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What's new in radionuclides for medical applications?

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For many years, nuclear medicine was focus mainly on imaging using Technecium-99m. Some therapy was conducted using Iodine-131 mainly to treat thyroid cancer. In the 2000's, positron emission tomography (PET) imaging arrived leading to a new wave of applications for nuclear medicine especially in cancer imaging using Flurodesoxyglucose labelled with fluorine-18 (18F-FDG). Several attempt to develop therapeutic agents failed to reach the market despite some efficacy as for example the Zevalin, an antibody labelled with Yttrium-90 for some lymphomas. Since 2013, the third wave of applications has started, focused on therapeutic agent using the peptide receptor radionuclide therapy and coupling imaging and therapy in the so-called theranostics approach. This has resulted in the approval of several new products for routine use including 2 therapeutic radiophamarmaceuticals labelled with Lutecium-177: 177Lu-DOTATATE for neuroendocrine tumors approved in 2018 and 177Lu-PSMA for metastatic prostate cancers (2021). Nowadays, almost all pharmaceutical groups have launched a nuclear medicine program leading to more than 45 different radiopharmaceuticals products in clinical trials.

This new wave use new radionuclides for therapy such as Lutecium-177, Copper-67, Terbium-161⋯for targeted beta-therapy and Actinium-225, Lead-212/Bismuth-212, Astatine-211 ⋯for targeted alpha therapy. New imaging radionuclides are also developed to be used as imaging counterparts to apply the theranostics approach using PET such as Gallium-68 or Copper-64 or using SPECT such as Lead-203 for example. At the same time people are looking not only to the tumor but also to its microenvironement and starts to explore the potential of Auger emission.

This talk will present the current use of radionuclides for nuclear medicine

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