CME 13
Drug Development + Radiopharmacy Committee
Wednesday, October 16, 08:00-09:30

Session Title
Current and Future of Radiopharmaceuticals

Chairpersons
Johnny Vercouillie (Tours, France)
Peter Laverman (Nijmegen, Netherlands)

Programme

08:00 - 08:30 Albert Windhorst (Amsterdam, Netherlands): PET Radiopharmaceuticals of Recent Years from a Radiopharmaceutical Chemist's Perspective

08:30 - 09:00 Clemens Kratochwil (Heidelberg, Germany): Current Value of PSMA-Targeting Ligands in Diagnostic and Therapeutic Nuclear Medicine

09:00 - 09:30 Ulli Köster (Grenoble, France): Established, Emerging and Future Radionuclides - Which will we use in 2030?

Educational Objectives

- To get an overview of radiopharmaceuticals that were introduced in clinical research over the last decade
- Presentation of the synthesis and radiopharmacy aspects of new radiopharmaceuticals, as the opportunities and limitations from a radiopharmaceutical chemistry perspective
- A focus on PSMA-targeting PET and SPECT tracers that have been developed during the last decade and their diagnostic strengths and weaknesses in various clinical indications.
- To understand the advantages and limits of non-conventional radionuclides: use of theranosctic pairs, availability, purity, cost…
- To understand the selection criteria used to give a real chance to a drug under development to reach the market
- To anticipate, on the basis of nowadays knowledge, which radionuclides could be of interest by 2025 and afterwards

Summary

Many new PET radiopharmaceuticals have been introduced in the last decade. The clinical drive for new radiopharmaceuticals is tremendous, despite of reimbursement issues. Radiopharmaceutical chemists are very active in developing new methodologies for radiolabeling of molecules, thereby pushing radiopharmaceutical development. A selection of new radiopharmaceuticals and new radiopharmaceutical chemistry methodologies will be discussed critically. As an example, PET-tracers

labeled with either 68Ga or 18F for the diagnosis or 177Lu for therapy, that have recently been introduced in clinical application will be presented. These radiopharmaceuticals provide additional information in primary staging of high-risk patients (e.g. to define the necessary extend of lymph node resection during surgery). In case of biochemical recurrence their value is localization diagnostics, e.g. for guiding external beam radiotherapy. In advanced stage patients (for lesions of >1 cm diameter 99mTc-labeled SPECT-tracer are comparable effective) they can be used to check response toward systemic hormone- and chemotherapies and to tailor patients for or against PSMA-targeting radionuclide therapy. Patient-selection is one key objective to obtain good response rates by eliminating target negative patients in advance. About 2/3 patients are suitable to receive PSMA-RLT and then the response rate toward 177Lu-PSMA is about 60%. The use of 68Ga and 177Lu represents the most advances in theranostics developments over the last decade, nevertheless other radionuclides interest researchers and industrials. Up to now, the selection of the most interesting radionuclides used or to be used in the development of radiopharmaceuticals went through a kind of "natural" selection that is driven by the physico-chemical profile of the radionuclides, but also by their worldwide availability. For the near future new radiopharmaceuticals that will reach the market will be based on a number of radionuclides (not exceeding a dozen) and for which priority is mainly given to large scale production. Economics will also be a driver for routine radiopharmaceutical development. The development of radiotheranostics pairs are now also influencing the selection of radionuclides. However, a new family of radionuclides may replace in a few years the predominance of technetium-99m, fluorine-18, gallium-68 and lutetium-177 and at the same time alphatherapy will also develop, again within a limited number of radionuclides. Therefore, it is important to make a difference between already advanced development programs with their associated radionuclides and the new generation of radionuclides for which scientists have about 8 to 10 years to demonstrate large scale production possibility. In consequence, it will be important to differentiate the work performed by developers from the work that is expected from researchers.

Key Words
Radiopharmaceuticals, radionuclides, diagnosis, therapy, research, industrial production