

Electronic Supporting Information

Gold nanoparticle size and shape influence on osteogenesis of mesenchymal stem cells

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Table S1. The HAuCl₄ solution volume, trisodium citrate volume, reaction time and centrifugation condition to synthesize sphere-40, sphere-70 and sphere-110.

Samples	HAuCl ₄ (0.1 mg/mL)	Trisodium citrate (10.0 mg/mL)	Reaction time	BSA (10 mg/mL)	Centrifugation
sphere-40	100.0 mL	1.20 mL	15 min	2.67 mL	8000 rpm, 10 min
sphere-70	100.0 mL	0.58 mL	15 min	2.67 mL	6000 rpm, 10 min
sphere-110	100.0 mL	0.40 mL	50 min	2.67 mL	5000 rpm, 6 min

Table S2. The volumes of HAuCl₄ solution, Au seeds solution, AgNO₃ solution, AA solution, BSA solution and centrifugation condition to synthesize star-40, star-70 and star-110.

Samples	HAuCl ₄ (30 mg/mL)	Au seeds	AgNO ₃ (5 mg/mL)	AA (38 mg/mL)	BSA (10 mg/mL)	Centrifugation
star-40	0.75 mL	25.0 mL	0.30 mL	0.50 mL	6.0 mL	10000 rpm, 10 min
star-70	0.75 mL	5.0 mL	0.30 mL	0.50 mL	6.0 mL	8000 rpm, 10 min
star-110	0.75 mL	1.1 mL	0.30 mL	0.50 mL	6.0 mL	6000 rpm, 10 min

Table S3. The volumes of HAuCl₄ solution, HCl, Au seeds or NaBH₄ solution, AgNO₃ solution, AA or hydroquinone solution, BSA solution and centrifugation condition to synthesize rod-40, rod-70 and rod-110.

Samples	HAuCl ₄ (0.01 M)	HCl (1.0 M)	AgNO ₃ (10 mM)	AA (0.1 M)	Au seeds	BSA (10 mg/mL)	Centrifugation
rod-40	10 mL	4 mL	0.44 mL	1.6 mL	0.48 mL	11.0 mL	10000 rpm, 15 min
rod-70	10 mL	4 mL	2.20 mL	1.6 mL	0.48 mL	11.0 mL	9000 rpm, 10 min
Samples	HAuCl ₄ (0.01 M)		AgNO ₃ (0.02 M)	Hydroquinone (0.62 M)	NaBH ₄ (0.5 M)	BSA (10 mg/mL)	Centrifugation
rod-110	7.6 mL		2.0 mL	1.6 mL	126.0 μL	8.4 mL	8000 rpm, 6 min

Table S4. The primers and probes for real-time PCR.

mRNA	Oligonucleotide
18 S rRNA	Hs99999901_s1
GAPDH	Hs99999905_m1
ALP	Forward 5'-GACCCTTGACCCCCACAAT-3' Reverse 5'-GCTCGTACTGCATGTCCCCT-3' Probe 5'-TGGACTACCTATTGGGTCTCTCGAGCCA-3'
IBSP	Forward 5'-TGCCTTGAGCCTGCTTCC-3' Reverse 5'-GCAAAATTAAAGCAGTCTTCATTTCG-3' Probe 5'-CTCCAGGACTGCCAGAGGAAGCAATCA-3'
SPPI	Forward 5'-CTCAGGCCAGTTGCAGCC-3' Reverse 5'-CAAAAGCAAATCACTGCAATTCTC-3' Probe 5'-AACCGCCACCAAGGAAAACACTCACTACC-3'
Runx2	Hs00231692_m1

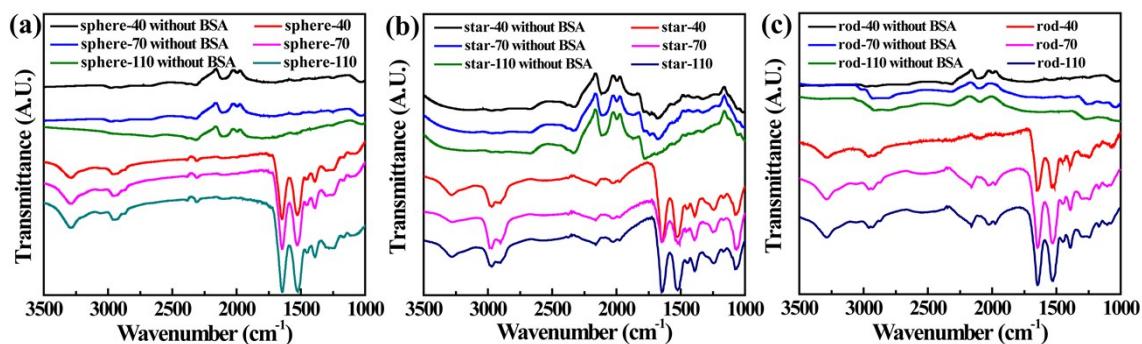


Fig. S1 FTIR spectra of various AuNPs before and after the BSA coating: sphere-40, sphere-70, sphere-110 (a), star-40, star-70, star-110 (b) and rod-40, rod-70, rod-110 (c).

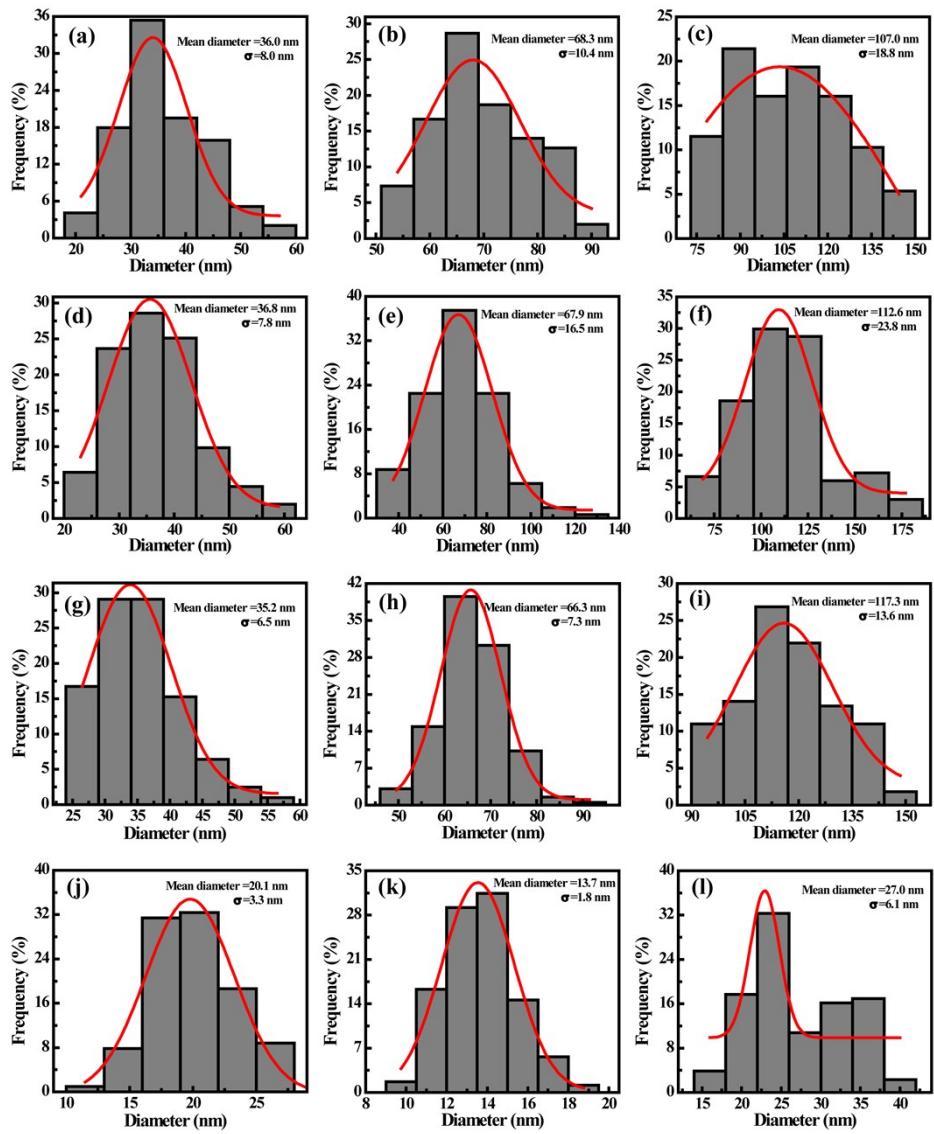


Fig. S2 Size distribution histogram of various AuNPs: sphere-40 (a), sphere-70 (b), sphere-110 (c), star-40 (d), star-70 (e), star-110 (f), length of rod-40 (g), length of rod-70 (h), length of rod-110 (i), width of rod-40 (j), width of rod-70 (k) and width of rod-110 (l).

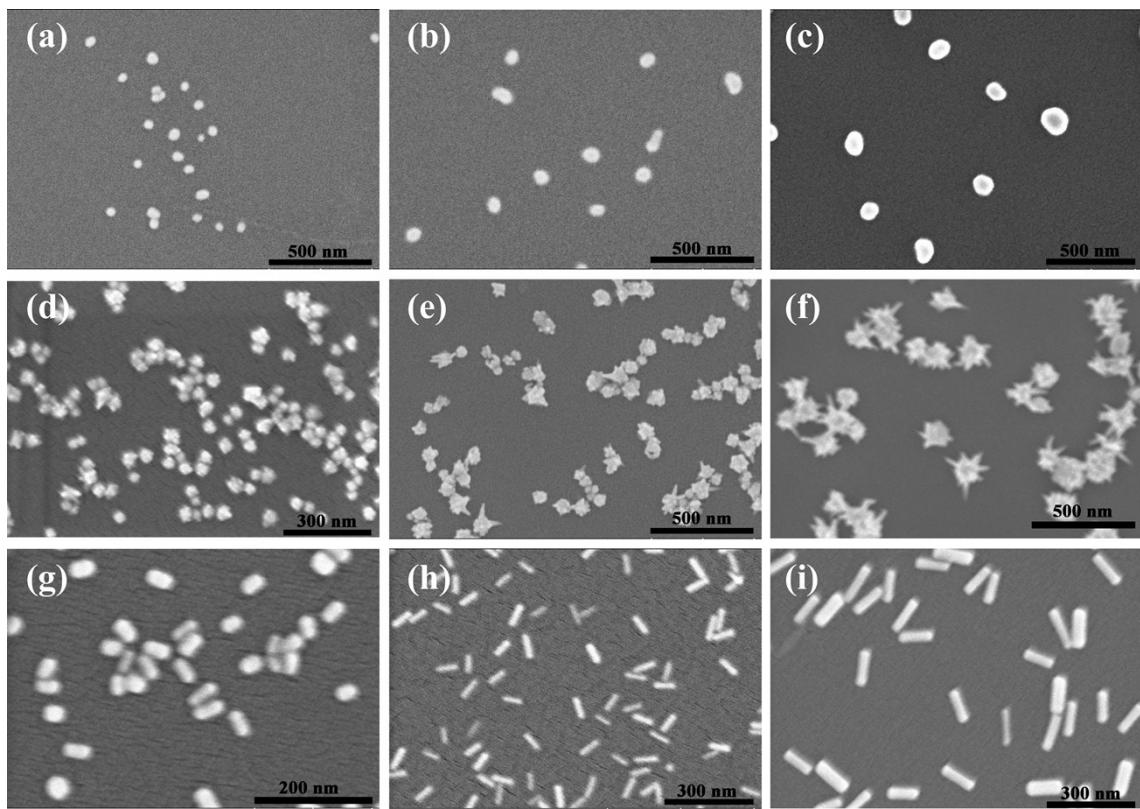


Fig. S3 SEM images of various AuNPs: sphere-40 (a), sphere-70 (b), sphere-110 (c), star-40 (d), star-70 (e), star-110 (f), rod-40 (g), rod-70 (h) and rod-110 (i).

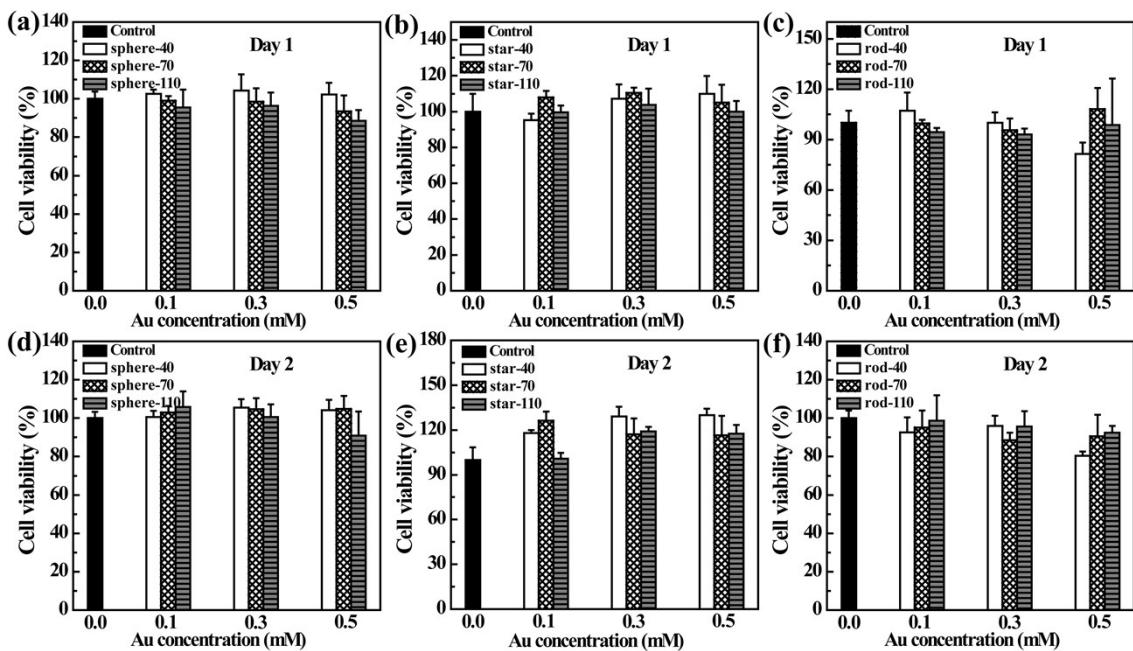


Fig. S4 Cell viability of hMSCs incubated with PBS (control) or various AuNPs in growth medium at the Au concentration of 0.1, 0.3 and 0.5 mM for 1 days (a-c) and 2 days (d-f).