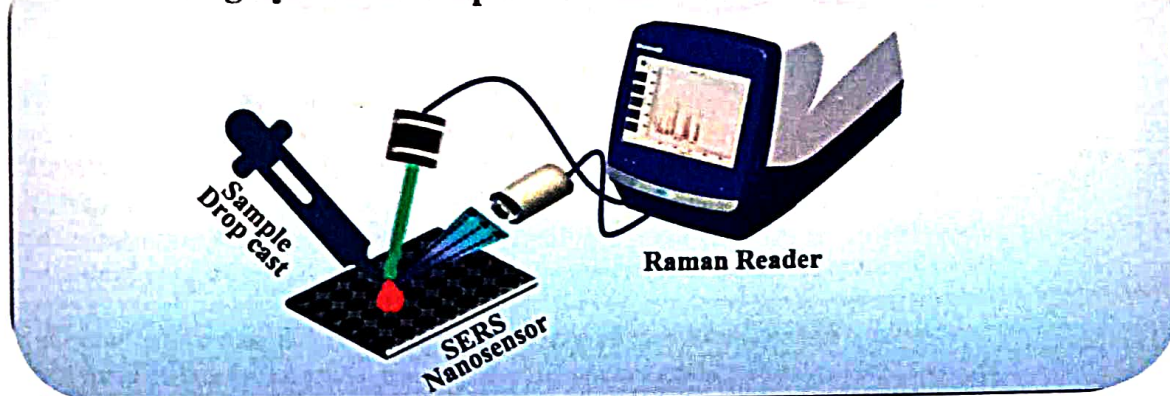


Researchers Develop Sensor to Track Disease Progression & Provide Rapid Medical Support

Nanosensing System for Rapid Detection of Inflammatory Biomarkers



INDIAN Institute of Technology Jodhpur researchers have developed a nanosensor that helps in the quick detection of Cytokines, a group of proteins that regulate various cells. This development aims to reduce the mortality rate due to delayed diagnosis and a lack of early warnings. Moreover, the technology has immense potential to be used as a rapid and point-of-care technique for health monitoring, disease diagnosis, prognosis, and immune response tracking.

Cytokines are one of the many biomarkers of inflammation that are used for diagnosing diseases and tracking their progression. They play an important role in tissue damage repair, cancer development and progression, and modulating immune reactions. This is why they are important for developing precision medicine and targeted therapeutics for various conditions like oncology, infectiology and rheumatological diseases, among others.

The work was published as a conference proceeding of the 2023 *IEEE Applied Sensing Conference (APSCON)*.

Talking about the developed technique and its future scope, Prof. Ajay Agarwal, Department of Electrical Engineering, IIT Jodhpur, said, "This technique, which is currently in its development stage, has provided exciting and encouraging results for three biomarkers, i.e. interleukin-6 (IL-6), interleukin- β (IL- β), and TNF- α which are key pro-inflammatory cytokines, released by inflammatory cells. As of now, the testing is done for controlled samples, but the team aims to take the technology to clinical trials soon. The group is also using this technique to develop detection protocols for the early-stage and quick diagnosis of Sepsis and Fungal infections."

This novel sensor developed at IIT Jodhpur uses Surface-enhanced Raman Spectroscopy to detect analytes even at low concentrations, is based on semiconductor process technology and works on the principle of Surface-Enhanced Raman Scattering (SERS).

Hence, this technique is powerful and capable of detecting trace-level molecules with high precision and selectivity.

The most widely used techniques currently for cytokine detection are Enzyme-Linked Immunosorbent Assay (ELISA) and Polymerase Chain Reaction (PCR). These methods are reliable but highly time-consuming, requiring trained personnel and a long sample preparation or analysis time of over 6 hours. However, the sensor developed by IIT Jodhpur takes only 30 minutes in comparison and is also cost-effective.

The developed sensor, a rapid and selective diagnostic technique, is used in conjunction with AI for quick and accurate data processing and analysis. By getting a faster and more robust diagnosis of a person's autoimmune diseases and bacterial infections, this sensor possesses the capability to transform a patient's medical treatment. This way, a patient's disease can be diagnosed and tracked promptly to guide the future course of treating them.

Reference

B. Akilandeshwari, S. Singh, A. Agarwal and S. Jha, "Rapid Detection of Inflammatory Biomarkers using Surface Enhanced Raman Spectroscopy," *2023 IEEE Applied Sensing Conference (APSCON)*, Bengaluru, India, 2023, pp. 1-4.

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