Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information:

Miktoarm star conjugated multifunctional gold nanoshells: synthesis and an evaluation of biocompatibility and cellular uptake

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Experimental: Materials: Tetraethylene glycol, p-toluenesulfonyl chloride, sodium hydroxide, sodium hydride, thioacetic acid, 4-dimethylaminopyridine, methylsulfonyl chloride, triethylamine, sodium azide, tetrabutyammonium iodide, lithium hydroxide, pentynoic acid, sodium ascorbate, copper (II) sulfate hexahydrate, borane THF, bis(triphenylphosphine)palladium(II) dichloride, (triisopropylsilyl) acetylene, and (trimethylsilyl) acetylene, trisodium citrate, sodium borohydride, tetrabutylammonium cyanide, sodium thiomethoxide, gold (III) chloride hydrate and (±) α-Lipoic acid were purchased from Sigma Aldrich and used as received. 1-Ethyl-3-(3-dimethylaminopropyl)carbodiimide, ≥98%, was purchased from Fluka and used as received. PEG_{350} was purchased from Alfa Aesar, 3-bromo-5-iodobenzoic acid, 98%, from AK Scientific, Inc. and used as received. All solvents were also used as purchased from ACP Chemicals or Fisher Scientific. Cobalt (II) chloride hexahydrate was purchased from Fisher Scientific, hydrochloric and nitric acid from ACP Chemicals, and used as received.

Table 1: From the TGA analysis, Miktoarm and LA concentrations were calculated using the equations (1) to (5) as mentioned in the materials and methods section. These concentrations were used for cell viability studies.

Tri-arm-GNS (µg/ml)	**Miktoarm conc (µg/ml)**	**LA (µg/ml)**
50	8.00	1.67
25	4.00	0.845
10	2.00	0.42
5	1.00	0.21
1	0.25	0.05

Table 2: Quantification of uptaken GNS-miktoarm by HUVEC cells analyzed at different time points.

GNS-miktoarm conc	12 h	24 h	48 h
50 µg (5 µg/ml) **(1.89 x 10^{11} GNS)**	1.6 x 10^5 GNS/cell (85%)	1.47 x 10^5 GNS/cell (77%)	1.65 x 10^5 GNS/cell (87%)
(4.88 x 10^{15} miktoarm)	4.048 x 10^9 miktoarm/cell (83%)	3.72 x 10^9 miktoarm/cell (76%)	4.17 x 10^5 miktoarm/cell (85%)
(1.06 x 10^{15} LA)	0.895 x 10^9 LA/cell (84%)	0.82 x 10^9 LA/cell (77%)	0.92 x 10^9 LA/cell (87%)
100 µg (10 µg/ml) **(3.79 x 10^{11} GNS)**	1.7 x 10^5 GNS/cell (45%)	2.26 x 10^5 GNS/cell (59%)	1.45 x 10^5 GNS/cell (38%)
(9.6 x 10^{15} miktoarm)	4.048 x 10^9 miktoarms/cell (42%)	5.72 x 10^9 miktoarm/cell (60%)	3.67 x 10^9 miktoarm/cell (38%)
(2.12 x 10^{15} LA)	0.895 x 10^9 LA/cell (42%) (0.019 µM)	1.26 x 10^9 LA/cell (59%)	0.81 x 10^9 LA/cell (38%)

Figure S1: TGA curve showing organic weight loss of GNS-miktoarm.

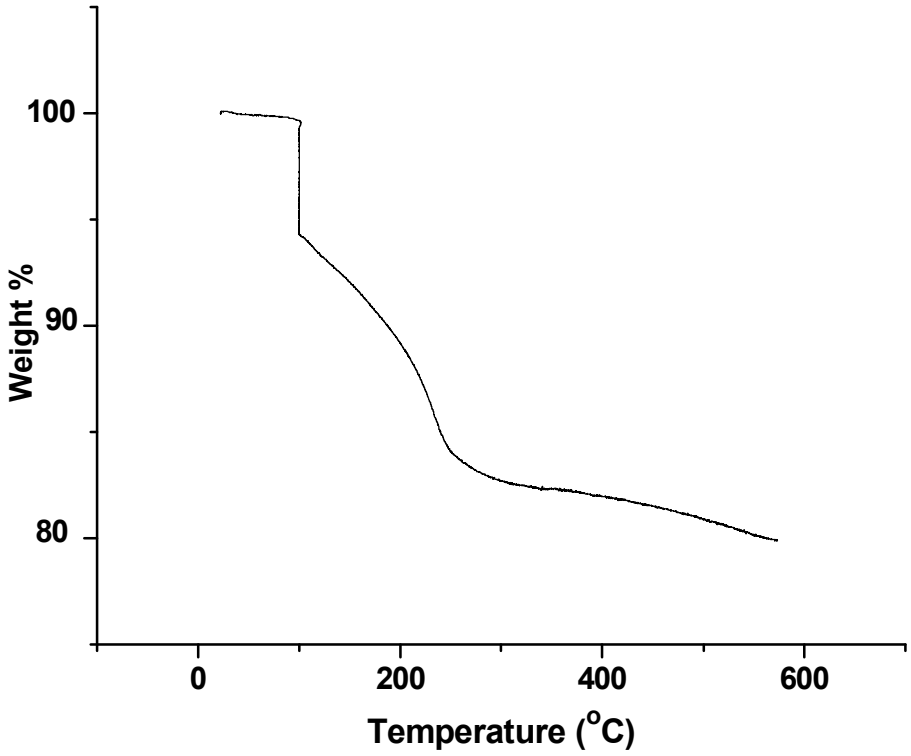

Figure S2: TEM image showing (a) the individual GNS-miktoarm (red arrow) within an endocytic vesicle of approximately 300 nm size and (b) 500 nm size. (c) Two endosomes showing tendency to fuse to form large endosome.

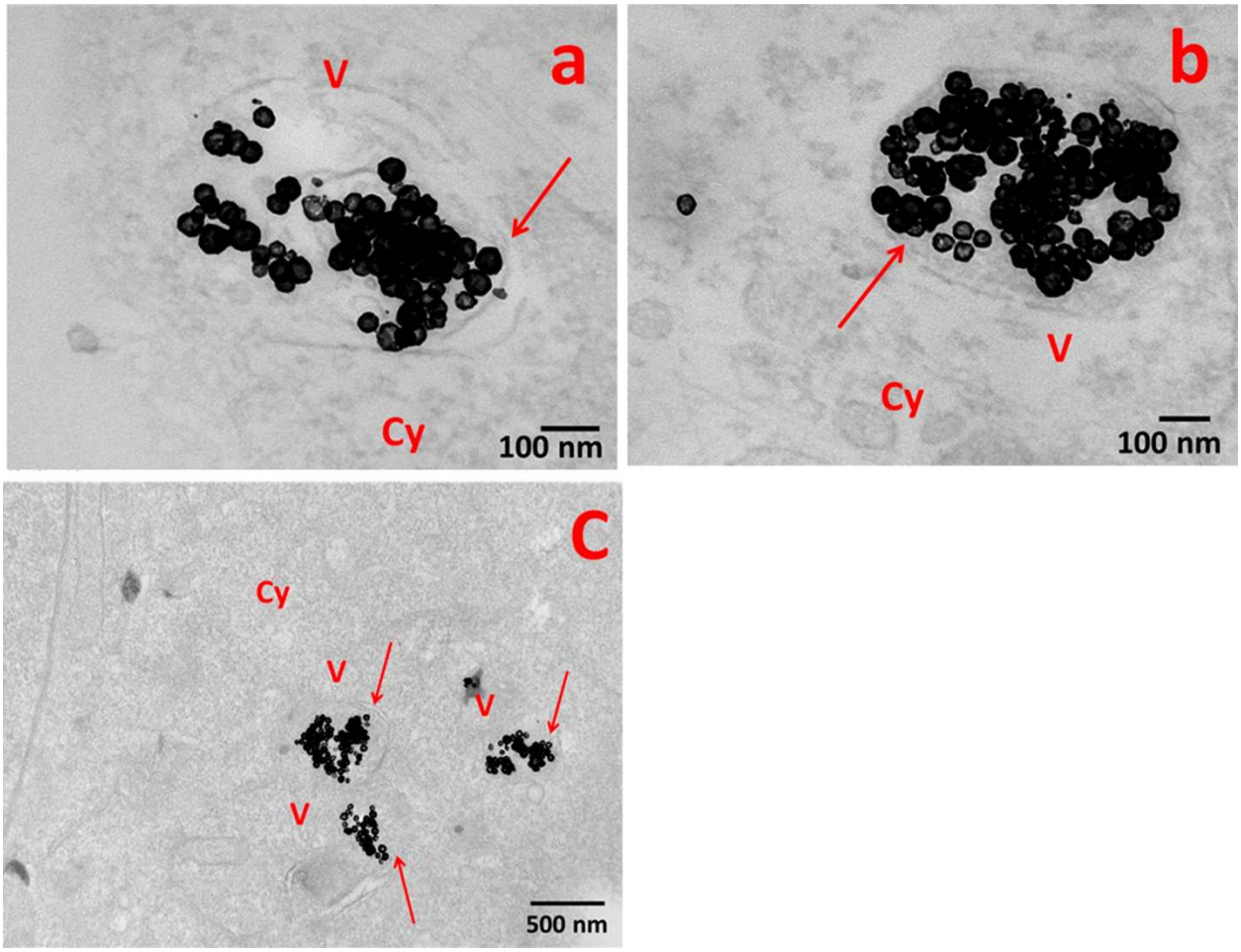

Figure S3: TEM image showing the medium influenced aggregated GNS-miktoarm (red arrows) at one end of the endocytic invagination (blue arrows).

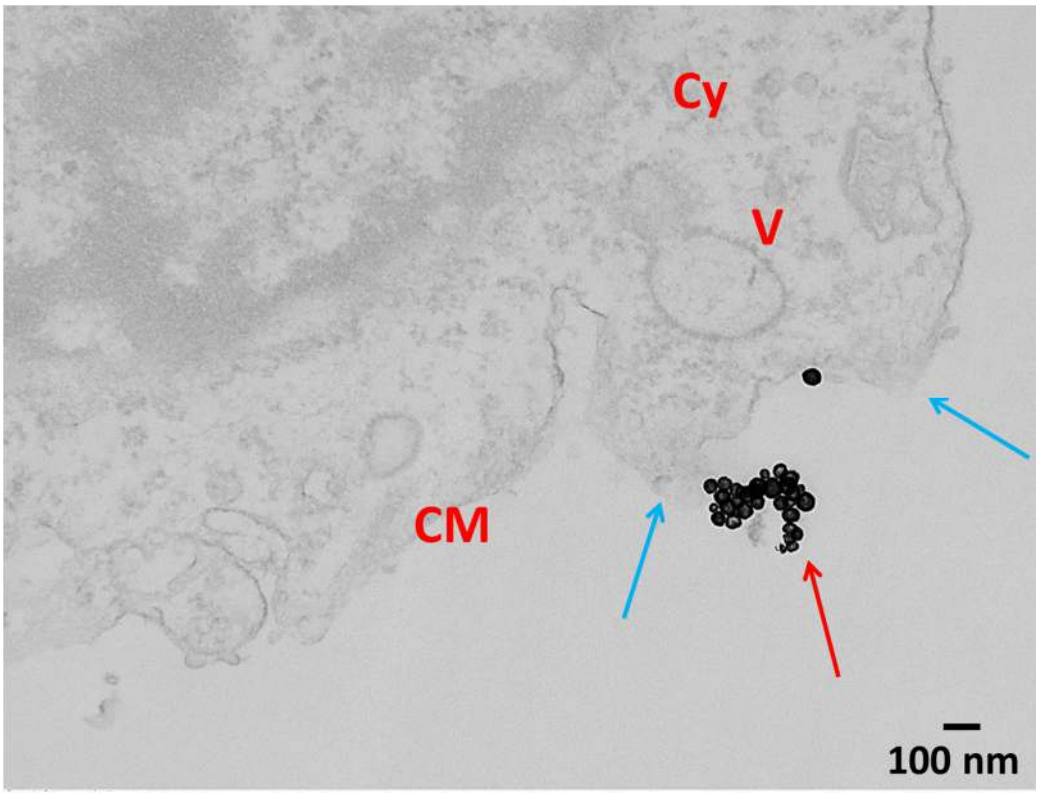

Figure S4: (a) TEM image of the GNS; (b) energy dispersive x-ray spectroscopy (EDS) analysis of the functionalized GNS; (c) TEM image of the functionalized GNS and their sizes; (d) magnified TEM of the functionalized GNS; (e) HR-TEM image of the functionalized GNS with the thickness and (f) HR-TEM image of the functionalized GNS with the lattice distance measurements.