PhD Thesis Title:	Radiation interaction properties of radiosensitizer doped tissues and suitable dosimeter for radiosensitizer enhanced radiotherapy
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ABSTRACT:

Over the past decades, the higher atomic number (Z) nanoparticles play an important role in cancer research. The doping of high Z nanoparticles (radiosensitizer) into the target tissue increased the efficiency of radiotherapy and medical imaging techniques. The radiation interaction properties are the important parameters for understanding the mechanism of radiation action on target tissues. In this present study, the radiation interaction properties of some high Z metal radiosensitizer doped tissues and tissue equivalencies of some phantom materials/dosimeters were theoretically studied for various ionizing radiations over the clinical range of energies. In addition to this, we practically evaluated the feasibilities of gel and film dosimeter for clinical implementation. The computer programs such as XCOM, Phy-X PSD, Phy-X ZeXTRa, Exabcal, and some theoretical formulas were utilized for the calculations of radiological properties. Results found that the radiation interaction properties of the radiosensitizer doped tissues were dependent on the radiation types, the radiation beam energies, the atomic number of the radiosensitizer, the concentration of the radiosensitizer, and the types of target biological tissues. Most of the studied polymer gel dosimeter, gafchromic film dosimeter, and 3D printing materials were found to be good tissue-equivalent against the various biological tissues. The radiation dose versus response units of the gel dosimeter, film dosimeters were R^2 =0.984 and R^2 =0.965 respectively. The results of the present studies are useful for understanding the concept of nanoparticle enhanced radiotherapy (NERT) and medical imaging. Moreover, it may be helpful for selecting the appropriate phantom materials/dosimeter to carry out accurate dosimetry.

References to author publications that relate specifically to the dissertation:

1. **Srinivasan k,** Samuel E. James Jabaseelan (2022), 'Studies on the tissue and water equivalence of some 3D printing materials and dosimeters', *Radiation physics and chemistry*. 198, 11059 https://doi.org/10.1016/j.radphyschem.2022.110259

2. **Srinivasan k**, James Jabaseelan Samuel E (2022), 'Effective atomic number and photon buildup factor of bismuth doped tissue for photon and particles beam interaction', *Polish Journal of Medical Physics and Engineering*. 28(1),37-51 https://doi.org/10.2478/pjmpe-2022-0005

3. **Srinivasan k**, Samuel E. James Jabaseelan (2020), 'Target biological tissue and energy influence on dose enhancement factor produced by gold nanoparticles and its relevant radiological properties', *Radiation physics and chemistry*.174, 108912. https://doi.org/10.1016/j.radphyschem.2020.108912

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5. **Srinivasan k**, James Jabaseelan Samuel (2017), 'Evaluation of radiation shielding properties of the polyvinyl alcohol/iron oxide polymer composite', *Journal of medicalphysics* 42,273-278 DOI: 10.4103/jmp.JMP_54_17