Mortality Evaluation of Peg Gold Nanorods on Zebrafish Embryos

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Gold nanoparticles, gold nanorods (GNRs) more specifically, are being studied for their innovative applications in imaging, targeting, therapeutics, and potential for a revolution in medical utilization. For this experiment, GNRs were made using a consistent seed-mediated approach in which gold salts are catalyzed by adding small gold spheres (seeds) in the vicinity of a weak reducing agent and the growth directing surfactant Hexadecyltrimethylammonium bromide (CTAB). Then, the GNRs' targeting properties were used to absorb near-infrared irradiation (NIR) frequencies which extend to the destruction of only selected cells. Due to the similar toxicity model of human homology, zebrafish provide an appropriate model system to study the impacts of irradiation on GNRs. To prevent potential toxic leakage or rod breakdown when injected into zebrafish embryotic cells, a polyethylene glycol (PEG) polymer coating, with the least toxicity, was used. In experimentation, studies showed that selective mortality can be accomplished by injecting PEG-coated GNRs into zebrafish embryos and irradiating. Data consistently shows higher mortality in those injected with GNRs than those without, and it was found a time interval existed in which there was 100% mortality in GNR cells and 0% mortality in non-GNR cells. Future studies include transplanting cells from one zebrafish containing GNRs into a second that does not and irradiate them in an effort to selectively kill only the cells containing GNRs assessed via a LIVE/DEAD stain. These experiments are ongoing. There are implications for generalizing these results to humans in cancer research and solidifying a new method for cancer therapy.