Development of a Detection Platform for Lactobacillus Paracasei-Derived EVs Using Functionalized Au Thin Film

Surin Hong
Department of Biotechnology, CHA University, Gyeonggi 13488, South Korea

Kyungmin Lee
Department of Biotechnology, CHA University, Gyeonggi 13488, South Korea

Youngbo Choi
Department of Safety Engineering, Chungbuk National University, Chungbuk, 28644, South Korea

Abstract:

Extracellular vesicles (EVs), including exosomes, are membrane-bound vesicles with potential as biomarkers, drug delivery systems, and therapeutic agents. However, conventional quantification methods like ELISA, nanoparticle tracking analysis (NTA), and flow cytometry face challenges such as complex preparation, labeling requirements, and non-target interference. Surface plasmon resonance (SPR) offers a promising alternative, enabling label-free, real-time analysis with high specificity. This study introduces a novel SPR-based method for quantifying Lactobacillus paracasei-derived EVs (Lp-EVs), known for their anti-inflammatory and anti-aging effects. By identifying overexpressed surface proteins on Lp-EVs, a sensor chip functionalized with selective receptors was developed, achieving precise and specific detection. This platform addresses the limitations of traditional methods, facilitating tailored sensor chip development for novel EV types and supporting therapeutic and cosmetic applications. Additionally, the proposed method provides a robust framework for determining exosome dosages, ensuring effective formulation management and advancing the clinical and commercial use of EVs.

Keywords:

EVs, Exosomes, Quantification, Characterization, Sensor chip.