第48回日本核医学会学術総会
第28回日本核医学技術学会総会学術大会
ランチョンセミナー1

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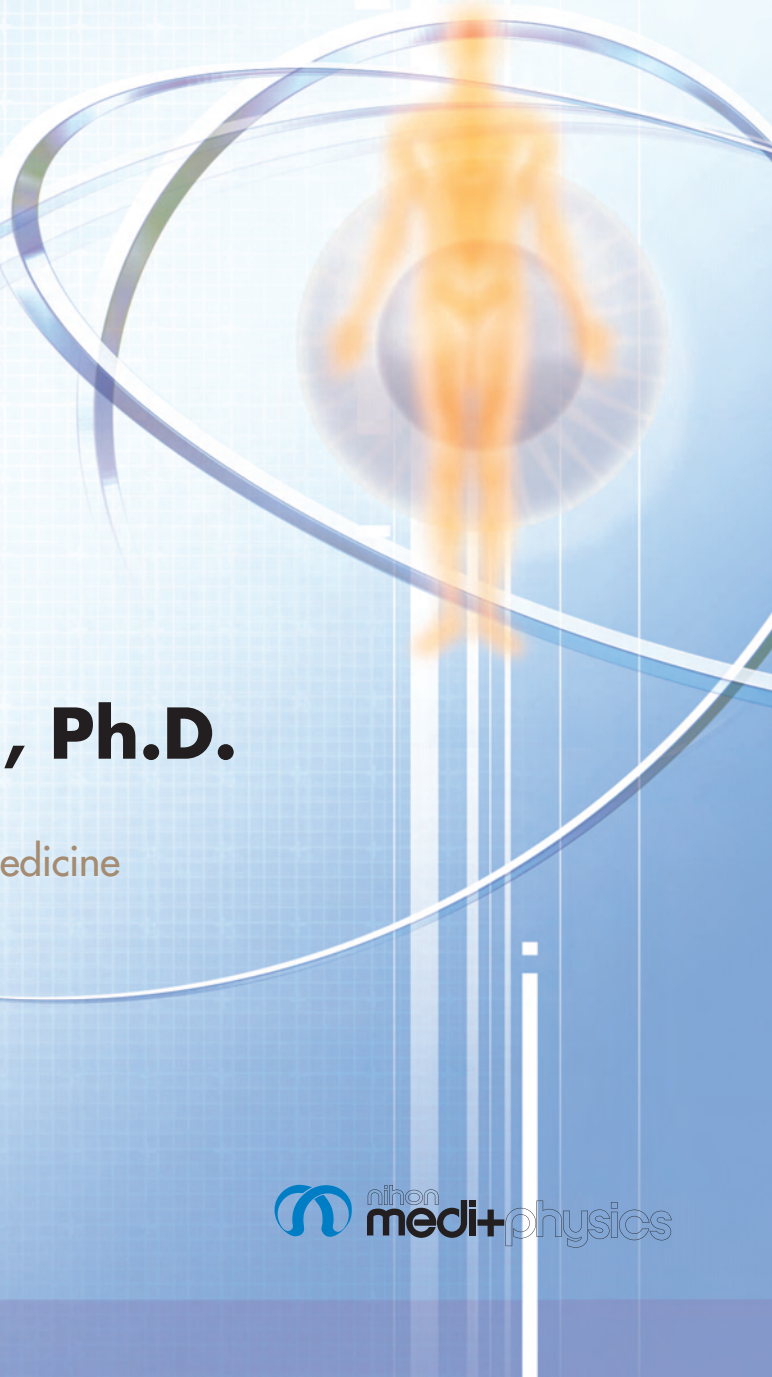
Prospects for Commercial PET Radiopharmaceuticals: Post FDG



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Prospects for Commercial PET Radiopharmaceuticals: Post FDG

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Although it is over thirty years since the first PET scanner was developed well over 90% of clinical PET studies utilize one radiopharmaceutical, 2-fluoro-2-deoxyglucose (FDG). This is in spite of the fact that many positron emitting radiopharmaceuticals have been developed and studied in patient populations. Agents have been developed and evaluated for diseases of the brain and heart as well as for oncologic applications. There are several reasons why clinical PET relies on one radiopharmaceutical, these include the need for reliable high-yield radiosyntheses of radiopharmaceuticals, the need for radiopharmaceuticals that can be prepared reliably at a high-specific activity as well as the expense in obtaining approval for the clinical use of new radiopharmaceuticals. Although the majority of radiopharmaceuticals that have been studied in humans are labeled with fluorine-18 and carbon-11 there has been increased research into the development of agents labeled with other positron emitting radionuclides including copper-64, bromine-76, yttrium-86, zirconium-89 and gallium-68. Gallium-68 can be produced using a germanium-68/gallium-68 generator where the parent half-life is 270 days and the daughter 68 minutes. Several agents, including gallium-68 labeled peptides, targeting the somatostatin receptor have been studied in several thousand patients. Copper-64 has been used to label small molecules, targeting tissue hypoxia, as well as peptides and antibodies. Several of these agents have been studied in clinical trials. There are advantages in utilizing nuclides such as gallium-68, where the generator can be used for many months as well as the nuclides copper-64, bromine-76 and yttrium-86 all of which have half-lives over ten hours making delivery more convenient than with flouirne-18. When labeling peptides, there are advantages and disadvantages with all of the nuclides. These advantages and disadvantages will be discussed.

Over the past several years, there has been great interest in utilizing nanotechnology to develop new imaging agents. The long-living radionuclides discussed above can all be utilized to label targeted nanoparticles. The advantages of nanoparticles are that one can attach or encapsulate different detection targeting and therapeutic groups to the particles. Another major advantage of nanoparticles is the ability to alter the pharmacokinetics of the particle to suit the imaging requirements of the technology being used. Examples of targeting nanoparticles labeled with copper-64 and bromine-76 will be described.