Combined Methods for Micro Particles

Determining: Are They Useful?

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Abstract

Microparticles (MPs) are considered important diagnostic biological markers in many diseases with promising predictive value. There are several methods that currently used for the detection of number and characterization of structure and features of MPs. Therefore, the MP detection methods have been remained pretty costly and time consuming. The short communication is depicted the perspectives to use coupling methods for MP measurement and structure assay. Indeed, there is large body evidence regarding that the combination of atomic force microscopy or coupling NTA with microbeads, plasmon resonance method and fluorescence quantum dots could exhibit much more accurate ability to detect both number and structure of MPs when compared with traditional flow cytometry and fluorescent microscopy. Whether several combined methods would be useful for advanced MP detection is not fully clear, while it is extremely promising.

Keywords: microparticles, detection, analytical limitations, biomarker, probability
Introduction

Microparticles (MPs) are specified small membrane vesicles with diameter ranged from 50 to 1000 nm [1]. They are produced and actively secreted by several cells due to activation and / or apoptotic stimuli [2]. Transferring active molecules, proteins, peptides, DNAs, RNAs / micro-RNAs, hormones, circulating free-cell MPs play a pivotal role in various biological processes including immune reaction, cell-to-cell cooperation, endogamous reparation, inflammation, proliferation and growth [3, 4]. MPs are recognized an important diagnostic biological markers in many diseases including cardiovascular (CV) and autoimmune diseases, cancer, sepsis, infections, and thrombosis [5-9]. Moreover, number of circulating MPs has been hypothesized to be responsible for prediction of the CV risk, thromboembolic events, autoimmune crisis, bleeding, as well as risk of all-cause mortality and CV death [10-12].

Nowadays, there are several methods that currently used for the detection of number (flow cytometry technique, optical coherent microscopy, nanoparticle tracking analysis [NTA], dynamic light scattering) and characterization of structure and features (electronic and atomic force microscopy, fluorescent microscopy, surface plasmon resonance [SPR] technoque) of MPs [13, 14]. The main limitations of methods of MPs’ identification are several requirements for biofluid fractionation, risk of sample contamination and increased biological variability that negatively effects on precision of measurement [15]. However, the MP detection methods have been remained pretty costly and time consuming. Additionally, majority of them requires be standardizing and approving. In this context, combined methods might to quantify and qualify MP detection. There is large body evidence regarding that the combination of SPR method to atomic force microscopy or coupling NTA with microbeads and fluorescence quantum dots exhibited much more accurate ability to detect both number and structure of MPs when compared with traditional flow cytometry and fluorescent microscopy [16-18]. Moreover, all these new methods could be used as screening method for MP detection and they would not only be much more reproducibility, specificity and sensitivity, but also they should be pretty inexpensive and assessable [19, 20]. Therefore, combined methods might assay some components of MPs including RNAs, lipids, proteins and active molecule profiling. Probably, similar approach would attenuate pre- and intra-analytical errors and improve entire precision of the methods. Thus, coupling some methods based on different principles might allow detecting numerous and structure of MPs. All these could be useful for providing the necessary information to clear biological role of MPs as diagnostic and predictive biomarkers.

In conclusion, currently used analytical methods as only technique for detection of MPs exhibited serious limitation to interpretation of received results. The combination of MPs’ detection methods is required to sufficiently increase of their specificity, sensitivity and probability in serial measurements.
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References


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