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Fluorescence-Encoded Gold Nanoparticles: Library Design and Modulation of Cellular Uptake into Dendritic Cells

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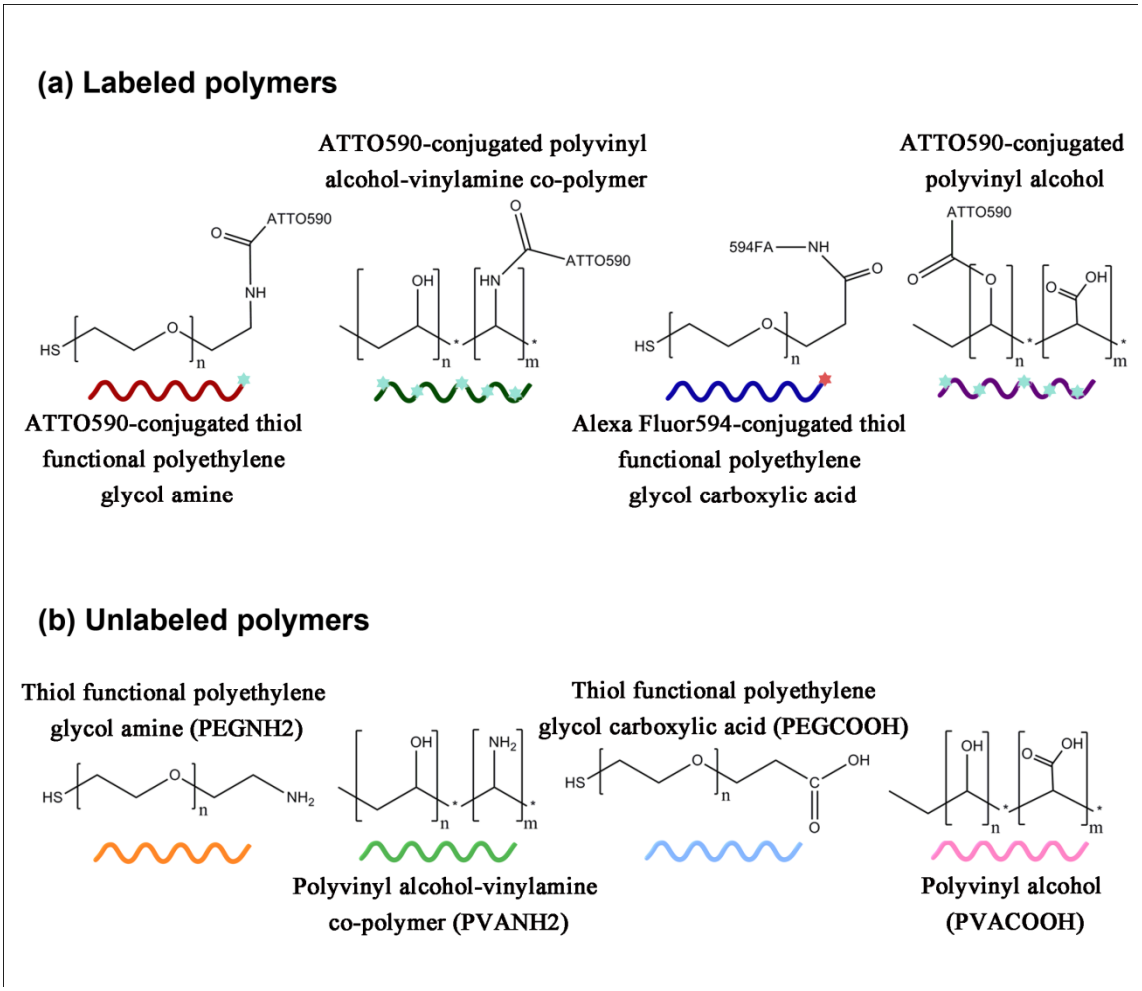

Figure S1. Chemical structures of dye-conjugated (a) and unlabeled (b) polymers used for coating of Au-NPs and their schematic drawings used in the Figure 1.

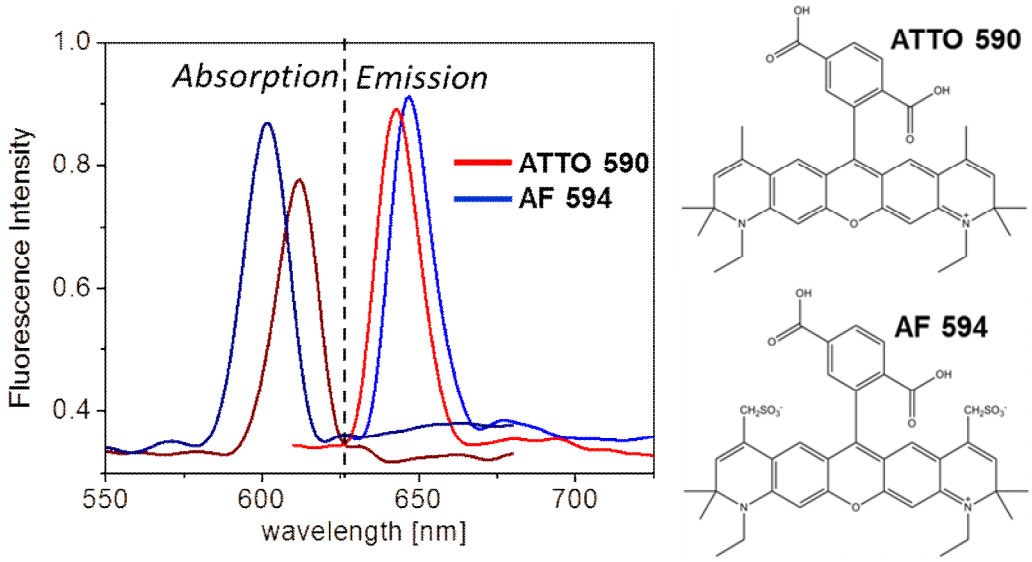

Figure S2. Chemical structure and electronic absorption and emission spectra of ATTO590 (blue) and Alexa Fluor 594 (AF594) (red). Both, absorption and emission were recorded in PBS solutions.

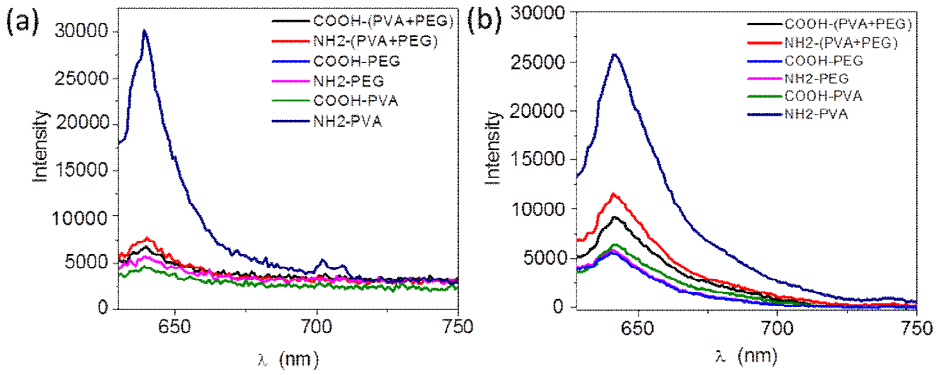

Figure S3. Emission spectra of (a) homo-functionalized and (b) hetero-functionalized Au-NPs. Emission were recorded in PBS (phosphate buffered saline) solution.

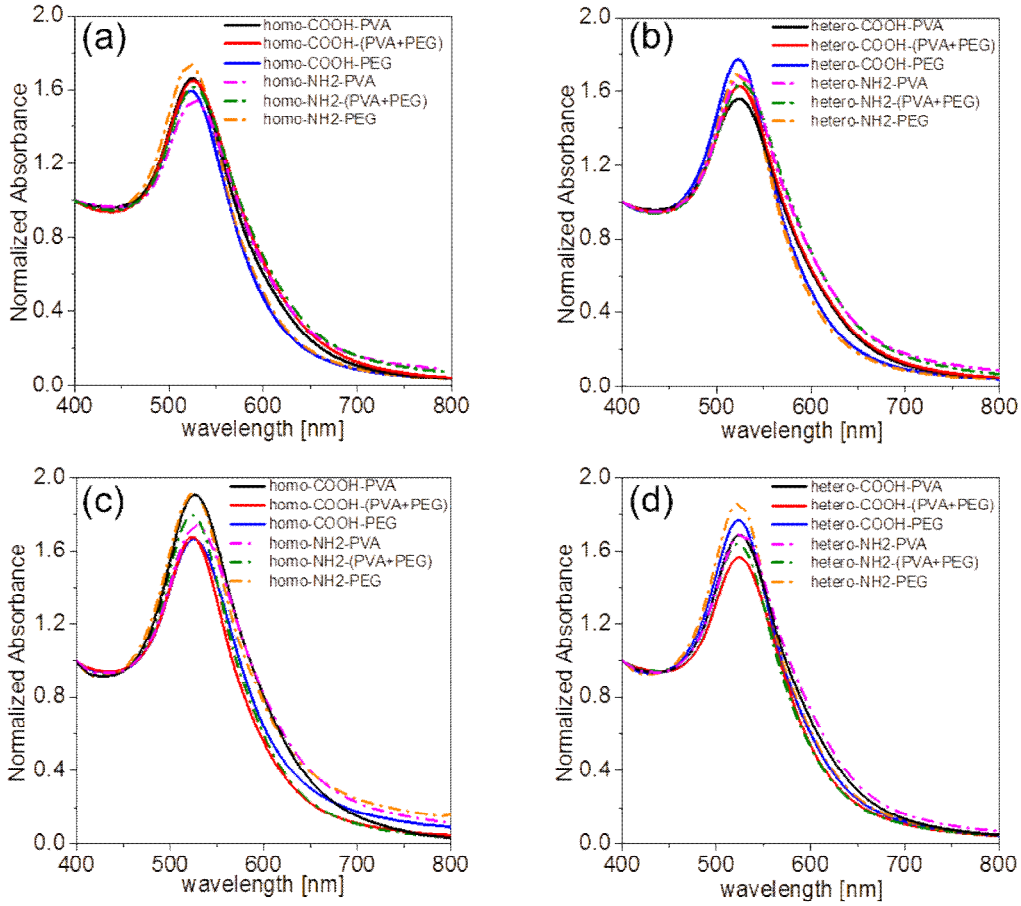

Figure S4. Colloidal stability in serum supplemented cell culture medium. UV-Vis spectra of homo- (a, c) and hetero-functionalized (b,d) Au-NPs kept at 37°C and 5% CO2 in RPMI 1640 medium (10% FCS, 1% L-Glu, 1% Pen-Strep, 10 ngmL-1 GM-CSF AND 10 ngmL-1 IL-4). The particles were incubated for 1 h (a, b) and 24 h (c, d).

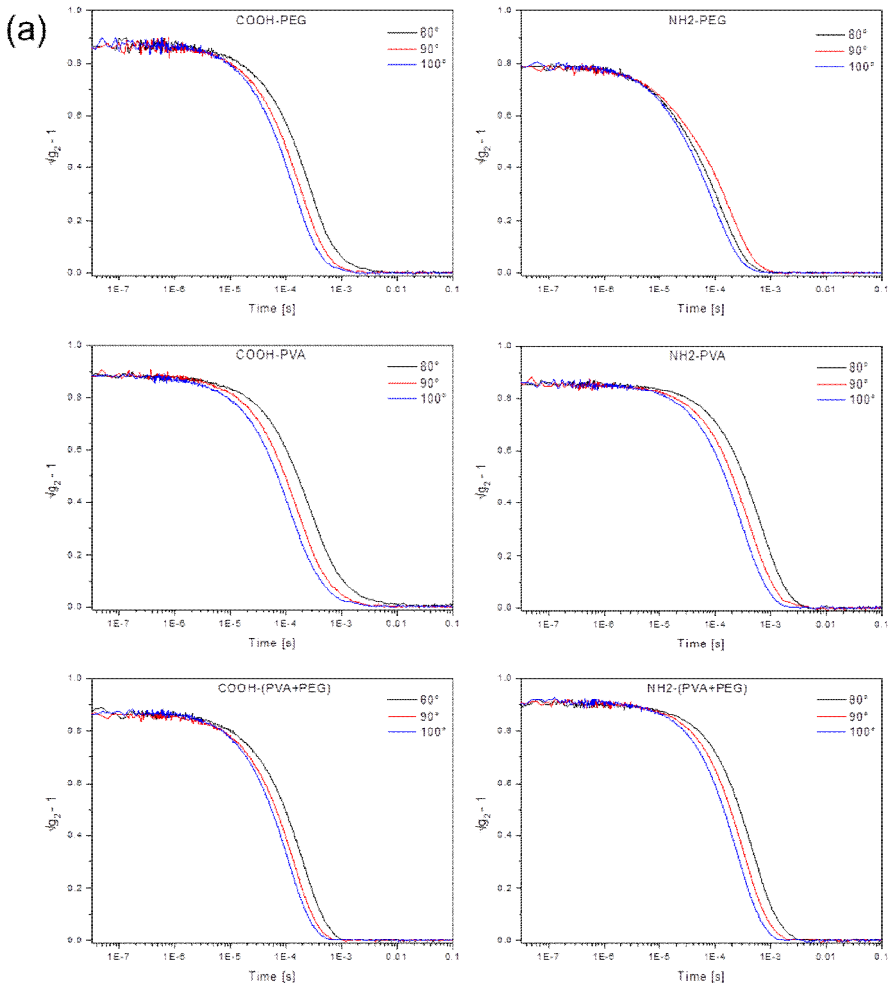

Figure S5. Temporal correlation functions recorded for unlabeled homo-functionalized (a), homo-functionalized (b), and hetero-functionalized (c) Au-NPs. Dynamic light-scattering measurements were carried out at room temperature and at three different scattering angles of 80, 90 and 100°, using a 3D LS spectrometer (LS instruments) equipped with a 21 mW HeNe laser (632.8 nm). Data was collected over 4 mins and three independent correlation functions were measured. The corresponding correlation functions were analyzed using the constrained regularized Cumulant method (Table S1).

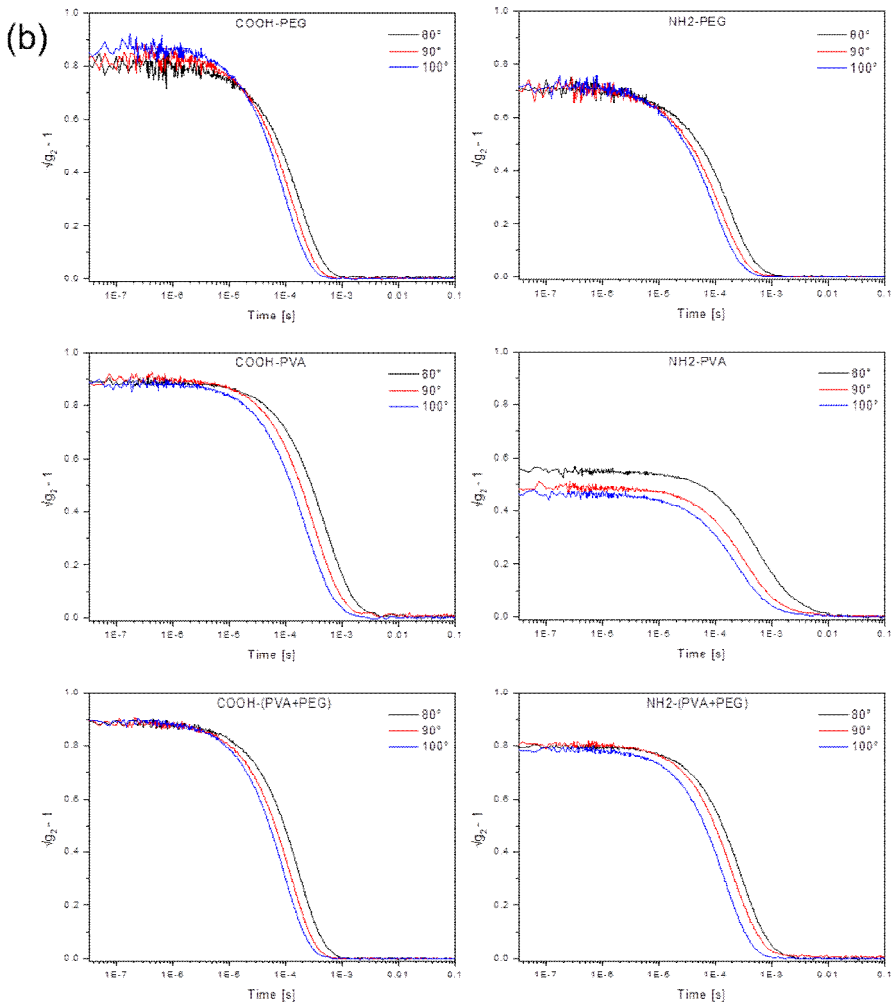

Figure S5. Temporal correlation functions recorded for unlabeled homo-functionalized (a), homo-functionalized (b), and hetero-functionalized (c) Au-NPs. *(continuation…)*

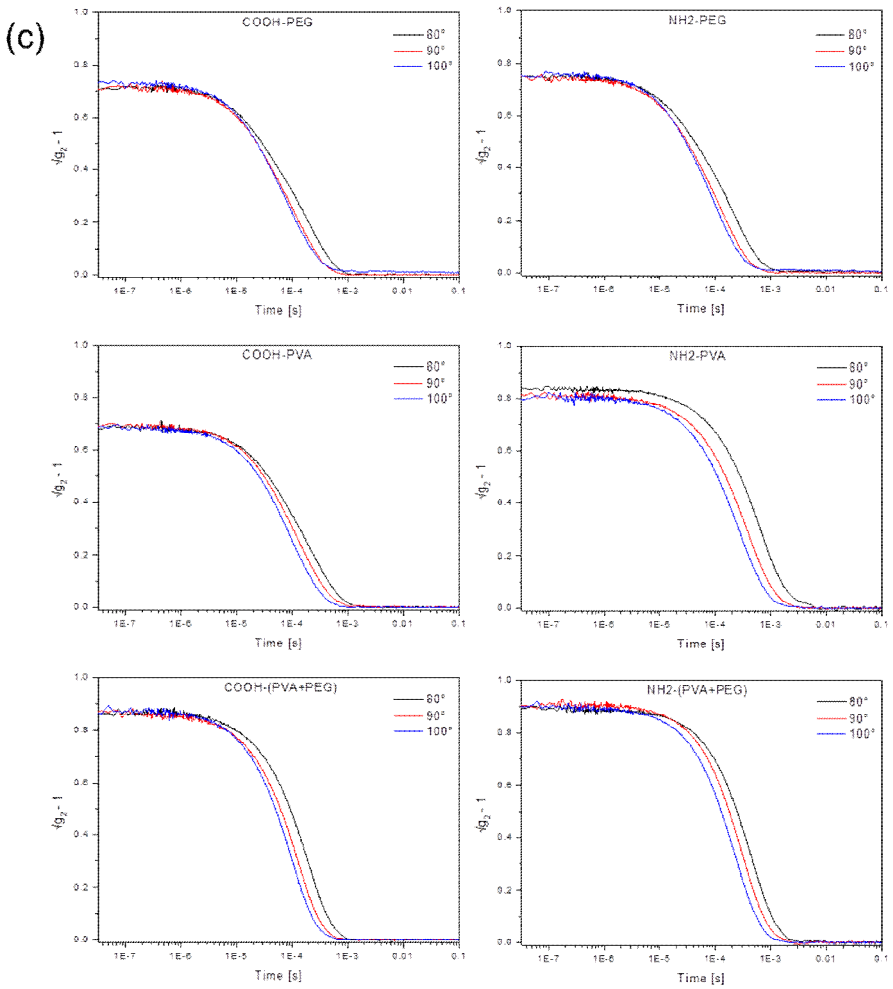

Figure S5. Temporal correlation functions recorded for unlabeled homo-functionalized (a), homo-functionalized (b), and hetero-functionalized (c) Au-NPs. *(continuation…)*

Table S1. Hydrodynamic diameter of polymer coated Au-NPs obtained by DLS measurements at room temperature and at a three different scattering angles of 80°, 90° and 100°.[a)]

Scattering angle	80°		90°		100°	
Unlabeled Homo-functionalized Au-NPs	**d [nm] (±SD)**	**Polydispersity (PD) [%]**	**d [nm] (±SD)**	**Polydispersity (PD %)**	**d [nm] (±SD)**	**Polydispersity (PD %)**
NH2-PEG	19.7 (0.2)	9.0	19.5 (0.2)	9.0	19.5 (0.2)	8.8
NH2-(PVA+PEG)	55.1 (0.6)	20.8	53.9 (1.0)	19.8	51.4 (0.3)	19.4
NH2-PVA	80.4 (0.5)	34.8	71.9 (1.7)	31.9	66.4 (0.6)	28.8
COOH-PEG	37.4 (2.3)	16.8	34.5 (0.5)	15.3	33.0 (0.2)	14.3
COOH-(PVA+PEG)	22.1 (0.2)	6.6	22.1 (0.2)	6.1	22.0 (0.1)	6.2
COOH-PVA	22.5 (0.6)	9.5	21.5 (0.1)	9.0	21.1 (0.1)	8.6
Homo-functionalized Au-NPs						
NH2-PEG	18.6 (0.2)	8.9	18.4 (0.1)	9.1	18.7 (0.6)	9.3
NH2-(PVA+PEG)	64.4 (0.6)	29.5	53.5 (0.6)	20.0	53.0 (0.4)	23.8
NH2-PVA	73.2 (6.0)	38.1	64.1 (0.3)	33.0	56.9 (0.4)	29.2
COOH-PEG	20.9 (0.1)	7.5	19.1 (0.1)	7.1	20.6 (0.1)	7.0
COOH-(PVA+PEG)	24.1 (4.3)	9.8	22.4 (0.1)	6.3	21.3 (0.1)	7.0
COOH-PVA	20.1 (0.2)	9.9	21.1 (0.2)	10.6	21.9 (0.2)	11.0
Hetero-functionalized Au-NPs						
NH2-PEG	32.5 (4.8)	15.0	32.3 (4.9)	14.6	32.2 (8.1)	14.3
NH2-(PVA+PEG)	35.0 (2.1)	15.8	33.5 (0.3)	14.6	33.1 (3.2)	15.4
NH2-PVA	53.1 (0.8)	24.5	50.0 (0.3)	22.6	47.5 (1.1)	21.3
COOH-PEG	23.2 (0.1)	10.4	23.9 (1.6)	10.6	24.4 (1.7)	10.7
COOH-(PVA+PEG)	32.7 (4.5)	15.3	32.2 (2.4)	15.1	33.2 (4.1)	15.5
COOH-PVA	30.1 (0.9)	13.9	28.5 (3.6)	13.1	26.3 (2.8)	11.8

[a)] DLS measurements were carried out in triplicate.

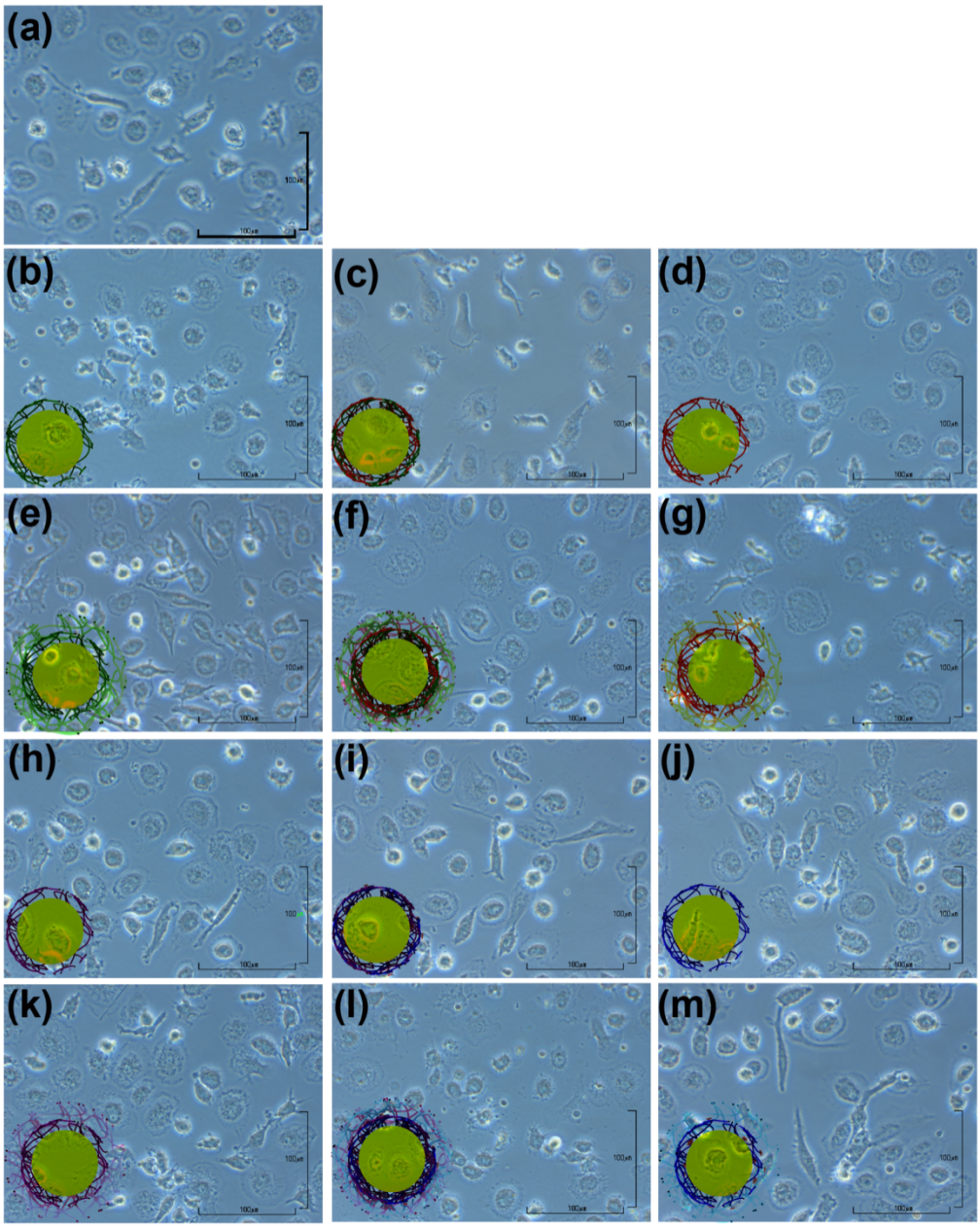

Figure S6. Phase contrast images of MDDCs after incubation with (a) no particles (control), homo-functional (b) NH2-PVA, (c) NH2-(PVA+PEG), (d) NH2-PEG, (h) COOH-PVA, (i) COOH-(PVA+PEG), and (j) COOH-PEG Au-NPs; and hetero-functional (e) NH2-PVA, (f) NH2-(PVA+PEG), (g) NH2-PEG (k) COOH-PVA, (l) COOH-(PVA+PEG), and (m) COOH-PEG Au-NPs.

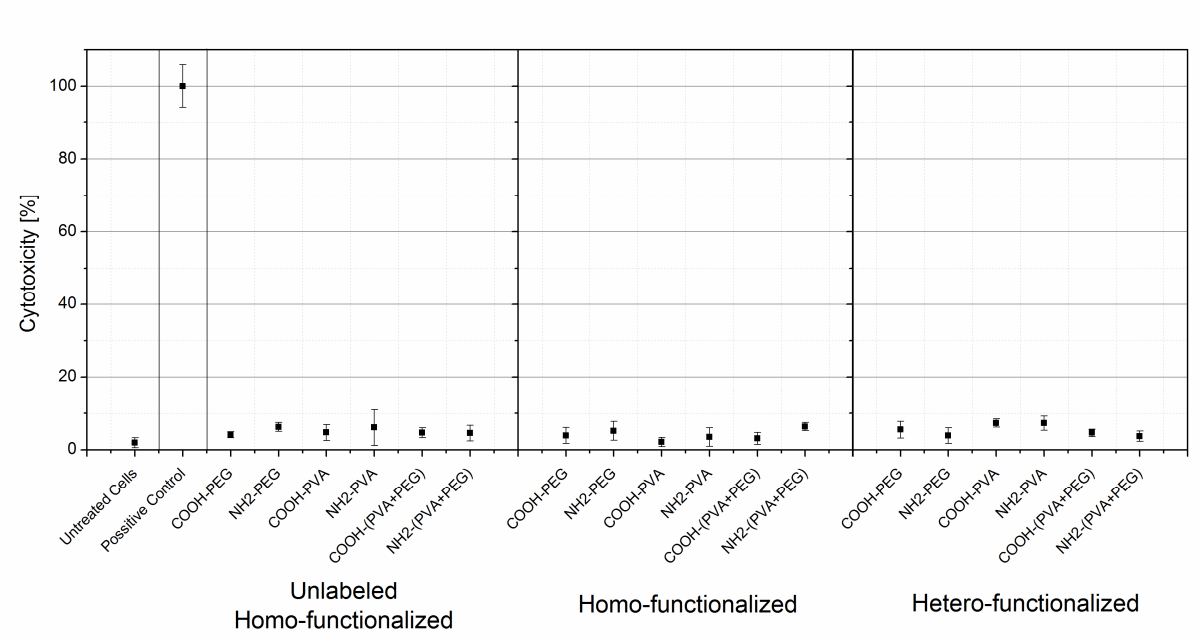

Figure S7. Release of lactate dehydrogenase (LDH) from human monocyte-derived dendritic cells (MDDC) after 15 h suspension exposure (Triton X-100 was used as the positive control, 1%) to unlabeled Au-NPs, as well as homo-functional and hetero-functional Au-NPs. Bars denote the mean standard deviation. A pairwise t-test was performed and significance was indicated by: *p < 0.001 versus untreated cells.

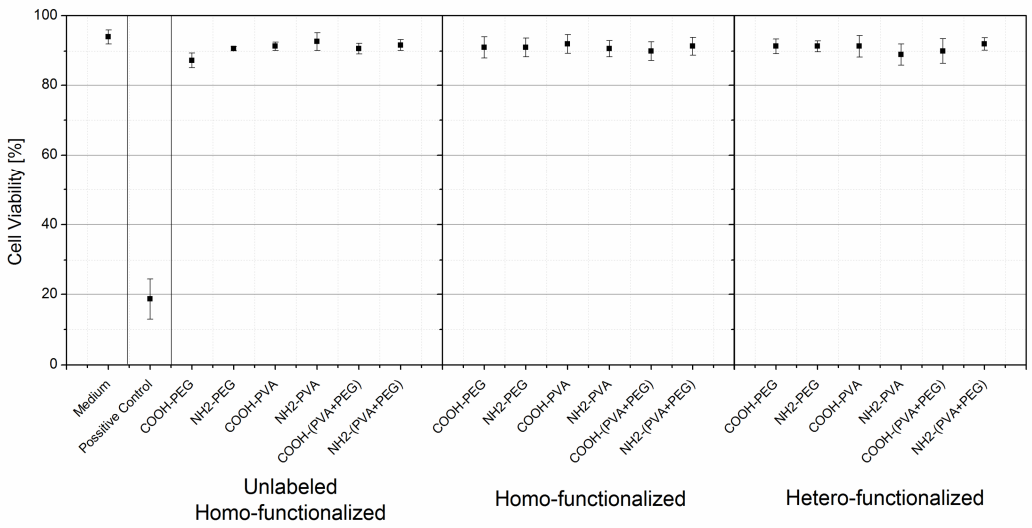

Figure S8. The viability of human monocyte-derived dendritic cells (MDDCs) was elaborated by Trypan blue exclusion assay (error bars = mean ± SD). Values were significant when compared to medium (pairwise t-test, *p< 0.05). Frozen cell cultures at -80 °C for 30 mins were used as the positive control.