New nanoprobes developed to monitor programmed cell death–related bioprocesses

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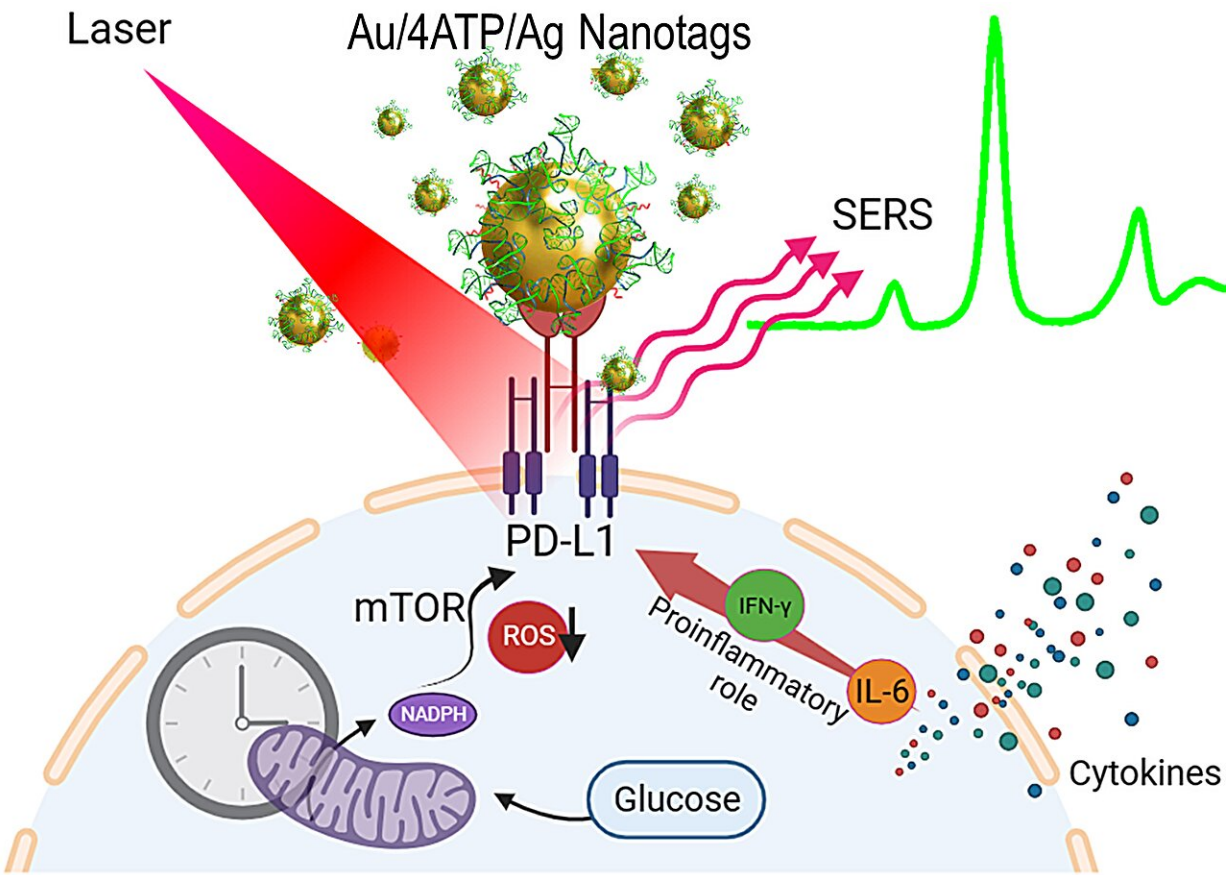

Biological processes affecting PD-L1 expression in cells were monitored using aptamer-SERS probe technology. Credit: Muhammad

A research team led by Prof. Huang Qing from the Hefei Institutes of

Physical Science of the Chinese Academy of Sciences has developed DNA-aptamer-based surface-enhanced Raman spectroscopy (SERS) probes to study immune system biomarker-related bioprocesses in cancer cell metabolism.

The study is published in *Analytical Chemistry*.

Programmed cell death protein 1 (PD-1) is an important immunosuppressive molecule in the human immune system, and programmed cell death ligand 1 (PD-L1) is its ligand protein molecule, both of which are immune checkpoint molecules.

An immune checkpoint is an inhibitory pathway of the immune system that is regulated by ligand/receptor interactions and it plays an important role in maintaining autoimmune tolerance and regulating physiological immune responses. It is crucial to accurately detect the dynamic process of PD-1 and PD-L1 expression, and to reveal the relevant regulatory factors and their relationships.

In recent years, the team has developed a series of biomarker-specific probes based on aptamer SERS technology, such as IL-6 protein in radiation injury and inflammation diagnosis, microRNA-122 in liver-related diseases, and PD-L1 in cancer progression.

In this study, they used a special type of nanoprobe made of DNA-combined SERS nanoparticles to investigate PD-L1 expression in living cancer cells.

The results showed that PD-L1 expression varied depending on cell metabolism and the presence of certain signaling molecules called cytokines. The way PD-L1 was expressed differed between different cell types and changed over time.

Importantly, certain cytokines like IL-6, IFN-γ, and IL-4 were found to increase PD-L1 expression, but the timing and extent of this increase varied depending on the specific cell type and its state.

This study not only expands the application of aptamer SERS biomarker technology, but also provides new experimental data and understanding for the study of the dynamic process of immune checkpoints and related regulatory factors.

More information: Muhammad Muhammad et al, Application of Aptamer-SERS Nanotags for Unveiling the PD-L1 Immunomarker Progression Correlated to the Cell Metabolic Bioprocess, *Analytical Chemistry* (2024). DOI: 10.1021/acs.analchem.3c05334

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