AbstractID: 12871 Title: Geometrically targeted radiation enhancer using semiconductive nanoparticles

Purposes: Photo-emitting semiconductive nanoparticles conjugated with photosensitizer molecules are a promising enhancer for radiation therapy. The purposes are to study toxicity, biodistribution, and *in vivo* efficacy of the nano-conjugate.

Methods and materials: The toxicity of the conjugate was evaluated by propidium iodide uptake of both 3T3 fibroblast and normal organotypic brain cells 5 to 10 days post exposure to drug with a concentration from 24fM to 24μM. H460 cancer cells were used as the xenograft model in nude mice and the tumors were grown for 1 week. To investigate the biodistribution, tail vein injection of 42nM QDs with or without conjugated folic acid were administered in 2 doses at 24 hours and 16 hours prior to dissection. Tissue samples were taken from the liver, the kidney and the tumor. To measure the efficacy, QDs conjugated with Photofrin and (or) folic acid were injected with the same total dose. 8 Gy of radiation were delivered in a single fraction. The tumor size was measured twice a week and compared with the control group.

Results: There was no detectable toxicity for QD concentration up to 24 pM. Cell death was observed at 24nM but remained at a very low level. Less than 2% positively labeled tumor cells were observed under fluorescent microscope with QDs alone. However, the percentage of positively labeled cells increased 38 folds with folate. The *in vivo* efficacy study is consistent with the biodistribution, with no detectable tumor growth delay from QD/Photofrin alone but a significant growth delay of 3 days ($p=0.05$) was observed with QDs conjugated to both Photofrin and folate.

Conclusions: Toxicity of the conjugate to normal tissue is low at the level for radiation enhancement. Effectiveness is demonstrated for the first time on an animal model. Methods of drug delivery play critical roles in the efficacy.