

## **Reactive oxygen species responsive cleavable hierarchical metallic supra-nanostructure**

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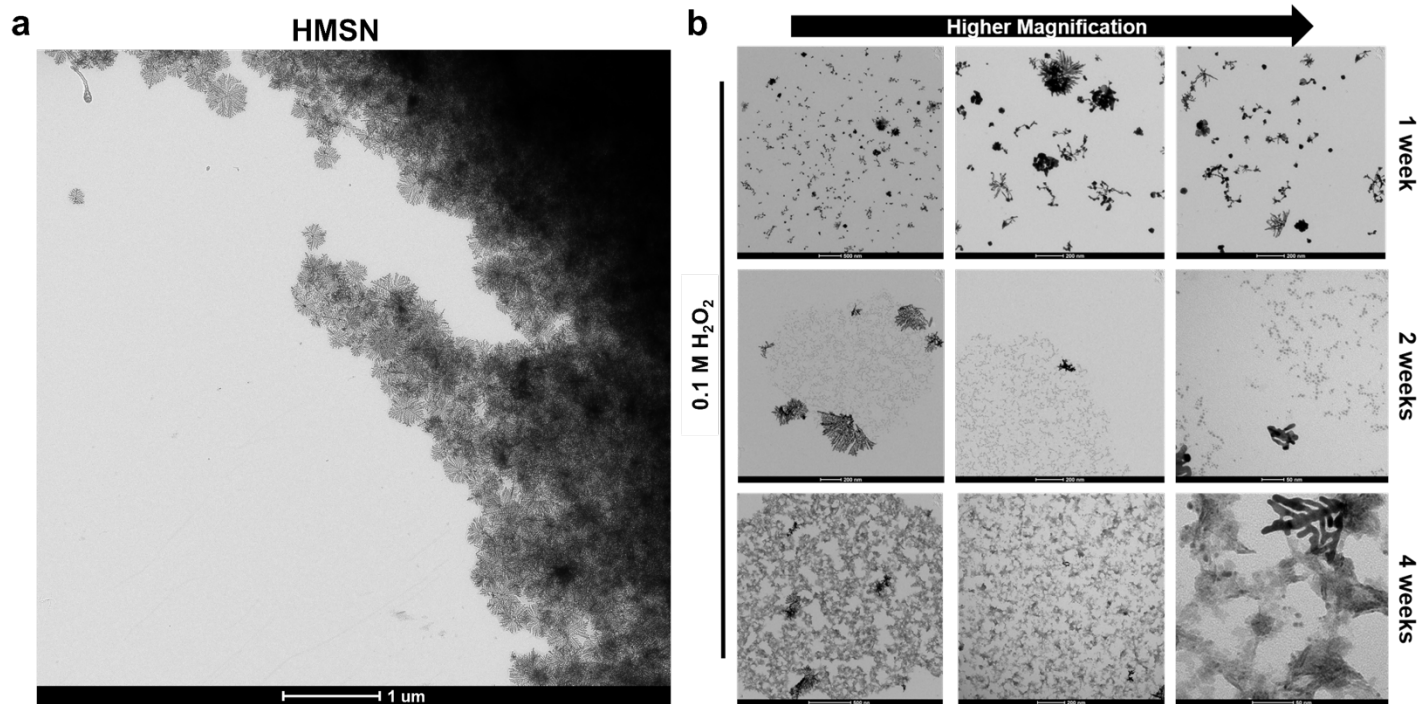
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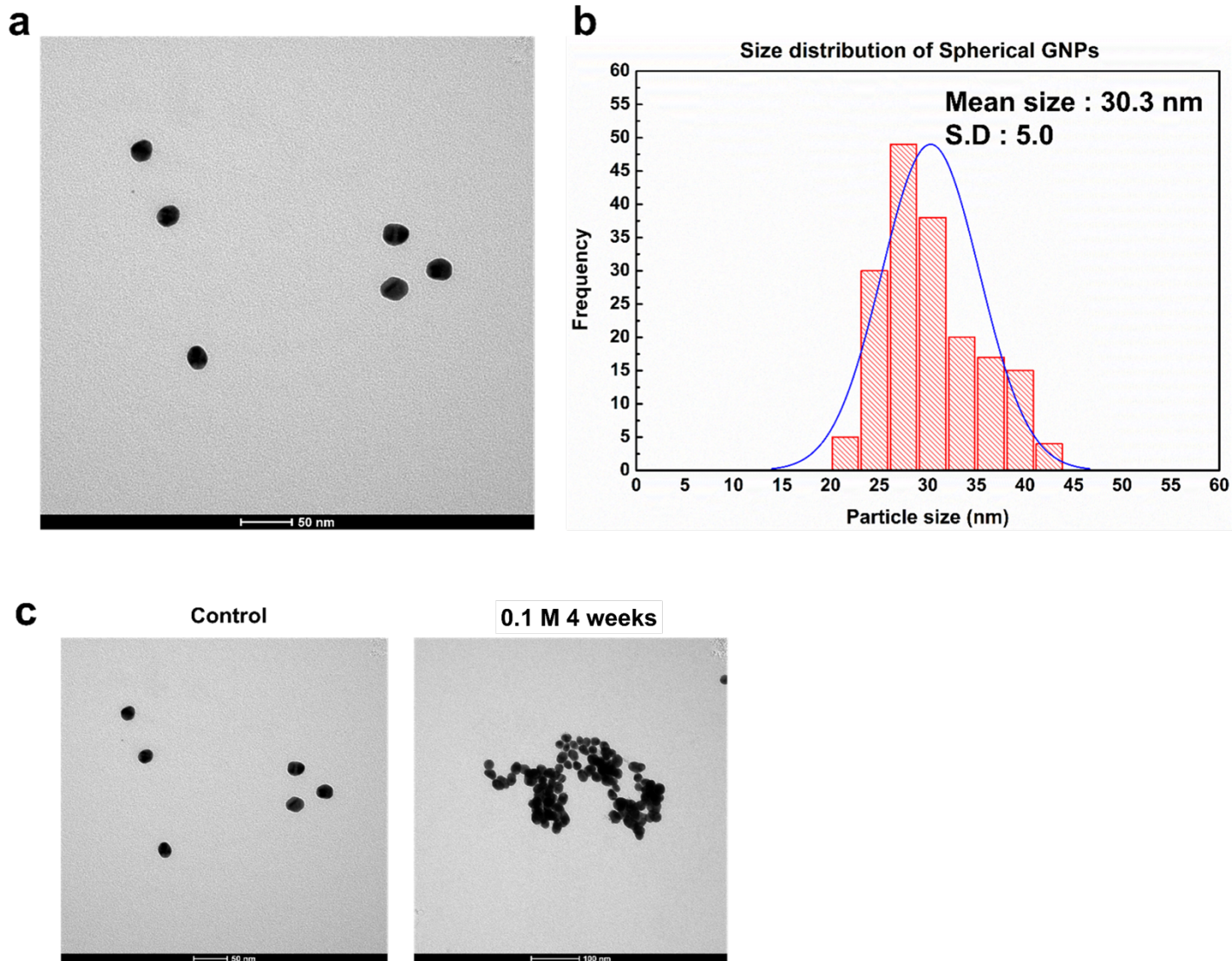
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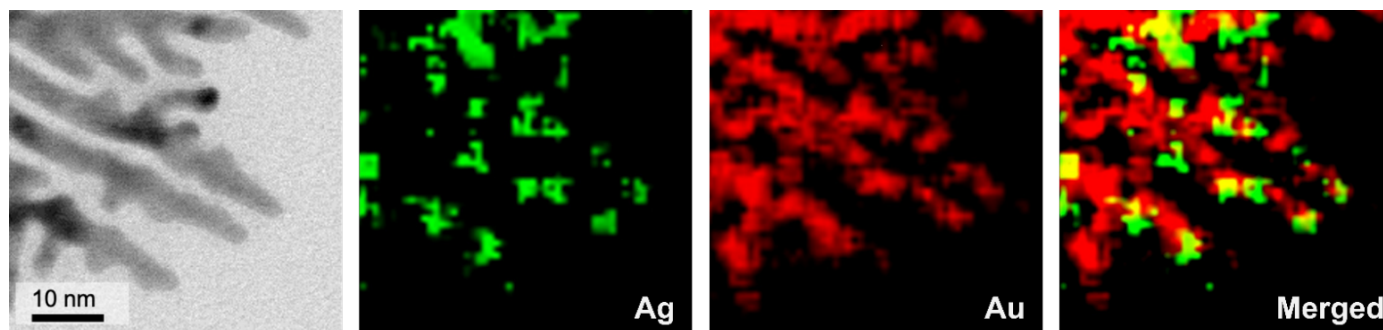
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**Figure S1.** Low magnification TEM images of (a) synthesized HMSN and (b) the samples incubated with 0.1 M  $\text{H}_2\text{O}_2$  for up to 4 weeks.

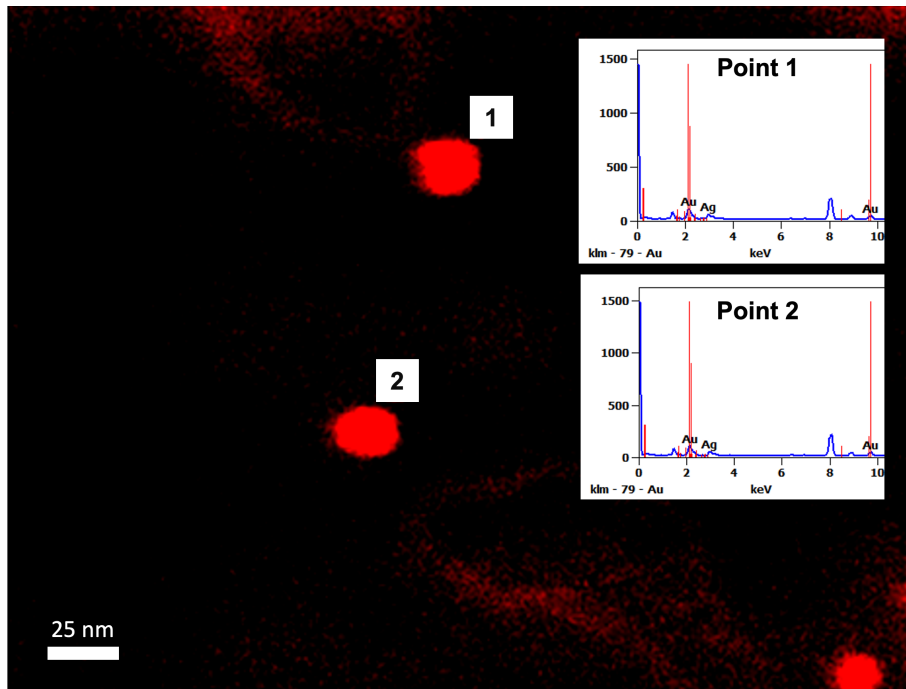


**Figure S2.** Transmission electron microscope (TEM) images showing (a) synthesized spherical gold nanoparticles (SGNP), (b) size distribution of SGNP, and (c) non-treated SGNP and SGNP incubated with 0.1 M  $\text{H}_2\text{O}_2$  for 4 weeks.

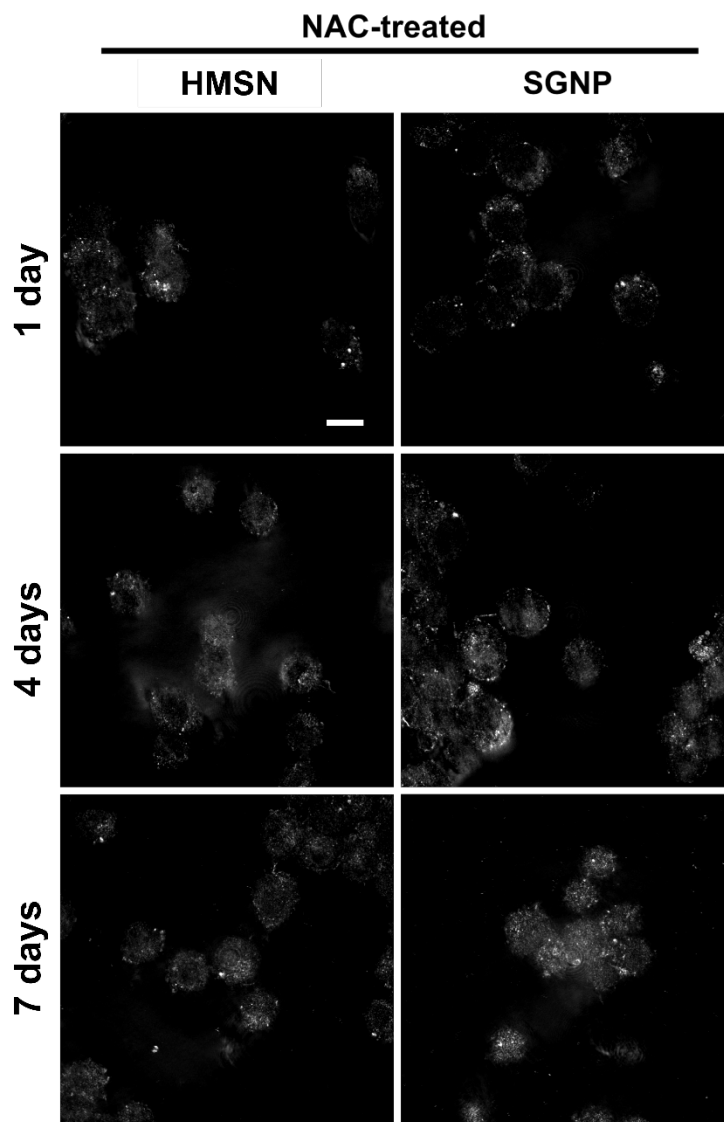


**Figure S3.** Scanning transmission electron microscope (STEM) images showing gold and silver components of branches in HMSN (Red: gold and Green: silver).



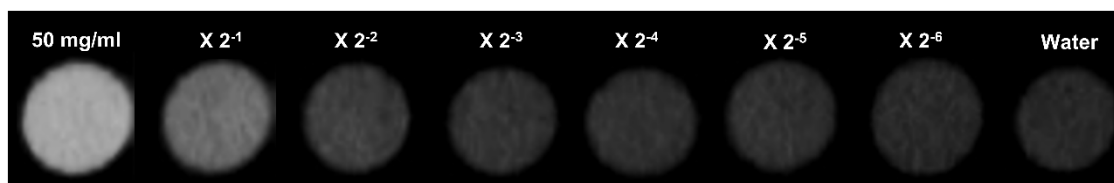


**Figure S4.** STEM image and elemental analysis of small nanoparticles generated from ROS-treated HMSN.

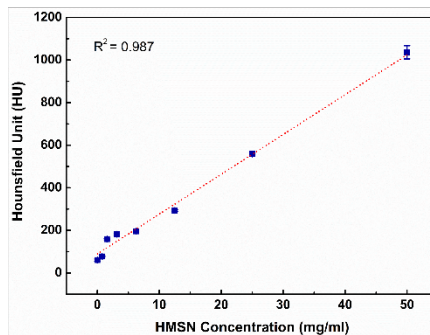


**Figure S5.** Dark field microscopic images demonstrating ROS effect on gold nanoparticles in cells by inhibition assay using N-acetylcysteine (NAC) after uptake of gold nanoparticles (HMSN and SGNP).

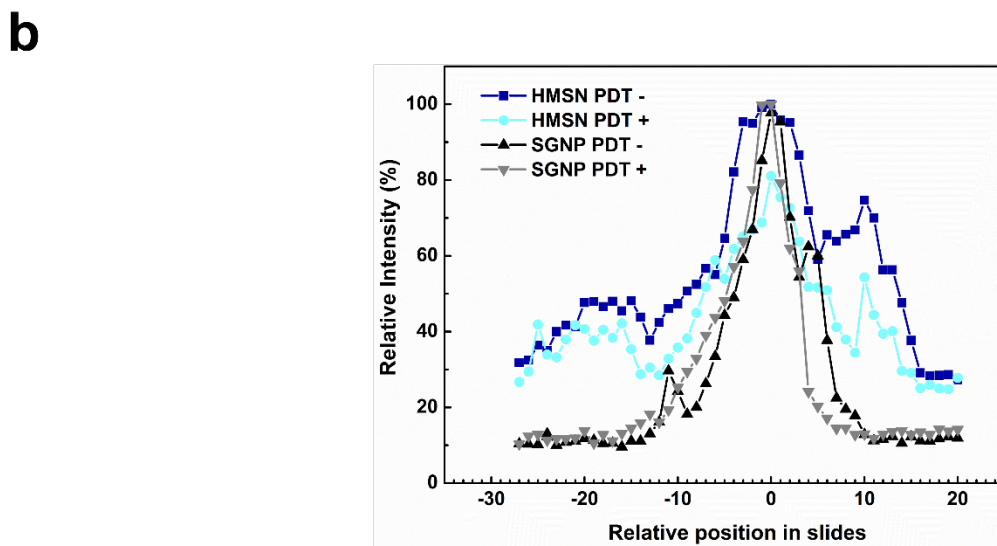
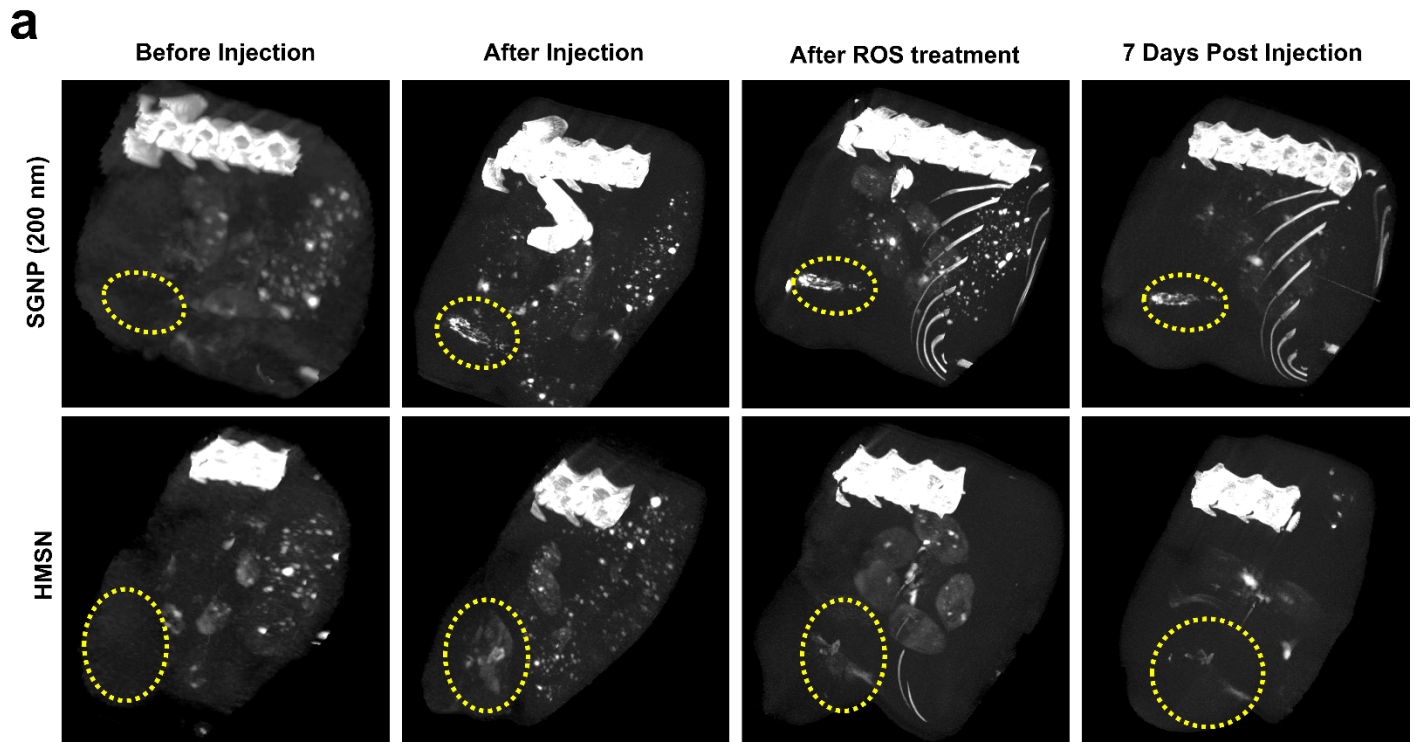
**a**



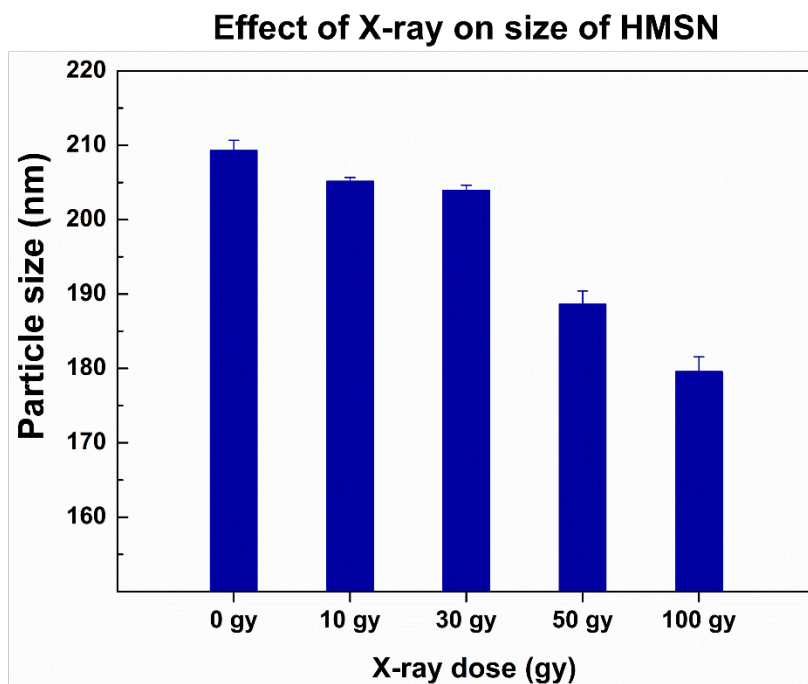
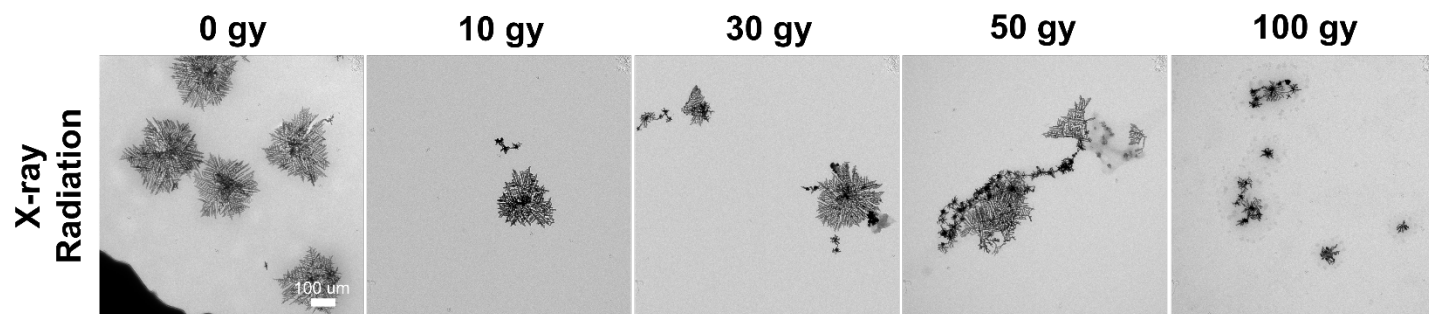
**b**



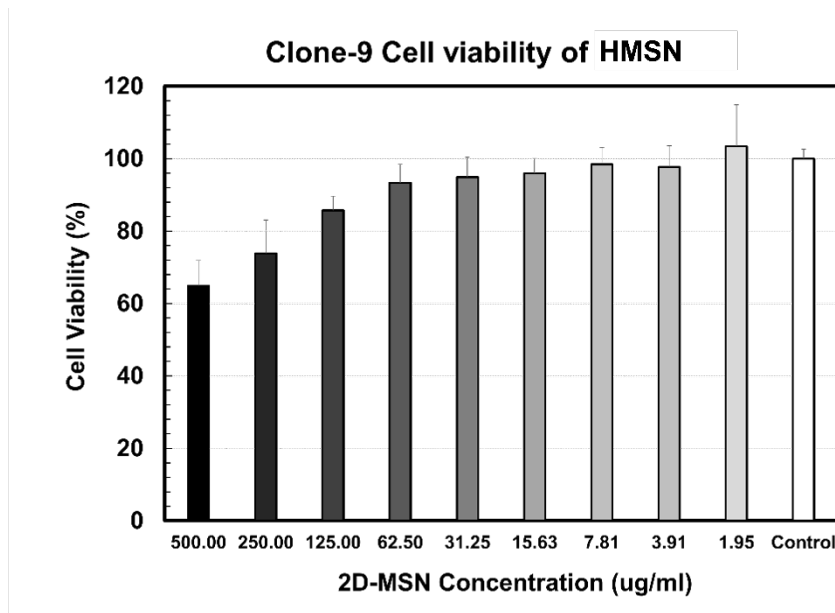
**Figure S6.** X-ray contrast effect of HMSN in various concentration dispersed in agarose phantom for computed tomography.



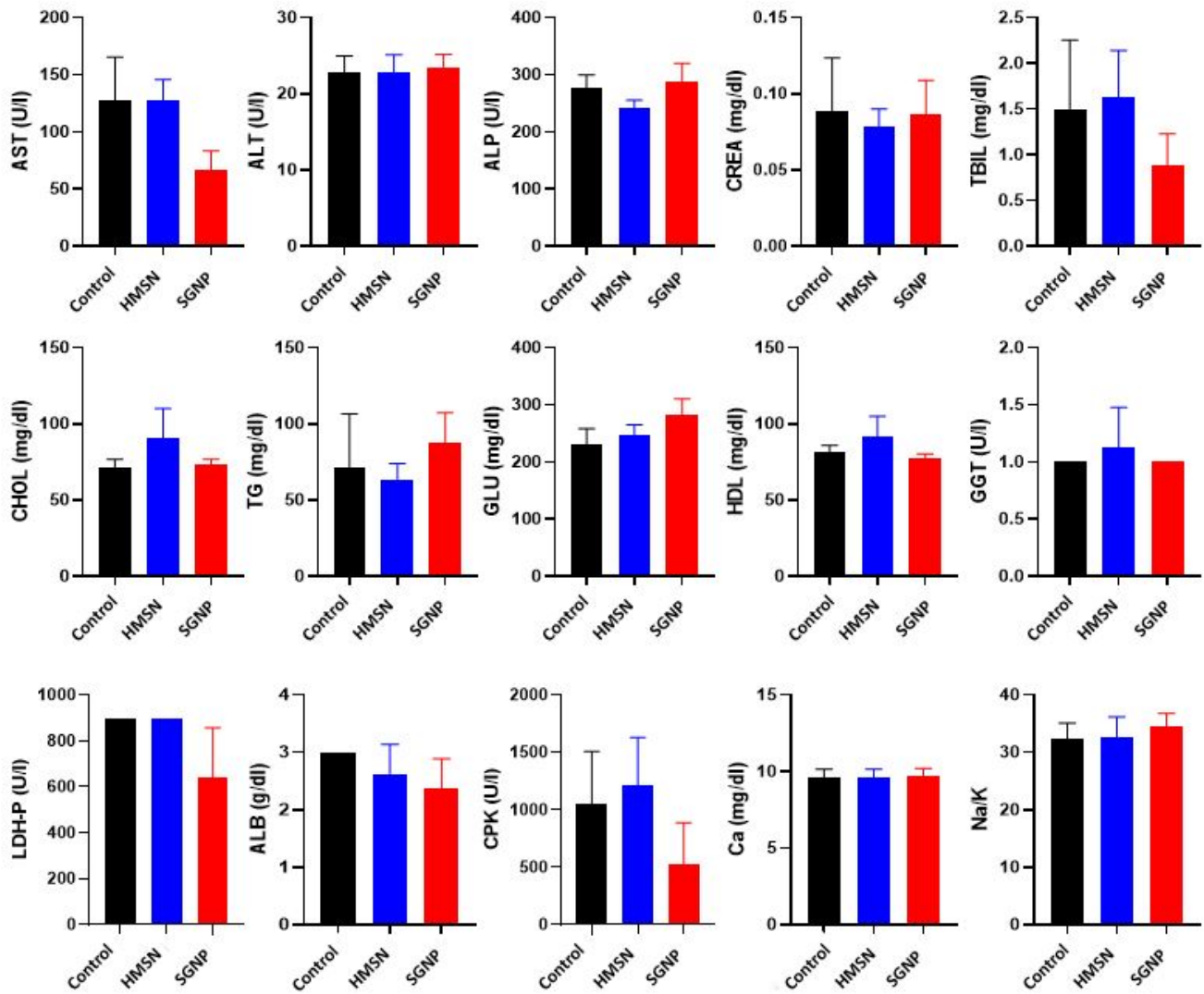
**Figure S7. a.** CT images of HMSN and SGNP before and after PDT-ROS treatment. **b.** CT signal intensity changes of tumors in each group.



**Figure S8.** TEM images of HMSN after X-ray irradiation with various doses (0 to 100 Gy) and the measurement of hydrodynamic size after X-ray irradiation using DLS. Ionizing radiation, which is another potential exogenous ROS source for the cancer treatment, showed the same treatment responsive structural deformation. When the X-ray was irradiated to HMSN suspension up to 100 Gy, dose-dependent deformation and degradation of HMSN was well observed in TEM images and DLS measurement.



**Figure S9.** Cell viability test of Clone-9 normal liver cell line for evaluation of biocompatibility of HMSN in vitro.



**Figure S10.** Hematological values of mice treated with IV injection of HMSN or SGNP after 1-week post-treatment. Samples (2.5 mg/kg, Au) were intravenously injected into C57BL/6 mice. After 1 week, the blood samples were collected using intracardiac blood collection. All samples were collected with a heparin coated tube and centrifuged (1,000g, 15 min, 4°C). Plasma samples were frozen at -80°C. An automatic chemistry analyzer (Fuji Film DRI-CHEM NX500i) was used to quantify the level of AST, ALT, ALP, CREA, TBIL, CHOL, TG, GLU, HDL, GGT, LDH-P, ALB, CPK, Ca, and Na/K in plasma.