Supporting Information for:

Light-triggered liposomal cargo delivery platform incorporating photosensitizers and gold nanoparticles for enhanced singlet oxygen generation and increased cytotoxicity

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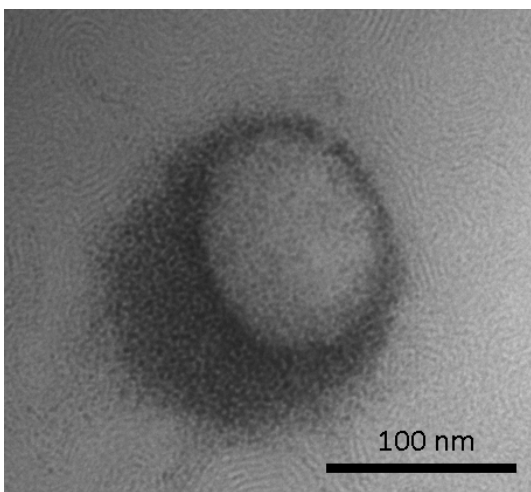Tel: +61 2 9850 9547

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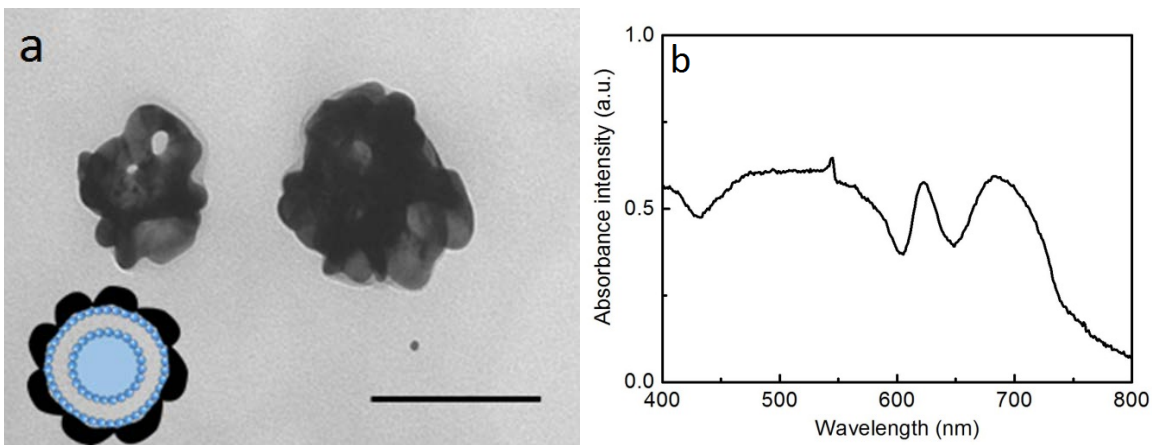**Figure S1. The TEM image of gold nanoparticles with a size of 3-5 nm used in this study.**

Figure S2. TEM image (a) and absorption spectrum (b) of gold-coated liposomes. Inset in (a) is its schematic illustration. The scale bar is 100 nm.
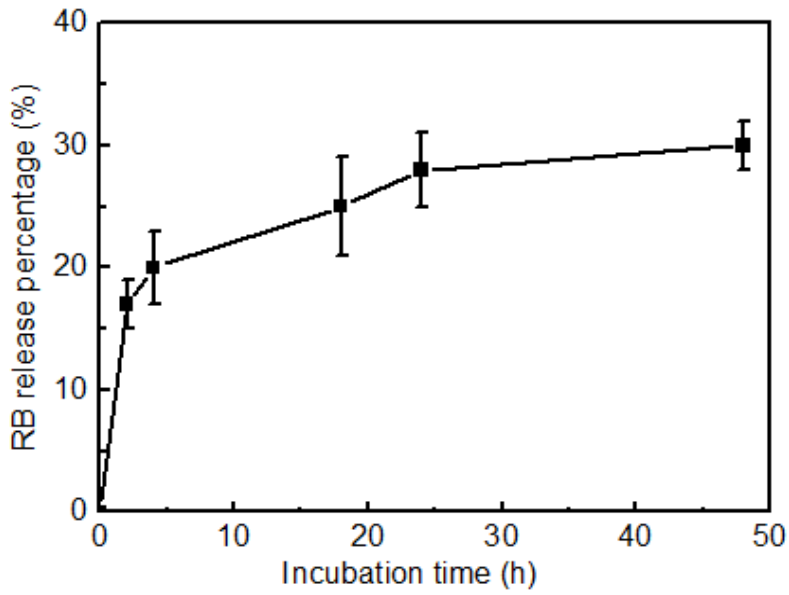
Figure S3. The percentage of released RB from liposomes (57:5:17) after 0 hr, 2 hr, 4 hr, 18 hr, 24 hr and 48 hr incubation in PBS (pH 7.4) containing 10% FBS
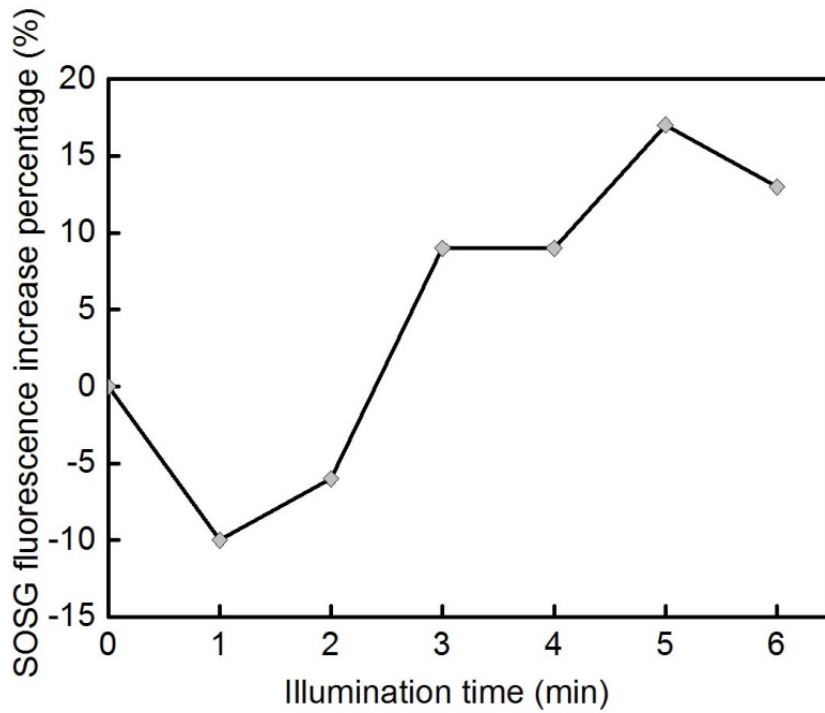

Figure S4. The increase percentage of SOSG fluorescence intensities in gold-coated liposomes exposed to a 532nm laser at different illumination time points.
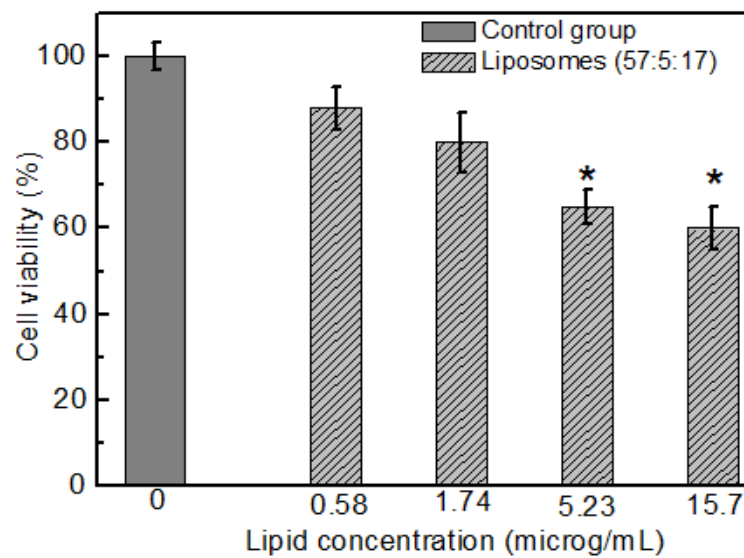
Figure S5. Cytotoxicity of gold-loaded liposomes incorporating RB and Dox (57:5:17) in MCF-7 cells after 6-min illumination. Data points represent the mean±S.D. of three separate experiments (n = 3), each performed in triplicate. *P <0.05 compared to the control group.
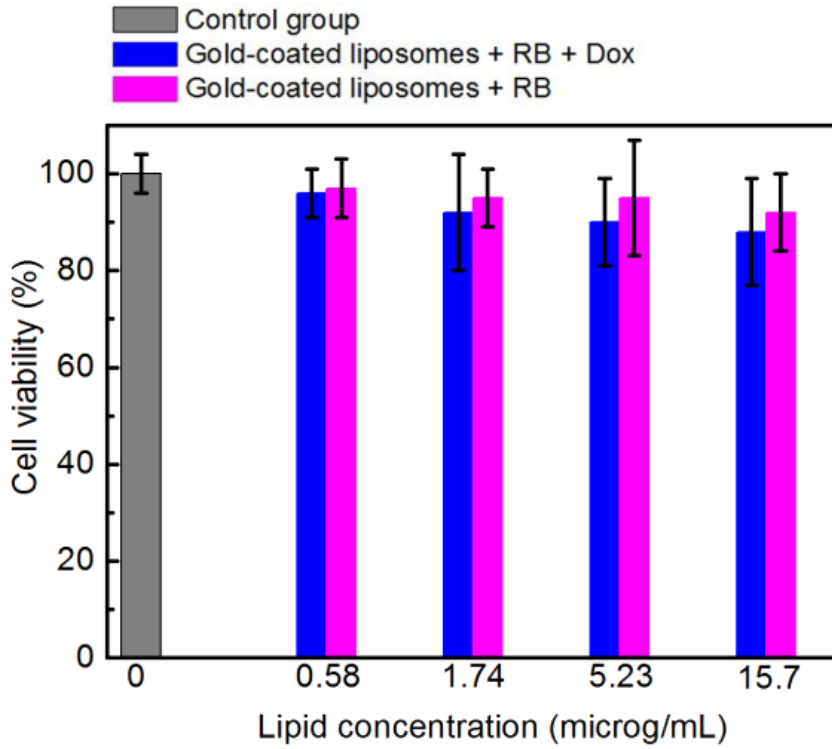
Figure S6. Cytotoxicity of different gold-coated liposomes on HCT116 cells after 6-min illumination. No significant change was observed by Student's t test.

Estimation of the number of gold nanoparticles per liposome:

We first calculated the total number of gold atom (N_{atom}) in our gold-loaded liposome sample based on ICP-MS analysis and the equation:

$$N_{atom} = \frac{[Au^{3+}] \times V}{M} \times N_A \qquad (1)$$

Where $[Au^{3+}]$ is the concentration of Au (III), V stands for the sample volume, M indicates the atomic weight of gold and N_A is the Avogadro number (6.023×10^{23} mol/L).

The average number of gold atoms per gold nanoparticle (U) was also calculated by using the following equation [1]:

$$U = \frac{2}{3} \times \pi \times \left(\frac{D}{\alpha}\right)^3 \qquad (2)$$

Where D refers to the diameter of gold nanoparticle and α is the edge of a unit cell whose value was 4.0786 Å. Therefore the number of gold nanoparticles (N_{gold}) in a gold-loaded liposome sample can be calculated based on the equation:

$$N_{gold} = \frac{N_{atom}}{U} \tag{3}$$

The number of lipid molecules (N_{tot}) in each liposome was calculated by using the equations:

$$N_{tot} = \frac{\left[4\pi(\frac{d}{2})^2 + 4\pi[\frac{d}{2}-h]^2\right]}{a} \tag{4}$$

where d is the diameter of a liposome, h indicates the thickness of a liposomal bilayer that was calculated as 4.7 nm for our lipid formulation, and a represents the average lipid head group area, whose value was calculated according to $a = a_1\,N_1 + a_2\,N_2 + a_3\,N_3 + \cdots$, where N is the molar fraction of each lipid component and a is 64 Å for HSPC and 61 Å for PE-NH$_2$ in our study [2].

The number of gold-loaded liposome for known concentration of lipid was estimated by using the equation:

$$N_{lipo} = \frac{[lipid] \times N_A}{N_{tot} \times 1000} \tag{5}$$

where $[lipid]$ is the lipid concentration, N_A is the Avogadro number (6.023×10^{23} mol/L) and N_{tot} is the total number of lipids per liposome.

Finally the number of gold nanoparticles per liposome (N) can be estimated as per the equation:

$$N = \frac{N_{gold}}{N_{lipo}} \tag{6}$$

References:

1. Chithrani BD, Ghazani AA, and Chan WC, Determining the size and shape dependence of gold nanoparticle uptake into mammalian cells. *Nano letters*, 2006; **6**(4): p. 662-668.
2. Murzyn K, Róg T, and Pasenkiewicz-Gierula M, Phosphatidylethanolamine-phosphatidylglycerol bilayer as a model of the inner bacterial membrane. *Biophysical journal*, 2005; **88**(2): p. 1091-1103.