

DOCTORAL CANDIDATE:

DEGREE: Philosophiae Doctor
FACULTY: Faculty of Mathematics and Natural Sciences
DEPARTMENT: The department of Chemistry
AREA OF EXPERTISE: Radiopharmaceuticals Chemistry
SUPERVISORS: Patrick Riss, Jon Peter Omtvedt
DATE OF DISPUTATION: 14th September 2018

DISSERTATION TITLE: *Synthesis of fluorine-18 labelled radiotracers and their pre-clinical and clinical characterization*

Positron emission tomography (PET) is one of the most sensitive in vivo imaging techniques available to clinicians and researchers. It helps in understanding the biological interactions and mechanism of various diseases through use of radiolabelled compounds called radiotracers.

Herein is described the development of facile radiolabelling approaches for straightforward access of ¹⁸F-labelled trifluoromethyl radiotracers towards both aliphatic and aromatic scaffolds. The method developed for ¹⁸F-trifluoromethylation of aliphatic compounds was applied to the radiosynthesis of [¹⁸F]lansoprazole and N-methyl[¹⁸F]lansoprazole. The compounds were used to analyze the blood-brain barrier penetration in healthy individuals and for the detection of tau-neurofibrillary tangles in Alzheimer's patients.

A single vial one-step method was developed for ¹⁸F-trifluoromethylation of aromatic compounds and applied to the radiosynthesis of a derivative of AH7921, which is a sub-type selective mu-opioid receptor agonist.

In addition, a series of new compounds were synthesized with aim to discover the new radioligands based on modifications to the lead compounds i.e. lansoprazole and AH7921. Several interesting candidates were identified from each series, and few were radiolabelled with fluorine-18. The newly developed ¹⁸F-labelled compounds have good potential to provide the in vivo characterization of tau-neurofibrillary tangles and quantification of the opioid receptors using the PET imaging respectively.