



SERS liquid biopsy: An emerging tool for medical diagnosis

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ABSTRACT

Surface-enhanced Raman scattering (SERS) is emerging as a novel strategy for biofluid analysis. In this review, we delineate four experimental SERS protocols that are frequently used for the profiling of biofluids: 1) liquid SERS for the detection of purine metabolites; 2) iodide-modified liquid SERS for the detection of proteins; 3) dried SERS for the detection of both purine metabolites and proteins; 4) resonant Raman for the detection of carotenoids. To explain the selectivity of each experimental SERS protocol, we introduce a heuristic model for the chemisorption of analytes mediated by adsorbed ions (adions) onto the SERS substrate. Next, we show that the promising results of SERS liquid biopsy stem from the fact that the concentration levels of purine metabolites, proteins and carotenoids are informative of the cellular turnover rate, inflammation, and oxidative stress, respectively. These processes are perturbed in virtually every disease, from cancer to autoimmune maladies. Finally, we review recent SERS liquid biopsy studies and discuss future steps that are required for translating SERS in the clinical setting.

In this review, we seek to delineate an unifying picture concerning the emerging field of SERS liquid biopsy. The roadmap of this review is shown in Fig. 1, which depicts the content of each section as well as the relationship between the topics.

1. SERS liquid biopsy

Label-free surface-enhanced Raman scattering (SERS) has recently established itself as a novel method of performing liquid biopsy [1]. The ultimate goal of SERS liquid biopsy is to develop fast and cheap

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