

## AbstractID: 7710 Title: Dosimetry Studies of GeneSeed Therapy

**Purpose:** Interstitially delivered gene therapy using GeneSeeds (small metallic containers similar in size to brachytherapy sources) may have many valuable properties for cancer treatment. We are currently pursuing both simulation and experimental work to more fully understand the dosimetry properties of GeneSeeds and their potential use as both a direct tumoricidal agent and a co-therapy for enhancing tumor radiation sensitivity.

**Method and Materials:** Simulated GeneSeed dosimetry was based on modeling of the diffusion process using the physical properties of the GeneSeed and its potential biochemical payloads. Experimental data was drawn from pathology and immunohistochemistry performed on sectional slices of mouse xenograft tumors into which single GeneSeeds had been implanted. These data were combined into a computational model (implemented in Matlab) which computes the dose as a function of distance and orientation from the GeneSeed using cylindrical coordinates. We have also developed an interface for placing multiple GeneSeeds in a 3-D space and computing their overall effect on a regular Cartesian coordinate grid, to facilitate integration with conventional treatment planning systems.

**Results:** GeneSeed dosimetry differs from conventional brachytherapy dosimetry by having a sigmoidally-shaped falloff as opposed to an exponential falloff. This implies that positioning of the GeneSeeds may require a higher level of precision than what is expected for conventional brachytherapy with radioactive sources. However, homogeneous coverage of larger regions can still be achieved using controlled inter-seed spacing. Image guided robotics may be of assistance in achieving the level of precision needed for this application.

**Conclusion:**

We have developed dosimetry models for single GeneSeeds based on a combination of experimental and simulation data. These models can be used to predict overall dosimetry of a larger distribution of GeneSeeds, similar to calculations for groups of brachytherapy seeds. GeneSeeds may have potential use in many organ targets.