Electronic Supplementary Material (ESI) for RSC Advances.

Supporting Information

Simultaneous fluorescence analysis of the different carbohydrates expressed on living cell surfaces using functionalized quantum dots

DongxiuHe[a,b,*], DanxiaWang[a*], XiaoxinShi[b*], WenjieQuan[b], RundeXiong[b], Cui-yunYu[a,b], HonglinHuang[a]

[a]*Institute of Pharmacy & Pharmacology, University of South China, Hengyang, Hunan, China;*

[b]*Hunan Province Cooperative Innovation Center for Molecular Target New Drug Study, Hengyang, Hunan, China.*

*These authors contributed equally to this work.

E-mail: 1025165380@qq.com

Contents:

1. Evolution of the absorption and photoluminescence spectra of a crude solution of CdTe QDs during the synthesis.

2. FTIR patterns of QDs

3. Photostability of the functionalized quantum dots

4. The effect of concentration of the functionalized QDs

5. HepG2 cell-targeting ability of the functionalized QDs

6. Lectin competitive-binding assay

7. Hemagglutination activity of the functionalized QDs

1. Evolution of the absorption and photoluminescence spectra of a crude solution of CdTe QDs during the synthesis

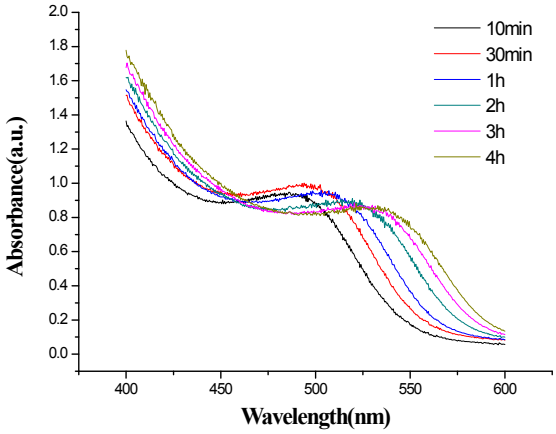


Fig. S1a Evolution of the absorption spectra of a crude solution of CdTe QDs during the synthesis

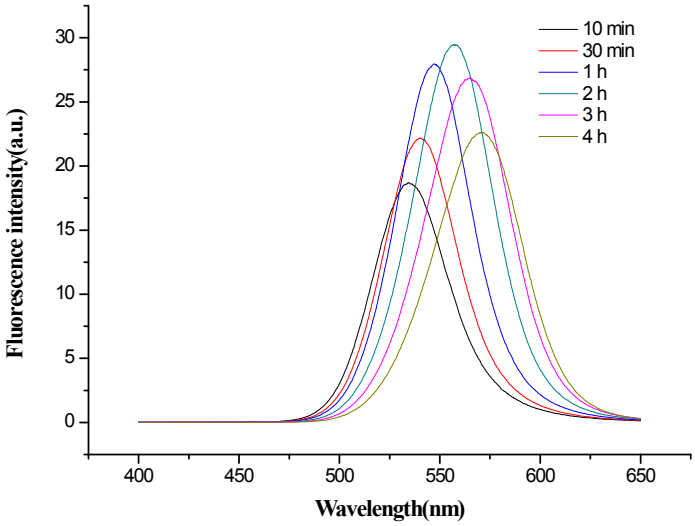


Fig. S1b Evolution of the photoluminescence spectra of a crude solution of CdTe QDs during the synthesis

2. FTIR patterns of QDs

FTIR patterns of QDs were shown in Fig. S2.The peaks at 1588 cm-1 and 1388 cm-1 show the asymmetric and symmetric vibrations of COO−, respectively. This is in accordance with the pH of the cadmium precursor solution (pH 10.5). The stretching vibration of S–H (2564 cm-1) was not observed in the as-prepared CdTe QDs with TGA used as the stabilizing and functionalizing agent. This was attributed to the thiol bound to the surface of QDs, which can dramatically remove the traps states.

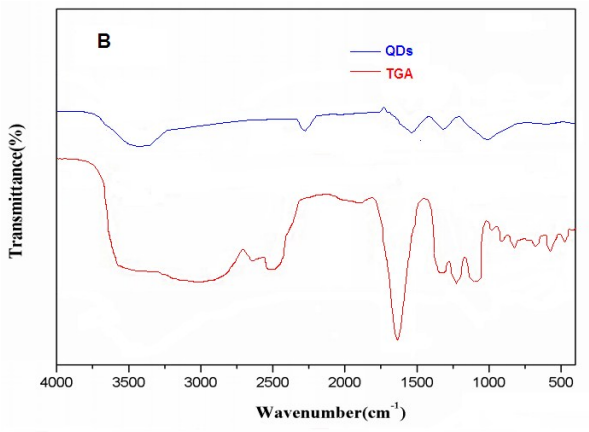


Fig. S2 FTIR patterns of QDs

3. Photostability of the functionalized quantum dots stained HepG2 cells

Stable fluorescence is the primary factors which should be taken into account when the functionalized QDs are applied to cancer diagnosis. For the study of the stability of the fluorescence signal of the functionalized QDs, the lectin-QDs conjugates (23.5nMQD550-DSA, or 9.4 nM QD618-LCA)was introduced to the resuspended cells (1×10^6) and shaken at room temperature for 20 min at 450 rpm in the dark, respectively. Then, the functionalized QDs stained cells were washed once with 500 μL of incubation buffer (consisting of PBS supplemented with 2.0% FBS) to remove unbound QDs. Subsequently, cells were suspended in 300 μL of PBS and analyzed at 30-min intervals by flow cytometry. The results of photostability of the functionalized QDs were shown in Fig. S3.

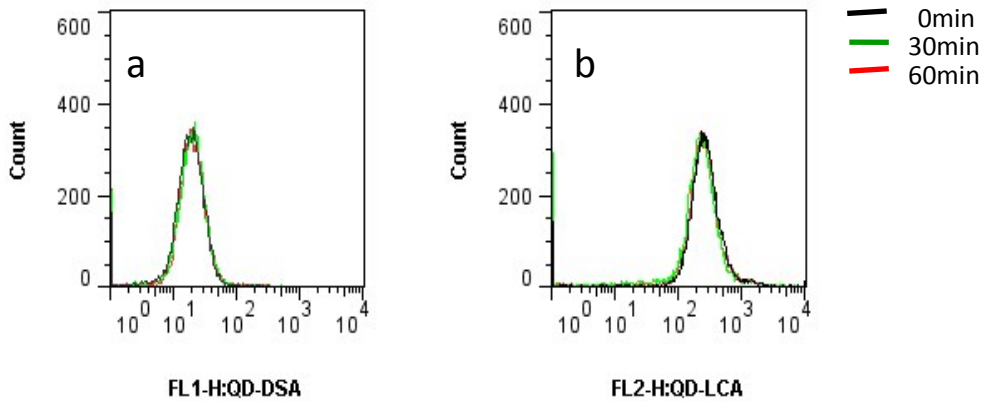


Fig. S3 Histogram of photostability of QD-DSA stainedHepG2 (a) and QD- LCA stained HepG2 (b)

4. The effect of concentration of functionalized QDs

The relationship between the concentration of functionalized QDs and the fluorescence intensity of HepG2 cells labeled with QD550-DSA and QD618-LCA has been demonstrated in Fig S4.

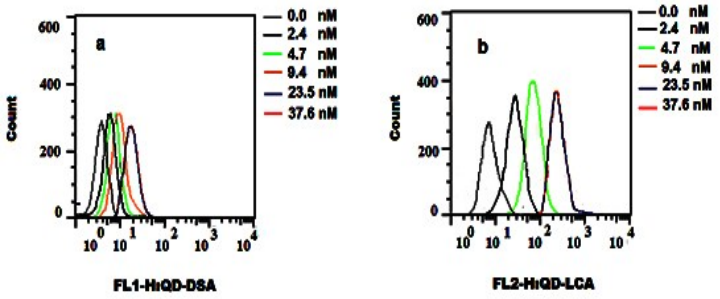
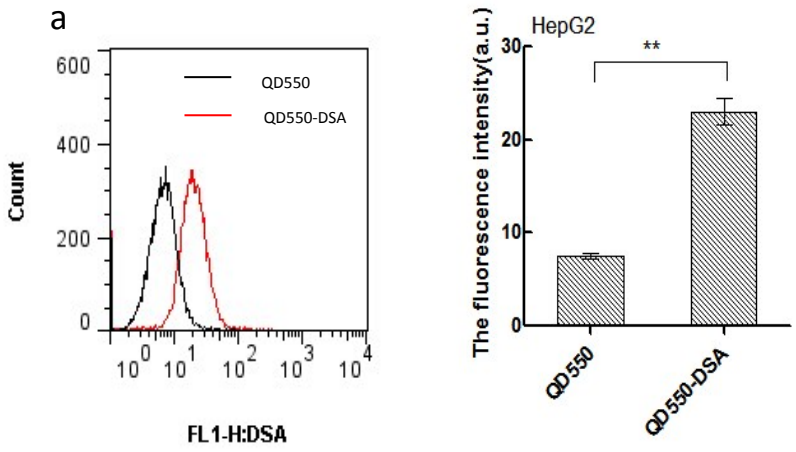


Fig. S4 The effect of various concentration of the QD550-DSA conjugates (a) and the QD618-LCA conjugates (b).

5. HepG2 cell targeting ability of the functionalized QDs

For specific target ability of the functionalized QDs, four samples(23.5 nM QD550-DSA , 23.5 nM QD550, 9.4 nM QD618 and 9.4 nM QD618-LCA)was introduced to HepG2 cells (1×10^6), respectively. Then, the cells were shaken at room temperature for 20 min at 450 rpm in the dark. Then, the functionalized QDs stained cells were washed once with 500 μL of incubation buffer (consisting of PBS supplemented with 2.0% FBS) to remove unbound QDs or functionalized QDs. Subsequently, cells were suspended in 300 μL of PBS for flow cytometry analysis.



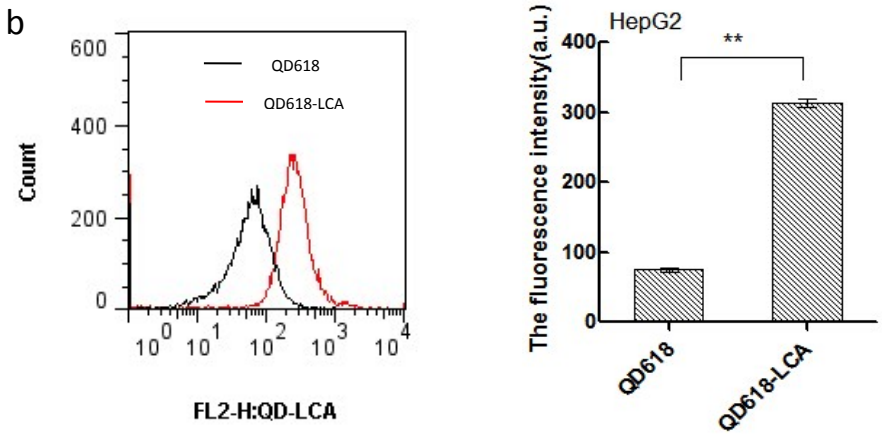
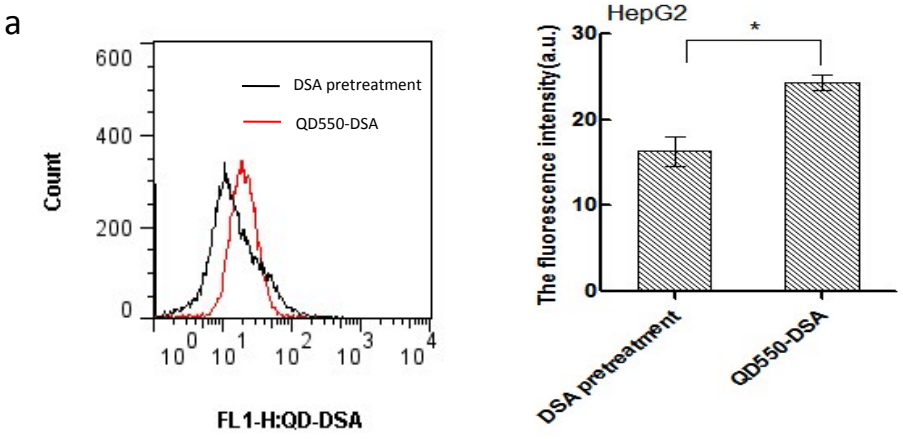


Fig. S5 HepG2 cell targeting ability of the QD550-DSA (a) and QD618-LCA (b). Error bars represent the standard error. Statistical significance was determined by one-way ANOVA (**P < 0.01)（n=3）

6. Lectin competitive-binding assay

To further verify that the specific targeting ability of the functionalized QDs is caused by the interaction between lectin and cell surface carbohydrates, lectin competitive inhibition assay was performed. For lectin competitive-binding assay, the functionalized QDs (23.5 nM QD550-DSA, or 9.4 nM QD618-LCA) was introduced to HepG2 cells (1×10^6) pretreated with lectin (23.5 nM DSA for QD550-DSA and 9.4 nM LCA for QD618-LCA), respectively. Then, the cells were shaken at room temperature for 20 min at 450 rpm in the dark. Then, the functionalized QDs stained cells were washed once with 500 μL of incubation buffer (consisting of PBS supplemented with 2.0% FBS) to remove unbound functionalized QDs. Subsequently, cells were suspended in 300 μL of PBS for flow cytometry analysis. The experimental results are shown in Fig S6.



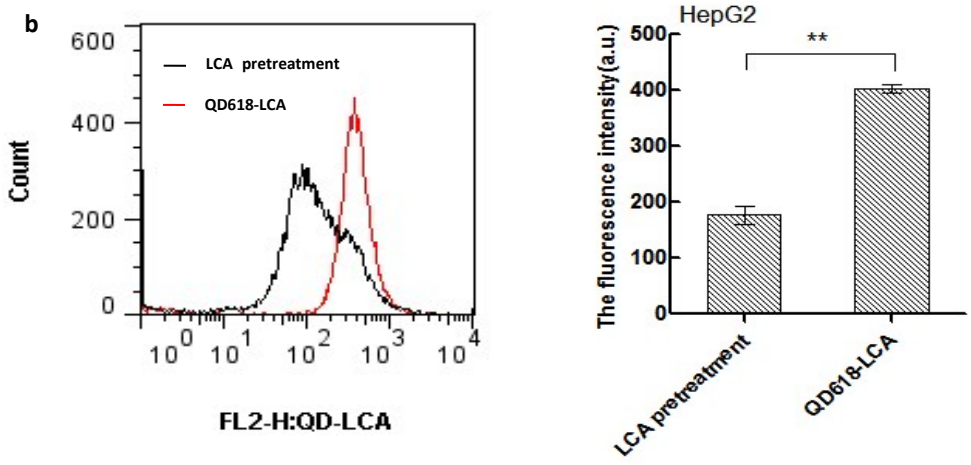


Fig. S6 Lectin competitive-binding assay of QD550-DSA (a) and QD618-LCA (b). Error bars represent the standard error. Statistical significance was determined by one-way ANOVA (**P < 0.01)（n=3）

7. Specific hemagglutination activity of the functionalized QDs

Table S1 Specific hemagglutination activity of the functionalized QDs

Systems	Hemagglutination activity(HU)	Specific activity
LCA	2^10	/
QD618-LCA	2^10	100%
DSA	2^10	/
QD550-DSA	2^10	100%