International Conference on Clinical PET-CT and Molecular Imaging (IPET 2015): PET-CT in the Era of Multimodality Imaging and Image-Guided Therapy

5 – 9 October 2015
IAEA Headquarters, Vienna, Austria

Organized by the IAEA

In cooperation with:

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BOOK OF ABSTRACTS

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Substance P – A Possible PET Diagnostic Agent

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Background: Tachykinins are excitatory neuropeptides synthetized in neuronal and glial cells of the human central and peripheral nervous system. These peptides act as excitatory neurotransmitters and/or neuromodulators and induce DNA synthesis leading to stimulation of cell division and proliferation. As their most prominent member, substance P (SP) has been known to trigger biological responses by linking to (mostly) NK 1 receptors. The presence of functional NK1 receptors has already been documented in malignant brain tumors of glial origin, medullary thyroid cancer, non-small cell lung cancer and pancreatic carcinoma.

Methodology: 99mTc and 188Re radiolabeled SP was tested for cell surface binding after incubation with NK1 receptor expressing U-87 MG cells, and negative control cell line L-929. Further preliminary whole-body biodistribution studies were carried out with 99mTc labeled SP using a hybrid SPECT/CT YAP(S)PET small-animal tomography scanner.

Results: Our results using 99mTc and 188Re radiolabeled SP, demonstrated the affinity of these radioconjugates for NK1 receptor expressing cells, showing pronounced cell surface binding after incubation with U-87 MG cells, compared to the negative control cell line L-929. Further preliminary whole-body biodistribution studies with 99mTc labeled SP using a hybrid SPECT/CT YAP(S)PET small-animal tomography scanner, showed a predominant kidney elimination 60 min post injection, which is expected for peptides, and an uptake in a region associated with the thymus. Although cardiac uptake was suspected in this region, it was excluded with ex-vivo measurement of the thymus gland, which after 60 min showed high, detectable uptake of 0.0132%IA/g. This finding confirmed previous ones about the localization of specific SP binding sites.

Conclusion: Following the success of 68Ga-DOTATOC, and knowing that receptor targeted imaging may provide better diagnostic outcomes in comparison with registering a high glucose uptake in the affected area using 18F-FDG, we believe that it would be interesting to consider new radiochemistry approaches of radiolabeling SP with 68Ga. 68Ga (or other PET radionuclides) may provide better screening and possible detection of malignant brain tumors of glial origin, but also other diseases known to express NK1 receptors.