Joint Symposium 12
Oncology & Theranostics Committee / European Organisation for Research and Treatment of Cancer (EORTC)
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Session Title
Nuclear Medicine in Precision Oncology

Chairperson
Lioe-Fee de Geus-Oei (Leiden, Netherlands)

Programme
29 min  Anna Wu (Duarte, United States of America): Molecular Imaging of the Immune System
       29 min  Michel Koole (Leuven, Belgium / EORTC): Targeted Alpha Therapy
       29 min  Dennis Vriens (Leiden, Netherlands): Managing Radioiodine Refractory Thyroid Cancer
       3 min   Session Summary by Chairperson

Educational Objectives
2. understand the current achievements and future challenges in translational dosimetry for personalized targeted alpha therapy (TAT) with a focus on actinium-225 ($^{225}$Ac).

Summary
Immunotherapies have revolutionized cancer therapy; however, challenges remain in identifying patients appropriate for treatment and assessing responses. Emerging molecular imaging strategies provide an opportunity for non-invasive, whole-body imaging of immune responses. This presentation will review current approaches and applications including metabolic imaging, cell labeling, and reporter gene strategies. In particular, antibody-targeted imaging of immune cells (immunoPET) will be discussed, including results from recent clinical imaging studies.

Starting with the clinical applicability and added value of targeted alpha therapy (TAT), this presentation will then review of the current, state-of-the-art dosimetry for TAT and discuss the future challenges that still need to be met in order to move to a personalized dosimetry approach for TAT. In addition, we will discuss the support pre-clinical studies may provide, to better characterize the pharmacokinetic (PK) profile of TAT-agents and to optimize the use of theranostic approaches for dosimetry. This presentation will focus on $^{225}$Ac (actinium-225) as an example for alpha particle emitting radionuclides and their specific characteristics.
The diagnosis of radioiodine refractoriness has a profound negative effect on the otherwise prognostically favourable disease of differentiated thyroid cancer. This presentation will first discuss the various definitions of radioiodine refractoriness and alleged causes of this form of dedifferentiation. Then the current role of multi-target tyrosine kinase inhibitors will be covered by reviewing the results of the DECISION and SELECT trials and post-marketing real-world data. Finally, future systemic options including selective targeting of actionable oncogenic driver mutations and redifferentiation strategies are discussed. Advises for future studies will be formulated.

**Keywords**
1. Molecular imaging; immunoPET; checkpoint inhibitor therapy; tumor infiltrating lymphocytes; CD8; cytotoxic lymphocytes; engineered antibodies; Zr-89; clinical PET imaging
2. Targeted alpha therapy (TAT); actinium-225 (^{225}\text{Ac}); personalized dosimetry; theranostic approaches; translational dosimetry
3. (Differentiated) Thyroid Cancer; Radioiodine Refractory; Dedifferentiation; Sodium-Iodine Symporter; Tyrosine Kinase Inhibitor; Systemic Treatment; Personalised Medicine; Sorafenib; Lenvatinib; Redifferentiation