Electronic supplementary information

Rapid dissolution of ZnO nanocrystals in acidic tumor microenvironment leads to preferential apoptosis[†]

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SI Fig. 1 (a) Schematic diagram depicting the surface chemical modifications in ZnO NCs, (b) FTIR spectra of bare ZnO, bare silica, silica capped ZnO, starch, starch coated ZnO, and PEGylated ZnO. In the case of bare ZnO sample Zn-O stretching mode vibrations at 447 cm⁻¹ is the main feature observed in the spectrum. With silica capping, relatively broad absorption peak at 1000 cm⁻¹ corresponding to Si–O vibration, together with a small shoulder at 890 cm⁻¹ due to Si–OH stretching

also appeared in addition to the Zn-O stretching mode. The spectrum of pure SiO_2 prepared separately without ZnO also showed the same vibrational features, confirming the capping of ZnO NCs with silica layer. In PEGylated ZnO, peaks at 1509 cm⁻¹ and 1335 cm⁻¹ correlate with C=C and C-O-C vibrations whereas 3200 cm⁻¹ and 3600 cm⁻¹ correlate with presence of hydroxyl group of PEG anchored on the surface of ZnO NCs.



SI Fig. 2 SEM images of a) Starch capped and b) PEGylated ZnO NCs



SI Fig. 3 MTT assay indicating the viability of cells exposed to 5 nm ZnO NCs. Normal breast cells and MDA-MB-231 cells incubated for 24 h. * represents P < 0.05 with control.



SI Fig. 4 Effect of size-scale (5 nm or 200 nm) on the percentage viability of primary HUVECs and cancer (KB) cells treated with 0-500 μ M ZnO NCs. * represents P < 0.05 with control. Data are representative of three separate experiments.



SI Fig. 5 MTT assay indicating the effect of surface capping on the viability of (a) HUVECs and (b) cancer (KB) cells treated with bare, PEGylated, SiO₂ capped and starch capped ZnO NCs, for 24 h. * represents P < 0.05 with control. Data are representative of three separate experiments.



SI Fig. 6 Graph depicting the DCF fluorescence intensities from HUVEC and KB cells treated with

varying concentrations of ZnO NCs.



SI Fig. 7 Flow cytogram showing concentration of free Zn^{2+} ions in the intracellular regions of (a) HUVECs and (b) KB cells treated with 0, 100 and 300 μ M of 5 nm ZnO NCs for 24 h. P2 region denotes fold increase in the fluorescence intensity due to the presence of free Zn^{2+} ion.



SI Fig. 8 Extracellular pH variations at different time intervals



SI Fig. 9 ICP data showing the dissolution characteristics of different ZnO NCs at various pH



SI Fig. 10 MTT assay indicating the effect pH on the cytotoxicity of ZnO NCs: Different concentrations of ZnO NCs (0-500 μ M) treated with KB cells under two different pH conditions.

* represents P < 0.05 with control. Data are representative of three separate experiments.



SI Fig. 11 MTT assay indicating the comparative cell viability of ZnCl₂ and ZnO towards HUVEC and KB cells.