

**Distinct Dose Contributions in Proton Therapy Calculated Using MCNP6 and TOPAS.**

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The trade-off between the delivery of high doses conformed to a tumor volume, and the restriction of the doses received by the surrounding healthy tissues and organs is what characterizes the efficiency of radiotherapeutic procedures. As a radiotherapy modality, proton therapy stands out in this scenario because it has dosimetric advantages, which, when combined with technological advances, allows a great potential in the dose distribution conformity. By modulating the protons Bragg peak as a function of beam energy and delivery time, the three-dimensional shaped dose distribution generates more pronounced dose gradients, which composes an ideal technique when preserving organs is a priority. In proton therapy, protons account for much of the dose deposition. However, as protons travel through matter, secondary particles are created by interactions, including electrons, neutrons, and gammas. It is believed that the secondary dose, mainly deposited by neutrons, can lead to secondary cancer, especially in pediatric cases. Therefore, the focus of this work is to study the contribution of the different particles in the total dose deposition. Monte Carlo simulations were performed with the MCNP6 code and the TOPAS interface (based on GEANT4) to estimate the dose deposition. A simple water simulator was used and the characteristics of the different beam contributions were investigated. Primary and secondary dose values were tabulated and discussed. By demonstrating the method of these calculations, the objective of this work is to serve as a guide for the study of the different contributions of the dose responsible particles in proton therapy, as well as for understanding how different Monte Carlo codes calculate these contributions.