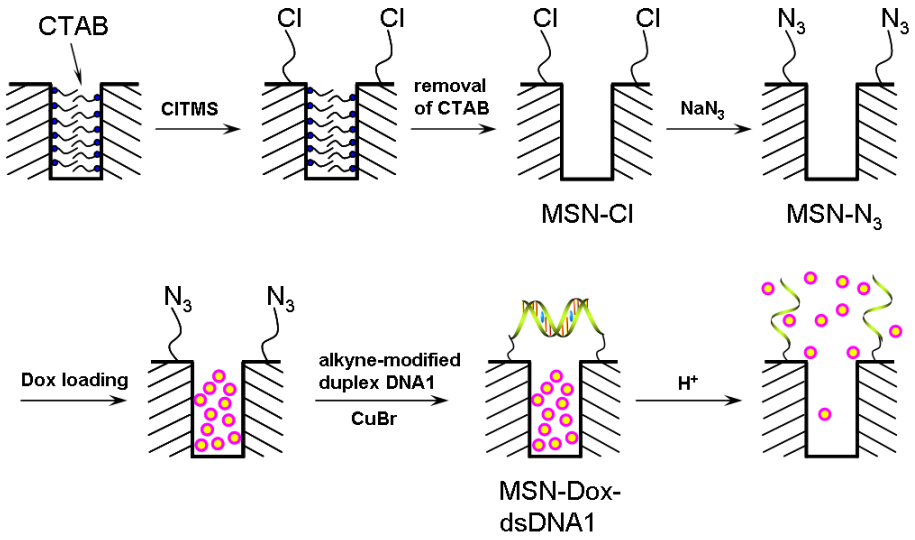
Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B


# Supporting Information

## Intracellular Acid-Triggered Drug Delivery System Using Mesoporous Silica Nanoparticles Capped with T-$Hg^{2+}$-T Base Pairs Mediated Duplex DNA

Dinggeng He, Xiaoxiao He, Kemin Wang*, Mian Chen, Yingxiang Zhao and Zhen Zou




**Scheme S1.** Schematic outline of synthesis of MSN-Dox-dsDNA1 and workflow of acid-responsive controlled release of Doxorubicin (Dox) molecules from the pores.

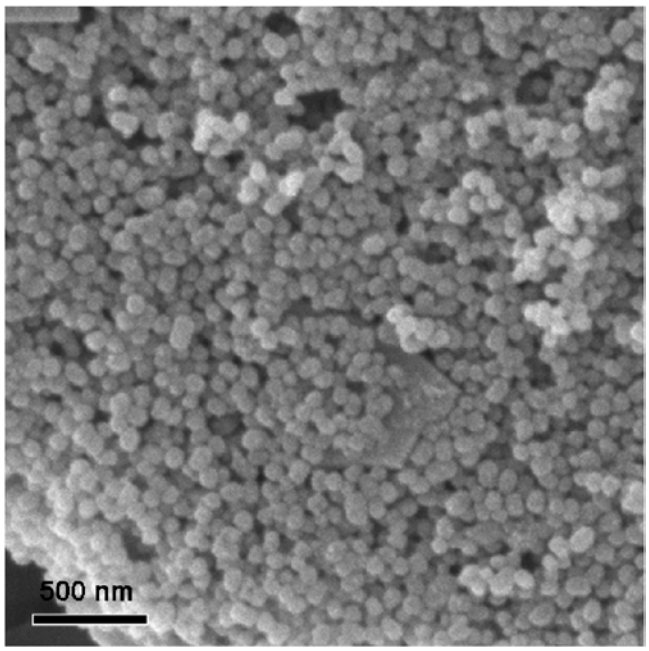



**Figure S1.** Scanning electron microscopy (SEM) of MSN-Cl.

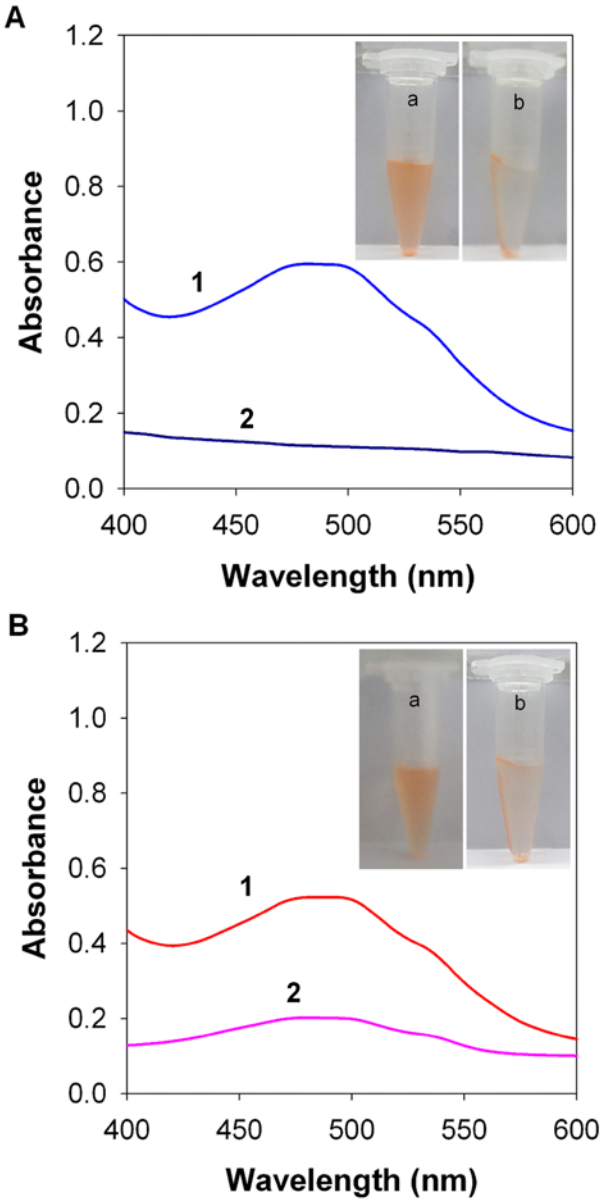



**Figure S2.** (A) UV-vis spectra of MSN-Dox-dsDNA1 dispersed in water (curve 1) and the supernatant solution after centrifugation (curve 2). Inset: photographs of MSN-Dox-dsDNA1 before (a) and after (b) centrifugation. (B) UV-vis spectra of Dox-loaded MSN uncapped with dsDNA1 dispersed in water (curve 1) and the supernatant solution after centrifugation (curve 2). Inset: photographs of Dox-loaded MSN uncapped with dsDNA1 before (a) and after (b) centrifugation.

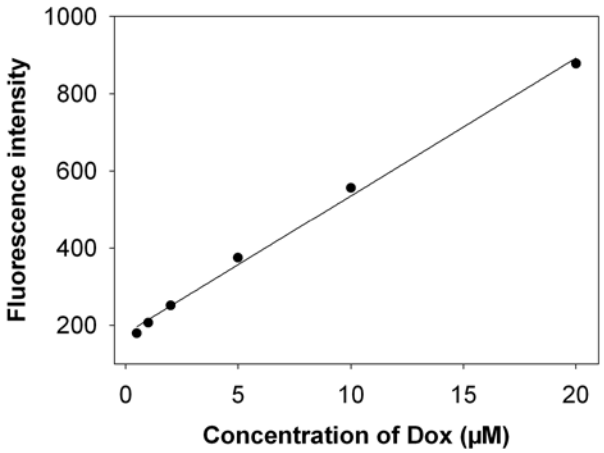



Figure S3. The linear relationship of fluorescence intensity to Dox concentration. Each spectrum in this figure was constructed from an average of three spectra. Linear equation: F=0.0077×C + 0.027, F: fluorescence intensity of Dox, C: concentration of Dox.

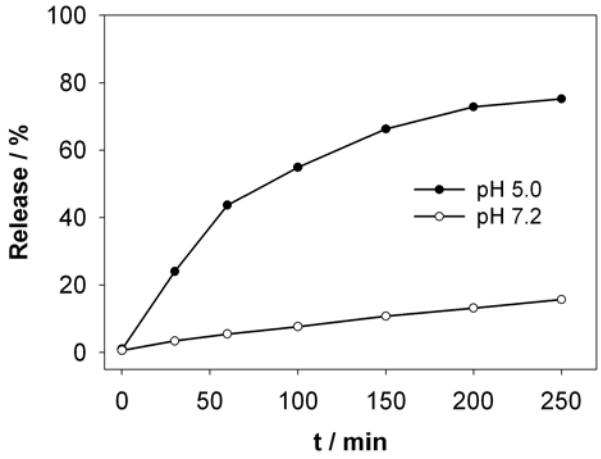



**Figure S4.** Controlled release profiles of IBU from the MSN-IBU-dsDNA1 at pH 5.0 and 7.2, respectively. Each data point in this figure was constructed from an average of three spectra.

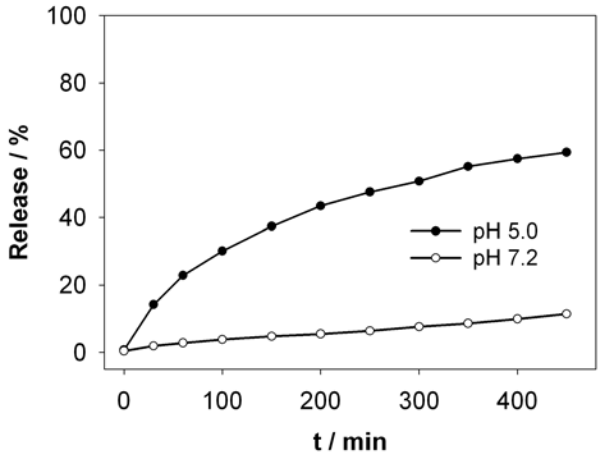



**Figure S5.** Controlled release profiles of $Ru(bipy)_3^{2+}$ from the MSN-$Ru(bipy)_3^{2+}$-dsDNA1 at pH 5.0 and 7.2, respectively. Each data point in this figure was constructed from an average of three spectra.

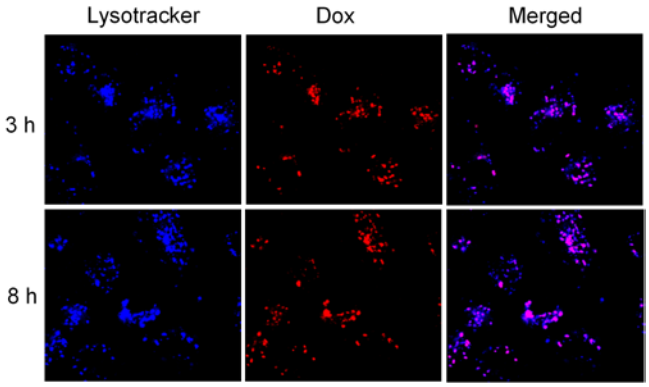



**Figure S6.** CLSM images of the cellular uptake and controlled-release behaviors of MSN-Dox-dsDNA3 after incubation with HeLa cells for 3 h and 8 h at 37 °C. Lysotracker blue (blue fluorescence) was used to stain the lysosomes. Cells were imaged using a 100× oil-immersion objective. The localization of nanoparticles inside of lysosomes was shown based on merging blue with red fluorescence (orange fluorescence).

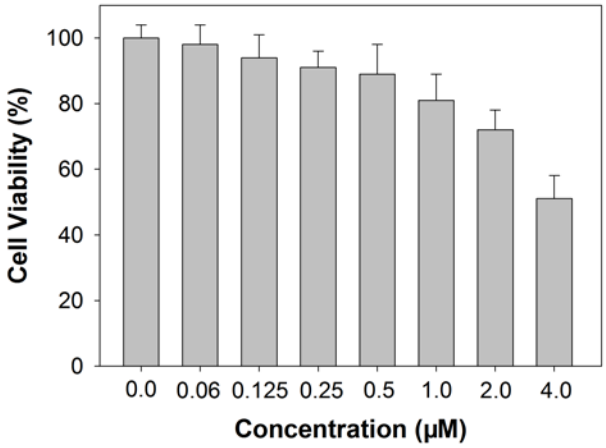



**Figure S7.** MTT cytotoxicity assay of HeLa cells treated with (a) $Hg^{2+}$ at various concentration ranges (0, 0.06, 0.125, 0.25, 0.5, 1.0, 2.0, 4.0 μM) for 24 h. The final report data were expressed as a percentage of the control (mean standard deviation).

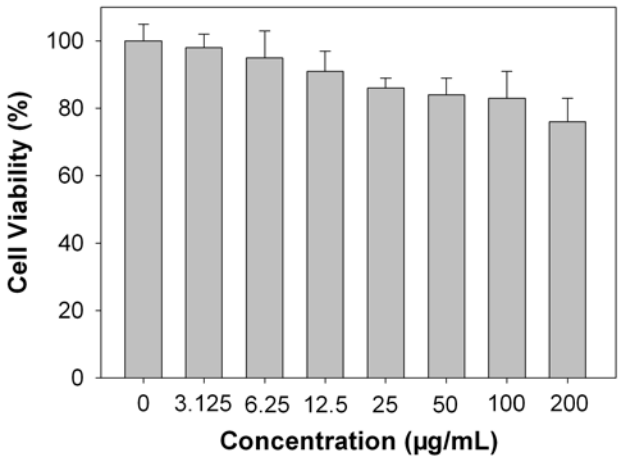


**Figure S8.** MTT cytotoxicity assay of HeLa cells after treatment with MSN-Dox-dsDNA3 at varying concentrations (3.125, 6.25, 12.5, 25, 50, 100, and 200 μg $mL^{-1}$) for 24 h. Cells without added nanoparticles were taken as the control experiment and the viability was set as 100%. The final report data were expressed as a percentage of the control (mean standard deviation).

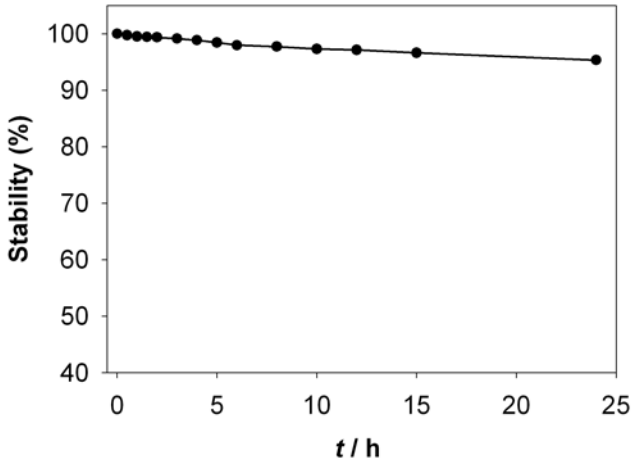



Figure S9. The stability of MSN-Dox-dsDNA1 in the serum. MSN-Dox-dsDNA1 dispersed in Tris–$HNO_3$ buffer (pH 7.2) was taken as the control experiment and the absorbance was set as 100%. The final report data were expressed as a percentage of the control.

**Table S1. BET and BJH parameters**

| Sample | BET Surface Area ($m^2/g$) | Total Pore Volume ($cm^3/g$) | Average Pore diameter (Å) |
|---|---|---|---|
| MSN-Cl | 921.6 | 0.72 | 24.6 |
| MSN-ssDNA1 | 859.0 | 0.60 | 23.3 |
| MSN-Dox-dsDNA1 | 124.7 | 0.05 | – |