Chemistry of Contrast Media

Small Molecules

Small Molecule Probes for Nuclear Medicine

Henry C. Manning
Radiology, Vanderbilt University, Nashville, TN, USA

Learning Objectives:

- To learn the basics of radiolabeling small molecules
- To learn the basic biology for targeting important pathways in cancer and other diseases
- To develop an understanding of how to develop a PET probe for a specific biological pathway or process
- To understand hurdles of translating PET probes from the preclinical setting to the clinical setting

Radiopharmaceuticals are central to all nuclear medicine studies; their development and routine production for preclinical and/or clinical use share a number of general principles. This lecture will provide a basic introduction to radiopharmaceutical design and development, beginning with initial conceptualization through scientific vetting that may lead to future clinical trials in patients. Though many types of pharmacophores can be radiolabeled for positron emission tomograpy (PET) or single photon emission computed tomography (SPECT) studies, the framework for this lecture will be developed around small, 'drug-like' molecules aimed at PET imaging in preclinical studies and humans. Approaches to incorporate common radiolabels such as cyclotron-produced fluorine-18 and carbon-11 will be discussed, including strengths and pitfalls, as well as the framework required to advance a novel PET agent through the regulatory process to early studies in humans.

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