AbstractID: 10722 Title: Photothermal cancer therapy using Gold nanorods

Purpose: Gold nanorods were used to investigate the effects of heat on PA-1 ovarian cancer cells and their response to thermal treatment through laser irradiation. In addition, the question of how the combination of X-ray radiation and nanoparticles affects cancer cell survival was also addressed.

Method and Materials: Different concentrations of Gold nanorods of diameter 10 nm and length 40 nm coated in a dense layer of hydrophilic polymers were used and two configurations of laser light were employed. A picosecond laser pulse with 1000 Hz repetition rate yielding 1 Watt of average power, and a continuous wave delivery technique yielding 0.5 Watt of laser power. PA-1 ovarian cancer cells were put into 96 well microtiter plate. Each well contained about 5000 cells plated in 100 μl of BME media. In addition, three wells containing cells and nanorods and three wells containing only cells were subjected to 1 Gy of photon dose.

Results: Three different nanoparticle concentrations were used for the case of pulsed laser beam irradiating the cells. The highest concentration of 6×10^{12} nr/ml led to complete cell killing even without any laser irradiation. For nanorods concentration of 1.2×10^{11} nr/ml and 6×10^{10} nr/ml, the number of survived cells decreased as the laser irradiation time increased from 1 min to 20 min, reaching 59% at 20 min mark. For the case of continuous laser operation and nanoparticle concentration of 1.2×10^{12} nr/ml, the number of cancer cells surviving laser irradiation dropped to 0 at all time intervals from 2 min to 10 min. When cells were subjected to 1 Gy of photon dose, no visible advantage of using nanorods in conjunction with radiation was observed.

Conclusions: Results of experimental studies show that nanorods are extremely effective agents in converting laser light into heat with promising thermal therapy applications for cancer treatment.