## **Supporting Information**

## Functionalized fluorescent dendrimer as pesticide nanocarrier: application in pest control

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## Materials and methods

**Materials and instruments:** Thiamethoxam (99.7%) was purchased from Sigma-Aldrich and used without further purification. The UV-Vis absorption spectra were recorded on a spectrophotometer (Cintra 20, GBC, and Australia). The corrected fluorescence spectroscopic studies were performed on a fluorescence spectrophotometer (Horiba Jobin Yvon FluoroMax-4 NIR, NJ, USA) at room temperature (25 °C). The particle sizes of drug-dendrimers complexes were measured in triplicate using a Zetasizer Nano ZS (Malvern Instruments, Southborough, MA).

## **Isothermal Titration Calorimetry**

Calorimetric titrations were carried out on a Nano ITC Standard Volume (TA Instruments, New Castle, DE, USA) with an active cell volume of 1.0 mL. All experiments were run at 25 °C in water. The dendrimer solutions (65  $\mu$ M, 250  $\mu$ L) were injected into a water solution of rug (138  $\mu$ M, 1 mL). Each titration consisted of twenty-five, 10  $\mu$ L injections at 300-second intervals with stirring speed of 250 rpm. The gap between two consecutive injections was 300

seconds, in order to allow the system to reach the equilibrium after each injection. The dilution of dendrimer solutions upon addition to the pure buffer solution placed in the cell was also determined, using the same number of injections and the same concentration employed in the titration experiment. The heats of interaction during each injection were measured by integration of each titration peak using the ORIGIN 7 software (OriginLab Co. Northampton, MA, delivered with the ITC). For each injection, the dilution heats determined in the control experiment were subtracted from the heats obtained in the interaction experiment. The neutron curve were used for the calculations of the molar enthalpy, equilibrium constant, entropy, and Gibbs free energy of the reaction.

**Cell culture medium**: *Drosophila* S2 cells were propagated in Schneider's *Drosophila* Medium (Sigma) supplemented with 10% FBS, 100 U/mL penicillin and 100  $\mu$ g/mL streptomycin at 25 °C without CO<sub>2</sub>.

Cytotoxicity assay: Cytotoxicity was monitored using Tali<sup>TM</sup> viability kit-Dead Cell Green (Invitrogen, Catalog A10787) that was a green-fluorescent nuclear and chromosome stain. It does not penetrate intact membranes, but easily penetrate compromised membranes characteristic of dead cells. The measurement was performed at 48 h post-incubation of dendrimer/drug complexes or drug only. Next, replace the fresh cell medium after 48 h of incubation and then add 1  $\mu$ L Dead Cell Green into 100  $\mu$ L cell medium for 0.5 h incubation.

**Insects raising**: Insect larvae of *Heliothis armigera* were fed with artificial diet containing the drug carrier G2 from first to third instar, then the guts of the third instar larvae were dissected and observed under a fluorescence microscope. The second instar larvae were picked out and individually fed with artificial diet mixed with G2/thiamethoxam complexes or thiamethoxam alone. Each larva was fed with 7.2  $\mu$ g drug and 24  $\mu$ g G2 in total. The developmental status of the treated larvae was observed.





Scheme S1. Chemical structures of three cationic dendrimers.



Fig. S1 Required incubation time (h) of G1-G3 for fluorescence detection.



Fig. S2 UV-vis absorption changes of G2 at concentration of 5.0  $\mu$ M upon addition of drug (from 0  $\mu$ M to 400  $\mu$ M) in water at 25 °C.



**Fig. S3** Relative emission intensity (F/F<sub>0</sub>) of G1, G2, and G3 at concentration of 5.0  $\mu$ M upon addition of 400  $\mu$ M drug in water at 25 °C (Ex = 545 nm).



**Fig. S4** (A) ITC titration of G1 (syringe, 65  $\mu$ M) into thiamethoxam solution (cell, 138  $\mu$ M). Binding isotherm (heat change versus G1/thiamethoxam molar ratio) was obtained from the integration of raw data (bottom). (B) ITC titration of G3 (syringe, 65  $\mu$ M) into thiamethoxam solution (cell, 138  $\mu$ M). Binding isotherm (heat change versus G3/thiamethoxam molar ratio) was obtained from the integration of raw data (bottom).



Fig. S5 Thermodynamic parameters of the interactions of dendrimer/drug.