

## Electronic Supplementary Information

### Upconversion Nanoparticles-labelled Immunochromatographic Assay for Quantitative Biosensing

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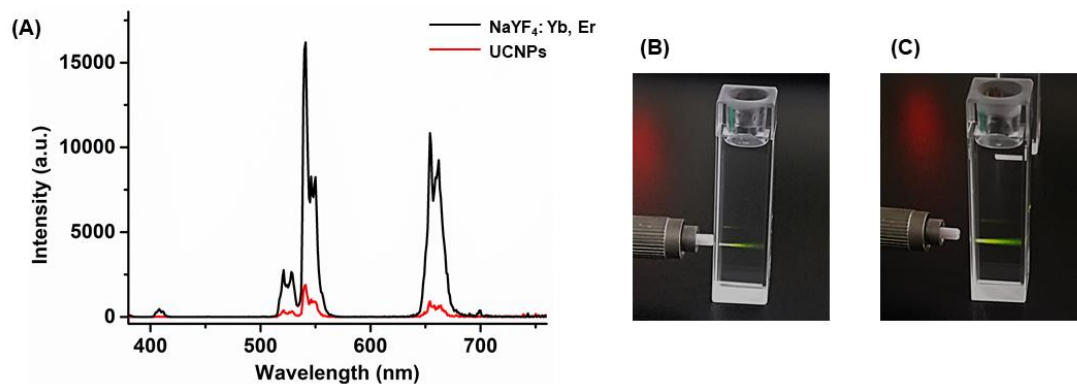
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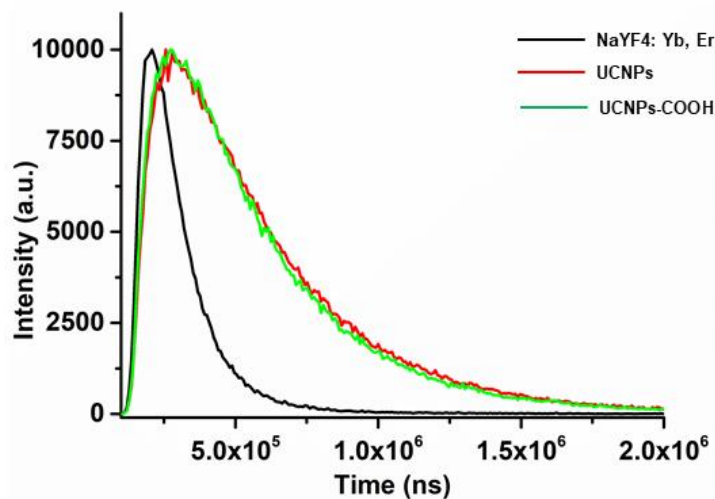
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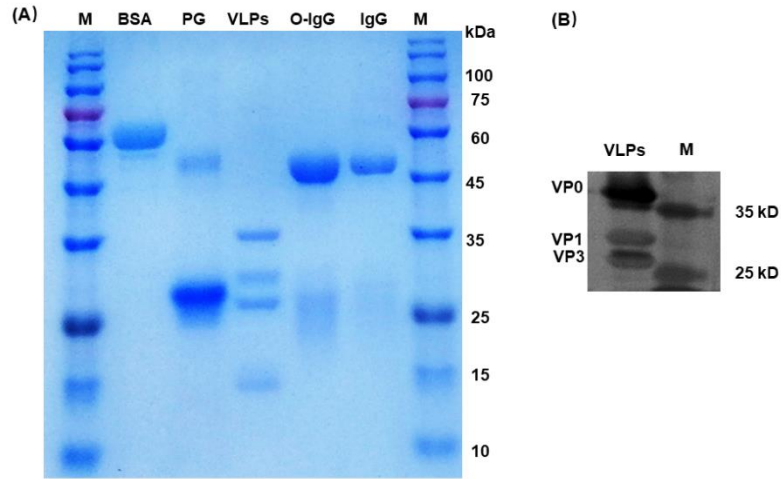
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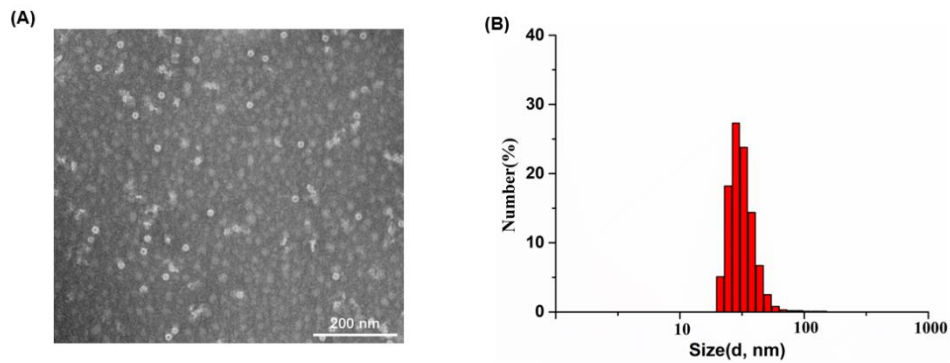
**Fig. S1.** (A) Fluorescence spectra of NaYF<sub>4</sub>: Yb,Er (red line) and UCNPs (black line) at 1 mg/mL in ethanol. Photographs of (B) NaYF<sub>4</sub>: Yb,Er and (C) UCNPs under 980 nm laser.



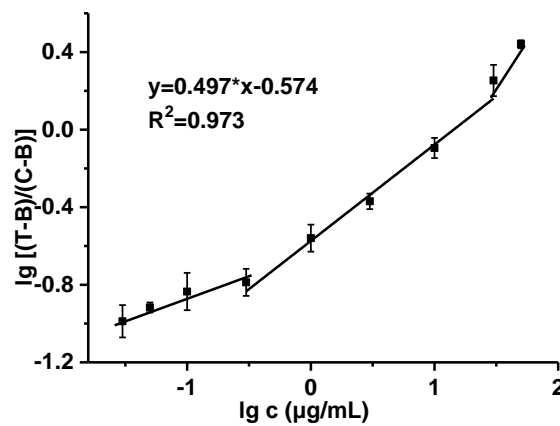
**Fig. S2.** The decay curves at the wavelength of 540 nm for NaYF<sub>4</sub>:Yb,Er (black line), UCNPs (red line) and UCNPs-COOH (green line). Excitation by 980 nm laser.



**Fig. S3.** (A) SDS-PAGE of proteins used in the platform. (B) Western blotting of VLPs. Marker (M), Protein G (PG), O-IgG (anti O-FMDV specific antibody) and nonspecific antibody from rabbit (IgG).



**Fig. S4.** (A) TEM image and (B) DLS size of VLPs.



**Fig. S5.** The calibration curve with a broad window of detection. The concentration of antibody ( $0.03 \mu\text{g mL}^{-1}$ ,  $0.05 \mu\text{g mL}^{-1}$ ,  $0.1 \mu\text{g mL}^{-1}$ ,  $0.3 \mu\text{g mL}^{-1}$ ,  $1 \mu\text{g mL}^{-1}$ ,  $3 \mu\text{g mL}^{-1}$ )

<sup>1</sup>, 10  $\mu\text{g mL}^{-1}$ , 30  $\mu\text{g mL}^{-1}$  and 50  $\mu\text{g mL}^{-1}$ ).

Table S1. Reproducibility analysis of the UCNP-based test strips in buffer.

Concentration ( $\mu\text{g mL}^{-1}$ )	within-run			between-run		
	Signal ratio	SD	RSD (%)	Signal ratio	SD	RSD (%)
1	0.248	0.004	1.8%	0.294	0.015	5.0%
5	0.706	0.012	1.7%	0.710	0.004	3.5%
10	1.047	0.015	1.4%	1.076	0.040	3.7%

within-run variability 1.6%                      between-run variability 4.1%

Table S2. Reproducibility analysis of the UCNP-based test strips in positive sera.

No.	Signal ratio	SD	RSD (%)
1	0.861	0.093	10.8
2	0.913	0.056	6.1
3	1.384	0.159	11.5