**Engineering of magnetic microspheres with polymer coatings and examination of their performance for isolation of small extracellular vesicles**

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The isolation and profiling of individual fractions of sEVs secreted by pathological cells are significant in discovering their physiological functions and clinical applications. Traditional methods for isolation and purification of sEVs from bodily fluids are facing a number of limitations, such as low yield, presence of contaminants, long-term operation and high costs, which restrict their routine practical applications. In this regard, bead-assisted platforms are very effective for trapping sEVs with high recovery yield and sufficient purity for further molecular profiling. In this study, we engineered composite microspheres made of calcium carbonate core impregnated with magnetite nanoparticles. Such composition allows collecting of microspheres by using magnet thus ensure rapid and gentle capture of microspheres in aqueous suspension. At the same time, polymeric shell containing polyphenol molecules on the surface of microspheres is used to induce coupling between microspheres and sEVs. The performance for isolating sEVs by developed microspheres is verified on sEVs derived from cell culture media. This is the first step toward isolation of sEVs by this approach which can be further expanded for trapping of sEVs from clinical samples.

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