Electronic Supplementary Material (ESI) for Analytical Methods
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Supporting Information

Fluorescence Resonance Energy Transfer Aptasensor for Platelet-derived Growth Factor Detection Based on Upconversion Nanoparticles in 30% Blood Serum

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Calculation of FRET efficiency (E), Förster distance (R_0) and the distance(r) between the donor (UCNPs) and the acceptor (AuNPs)

The FRET efficiency, E, can be measured experimentally and is commonly defined as [1]

$$E = (E_0-E_1)/E_0 \quad (1)$$

Where $\boldsymbol{E_1}$ is the integrated fluorescence intensity (25.51, which obtained from the fluorescence spectrum shown in Fig. 5) of the donor in the presence of the acceptor when the concentration of PDGFBB is 850 nM. $\boldsymbol{E_0}$ is the integrated fluorescence intensity (30.06, obtained form the fluorescence spectrum of Fig. 5) of the donor alone (no acceptors present). *E* was calculated that is 0.152 according to Equations 1.

R_0 is the separation distance at which the energy transfer efficiency is 50%. It can be calculated according to the following formula.

$$E = n \cdot R_0^6 / (n \cdot R_0^6 + r^6) \quad (2)$$

Where n is the average number of acceptor molecules interacting with one donor, which can be experimentally determined from fluorescence data (shown in Fig. S1). According to wang's report[2], n can be obtained from the abscissa value of the intersection point of the two tangents, which is closed to 13 in this work. Therefore, the distance (r) between the donor surfaces and acceptor centers in the assemblies can be roughly estimated from the diameters of nanoparticles which is about 4.5 nm. The calculated donor-to-acceptor separation distance R_0= 2.2 nm.

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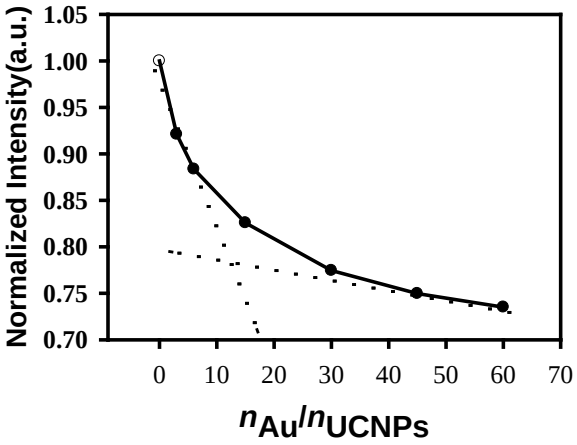

Fig. S1: Fluorescence quenching of UCNPs by AuNPs, as a function of the acceptor-to-donor ratio (n). The fluorescence intensity values obtained in experiments where the concentration of the donor was maintained constant (0.5 mg/mL) and the concentration of the acceptor was varied. Where the concentration of PDGF-BB is 850 nM.

Summary of the detection of PDGF

Table S. A tabulated summary of the detection of PDGF

Detection Limit	Dynamic Range	Environment Detection	Detection Method	Ref.
50 pM	5 – 200 nM	In Buffer	CE	[3]
80 pM	0.1 - 2.0 nM	In PBS	Photoluminescence	[4]
50 pM	400-700 pM	In Blood Serum	Electrochemistry	[5]
4 pM	0.001-100 nM	In PBS Buffer	Fluorescence	[6]
0.1 nM	0-1 nM	In physiological buffer	Fluorescence	[7]
10 nM	200 – 1200 nM	In 30% Blood Serum	Fluorescence	This work

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