Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information

Supplementary section S1:

Transmission Electron Microscopy (TEM) images of as made and PEG/RGD coated gold nanoparticles (GNPs):

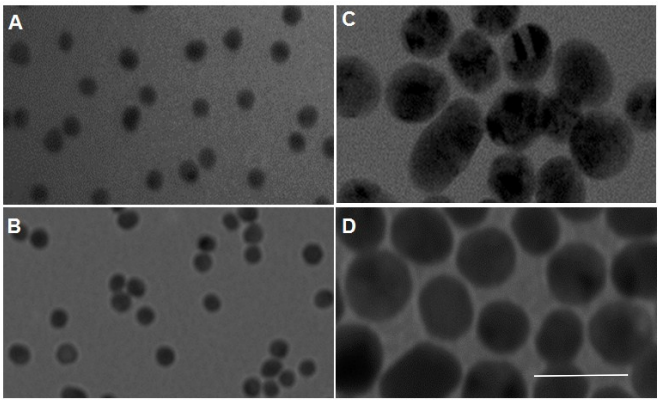

Figure S1: TEM images of as made and PEG/RGD coated GNPs. A-B) As made and PEG/RGD coated GNPs of 14 nm in diameter, respectively. C-D) As made and PEG/RGD coated GNPs of 50 nm in diameter, respectively. The scale bar is 100 nm.

Supplementary section S2:

The biocompatibility of as made GNPs, PEG coated GNPs, and PEG/RGD coated GNPs were tested using long term cell survival assay and short term confluency assay. There was no apparent toxicity in the presence of NPs under the concentration used in this study.

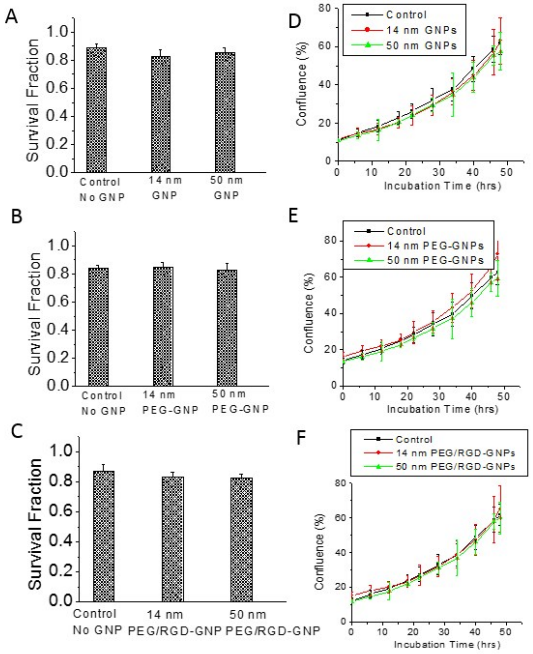

Figure S2: Biocompatibility data for as made, PEG coated, and PEG/RGD coated GNPs. A-B) Results of the clonogenic assay and confluency assay for as made GNPs, respectively. C-D) Results of the clonogenic assay and confluency assay for PEG coated GNPs, respectively. E-F) Results of the clonogenic assay and confluency assay for PEG/RGD GNPs, respectively.

Supplementary section S3:

Nanoparticle uptake was size dependent. We used 14, 50, and 74 nm sized NPs. Nanoparticles of diameter 50 showed the highest uptake when NPs were uncoated. However, when NPs were PEGylated, uptake was reduced more for larger NPs and smaller NPs seemed to be better for applications. We were able to increase the uptake of smaller NPs by using PEG/RGD combinations. However, the uptake of larger NPs remained low even after coating them with PEG/RGD combination. Hence, for this study we used one smaller size and one larger size to further our experiments.

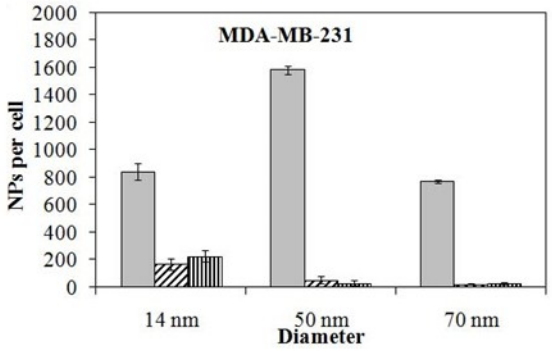

Figure S3: Cellular uptake of as made, PEG coated, and PEG/RGD coated NPs.

Supplementary section S4:

Imaging of GNP clusters localized within cells using TEM and hyperspectral optical imaging. The resolution of the hyperspectral optical imaging is not strong enough to identify individual NPs while TEM imaging has a very high resolution to individual NPs localized in small vesicles. However, it is not possible to image the whole cell using TEM while optical imaging allows three dimensional imaging.

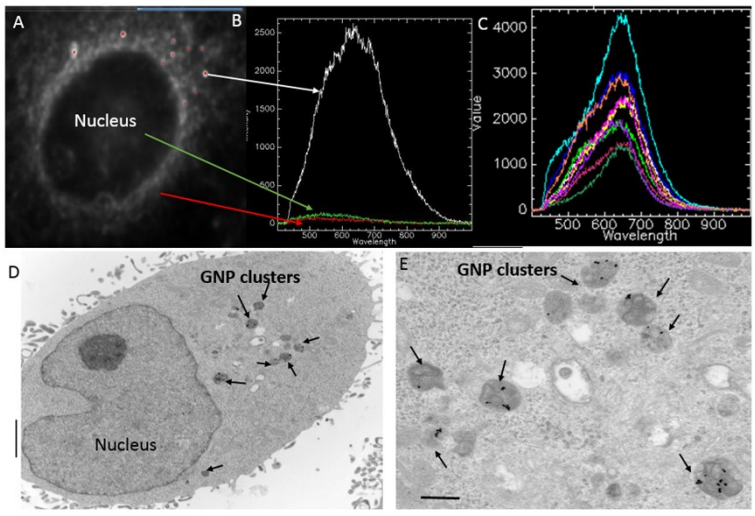

Figure S4: Imaging of GNP clusters localized within cells using TEM and hyperspectral optical imaging. A) Cross sectional view across a cell using hyperspectral imaging. The bright white dots are GNP clusters localized within that plane of the cell. B) Reflectance spectra from different parts of the cell. The white spectrum was the reflectance spectrum from a GNP cluster. The green and red spectra were from the nucleus and the cytoplasm of the cell. C) The reflectance spectra of GNP clusters marked with a red dot in the image A. D) Cross sectional view across a cell using TEM imaging. GNPs were localized in small vesicles

(marked with black arrow). The scale bar is 2 µm. E) Enlarged view showing the NPs localized in small vesicles. The scale bar is 500 nm.

Supplementary section S5:

Mapping the distribution of NPs within cells using hyperspectral optical imaging.

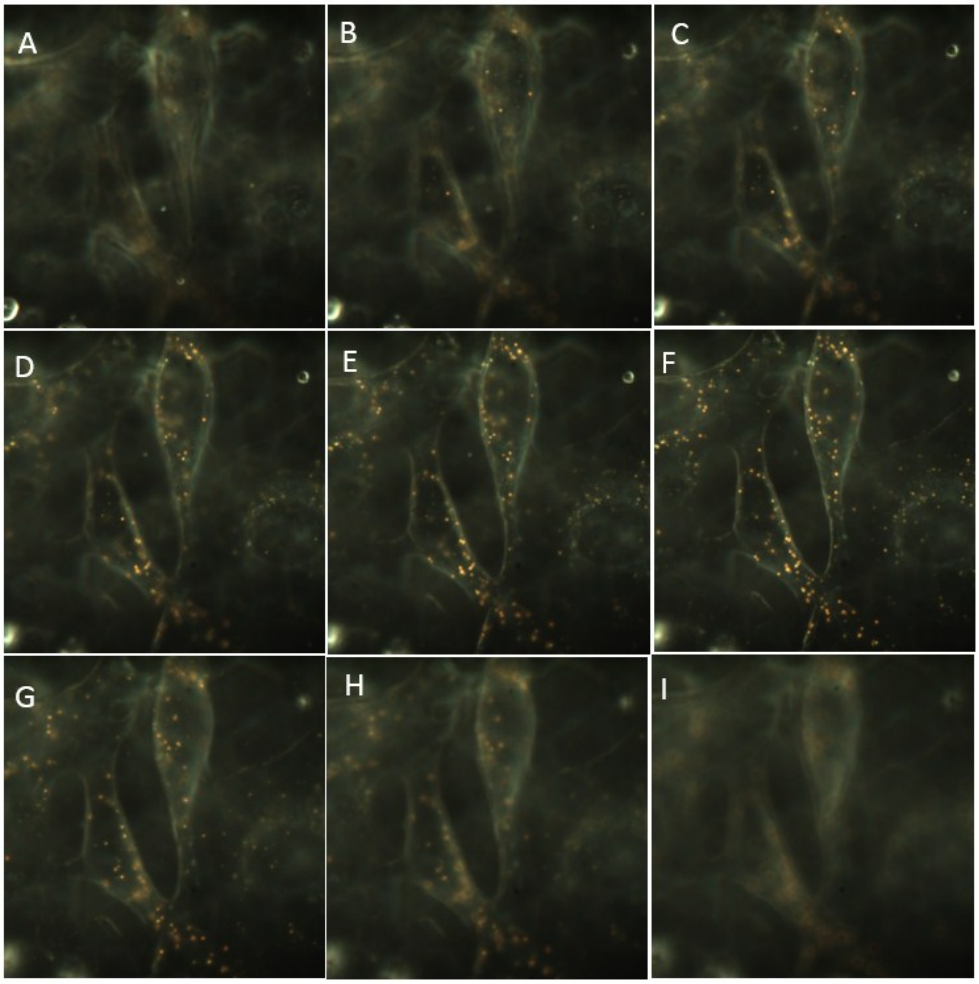

Figure S5: The distribution of GNPs within the cell. The images were taking from top of the cells to the bottom of the cells along the Z-axis assuming that the each image plane is in XY plane. A-I) Two-dimensional view across few cells along the z-axis to show the distribution of NPs from top of the cells to the bottom, respectively.