Supplementary Information

Preferential Accumulation of Phospholipid-PEG and Cholesterol-PEG Decorated Gold Nanorods into Human Skin Layers and their Photothermal-Based Antibacterial Activity

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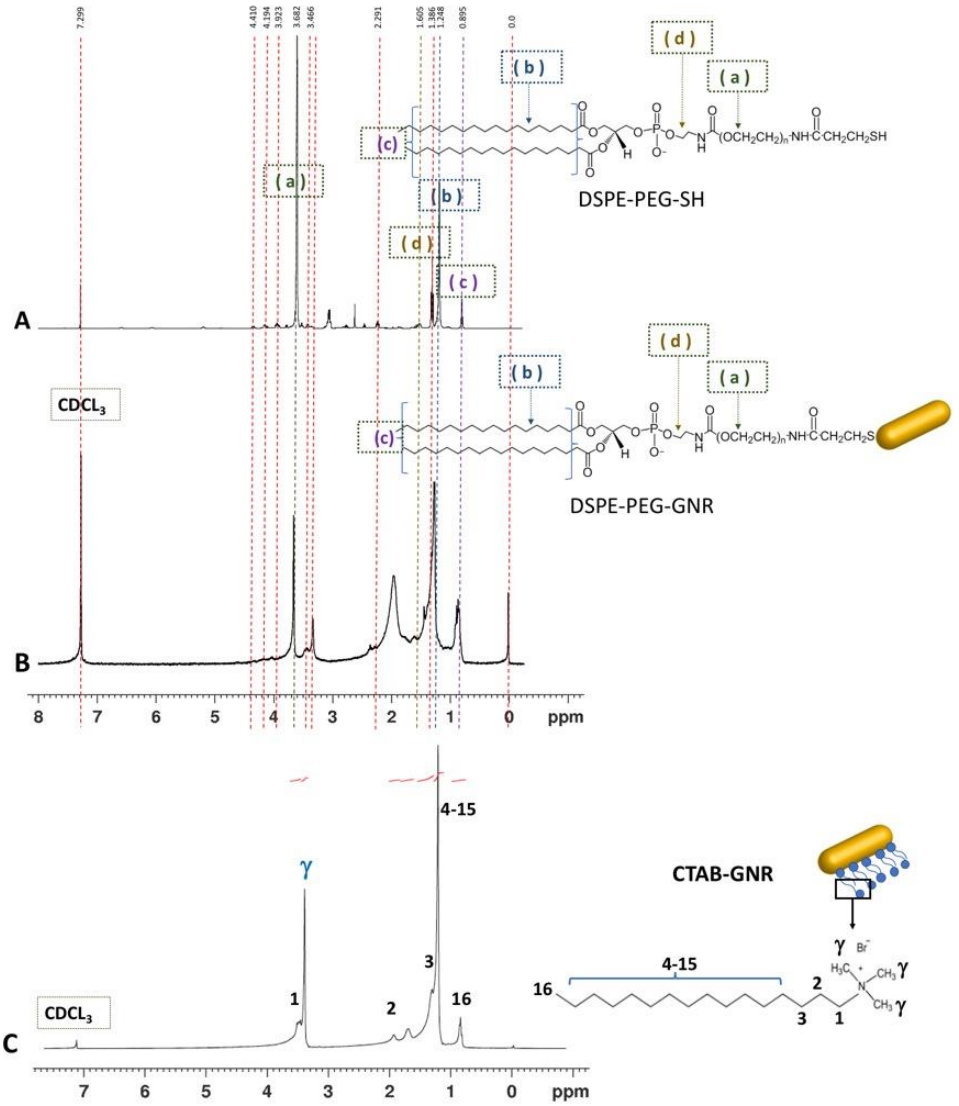

Figure S1. ^{1}H-NMR spectra of DSPE-PEG-SH, DSPE-PEG-GNR and CTAB-GNR. Combined ^{1}H-NMR spectra of **A.** DSPE-PEG-SH and **B.** DSPE-PEG-GNR show the signals similarity of characteristic chemical shift values with slightly broadened and shifted peaks upon attachment to GNR; (a) a characteristic sharp peak of repeated units of PEG at ~ 3.68 ppm; (b) a characteristic sharp peak of methylene groups of DSPE at ~ 1.25 ppm; (c) a characteristic peak of the methyl group of DSPE at ~ 0.89 ppm; (d) a characteristic peak of the methylene groups attached to amide at 1.60 ppm. **C.** ^{1}H-NMR spectrum of CTAB-GNR showed a

characteristic sharp peak of the γ-methyl protons at ~ 3.39 ppm that was reduced dramatically upon displacement of CTAB by DSPE-PEG-SH. All the spectra were acquired in $CDCL_3$.

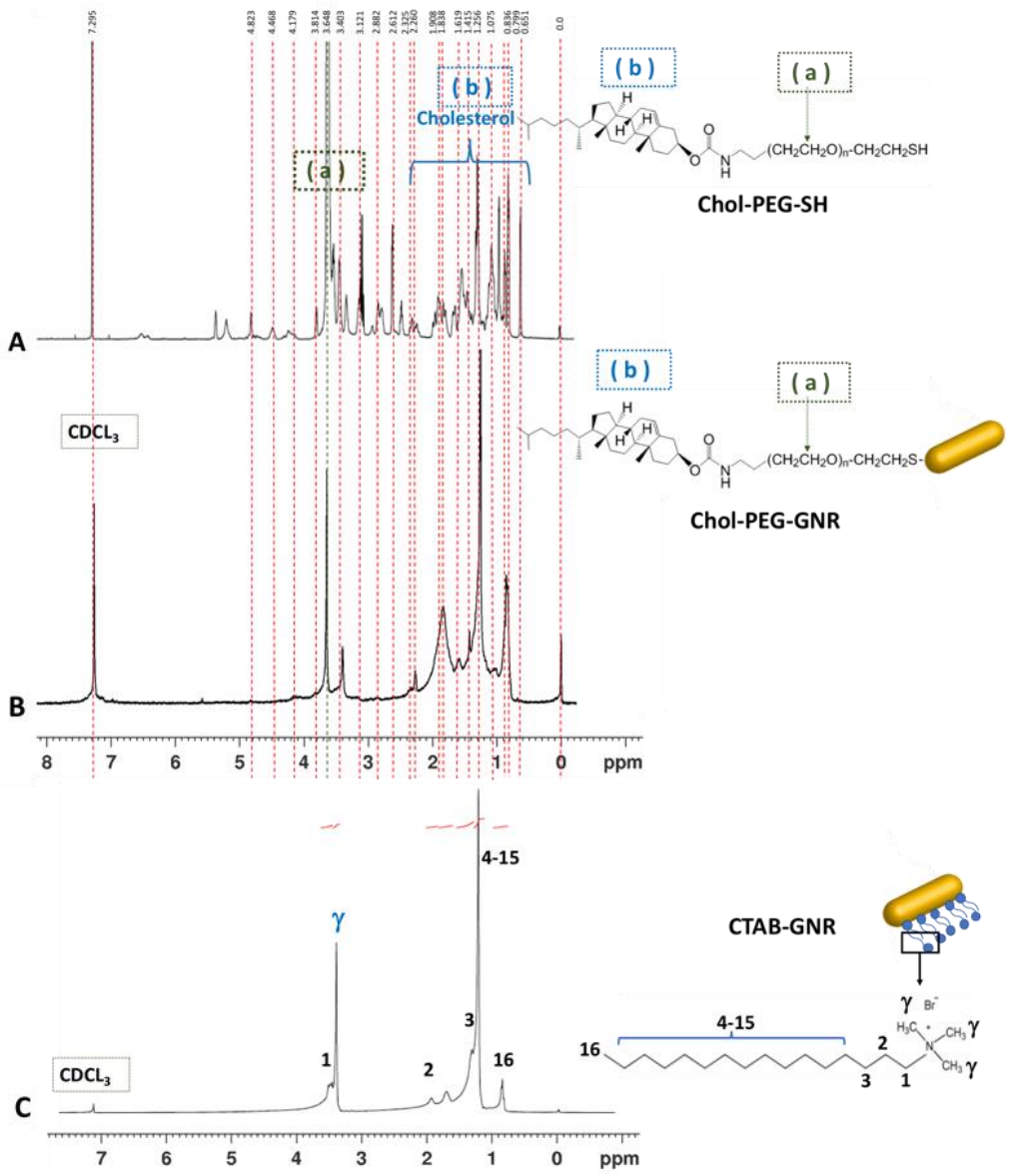

Figure S2. [1]H-NMR spectra of Chol-PEG-SH, Chol-PEG-GNR and CTAB-GNR. Combined [1]H-NMR spectra of **A.** Chol-PEG-SH and **B.** Chol-PEG-GNR show the signals similarity of characteristic chemical shift values with slightly broadened and shifted peaks upon attachment to GNR; (a) a characteristic sharp peak of repeated units of PEG at ~ 3.68 ppm; (b)

Characteristic peaks of cholesterol protons. **C.** ^{1}H-NMR spectrum of CTAB-GNR showed a characteristic sharp peak of γ-methyl protons at ~ 3.39 ppm that was reduced dramatically upon displacement of CTAB by Chol-PEG-SH. All the spectra were acquired in $CDCL_3$.

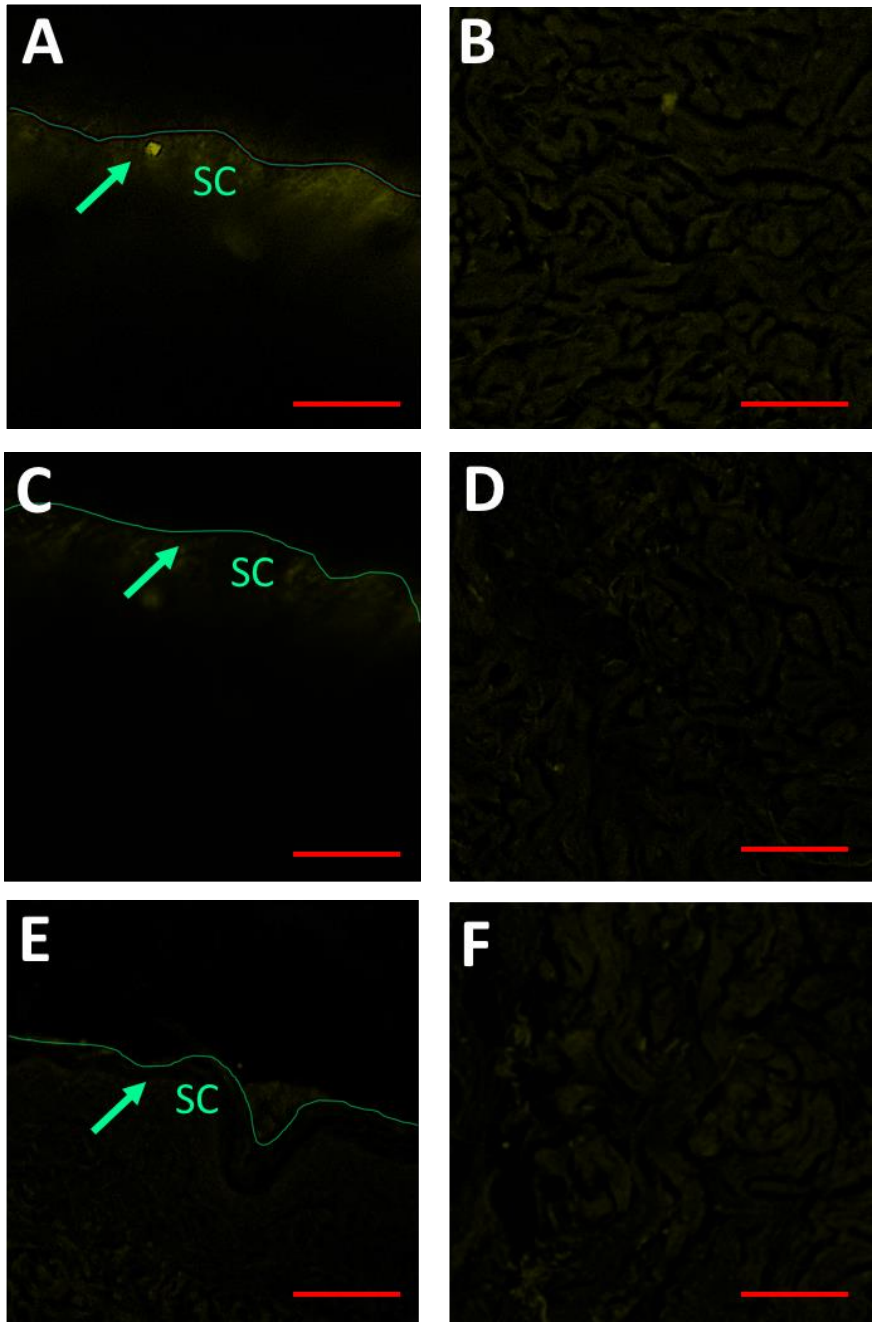

Figure S3. Confocal fluorescence microscopy images of skin samples pre-treated with m-PEG-GNR, NH_2-PEG-GNR and COOH-PEG-GNR. **A & B.** SC and dermis of skin pre-treated with m-PEG-GNR, respectively. **C & D.** SC and dermis of skin pre-treated with NH_2-PEG-GNR respectively. **E & F.** SC and dermis of skin pre-treated with COOH-PEG-GNR, respectively.

All the images showed low fluorescence intensity of the neutral or charged PEGylated GNR applied to skin samples. Scales = A, C and E = 200 μm, B, D and F = 100 μm.

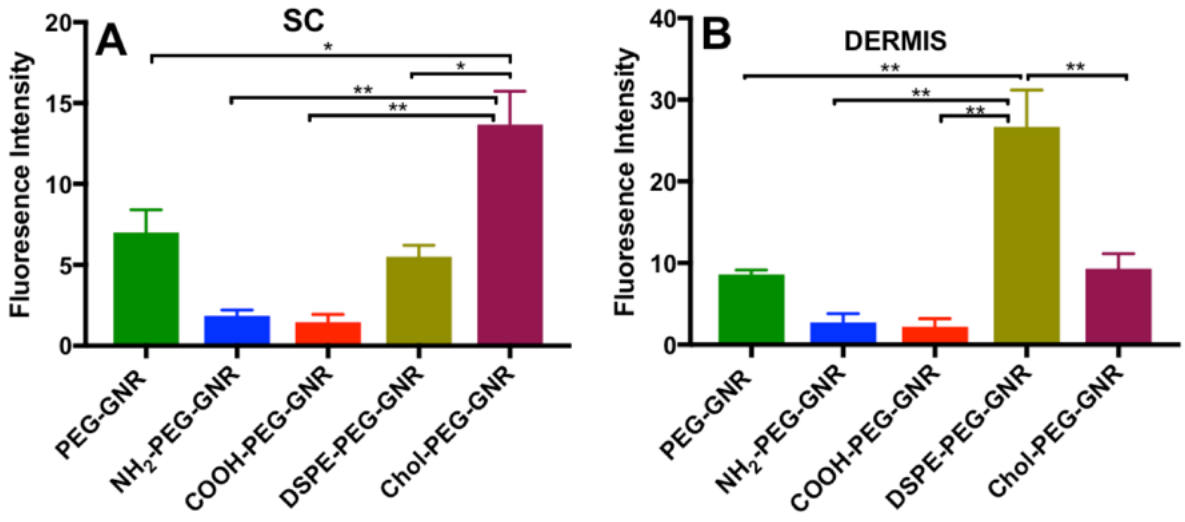

Figure S4. Fluorescence intensities of GNR of different surface functionalities that accumulated into: **A.** Stratum corneum layers, and **B.** Dermis layer. Data are given as mean ± SD (n = 3). Unpaired t-test was used to evaluate the differences; * $p < 0.05$, ** $p < 0.01$.