materials

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Supplementary Materials

Controlled Formation of a Protein Corona Composed of Denatured BSA on Upconversion Nanoparticles Improves Their Colloidal Stability

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Citation: Shanwar, S.; Liang, L.; Nechaev, A.V.; Bausheva, D.K.; Balalaeva, I.V.; Vodeneev, V.A.; Roy, I.; Zvyagin, A.V.; Guryev, E.L. Controlled Formation of a Protein Corona Composed of Denatured BSA on Upconversion Nanoparticles Improves Their Colloidal Stability. *Materials* **2021**, *14*, 1657. https://doi.org/10.3390/ma14071657

Academic Editor: Jinheung Kim

Received: 4 February 2021
Accepted: 22 March 2021
Published: 28 March 2021

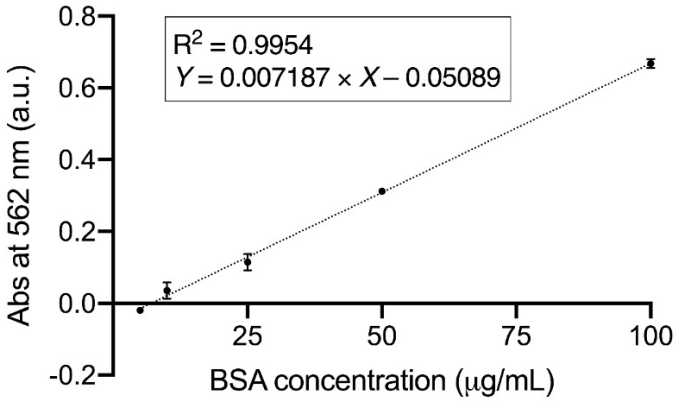

Figure S1. Calibration curve for the Pierce Micro BCA™ Protein Assay Kit.

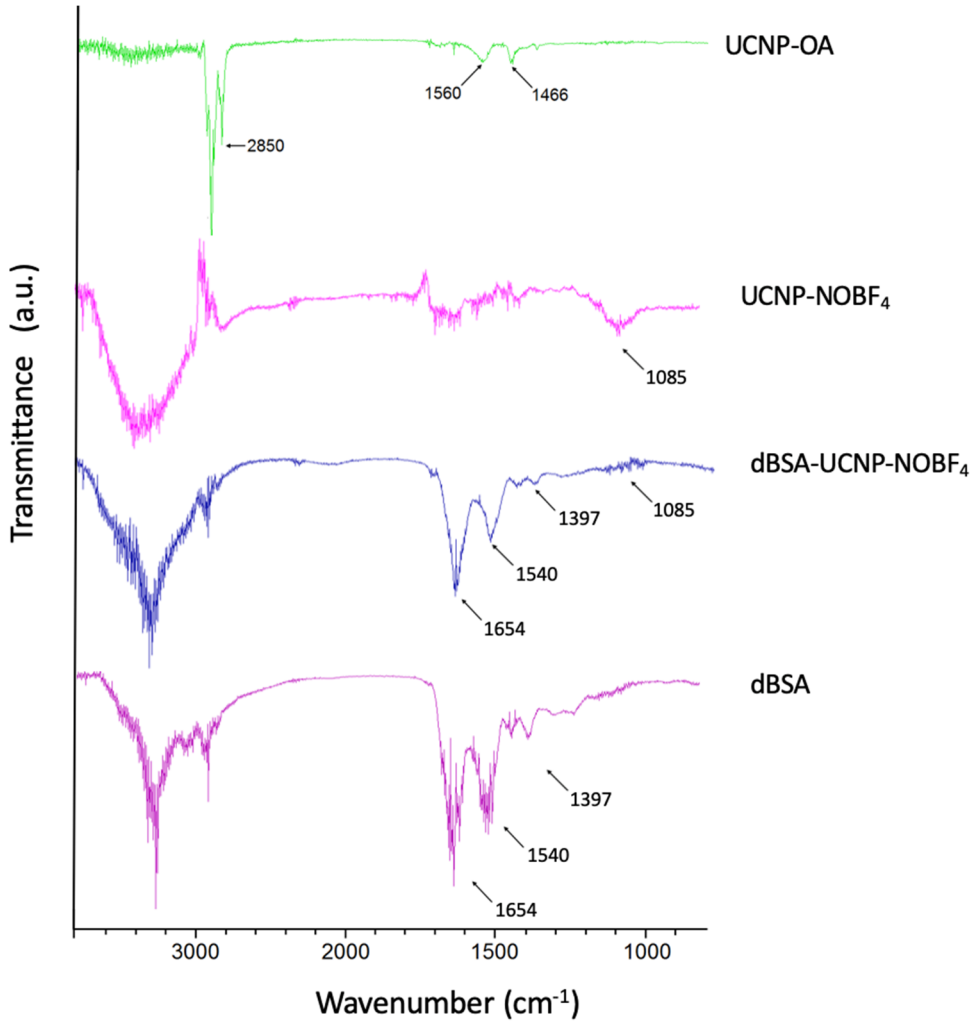

Figure S2. FTIR absorption spectra of UCNP-OA, UCNP-$NOBF_4$, and lyophilized dBSA-UCNP-$NOBF_4$; UCNP: Upconversion nanoparticles; OA: Oleic acid.

The appearance of the 2933 cm^{-1} and 2850 cm^{-1} peaks corresponds to the asymmetric and symmetric stretching vibrations of $–CH_2$ groups of oleic acid, respectively. Additionally, two bands at 1560 and 1466 cm^{-1} are observed and assigned to the asymmetric and symmetric stretch of the COO^- of oleic acid, respectively. Moreover, the $NOBF_4$ treatment of UCNP caused an intensity reduction of the peaks at 2933 and 2850 cm^{-1} and the appearance of a new band at 1085 cm^{-1} associated with BF_4^- anions. The FTIR spectrum of lyophilized dBSA-UCNP-$NOBF_4$ shows a reduction in the 1085 cm^{-1} peak corresponding to the BF_4^- anions and an alteration of the band at 1397 cm^{-1} assigned to amide III of dBSA, C≡N stretching mode and N–H bending mode.

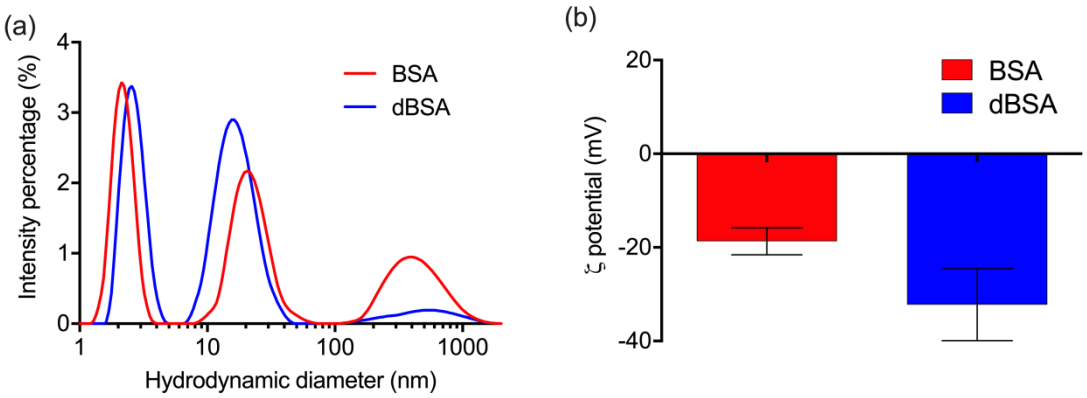

Figure S3. Characterization of bovine serum albumin (BSA) and denatured BSA by Dynamic Light Scattering and Electrophoretic Light Scattering (DLS and ELS): (**a**) hydrodynamic diameter distributions of BSA and dBSA acquired by DLS in deionized water; (**b**) the ζ-potential of BSA and dBSA acquired by ELS in deionized water.

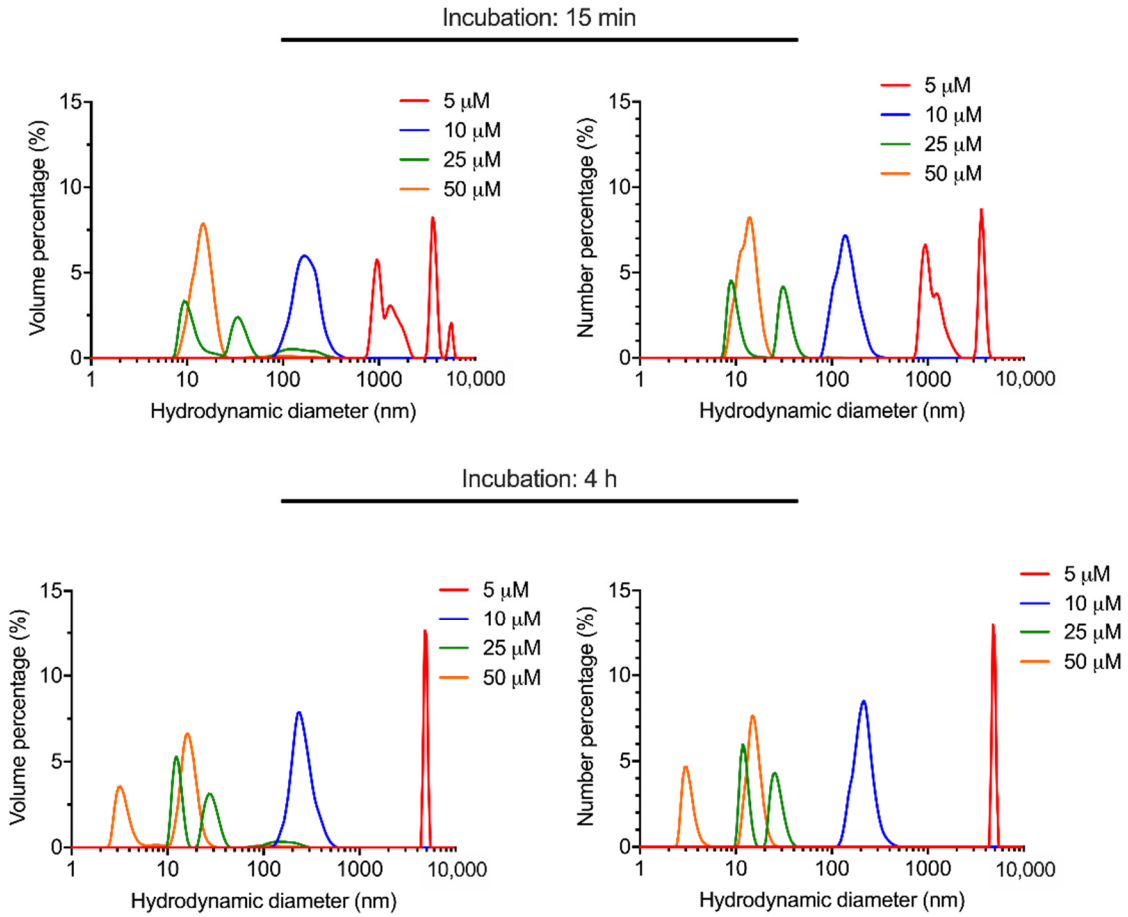

Figure S4. Concentration optimization of dBSA for forming protein corona on the surface of UCNP-$NOBF_4$ by volume and number.

Hydrodynamic diameter of dBSA-UCNP-$NOBF_4$ following the incubation of UCNP-$NOBF_4$ (0.25 mg/mL) with dBSA at different concentrations (5–50 μM) at room temperature for 15 min and 4 h measured by DLS.