CTE 4 (Technologists/CAMRT)
Monday, October 23, 16:30-18:00

Session Title
Radionuclide Production

Chairs
Pedro Fragoso Costa (Oldenburg)
François Couillard (CAMRT, Ottawa)

Programme

16:30 - 17:00	Frank Rösch (Mainz): Reactor Produced Radioisotopes Used in Nuclear Medicine
17:00 – 17:30	Francisco Alves (Coimbra): Cyclotron Produced Radioisotopes Used in Nuclear Medicine
17:30 - 18:00	François Couillard (CAMRT, Ottawa): Molybdenum-99 World Supply

Summary
To all nuclear medicine procedures, belongs a radionuclide. Nuclear medicine technologists are familiar with requesting radionuclides, eluating generators or even working in a multidisciplinary team operating a cyclotron. This session intends to provide the background information on how the fundamental radionuclides are produced.
The two major sources of artificial radioisotopes are accelerators and reactors. The most used radiopharmaceuticals in nuclear medicine are based on ^{99m}Tc and ^{131}I, produced in reactors (research or energy producing). Historically these have been the backbone of clinical (therapeutic and diagnostic) nuclear medicine. Still the most effective way of producing radionuclides is in the nuclear reactor, since reactor offers large volume for irradiation, simultaneous irradiation of several samples, economy of production and possibility to produce a wide variety of radioisotopes.
As we have witnessed in the past 10 years or more, a steady increase of PET/CT procedures has fed the installation of many of the so-called tabletop cyclotrons, small circular particle accelerators, able of providing short lived PET radionuclides, ready for radiopharmaceutical labeling.
The radionuclide production programme involves several interrelated activities such as target fabrication, irradiation in reactor or accelerator, transportation of irradiated target to radioactive laboratory, radiochemical processing or encapsulation in sealed source, quality control and transportation to end users. It is therefore important to comprehend what are the vital points of the logistics involved in radionuclide production to fully grasp its role in nuclear medicine procedures.

Educational Objectives

- Get acquainted with the variety of production modes and nuclear reactions involved in producing radioisotopes used in nuclear medicine
- Basic understanding of the physical principles underpinning the production of radioisotopes
- Differentiate between diagnostic and therapeutic radionuclides
- Describe the basic functioning of a nuclear reactor
- Describe the basic functioning of a cyclotron
- Get acquainted with the different available radionuclide generators (both accelerated and reactor produced)
- Understand what are the logistic challenges involved in the supply of Mo-99

Key Words

Radionuclide, Cyclotron, Reactor, Molybdenum 99

Take Home Message

Without a radionuclide, there is no nuclear medicine. It is advantageous for technologists working in a clinical set-up to have a complete view of the radioactive materials that are available and their production methods.