Supporting Information

Biomimetic 3D DNA nanoplatform for enhanced capture and high-purity isolation of stem cell exosomes

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1. Reagents and Apparatus. All oligonucleotides were obtained from Shanghai Sangon Biological Engineering Technology and Services Co., Ltd. (Shanghai, China). All the synthetic oligonucleotides were HPLC purified and freeze-dried by the supplier. Their sequences were listed in Supporting Information (Table S-1). All oligonucleotides were received as powders and centrifuged so that they would reside at the bottom of the containers. The powder was then dissolved with 10 mM phosphate-buffered saline (PBS, pH 7.4) to give stock solutions of 100 μM. Magnetic bead (MB) were purchased from ThermoFisher. Chloroauric acid ($HAuCl_4 \cdot 3H_2O$), N-hydroxysuccinimide (NHS), 1-ethyl-3-[3-dimethylaminopropyl]carbodiimid hydrochloride (EDC), tris(hydroxymethyl)aminomethane (Tris), L-Cysteine, sodium chloride (NaCl), potassium chloride (KCl), magnesium chloridehexahydrate ($MgCl_2$), disodium hydrogen phosphate (Na_2HPO_4), dibasic sodium phosphate (Na_2HPO_4) were purchased from Sigma-Aldrich. Dulbecco's modified Eagle's medium (DMEM), fetal bovine serum (FBS), penicillin-streptomycin and trypsin were obtained from GIBCO Invitrogen Corp. dNTP and Phi 29 DNA polymerase, and DNA T4 Ligation kit were purchased from Fermentas. The primary antibody for CD63, ALIX, HSC70, TSG101 were obtained from Cell Signaling Technology. The secondary antibody (goat anti-rabbit IgG (H&L)-HRP was obtained from Invitrogen. All reagents are analytical grade and solutions were prepared using ultrapure water (specific resistance of 18 MΩ cm, Milli-Q Gradient System, Millipore, Bedford, MA). All UV-vis absorbance measurements were conducted on a UV-vis spectrophotometer (Shimadzu). Zeta potential and size was measured with a Malvern Zetasizer (Nano-ZS90). The shape and size of MB, AuNPs, MB/AuNPs, MB/AuNPs/primer, MB/AuNPs/RCA were characterized on a transmission electron microscope (TEM) with a working voltage of 200 kV (JEOL, JEM-2100, Japan). Gel electrophoresis and western blot images were acquired on a gel imaging system (ChemiDocTM).

2. Dynamic light Scattering (DLS) and zeta potential measurements. Zeta potential and dynamic light scattering measurements of hydrodynamic radii were made on a Malvern Zetasizer Nano-ZS (Malvern Instruments). Results were averaged over ten measurements. When measuring the zetal potential and DLS, the pH of the solution was 7.4, and the exosome concentration detection kit was used to obtain an exosome concentration of 2.23 mg/mL.

Table S1. DNA sequence (5’-3’):

Primer: C ACC TCG CTC CCG TGA CAC TAA

HS-primer: HS-TTT TTT C ACC TCG CTC CCG TGA CAC TAA

Circle template: GGC ACT GTG ATT ACG AT AAA AAA AAA AAA AAA AAA AAA GTG GGG TGG AGC GAG

Monovalent CD63 Aptamers: HS-TTT TTT CAC CCC ACC TCG CTC CCG TGA CAC TAA TGC TA

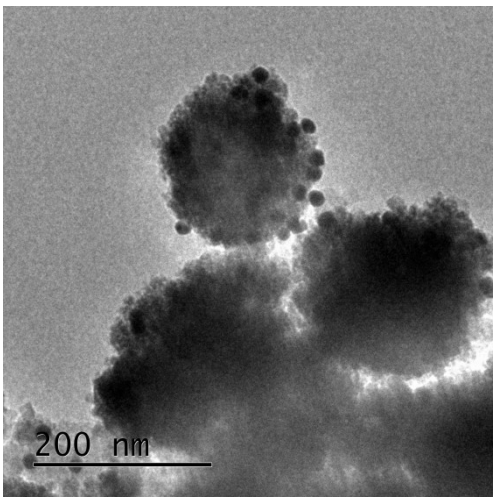

Fig. S1. TEM of MB/AuNPs.

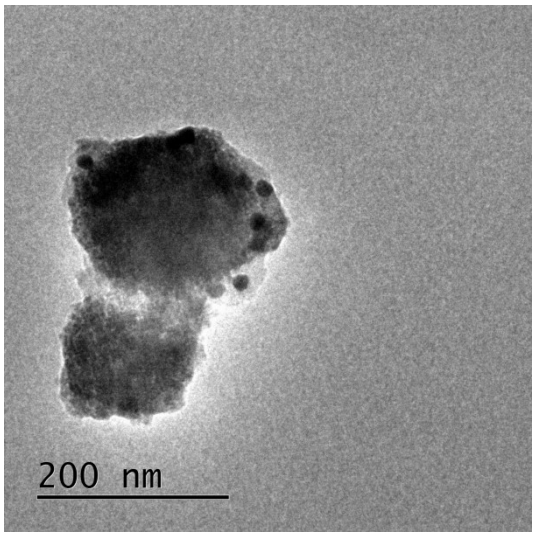

Fig. S2. TEM of MB/AuNPs/primer.

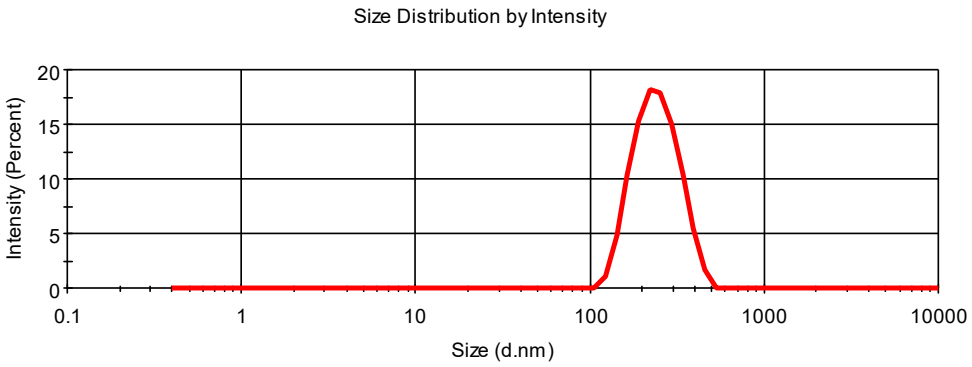

Fig. S3. DLS of isolated MB.

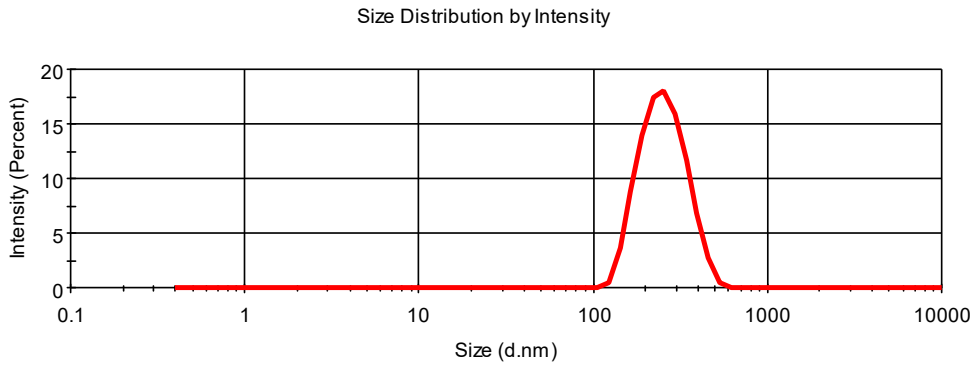

Fig. S4. DLS of isolated MB/AuNPs.

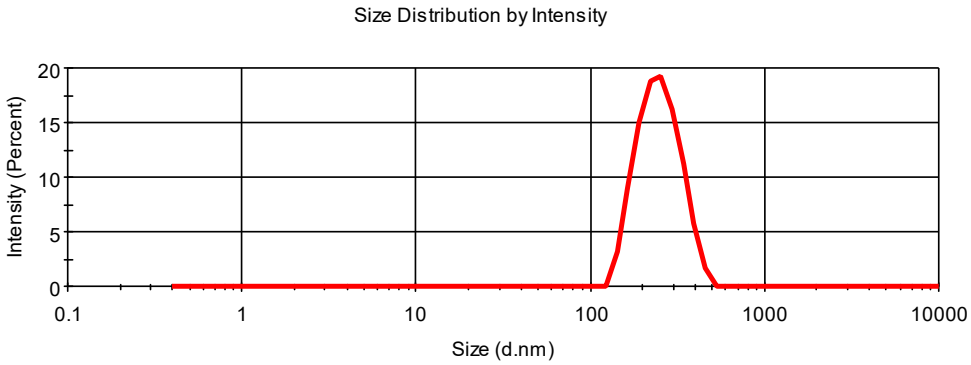

Fig. S5. DLS of isolated MB/AuNPs/primer.

Fig. S6. DLS of isolated MB/AuNPs/RCA.

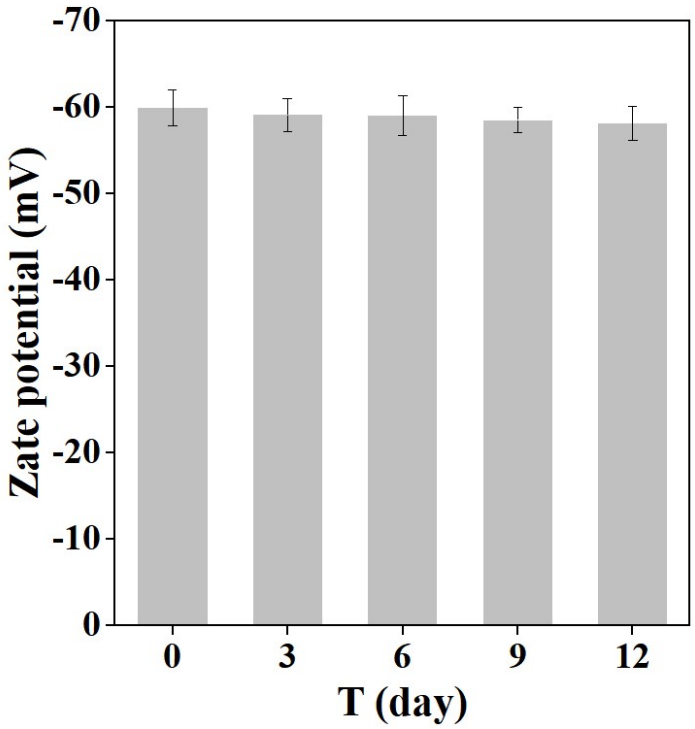

Fig. S7. The stability of MB/AuNPs/RCA in complex environments characterized by Zeta potential.

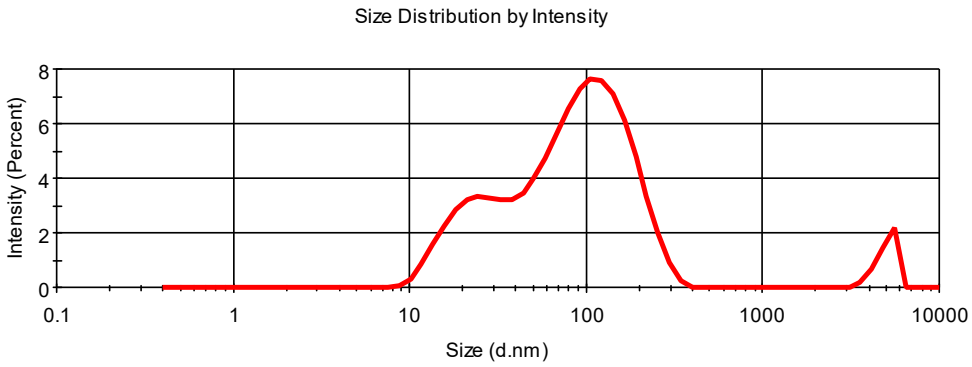

Fig. S8. DLS of isolated exosomes.

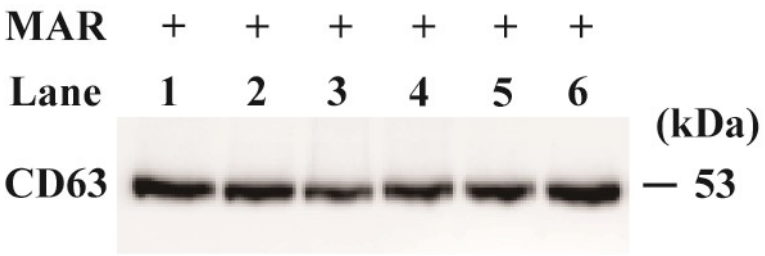

Fig. S9. WB characterization of MB/AuNPs/RCA reuse performance.

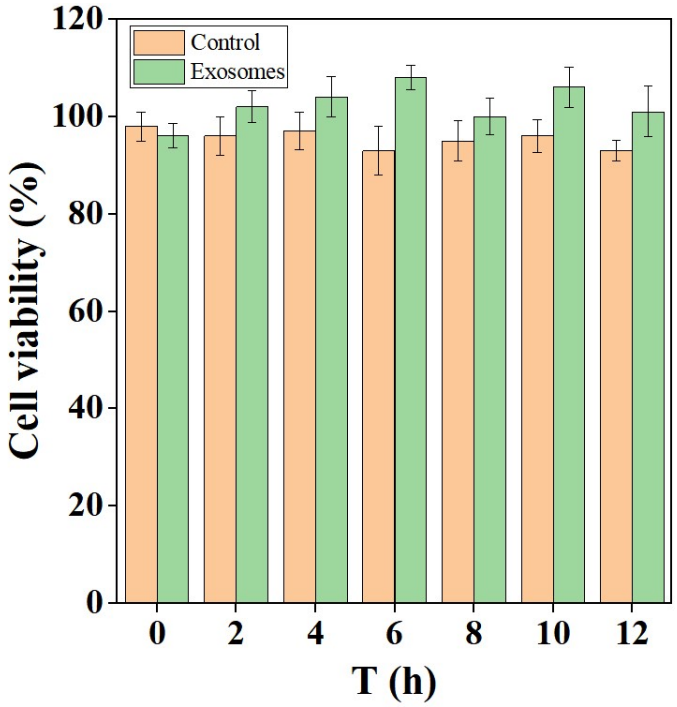

Fig. S10. Viability of cells incubated with different times of exosomes.

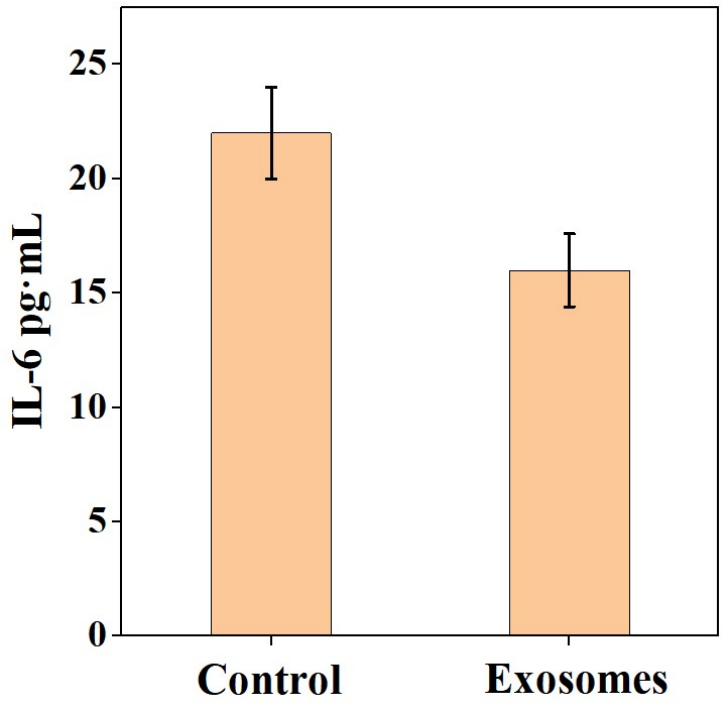

Fig. S11. The concentrations of IL-6 in control or exosomes media.

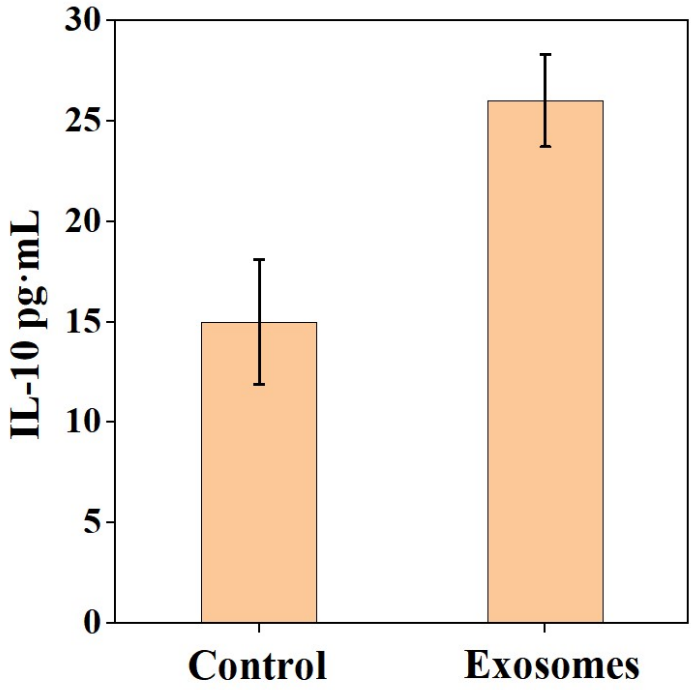

Fig. S12. The concentrations of IL-10 in control or exosomes media.