SYNTHESIS AND EVALUATION
OF
RADIOACTIVE GOLD NANOPARTICLES FOR CANCER TREATMENT AND IMAGING

Amal Yousif Al-Yasiri

Dr. Kattesh V. Katti and Dr. Sudarshan K. Loyalka

Dissertation Supervisor

ABSTRACT

This research study explores an appropriate method for production of radioactive gold nanoparticles that may be more appropriate for treating cancer. The first protocol includes using a nontoxic and antitumor phytochemical reductant agent, Mangiferin that can be used to produce radioactive gold nanoparticles to treat and image prostate cancer while the second protocol uses sodium citrate as reductant agent to produce radioactive gold-199 nanoparticles that can be used for imaging. Also in this research, MCNP code was used to build a simple geometrical model of a human prostate, and then estimate the dose distribution that is deposited by radioactive gold nanoparticles ($^{198}$AuNPs or $^{199}$AuNPs).

The results from *in vivo* evalution of MGF-$^{198}$AuNPs indicated that MGF-$^{198}$AuNPs have significant therapeutic effect and they were able to control the tumor size in comparison to control group. Also, *In vivo* evaluation results of radioactive citrate-$^{199}$AuNPs showed that citrate-$^{199}$AuNPs are stable *in vivo* and therfore, they can be used in imaging procedures. The results of MCNP simulations showed that the deposited dose by $^{198}$AuNPs or $^{199}$AuNPs, which are distributed homogenously in the tumor, has highest value at the tumor region and then decreases exponentially toward the normal tissue in the prostate as well as surrounding organs.