

## Mid-Congress-Symposium 13

Technologist + Dosimetry + Physics Committee

Wednesday, October 28, 09:00-16:00

### Session Title

Mid-Congress Symposium for Technologists - Introduction to Dosimetry

### Chairperson

Christelle Terwinghe (Leuven, Belgium)

### Programme

09:00 - 09:15 Andrea Santos (Lisbon, Portugal): Welcome by the EANM Technologist Committee Chair

09:15 - 09:45 Jonathan Gear (London, United Kingdom): MIRD Scheme

**09:45 - 09:50 Break**

09:50 - 10:50 Ian Armstrong (Manchester, United Kingdom): Quantitative Imaging

**10:50 - 11:05 Break**

11:05 - 12:05 Gwenaëlle Marin (Brussels, Belgium): Principles of Dosimetry

**12:05 - 12:10 Break**

12:10 - 12:55 Jonathan Gear (London, United Kingdom): Dosimetry in Radionuclide Therapy Planning - Neuroendocrine Tumours

**12:55 - 13:55 Break**

13:55 - 14:40 Gwenaëlle Marin (Brussels, Belgium): Dosimetry in Radionuclide Therapy Planning - Primary and Metastatic Liver Tumours

**14:40 - 14:55 Break**

14:55 - 15:55 Dimitris Visvikis (Brest, France): Artificial Intelligence in Nuclear Medicine

### Educational Objectives

1. Explain the MIRD formalism
2. Define absorbed dose
3. Demonstrate time activity curve regression
4. Highlight the importance of BED calculation and risk factors
5. Explain dose-effect relations
6. Discuss <sup>90</sup>Y-DOTATOC / <sup>177</sup>Lu-DOTATATE dose calculations using cases

7. Look into an  $^{123}\text{I}$  mIBG dosimetry calculation
8. Discuss SIRT dose calculations for  $^{90}\text{Y}$  and  $^{166}\text{Ho}$  using cases
9. Explain voxel based dosimetry (SIRT)
10. Show different applications to delineate organs and tumours
11. Overview the practical aspects of quantitative imaging
12. Discuss total body counting for WB dosimetry
13. Describe the method of phantom scanning for quantitative imaging
14. Define the Artificial Intelligence applications in Nuclear Medicine

### Summary

The use of radionuclide therapies for treatment of systemic malignancies has expanded tremendously in the last decades. The European Council directive 2013/59 Euratom mandates dosimetry in order to plan Radionuclide Therapy to individual patients and verification of the delivered dose to the target volumes and the healthy tissue. Values of absorbed dose in the tumours and in healthy tissues are important for ensuring the required therapeutic effect, while the absorbed dose to the healthy tissue should be tolerable. Medical internal radiation dosimetry (MIRD) is the calculation of the total amount of radiation energy emitted by the radiopharmaceutical and the estimation of the fraction of energy emitted by the source organ that is absorbed by the target organ.

To determine the energy deposit in the organs, the injected activity has to be specified. The calculation of the calibration factors for several instrumentations has to be performed very accurately. Several imaging scans, measurements and blood samples could be performed at several time points after administration of the radiopharmaceuticals. The role of the technologist to execute the needed proceedings and to list all required data is crucial.

To calculate the energy deposit of the injected activity, delineations of organs and tumours are required. Several delineation applications are developed in recent years. With the increasing use of radionuclide therapies, an auto-delineation of organs would be very helpful to reduce the workload.

The nuclear medicine physicist has the responsibility to ensure that all steps have been taken before and after the radionuclide therapy administration to ensure reliable dose calculations.

Dosimetry implies proper calibration of the instrumentation, standardized procedures and harmonization. Dosimetry procedures have to be implemented and all staff involved should be properly educated.

### Key Words

Dosimetry, quantitative imaging, MIRD, Artificial intelligence