SUPPLEMENTARY INFORMATION

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

Xue Mi¹, Ellie M. Lucier¹, Dylan G. Turpeinen¹, Eugenia Li Ling Yeo², James Chen Yong Kah²,*

and Caryn L. Heldt¹,*

¹Department of Chemical Engineering, Michigan Technological University, USA
²Department of Biomedical Engineering, National University of Singapore, Singapore

*Co-corresponding authors: kah@nus.edu.sg and heldt@mtu.edu
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:

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

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

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

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

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

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

Therefore, concentration of control

$$\text{BSA=} \frac{1.0 \times 10^{13} \frac{\text{particles}}{\text{mL}} \times 14}{6 \times 10^{23} \frac{\text{particles}}{\text{mol}^{***}}} \approx 10^{-9} \frac{\text{mol}}{\text{mL}} = 1 \text{ nM} = 10^{-3} \mu \text{M}$$

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

