Supplemental File

Nanogel hybrid assembly for exosome intracellular delivery: Effects to endocytosis and fusion by exosome surface polymer engineering

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Supplementary Information

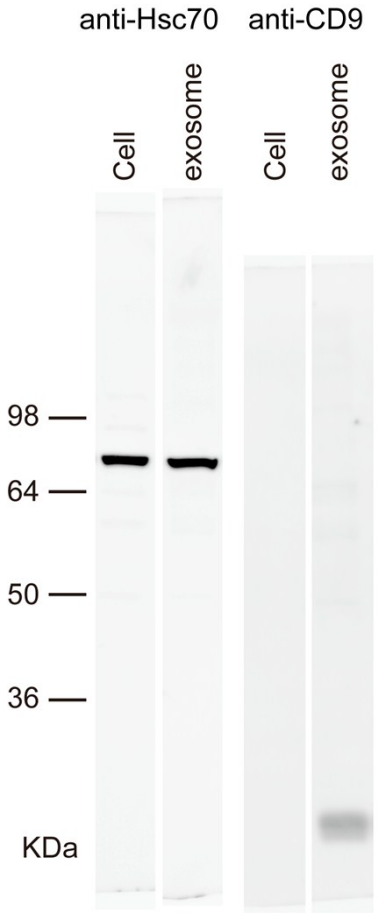

Fig. S1 Full length of image of western blotting for Fig. 2c**.**

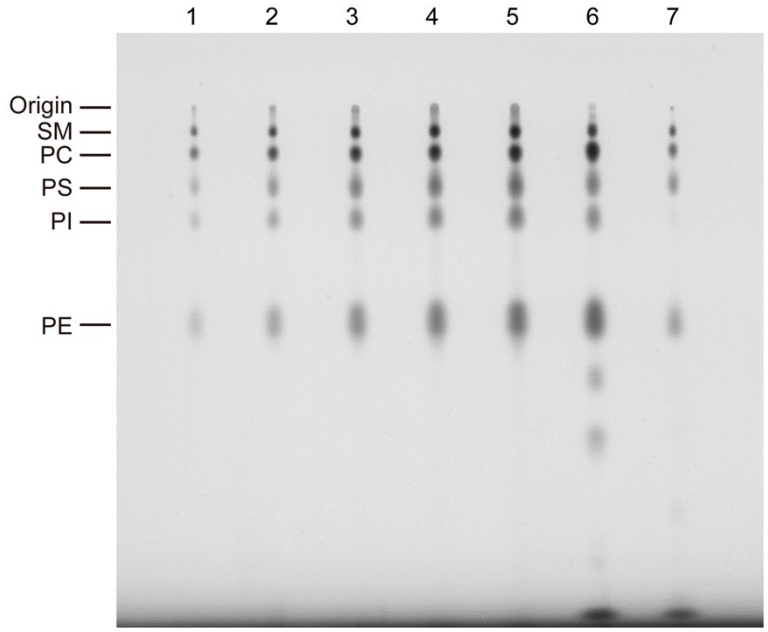

Fig. S2 TLC chromatograms of lipids in Raw264.7 cell-derived exosomes and Raw264.7 cells. Lanes 1–5 contain lipids standard solution spotted in 0.2, 0.5, 1.0, 1.5 and 2.0 μg, respectively. Lane 6 contain extracted sample from Raw264.7 cells. Lane 7 contain extracted sample from Raw264.7 cell-derived exosomes.

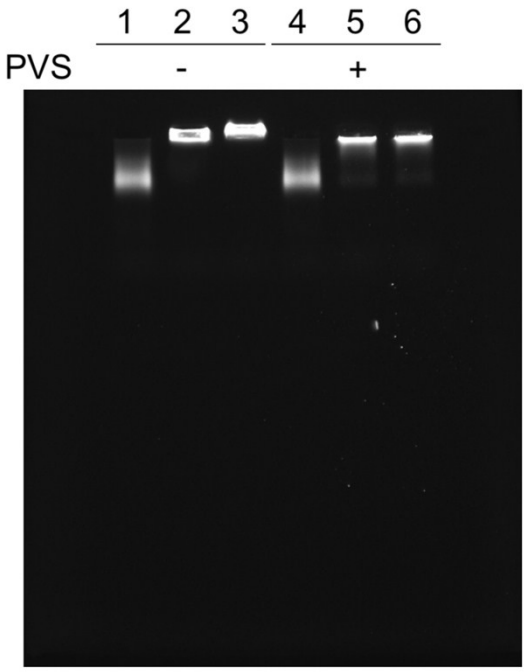

Fig. S3 Evaluation of $CHPNH_2$ nanogel/CFSE-Raw-exosome hybrids formation by agarose gel (0.5%) electrophoresis with 40 mM Tris-acetate buffer (pH7.4) at 50V for 30 min under cooling (approximately 10–15ºC), in the presence or absence of 6.7 mol % polyvinyl sulfate sodium salt (PVS) unit relative to the amino group moles of $CHPNH_2$. Lane 1, 4: CFSE-Raw-exosome, Lane 2, 5: $CHPNH_2$ nanogel/CFSE-Raw-exosome hybrid (1wt:1wt), Lane 3, 6: $CHPNH_2$ nanogel/CFSE-Raw-exosome hybrid (2.5wt:1wt).

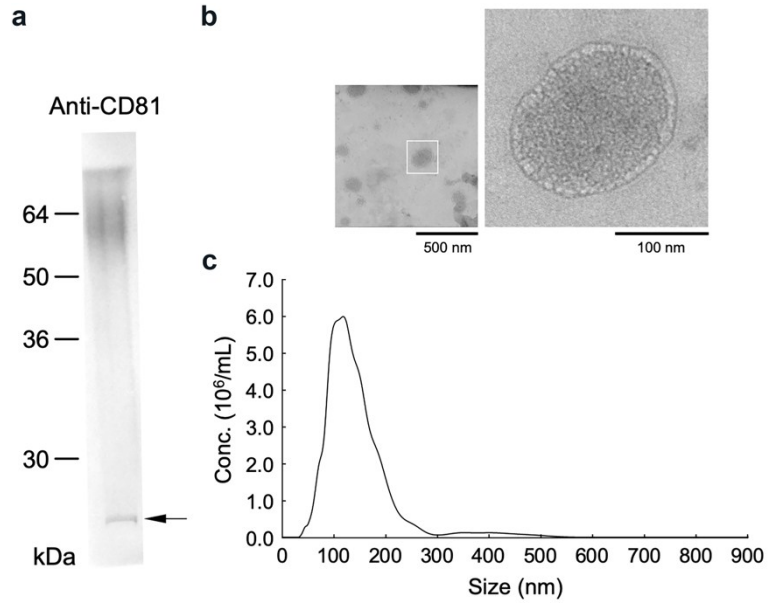

Fig. S4 The characterization of PC12-derived exosomes. (a) Western blot analysis for CD81 (26 kDa) protein in PC12-derived exosomes. (b) Morphological observation by TEM. Scale bar represents 500 or 100 nm respectively. (c) Size distribution profile of exosomes determined by NTA.

Table. S1 The size and ζ-potential of $CHPNH_2$ nanogel/Raw264.7 cell-derived exosome hybrids.

Storage time[a]	Raw exosome (Raw exo)		Nanogel/Raw exo hybrid (1:1)[c]	
	Size ± S.D. (nm)[b]	ζ-potential ± S.D. (mV)[b]	Size ± S.D. (nm)[b]	ζ-potential ± S.D. (mV)[b]
0 h	157 ± 3	-11.9 ± 0.9	170 ± 11	-4.1 ± 0.8
4 h	162 ± 8	-11.0 ± 0.4	175 ± 10	-3.4 ± 1.1
24 h	156 ± 9	-12.1 ± 0.8	175 ± 12	-4.0 ± 0.5

[a] Samples were stored in PBS at 37ºC. [b] Determined by NTA (Nano sight) and Zetasizer, respectively (n=3). [c] In parentheses indicates the weight ratio of nanogel to exosome.

Table. S2 The size and ζ-potential of $CHPNH_2$ nanogel/PC12 cell-derived exosome hybrids.

	Size ± S.D. (nm)[a]	ζ-potential ± S.D. (mV)[a]
PC12 exosome (PC12 exo)	145 ± 11	-11.5 ± 3.1
Nanogel/PC12 exo hybrid (1:1)[b]	161 ± 3	0.4 ± 2.2
Nanogel/PC12 exo hybrid (2.5:1)[b]	166 ± 7	0.4 ± 1.0

[a] Determined by NTA (Nano sight) and Zetasizer, respectively (n=3). [b] In parentheses indicates the weight ratio of nanogel to exosome.