surface.

The nanoparticle detection is performed with the AVAC scanner, a proprietary platform that allows the simultaneous measurement and analysis of plasmonic nanoparticle with ultra-high throughput [3,4]; the complete measurement and analysis of a 96-well plate takes less than 5 minutes. The plasmonic nanoparticles are first optically identified, and then the scattering spectrum of each individual nanoparticle is analyzed in order to characterize, classify, and finally count the particles. The combination of different nanoparticle parameters such as brightness, spectral information or polarization state allows a very high specificity, and results in a very low limit of detection in the femtogram range, and provides the capability of detecting several biomarkers within the same sample (multiplexing). In combination with the biosensing platform, Mecwins has developed a cartridge prototype, which is compatible with sample handling systems routinely used in hospitals and analytical laboratories.

Our proprietary detection technology is up to one million times more sensitive than ELISA technology, which has been the standard for protein detection for over forty years. This innovative AVAC technology provides a solution for those diagnostic situations where ultra-sensitive detection is needed; moreover, this technology is also suitable for point-of-care (POC) applications. AVAC technology has proven extraordinary sensitivity with many established biomarkers in clinical use for diagnosis, monitoring, and prognosis, with applications in oncology, myocardial infarction, rheumatoid arthritis, and infectious diseases. An example of the extraordinary capabilities of the technology is demonstrated with the p24 immunoassay (Figure 2), which exhibits a sub-femtogram sensitivity in human serum samples.

References

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Figures

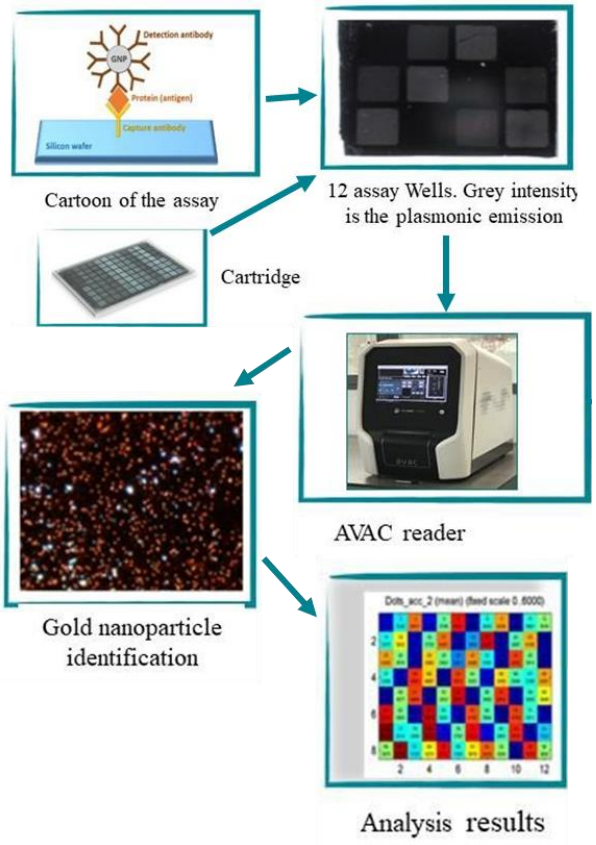

Figure 1. Workflow of the entire AVAC assay process.

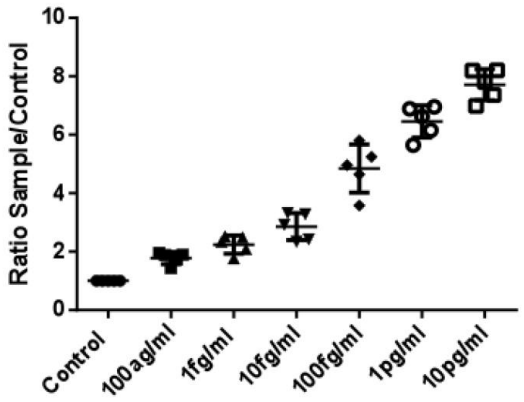

Figure 2. Calibration curve for Mecwins' p24 immunoassay in human diluted serum; data are represented as ratio sample/control.