# Electronic Supporting Information

## *In Situ* Preparation of Gold-Polyester Nanoparticles for Biomedical Imaging

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## Contents:

*1. Polymerization of D,L-lactide-polyethylenglycol (PDLLA-PEG-COOH) block copolymer*

All reagents were dried prior to use in a vacuum oven at 28 mmHg pressure and room temperature. PDLLA-PEG-COOH co-polymer was synthesized by ring opening polymerization of D,L-lactide using hydroxyl polyethylene glycol carboxylate as the initiator and tin(II) 2-ethylhexanoate as a catalyst. In a typical synthesis, HO-PEG-COOH (0.455 g), D,L-lactide (2.5 g), and $Na_2SO_4$ (300 mg) were vacuum dried (28 mmHg, room temperature) overnight in a 100 mL round-bottomed, 3-neck flask equipped with a magnetic stir bar before use. HO-PEG-COOH and D,L-lactide were then dissolved by stirring in anhydrous toluene (10 mL) at 120 ˚C under $N_2$ gas. After 20 min, tin(II) 2-ethylhexanoate (5.07 μL) was added to the reaction vessel. The vessel was then sealed with a rubber septum and the headspace was purged with $N_2$. The flask was equipped with a reflux condenser and the resulting reaction mixture was heated at reflux for 12 h. Next, the polymer product was extracted into a chloroform (30 mL)/water (18 mL) mixture to remove residual catalyst and unreacted HO-PEG-COOH. The organic phase was collected and dried over anhydrous $Na_2SO_4$, concentrated by rotary evaporation, and the polymer product was precipitated in cold methanol. The precipitates were isolated by centrifugation at –9 ˚C for 5 min then kept at –80 ˚C for 6 h followed by freeze-drying for 3 d. The final product was stored at –20 ˚C prior to characterization and use.

*2. $^{1}H$ NMR spectrum of synthesized PDLLA-PEG-COOH polymer*

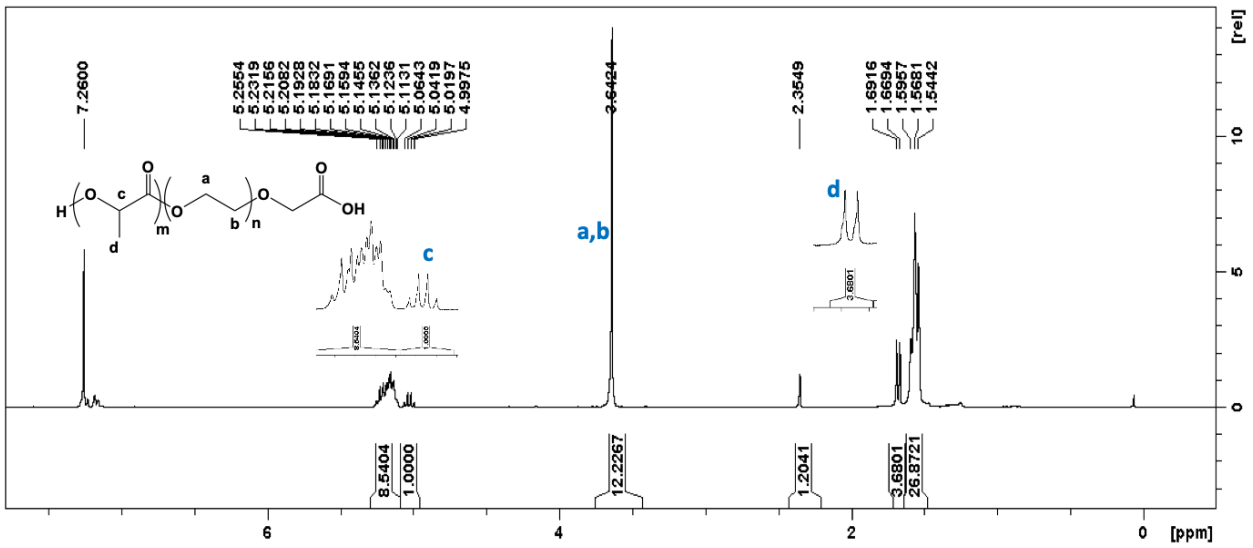
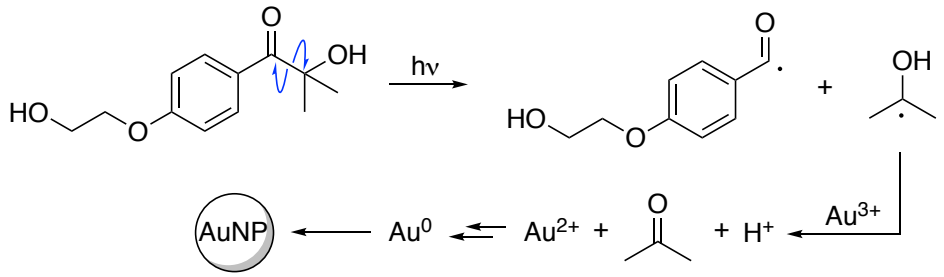



***Figure S1:*** *$^{1}H$ NMR spectrum of the synthesized PDLLA-PEG polymer*

*3. Scheme of photochemical synthesis of gold nanoparticles*




**Scheme S1.** The photochemical synthesis of gold nanoparticles in the presence of Irgacure I-2959 and $HAuCl_4 \bullet xH_2O$. (Adapted from: Marin, M. L.; McGilvray, K. L.; Scaiano, J. C. *J. Am. Chem. Soc.* **2008**, *130*, 16572-16584.)

*4. Digital photograph of experimental set-up for Au-polyester NP synthesis by irradiation through chicken tissue barrier*

**Figure S2.** Digital photograph of experimental set-up for Au-polyester NP synthesis by irradiation through chicken tissue barrier.

*5. FTIR analyses of all synthesized nanoparticles*

The key features of the IR spectrum were observed for the PDLLA-PEG-COOH polymer nanoparticles: a strong absorbance peak at 3307 $cm^{-1}$ (OH stretching due to the polymer termini or adventitious water), peaks at 2927, 2898, and 2844 $cm^{-1}$ attributed to $sp^3$ C-H stretching, sharp peak at 1757 $cm^{-1}$ arising from carbonyl stretching, and 1081 $cm^{-1}$ arising from C-O stretching. Overall, the FT-IR data demonstrated that both PDLLA-PEG-COOH NPs and Au-polyester NPs, prepared by UV irradiation with or without a tissue barrier, exhibited nearly identical IR signatures, which clearly demonstrates that the chemical composition of the polymer NPs is unchanged during the course of the Au NP preparation.

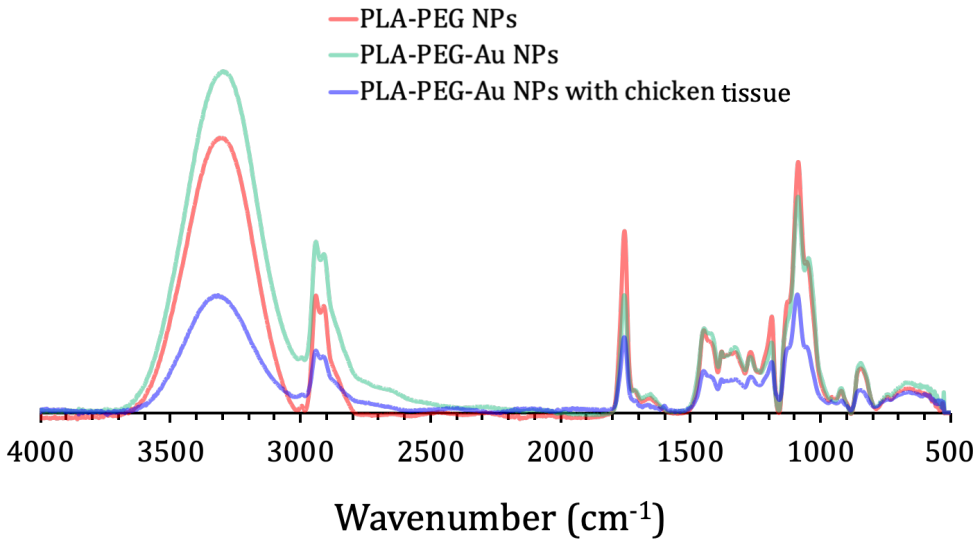



**Figure S3:** FT-IR spectra of the synthesized NPs; PLA-PEG-COOH NPs, Au-polyester, NPs and Au-polyester NPs produced by irradiation through a chicken tissue barrier.

*6. Thermogravimetric analysis (TGA)*

Thermogravimetric analysis (TGA) curves in an air environment for both PDLLA-PEG-COOH copolymer, PDLLA-PEG-COOH NPs, and Au-polyester NPs are displayed in Figure S4. The samples were prepared and freeze-dried prior to analysis. TGA showed a slight weight loss over the range of 20–60 ˚C and 30–160 ˚C, respectively, which were assigned to the loss of adsorbed water. Significant mass losses were apparent over the ranges of 60 to 400 ˚C and 200 to 400 ˚C, respectively, due to the thermal decomposition of PDLLA-PEG-COOH followed by another slight curve change over the range of 400 to 500 ˚C. After 500 ˚C, there was almost no change in the sample weight loss and the final weight loss for both nanoparticle formulations was nearly 100%, indicating that almost all of the PDLLA-PEG-COOH burned off during the course of the TGA measurement. The degradation of the two NP samples exhibited relatively similar behaviors in the presence and absence of Au NPs, which confirms that loading Au NPs into the polymeric NP did not dramatically affect the thermal decomposition profile of the polymer. A sample of the bulk PDLLA-PEG-COOH polymer revealed a decomposition profile with a slight weight loss assigned to water evaporation over the range of 20 to 170 ˚C followed by two clear decomposition curves over the ranges of 170 to 410 and 410 to 600 ˚C.

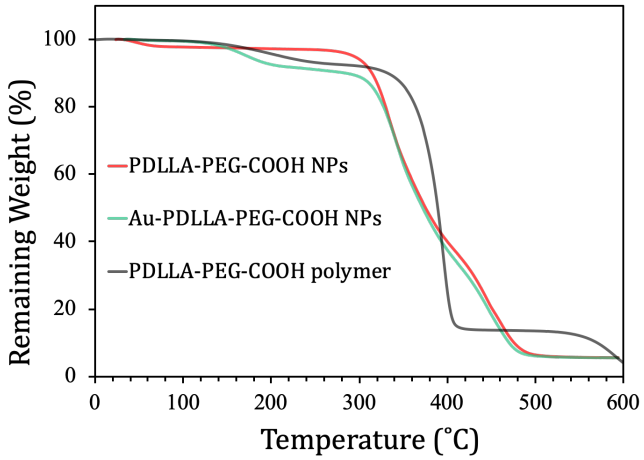



**Figure S4.** Thermogravimetric analysis (TGA) of gold-free PDLLA-PEG-COOH NPs and Au-polyester NPs compared with the PDLLA-PEG-COOH polymer material itself. The presence of AuNPs resulted in only slight variations between the two curves.

*7. Cell viability assay of Au-polyester NPs on U-87 MG cells*

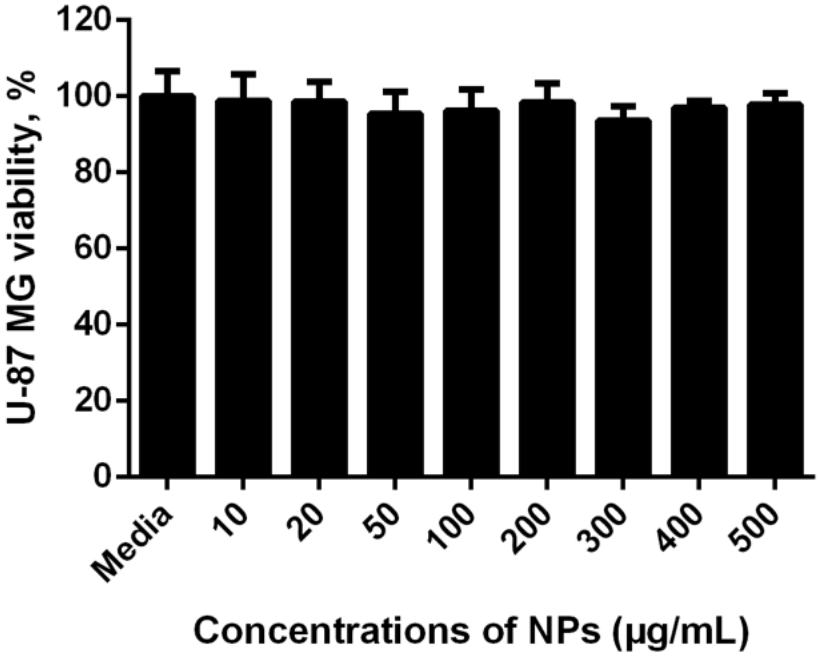



**Figure S5.** Cytotoxicity assessment of Au-polyester NPs at different concentrations on human glioblastoma U-87 MG cells. The Au-polyester NPs were non-toxic over the entire concentration range of 10-500 µg/mL.

*8. Photochemical synthesis of Au-polyester NPs in the presence of cells*

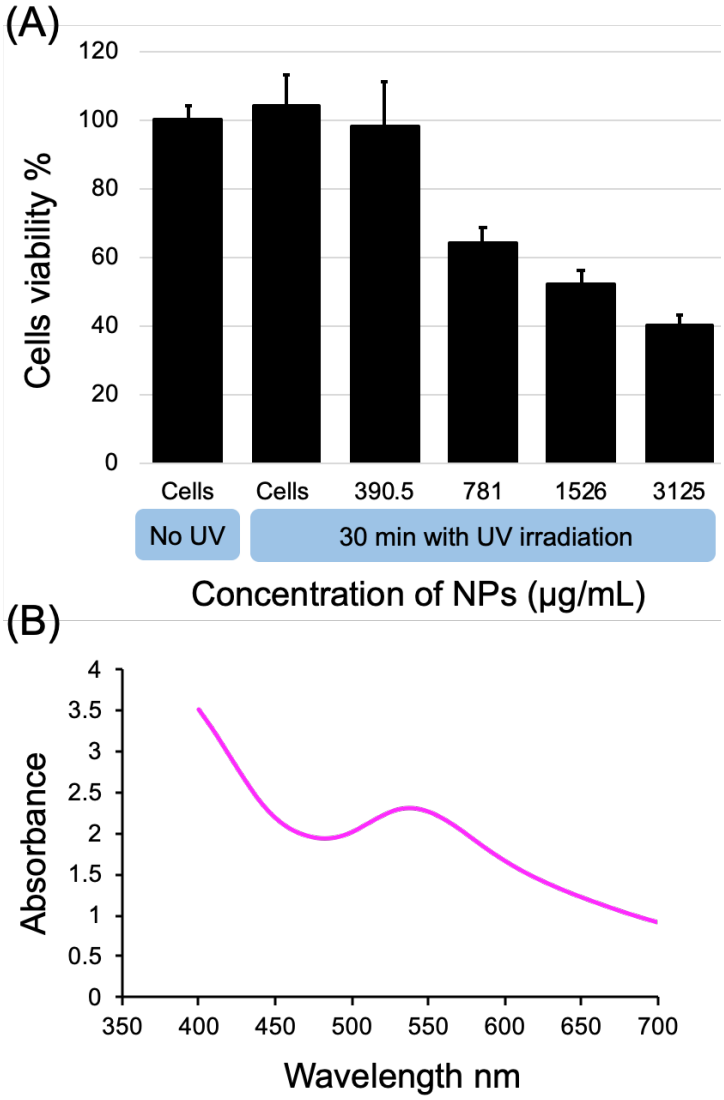



**Figure S6.** (A) MTS cytotoxicity assay at different concentrations of gold-polyester NPs with compared to cells only (control) with and without exposition to UV irradiation for 30 min on adipose stromal cells demonstrated that UV light (254 nm) has no impact on cell death and thus it would be applicable with live cells. (B) Absorbance spectrum of one sample showing the formation of gold NPs within the polymer during 30 min UV irradiation.

*9. Cellular uptake experiments Au-polyester NPs*

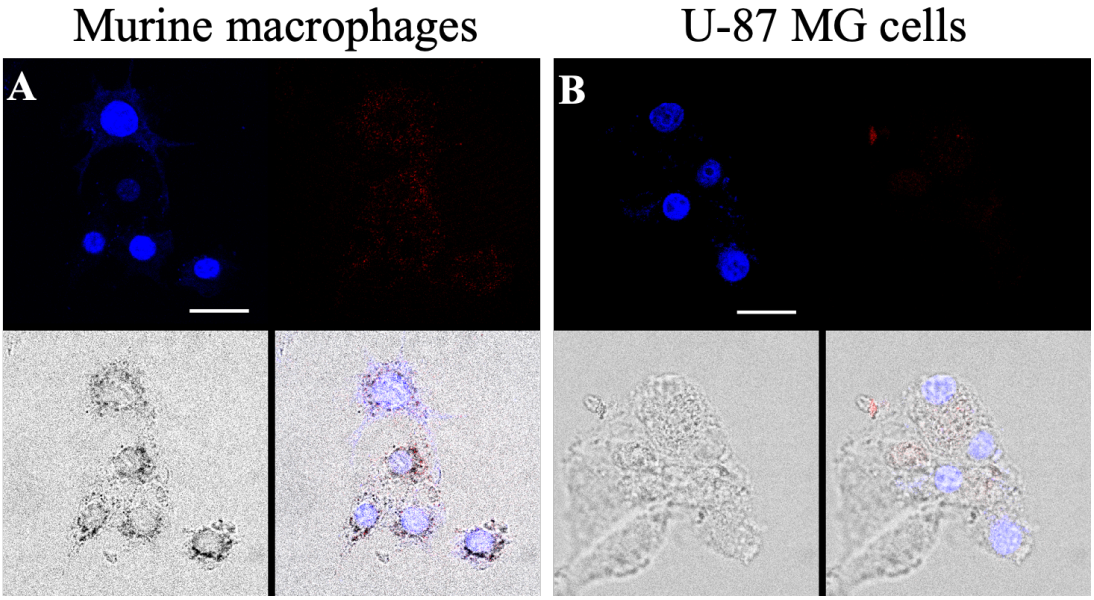



**Figure S7.** Confocal microscopy images of internalization of Au-polyester NPs in both RAW 264.7 and glioblastoma cells for 1h incubation and 1000 µg/mL of Au-polyester NPs as indicated in the two panels (A, B). Each channel contains blue color which indicates nuclei cytoplasm (upper-left corner), red color is indicative of NPs (upper-right corner), white-black image is DIC image of the cells (lower left corner), and overlay (lower right corner). Scale-bar is 20 µm.