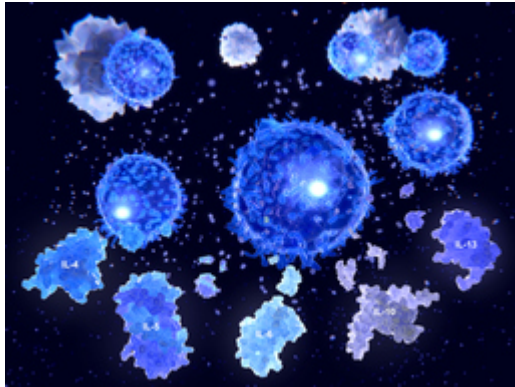




Plasmo-Optoelectronic Immunosensor

TECHNOLOGY NUMBER: 7407



Technology ID

7407

Category

Medical Devices

Life Sciences

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OVERVIEW

A nanotechnology-based biologic sensor device platform to profile biomarker molecules

- Nanoplastic filter using nanoparticles on a substrate with photoconductive thin film
- Characterizes various biomarkers from samples including blood, saliva, and urine

BACKGROUND

Precision medicine is emerging clinical care designed to target particular groups of patients for optimal therapeutic benefit. Molecular profiling of disease biomarkers is one of the key methods used in enabling precision medicine. Conventional molecular profiling techniques, such as enzyme-linked immunosorbent assay (ELISA) and bead-based immunoassay processes require lengthy and complicated assay processes, some of which require up to 8 hours to complete. These limitations prevent clinicians from analyzing biomarker profiles and host responses to drugs in real time at the place of patient care. Still, active monitoring of the time-varying immune status of a diseased host often requires rapid and sensitive detection of cytokines. Metallic nanoparticle-based localized surface plasmon resonance (LSPR) biosensors hold promise to meet this clinical need by permitting label-free detection of target biomolecules. However, these biosensors suffer from relatively low sensitivity when compared to conventional immunoassay methods that involve labeling processes. As such, a need exists for a method to rapidly quantify cytokine levels to optimize delivery of critical care.

INNOVATION

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Researchers have created a nanotechnology-based biological sensor device platform that is battery-operated, portable, mechanically flexible, and self-contained, enabling simultaneous profiling of the concentration levels of multiple biomarker molecules. This biosensor is classified as a nanoparticle-based localized surface plasmon resonance (LSPR) technique which uses a nanoplasmonic filter containing nanoparticles arranged on a substrate with a photoconductive thin film. This design provides label-free detection of IL-1beta, a pro-inflammatory cytokine, with detection limit as low as 250 fg/mL (14 fM) and a short assay time of 10 minutes. The system therefore allows for a rapid, accurate, sensitive, and specific measure of a of molecules including proteins, enzymes, DNA, and RNA in specimens derived from blood, saliva, or urine. For example, a patient's immune status can be evaluated to direct point-of-care precision medicine in the setting of systemic immune disorders and inflammatory responses to trauma. The presented biosensing approach could be further developed and generalized for point-of-care diagnosis, wearable bio/chemical sensing, and environmental monitoring.