Electronic Supplementary Material (ESI) for RSC Advances.

Electronic Supporting Information

Precisely Control the Cellular Internalization of DNA-Decorated Semiconductor Polymer Nanoparticles for Drug Delivery

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Table of Contents

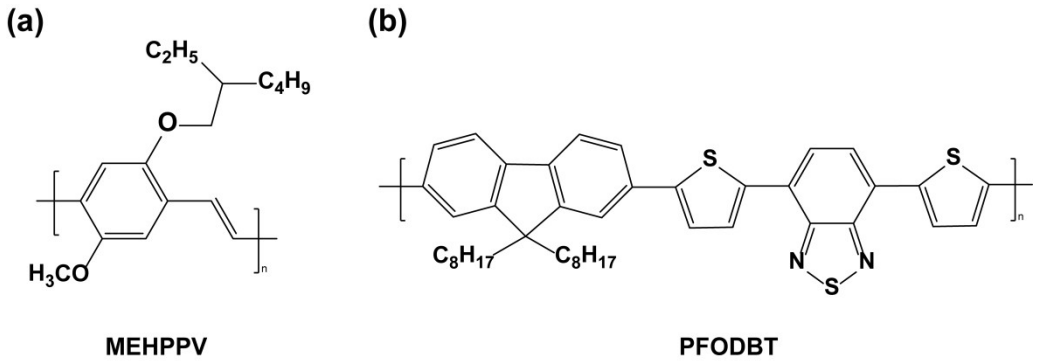

Figure S1. Chemical structures of the used SPs: (a) MEHPPV and (b) PFODBT, both of which are hydrophobic.

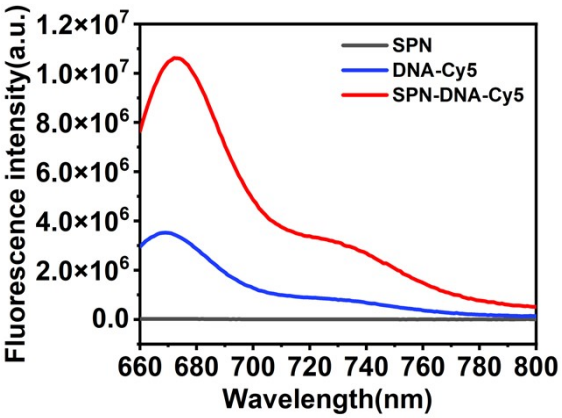

Figure S2. Fluorescence intensity of SPN, DNA-Cy5 and SPN-DNA-Cy5 at the excitation of 650 nm.

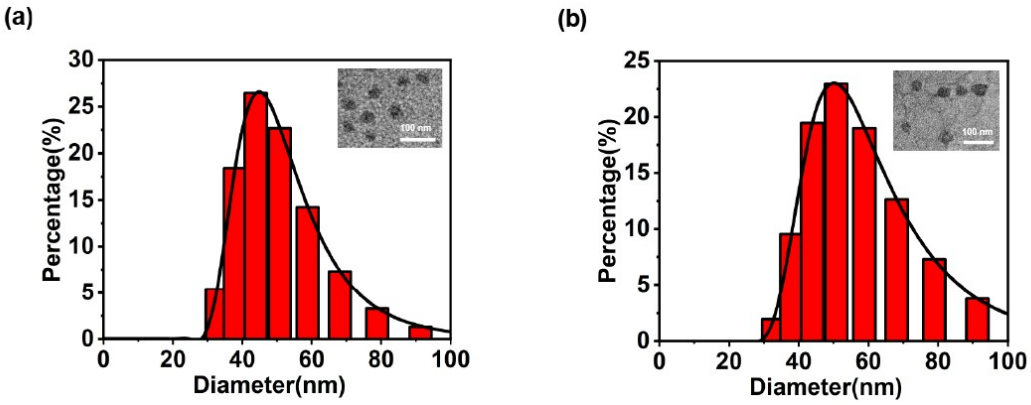

Figure S3. Dynamic light scattering (DLS) analysis and transmission electron microscopy (TEM) (inset) of SPN (a) and SPN-DNA (b), the size of SPN was about 50.1 nm and the size of SPN-DNA was about 57.5 nm.

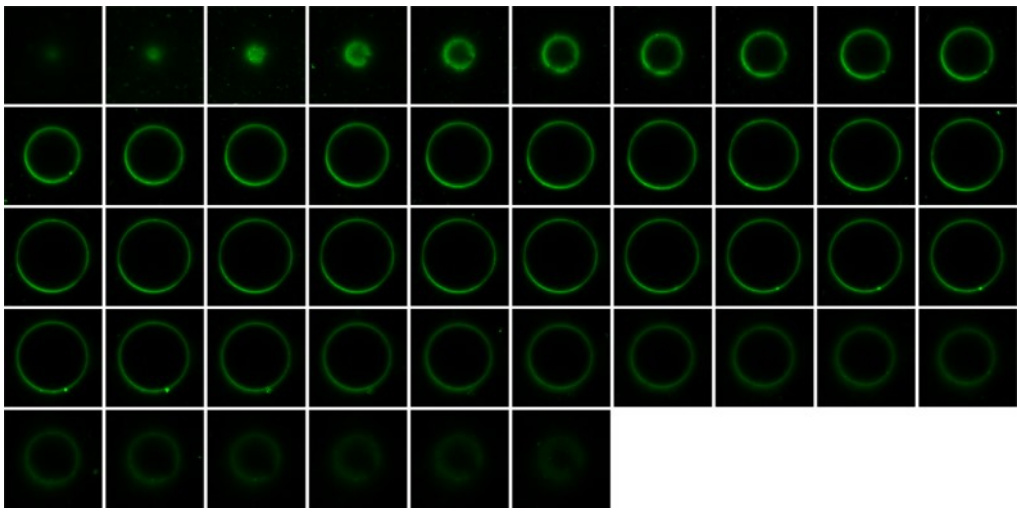

Figure S4. The 3D confocal laser scanning microscopy (CLSM) of Bead-DNA connected with SPN-DNA and Linker. These images are the scanning images of various sections of spherical microbead (from top to bottom or from bottom to top) lit by SPN-DNA, which better illustrates the successful omnidirectional connection of microbead and SPN-DNA, thus providing intuitive evidence that DNA is modified on the surface of SPN by hydrophobic interaction rather than adsorption. Excitation wavelength: 488 nm, emission wavelength: 520-800 nm.

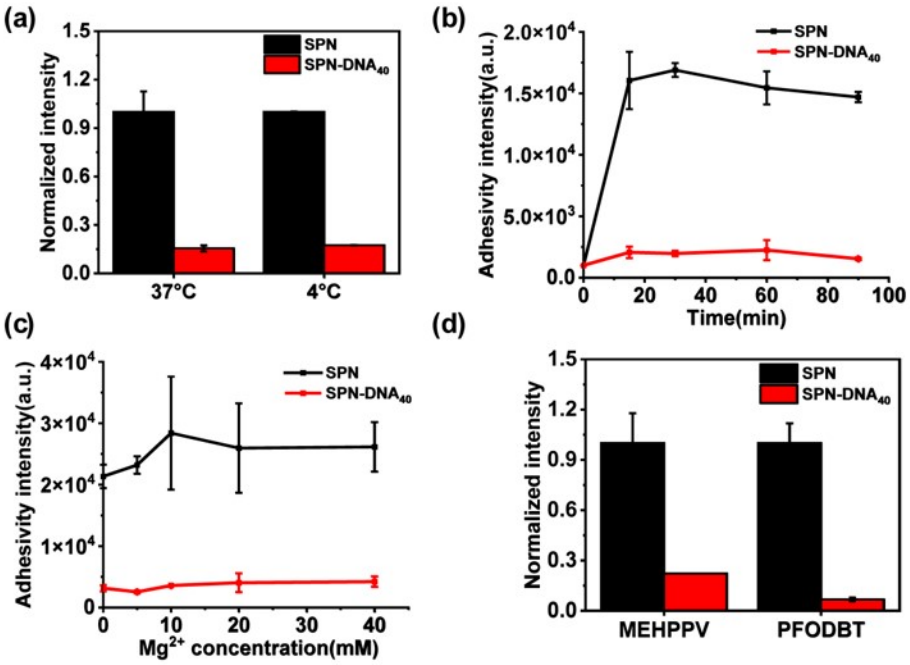

Figure S5. The effects of (a) temperature, (b) incubating time, (c) ionic strength and (d) core polymer on the cellular internalization of SPN and SPN-DNA_{40}. The cells were referred to CCRF-CEM. All experimental data were obtained by flow cytometry, and 10,000 cells were recorded.

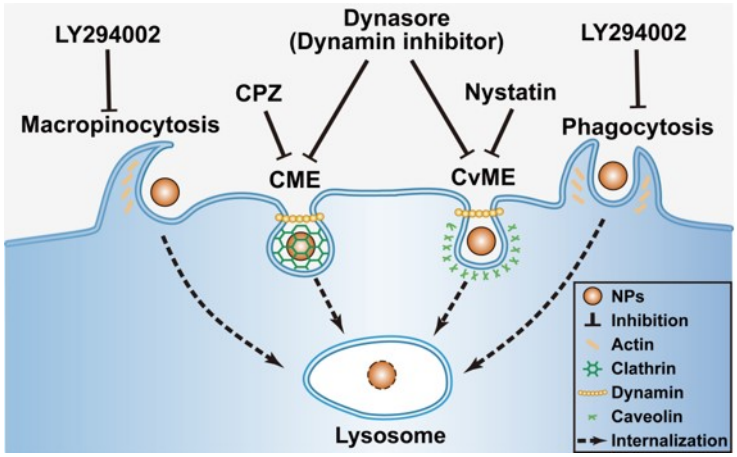

Figure S6. Inhibitors for each endocytosis pathway of NPs. Dynasore is a widely used inhibitor that can inhibit the energy-dependent (dynamin-dependent) endocytosis pathway by restraining the formation of dynamin that is required in the process of clathrin-mediated endocytosis (CME) and caveolae-mediated endocytosis (CvME). Chlorpromazine (CPZ) can inhibit CME by disrupting the molecules that make up clathrin protein. Nystatin can inhibit CvME via preventing the formation of vesicle. LY294002 can inhibit phagocytosis and macropinocytosis.

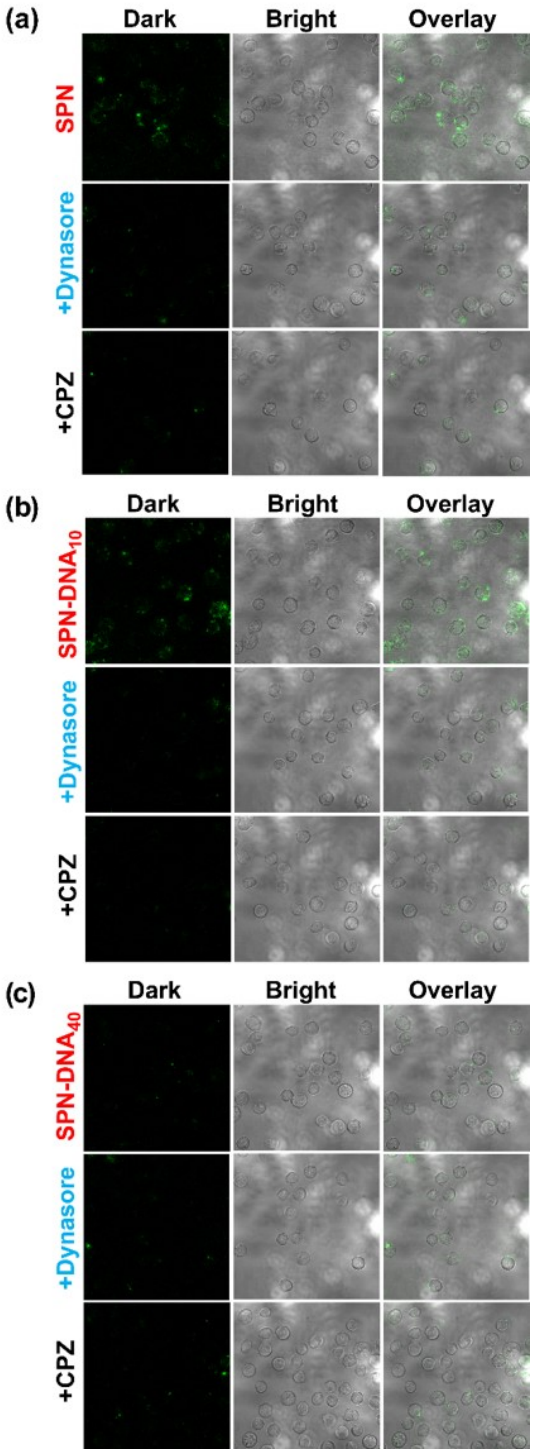

Figure S7. Confocal laser scanning microscopy (CLSM) analysis showed the changes in the cellular internalization of SPN (a), SPN-DNA_{10} (b) and SPN-DNA_{40} (c) after the pretreatment of inhibitors including Dynasore against dynamin (+Dynasore) and CPZ against clathrin (+CPZ). Excitation wavelength: 488 nm, emission wavelength: 510-800 nm.

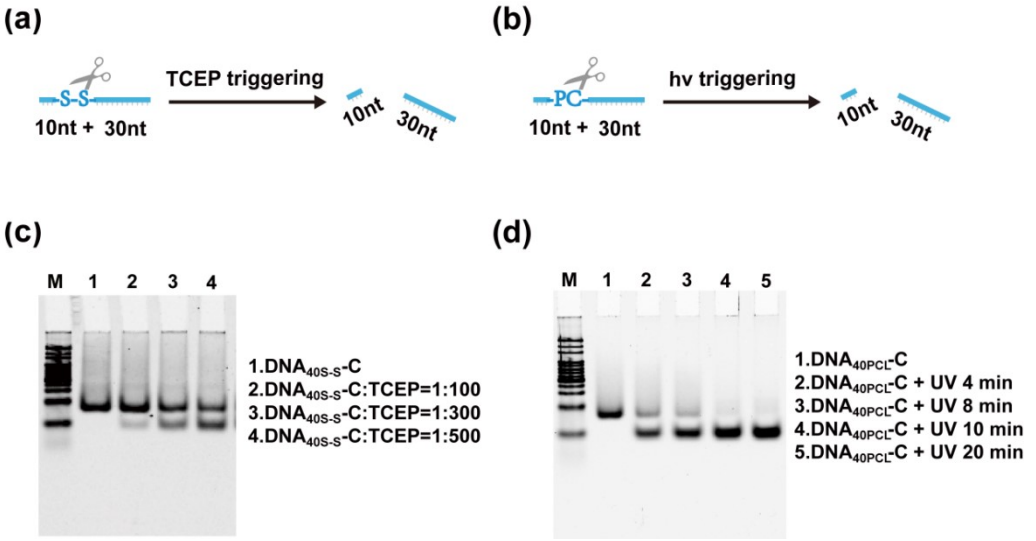

Figure S8. Illustration of $DNA_{40S\text{-}S}$-C (a) or DNA_{40PCL}-C (b) triggered by TCEP or UV irradiation, respectively. N-PAGE analysis of $DNA_{40S\text{-}S}$-C (c) or DNA_{40PCL}-C (d) triggered by TCEP or UV irradiation, respectively. The higher the concentration of TCEP or the longer the time of UV irradiation, the more 40 nt of DNA containing disulfide bond or PC-Linker would be broken, and the more 30 nt of DNA would appear.

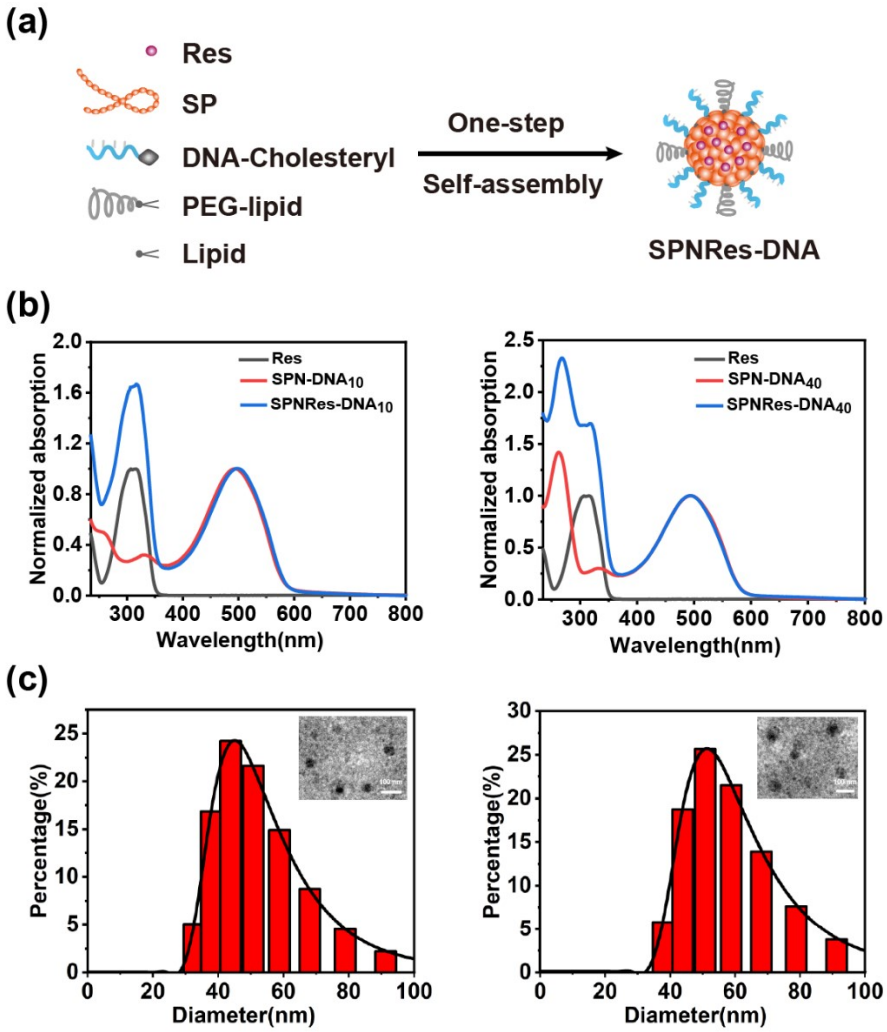

Figure S9. (a) Synthesis of SPNRes-DNA, in which Resveratrol (a hydrophobic chemotherapeutic drug, abbreviated as Res) was encapsulated via hydrophobic interaction. (b) UV absorption of SPN-DNA and SPNRes-DNA, which was normalized to 495 nm. The drug loading efficiency of SPN-DNA encapsulating Res is calculated to be about 73 %. (c) Dynamic light scattering (DLS) analysis and transmission electron microscopy (TEM) (inset) of SPNRes-DNA_{10} and SPNRes-DNA_{40}, the size of SPNRes-DNA_{10} was about 52.2 nm and the size of SPNRes-DNA_{40} was about 58.7 nm.

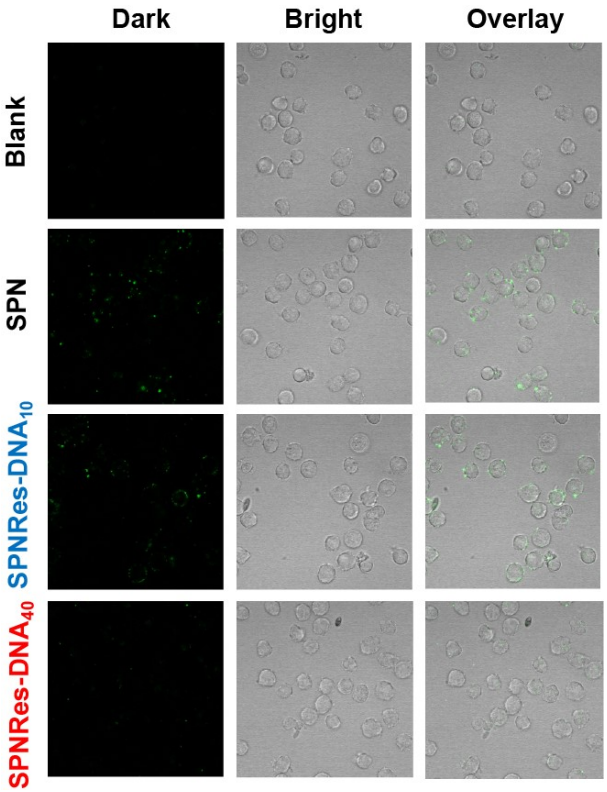

Figure S10. Confocal laser scanning microscopy (CLSM) analysis exhibited the differences of cellular internalization between SPNRes-DNA_{10} and SPNRes-DNA_{40}. Excitation wavelength: 488 nm, emission wavelength: 510-800 nm.

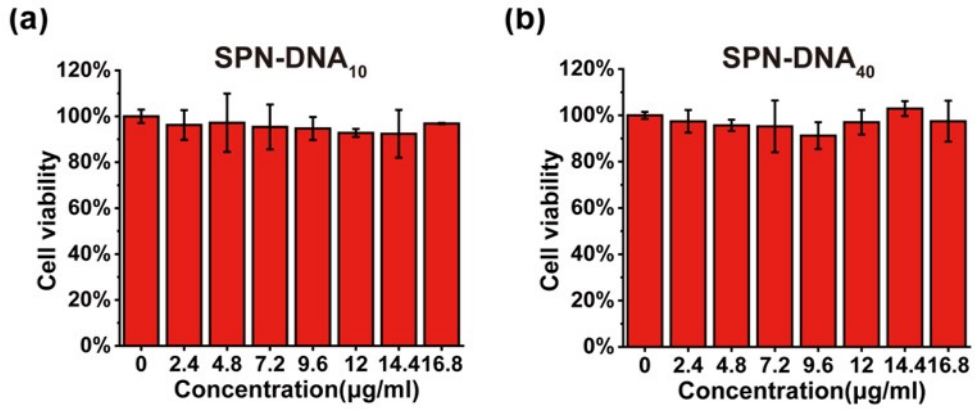

Figure S11. The cytotoxicity when cells incubated with SPN-DNA_{10} or SPN-DNA_{40} with increasing concentration of particles. The cells were referred to A549. The experimental data were obtained by microplate reader at 570 nm.

Table S1. The sequences used in Scheme 1, Fig. 2-Fig. 5.

Name	Sequence 5’ to 3’
DNA_{10}-C	CAT CAT TGG C-**Cholesteryl**
DNA_{20}-C	CAT CAT TGG CGC TGA CGC TT-**Cholesteryl**
DNA_{30}-C	CAT CAT TGG CGC TGA CGC TTT TTT TTT TTT-**Cholesteryl**
DNA_{40}-C	CAT CAT TGG CGC TGA CGC TTT TTT TTT TTT TTT TTT TTT T-**Cholesteryl**
DNA_{50}-C	CAT CAT TGG CGC TGA CGC TTT TTT TTT TTT TTT TTT TTT TTT TTT TT-**Cholesteryl**
DNA_{60}-C	CAT CAT TGG CGC TGA CGC TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT-**Cholesteryl**
$DNA_{40S\text{-}S}$-C	CAT CAT TGG CGC TGA CGC TTT TTT TTT TTT-**S-S**-TTT TTT TTT T-**Cholesteryl**
DNA_{40PCL}-C	CAT CAT TGG CGC TGA CGC TTT TTT TTT TTT-**PCL**-TTT TTT TTT T-**Cholesteryl**

Table S2. The sequences used in Fig. 1.

Name	Sequence 5’ to 3’
C-DNA-Cy5	**Cholesteryl**-TTT TTT TTT TAT CTA ACT GCT GCG CCG CCG GGA AAA TAC TGT ACG GTT AGA-**Cy5**
B-DNA	**Biotin**-TTT TTT TTT TTC TAA CCG TAC AGT ATT TTC CCG GCG GCG CAG CAG TTA GAT
Linker	GCG TCA GCG CCA ATG ATG TTT TTT TTT TAT CTA ACT GCT GCG CCG CCG GGA AAA TAC TGT ACG GTT AGA
DNA-C	CAT CAT TGG CGC TGA CGC TTT TTT TTT TTT TTT TTT TTT TTT TTT TTT TT-**Cholesteryl**