Supporting Information

Amphiphilic Polymer-Mediated Aggregation Induced Emission Nanoparticles for Highly Sensitive Organophosphorus Pesticide Biosensing

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EXPERIMENTAL SECTION

**Reagents.** Bromotriphenylethylene (VP$_3$-Br), (4-aminophenyl)boronic acid, tetrabutylammonium bromide (TBAB), tetrakis(triphenylphosphine)palladium [Pd(PPh$_3$)$_4$], acrylic acid, dimethyl diallyl ammonium chloride (DMDAAC), 2,2'-azobis(2-methylpropionitrile) (AIBN), 1-(3-dimethylaminopropyl)-3-ethylcarbodiimide hydrochloride (EDC), N-hydroxysuccinimide (NHS), acetylthiocholine (ATCh), acetylcholinesterase (AChE), paraoxon, chlorpyrifos, malathion, diazinon, parathion, and chloroauric acid were purchased from Alfa Aesar and used as received. The ultrapure water was obtained from a Milli-Q water purification system (Millipore Corp., Bedford, MA). All other solvents and salts were purchased from Guangzhou Dongzheng Company and used directly. Intermediate TPE-NH$_2$ was prepared according to the literature procedures.$^1$

**Characterization.** $^1$H NMR spectrum was used to characterize the structure of TPE-N-A on a Mercury-Plus 300 spectrometer using CDCl$_3$ as solvent and tetramethylsilane (TMS) as internal standard. FT-IR spectrum was determined on a Nicolet NEXUS 670 spectrometer. TEM characterizations on JEM1200EX were used to investigate the self-assembling behavior in water solution. UV-vis spectra on Hitachi U-3900 spectrophotometer were conducted to study the aggregation behavior of AuNPs. Fluorescence spectra were measured on a Shimadzu RF-5301PC spectrometer with exciting wavelength of 365 nm.
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Figure S1. (A) FL spectra of TPE-N-A in water-THF mixture. (B) FL intensity vs the water fraction in mixture.
Figure S2. $^1$H NMR spectrum of PTD-0.10.
Figure S3. FL intensity of PTD (80 μg/mL) with different TPE-N-A amount.
Figure S4. The images of different PTD in PBS solution: (a) PTD-0.05, (b) PTD-0.10, (c) PTD-0.15, and (d) PTD-0.20.
Figure S5. (A) The influence of different PTDNPs-0.10 concentrations on AChE activity. (B) The influence of different PTDNPs-0.10 concentration on MCF-7 cell viability.

The cytotoxicity of PTDNPs-0.10 on AChE activity was investigated through the Ellman method using ATCh and 5,5'-dithiobis-(2-nitrobenzoic acid) (DTNB) as the co-reactants. PTDNPs-0.01 with different concentrations was first incubated with AChE for 30 min. Subsequently, ATCh and DTNB were added into the reaction solution, and the reaction solution was allowed to react for 60 min. The resulting solution was characterized by UV-vis technique. Through the change in absorbance at 412 nm, the cytotoxicity of PTDNPs-0.01 on AChE activity was evaluated.

The cytotoxicity of PTDNPs-0.10 on cells was evaluated by MTT assay. Briefly, MCF-7 cells were seeded at a density of 1×10⁴ cells per well in 96-well plates and cultured overnight under 5% CO₂ at 37 °C. A series of various concentrations of PTDNPs-0.10 were added into the experimental groups. After 12 h, the medium was removed and the cells were washed with PBS three times. Subsequently, 10 μL MTT (5mg/mL in PBS) solution and 90 μL serum-free medium were added into the plates and further incubated for another 4 h. The culture medium containing MTT was discarded and 100 μL dimethyl sulfoxide (DMSO) was added into each well to solubilize the formazan crystals precipitate with gentle shaking. At last, the absorption at 490 nm of each well was measured to evaluate the PTDNPs-0.10' biocompatibility.
Figure S6. (A) TEM image of AuNPs. (B) The UV-vis spectrum of AuNPs.
Figure S7. FL intensity of PTDNPs-0.10 (160 µg/mL) with different AuNPs concentrations.
Figure S8. FL intensity of PTDNPs-AuNPs under different conditions: (a) PTDNPs-0.01, (b) PTDNPs-AuNPs, (c) PTDNPs-AuNPs + NaCl, (d) PTDNPs-AuNPs + KCl, (e) PTDNPs-AuNPs + MgCl₂, (f) PTDNPs-AuNPs + CaCl₂, (g) PTDNPs-AuNPs + Na₂SO₄, (h) PTDNPs-AuNPs + Na₂CO₃, (i) PTDNPs-AuNPs + H₂O₂, (j) PTDNPs-AuNPs + thiophenol, and (k) PTDNPs-AuNPs + thiophenol (after heating treatment). The concentration of all substances was 10 mM.
Figure S9. FL intensity of PTDNPs-AuNPs under different conditions: (a) PTDNPs-0.01, (b) PTDNPs-AuNPs, (c) PTDNPs-AuNPs + lecithin, and (d) PTDNPs-AuNPs + glycine betaine.
Figure S10. (A) FL intensity of the established platform vs different ATCh concentration. (B) FL intensity of the established platform vs different incubation time between PTDNPs-0.10, AuNPs, ATCh and AChE.
Figure S11. FL intensity of the established platform vs the reaction time between paraoxon and AChE.
Figure S12. FL intensity of the established platform toward different substances: (a) blank, (b) paraoxon, (c) chlorpyrifos, (d) malathion, (e) diazinon, (f) parathion, (g) nitrobenzene, (h) 4-nitrophenol, and (i) diethyl (4-methoxybenzyl)phosphonate.
References


