SUPPLEMENTARY INFORMATION

Mannitol-induced gold nanoparticle aggregation for the ligand-free detection of viral particles

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The calculation for concentration of control BSA of 10^{-3} μM based on the same area coverage of 10^8 MTT_{50}/mL virus PPV on AuNPs is shown as follows:

Step 1, unit conversion from PPV titer to number of PPV particles:

$$10^8 \frac{\mathrm{MTT_{50}}}{\mathrm{mL}} = 8\ \log_{10}\left(\frac{\mathrm{MTT_{50}}}{\mathrm{mL}}\right) \times \frac{10^7\ \frac{\mathrm{pfu}}{\mathrm{mL}}}{7.8\ \log_{10}\left(\frac{\mathrm{MTT_{50}}}{\mathrm{mL}}\right)}^{*} \times \frac{1 \times 10^6\ \mathrm{particles}}{1\ \mathrm{pfu}}^{**} = 1.0 \times 10^{13}\ \frac{\mathrm{particles}}{\mathrm{mL}}$$

$$* \ 7\ \log_{10}\left(\frac{\mathrm{pfu}}{\mathrm{mL}}\right) = 7.8\ \log_{10}\left(\frac{\mathrm{MTT_{50}}}{\mathrm{mL}}\right),^{1}\ \text{thus} 10^7\ \frac{\mathrm{pfu}}{\mathrm{mL}} = 7.8\ \log_{10}\left(\frac{\mathrm{MTT_{50}}}{\mathrm{mL}}\right)$$

$$** \ \text{Infectivity ratio} = \frac{\text{infectious particles}}{\text{total particles}} = 1{,}000{,}000,^{2}$$

$$\text{thus } 1\ \text{pfu} = 1{,}000{,}000\ \text{particles}$$

Step 2, coverage area of PPV=$A_{PPV} = \pi r_{PPV}{}^2 = \pi(\frac{d_{PPV}}{2})^2 = \pi(\frac{25\ \mathrm{nm}}{2})^2 = 156\pi\ \mathrm{nm}^2$

Coverage area of BSA=$A_{BSA} = \pi r_{BSA}{}^2 = \pi(\frac{d_{BSA}}{2})^2 = \pi(\frac{6.78\ \mathrm{nm}}{2})^2 = 11.5\pi\ \mathrm{nm}^2$

Ratio of coverage area PPV/BSA=$\frac{156\pi\ nm^2}{11.5\pi\ \mathrm{nm}^2} = 14$

Therefore, concentration of control

BSA=$\frac{1.0\times10^{13}\frac{\mathrm{particles}}{\mathrm{mL}}\times14}{6\times10^{23}\ \mathrm{particles/mol}^{***}} \approx 10^{-9}\ \frac{\mathrm{mol}}{\mathrm{mL}} = 1\ \mathrm{nM} = 10^{-3}\mu\mathrm{M}$

$$*** \ \text{Avogadro's constant} = 6 \times 10^{23}\ \mathrm{mol}^{-1}\ ,^{3}\ \text{thus } 1\ \mathrm{mol} = 6 \times 10^{23}\ \text{particles}$$

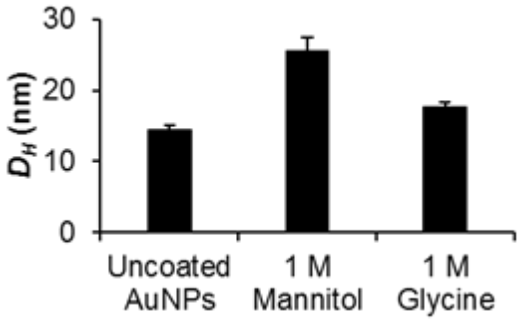

Figure S1 Uncoated AuNPs before and after 1 M osmolyte.
All data points are the average of three separate tests and error bars represent the standard deviation.

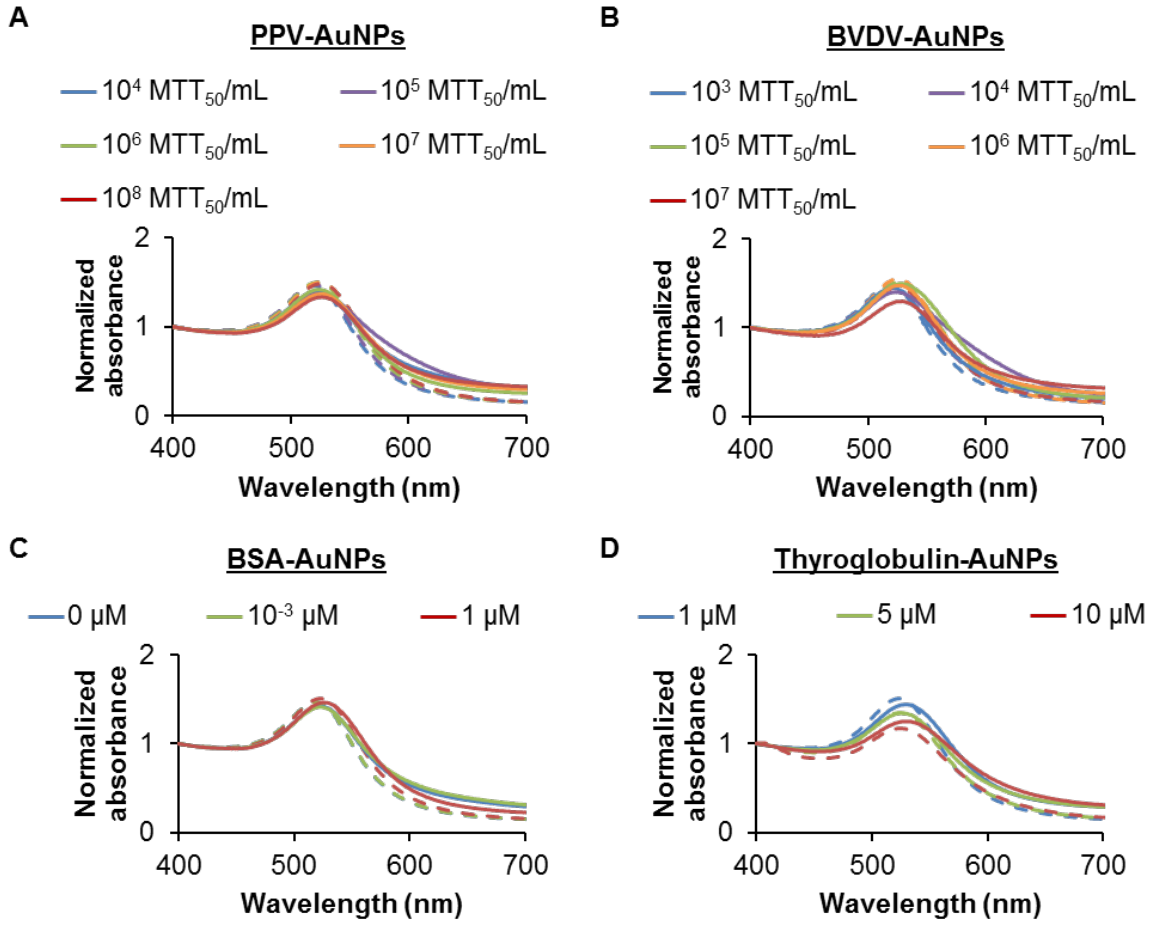

Figure S2 UV-Vis absorbance spectra of coated AuNPs before and after 1 M osmolyte. Dashed lines represent coated AuNPs before 1 M mannitol and solid lines represent coated AuNPs after 1 M mannitol.

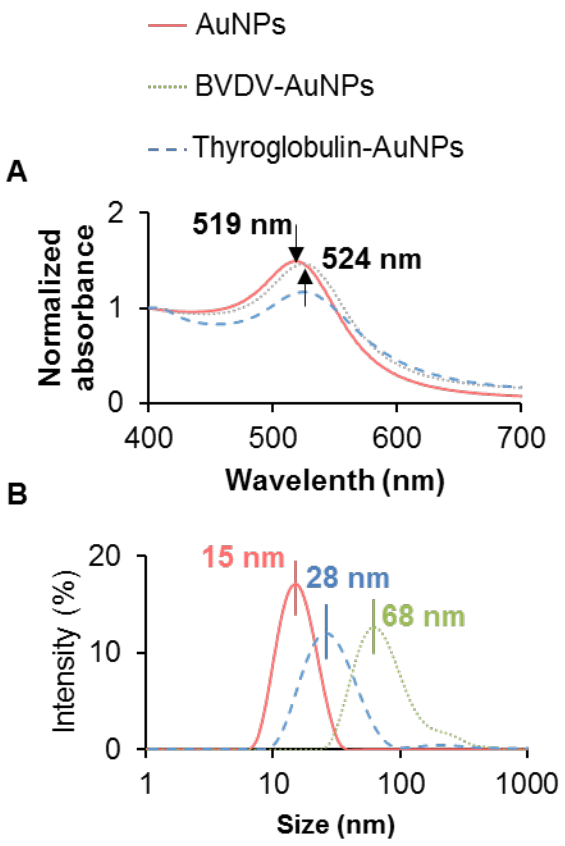

Figure S3 Characterization of synthesized and BVDV or thyroglobulin coated AuNPs. (A) UV-Vis absorption spectrum, (B) hydrodynamic diameter

REFERENCES

(1) Heldt, C. L.; Hernandez, R.; Mudiganti, U.; Gurgel, P. V.; Brown, D. T.; Carbonell, R. G. A Colorimetric Assay for Viral Agents That Produce Cytopathic Effects. *J. Virol. Methods* **2006,** *135* (1), 56-65.

(2) Muzyczka, N.; Berns, K. I. Parvoviridae: The Viruses and Their Replication. In *Field's Virology*; Knipe, D. M.; Howely, P. M., Eds.; Lippincott Williams & Wilkins: 2001; pp 2327-59.

(3) Prausnitz, J. M. P.; Lichtenthaler, R. N.; Azevedo, E. G. *Molecular Thermodynamics of Fluid-Phase Equilibria*, Third Edition ed.; Prentice Hall PTR: 1999.