CME 6 (Dosimetry)
Monday, October 15, 11:30-13:00

Session Title
Alpha Particle Dosimetry - When, Why and How

Chairpersons
Nicolas Chouin (Nantes)
Joe O'Sullivan (Belfast)

Programme

11:30 - 11:50	James Nagaraja (Nijmegen): Introducing Alpha-Particle Emitter into the Clinic, Does Dosimetry Answer all Questions?
11:50 - 12:10	Rob Hobbs (Baltimore): Small Scale Dosimetry Models, a Universal Answer for Personalized Alpha-Therapy?
12:10 - 12:30	Alexander Haug (Vienna): The Significance of Radium - 223 in the Therapy Landscape of Advanced Prostate Cancer
12:30 - 12:50	Lidia Strigari (Rome) / Rosa Sciuto (Rome): The Role of Dosimetry to Predict Biological Effect in Patients Treated with Ra233
12:50 - 13:00	Questions & Answers with all Speakers

Educational Objectives

1. Value of dosimetry for predicting toxicity risks and therapeutic outcome of novel and existing alpha-particle emitter radionuclide therapy. *When does dosimetry need to be applied?*
2. Small scale dosimetry models available to estimate enhances radiobiological effects of alpha-particle emitters in bone marrow, kidneys and tumour lesions. *Why are special models needed?*
3. How Ra-223 therapy can be integrated within the total clinical framework of treatment for prostate cancer and why dosimetry forms an essential ingredient. *How can dosimetry be used?*
4. Knowledge of existence and understand the dose-effect models for Ra-223 therapy. *When, why and how is radiobiology folded into the dosimetry framework?*

Summary

Absorbed doses provide a good guidance in the amount of activity that can be safely and effectively used in alpha-particle emitter radionuclide therapy. In the development of new therapies dosimetry is therefore used in the phase 1 trials as indicator of radiation-induced toxicity in normal organs. Mean absorbed doses for alpha-particle emitters need to be used with caution, as it is strongly influenced by the uptake pattern of the radiopharmaceutical on small scale together with the short range of alpha-particles. Several small-scale dosimetry models are available for the absorbed dose to the functional units in e.g. bone marrow and kidneys. It is, however, impractical to perform small scale dosimetry for each patient and a generic RBE can be derived for each alpha particle emitter molecule combination.

The RBE weighted absorbed dose is explicitly needed in the combination of alpha-particle emitters with other ionizing radiation therapies. Radium-223 is a very successful alpha-particle therapy for metastasized prostate cancer bone lesions. Dosimetry provides good knowledge on its mechanism of action and is of great value in designing synergetic combinations with other therapies for end-stage prostate cancer. Radiobiological models are needed for the dose-response correlation of survival and toxicity in the combination of both radionuclide and external beam therapy. Biodosimetric assays can yield more reliable information on the delivered absorbed dose (i.e. increment of number of dicentrics and micronuclei from lymphocytes). These models help to find the optimal activity and schedule-duration for personalization of the therapy.

Key Words
Alpha emitter, dosimetry, radiobiological models, prostate cancer, bone metastases