Supplementary Information

Water stable, red emitting, carbon nanoparticles stimulate 3D cell invasion via clathrin-mediated endocytic uptake

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SI table 1: Different red emissive carbon nanoparticles synthesised in recent years

| No. | Reactants | Method of synthesis | Time | Temp (in °C) | Emission wavelength | Size | Ref |
|-----|-----------|---------------------|------|--------------|---------------------|------|-----|
| 1   | PEG400, with EuCl₃ · 6H₂O | Microwave synthesis | 1-6 hrs | 150 - 200 | 615 nm | 3-5 nm | (28) |
| 2   | pulp-free lemon juice | Solvothermal | 10 hrs | 190 | 631 nm | ~4.6 nm | (29) |
|   |                  |            |          |          |          |          |
|---|-----------------|------------|----------|----------|----------|----------|
| 3 | Citric acid,    | solvothermal | 12 hrs   | 180      | 630 nm   | 2-3 nm   |
|   | urea in         |            |          |          |          |          |
|   | formamide       |            |          |          |          |          |
| 4 | Ru-Aphen and    | Hydrothermal | 3hrs     | 185      | 606-616nm| 3-6 nm   |
|   | Citric acid     |            |          |          |          |          |
| 5 | Dicyandiamide   | Hydrothermal | 10 hrs   | 200      | 630nm, 680nm | ~5.7 nm   |
|   | , o-paraphenylene |          |          |          |          |          |
|   | diamine and     |            |          |          |          |          |
|   | sulfuric acid   |            |          |          |          |          |

**SI 2: Fluorescence intensity of CNPs in different solvents**

![Graph](image)

**SI 2(a)** Emission spectra of CNPs (0.5 mg/mL) dispersed in different solvents (Water, Acetone, Acetonitrile, DMF, DMSO, Ethanol, Ethyl Acetate, Hexane, Isopropinoic Acid, Methanol) **(b) & (c)** Images of CNPs dissolved in different solvents under white light (above) and UV light (below). (From left to right – Water, Hexane, Acetone, Acetonitrile, DMSO, DMF, Ethyl acetate, IPA, ethanol, methanol)
SI 3: Stability check of CNPs in water for seven days

**Figure SI 3**: Stability studies of CNPs. **(a) and (b)** normalized fluorescence intensity reading taken for seven days, **(c)** Images of 0.5mg/ml CNPs dispersed in water for seven days to check their stability.

SI 4: Fluorescence intensity of CNPs and PPDA
SI 4: Fluorescence intensity comparison of PPDA and CNPs at 480 nm excitation wavelength.

**SI 5: MTT assay**

*Figure SI 5:* Cytocompatibility studies. Cell viability was determined by MTT assay using (a) SUM 159 and (b) MeFs. The cells were treated with CNPs at 10, 20, 30, 50, 100, 200 and 500 µg/mL for 24 h.

**SI 6: 2D Cellular studies of CNPs via confocal microscopy**
Figure SI 6(i): Concentration dependent cellular uptake studies of CNPs at different time intervals. (a) Confocal images of MeFs incubated with 10, 25, 50 and 100 µg/ml of CNPs respectively. First column in the figure represents untreated MEF cells imaged after 60 min of incubation. Scale bar is 5 µm. (b-e) Quantification of cellular uptake of at 10, 25, 50 and 100 µg/ml of CNPs at 5, 15, 30 and 60 min respectively. **** Indicates statistically significant value of p < 0.0001. ** Indicates statistically significant value of p = 0.002, * Indicates statistically significant value of p = 0.03 and ns indicates non-significant value of p (one-way ordinary ANNOVA).

Figure SI 6(ii): Time dependent cellular uptake studies of CNPs at different time intervals. (a) Confocal images of MEFs incubated with 10, 25, 50 and 100 µg/ml of CNPs respectively. First column in the figure represents untreated MEF cells imaged after 60 min of incubation. Scale bar is 5 µm. (b-e) Quantification of cellular uptake of CNPs at 10, 25, 50 and 100 µg/ml respectively. **** Indicates statistically significant value of p < 0.0001, ** Indicates statistically significant value of p = 0.005 and ns indicates non-significant value of p (one-way ordinary ANNOVA).
