Compr Health Biomed Stud. 2023 April; 1(4): e148451. https://doi.org/10.5812/chbs-148451.

Published online: 2024 May 25. **Letter**

# In-silico Methods for Estimating the Risk of Radiation-induced Cataracts in Nuclear Medicine Technicians

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**Received** 2024 May 1; **Accepted** 2024 May 6.

*Keywords:* Eye Lens Dose, Occupational Exposure, Radiation Protection, In-silico Methods

*Dear Editor,*

Here is the revised text, maintaining all numbers, references, and the overall meaning:

Radiation exposure from gamma-emitting radionuclides, such as Tc-99m, to the eye lenses of nuclear medicine technicians during the radiopharmaceutical preparation and injection process may cause severe deterministic radiation effects, such as cataracts, which have a dose threshold of 0.5 Gy and an annual effective dose limit of 20 mSv averaged over 5 years (1). The risk of cataract incidence has a direct relationship with the amount of radiation absorbed dose, which is defined as absorbed energy per unit mass of the irradiated object (2). Therefore, estimating the absorbed dose to the eye lenses is crucial for nuclear medicine technicians. There are several experimental and in-silico methods for dose estimation in nuclear medicine, such as thermoluminescence dosimetry (TLD) and Monte Carlo (MC) simulation (3, 4). Experimental methods have several limitations, for example, easy access to dedicated dosimeters, especially in least-developed countries, implantation of dosimeters in eye lenses, and cost. On the other hand, validated in-silico methods can measure the exact dose to the eye lenses, provide easy access to MC codes, and allow for dose assessment from different types of radiation, modeling radiation interaction in real geometries using anthropomorphic mathematical phantoms (3, 5). MC simulation and the MIRD (Medical Internal Radiation Dosimetry) approach are important in-silico dose estimation methods in nuclear medicine. MC simulation is a numerical method based on statistical equations for solving geometrically complicated problems. Due to the stochastic nature of radiation transport in matter, MC simulation is the most accurate in-silico method in radiation dosimetry (5). The main limitation of MC codes is their long computation time. However, the MIRD approach is a deterministic method in which mathematical equations are used for dose calculation. Compared to the MC method, the MIRD approach is fast, but its accuracy is less than that of the MC method. In conclusion, considering different radiation exposure conditions for a technician in a nuclear medicine center, validated in-silico codes, instead of experimental methods, can be used for accurate modeling of radiation interaction in the human body, such as eye lenses.

## Footnotes

**Authors' Contribution:** Study concept and design, drafting of the manuscript.

**Conflict of Interests Statement:** Author declared no conflict of interests.

**Funding/Support:** Author declared no Funding/Support.

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