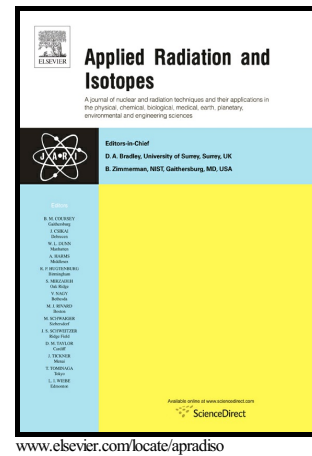


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## Micro-dosimetry calculation of Auger-electron-emitting radionuclides mostly used in nuclear medicine using GEANT4-DNA

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### Abstract

A large number of nuclear medicine radionuclides are Auger-electron-emitters and internal conversion electrons which can transmit significant doses to the patient during diagnosis. Therefore, the dosimetry of these radioisotopes is necessary for the evaluation of their biological effects and their use for treatment and targeted-radiotherapy.

In this study, dosimetry calculation of a number of widely used radioisotopes in nuclear medicine was performed on a cellular scale using Geant4-DNA simulation.

S-values of some of the diagnostic radioisotopes, including  $^{123}\text{I}$ ,  $^{125}\text{I}$ ,  $^{99\text{m}}\text{Tc}$ ,  $^{67}\text{Ga}$ ,  $^{201}\text{Tl}$ , and  $^{111}\text{In}$ , were evaluated in a homogeneous spherical geometry model with unit density in which the cell and nucleus were concentric. The results revealed that S-values of these diagnostic radioisotopes were mainly greater than S-values of the radioisotope  $^{131}\text{I}$ , which emits  $\beta$ -particles; they were lower but can be compared with  $^{211}\text{At}$  (emitter of alpha particles) in the cellular scale. It shows better the importance of dosimetry calculation of diagnostic Auger-electron-emitting radioisotope in a cellular scale and their applicability in treatment. It should be noted that the S-values obtained out of the Geant4-DNA simulation are in line with the values of the other codes and the MIRD technique.

### Keywords:

Auger electron, nuclear medicine, internal conversion electron, cell, MIRD, GEANT4-DNA, S-value.

### 1- Introduction

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