Biophotonics-based analysis for clinical application

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Abstract

The application of biophotonics, like vibrational spectroscopies and biosensors, offer valuable alternatives to the traditional biomolecular techniques, including ELISA, Real Time-Polymerase Chain Reaction (RT-PCR), mass spectroscopy, for the diagnosis and monitoring treatment of several diseases. Often the conventional methods require consistent sample amount, rely on operator expertise for manual procedure steps, can be time- consuming and provide only partial information about the biochemical features.
Instead Raman Spectroscopy (RS) ensures high chemical specificity and fast analytical procedure due to the minimal sample preparation, due to the described advantages, RS has been successfully applied in the diagnostic field and proposed as potential device for the analysis of liquid biopsy in several pathologies (1).
We propose in this presentation an overview of our biophotonic platform as promising methods used in the field of extracellular vesicles (EVs)-related biomarker discovery and saliva analysis.
Herein, we propose the Raman Spectroscopy (RS) and Surface Enhanced Raman Spectroscopy as promising and valuable tools for the diagnosis (2), prognosis and monitoring of the pathological state in neurodegenerative (3; 4) and pulmonary diseases.
I will show the RS bulk characterization of blood EVs as a feasible and reproducible method to diagnose people with Parkinson Disease and evaluate the effectiveness of the rehabilitation treatment.
The elevated sensitivity of Raman spectroscopy (RS) makes it a promising candidate in molecular diagnostics and biomarker discovery. Thus, we propose the analysis of saliva, a non-invasive and painless biological specimen, with RS as an investigative tool for the clinicians, helping the management of complex disease like Amyotrophic Lateral Sclerosis and pulmonary chronic pathologies, like Chronic Obstructive Pulmonary Disease (5) or for the diagnosis of Sars CoV2 infection (6).
In the complex the results of our studies support the use of RS as technological approach that could be complementary to current clinical assessments to accelerate the diagnosis or identification of the optimal treatment for each patient.

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