Charles University in Prague

Faculty of Pharmacy in Hradec Králové, Department of Pharmacology and Toxicology

Student: Mgr. Tereza Vašků

Supervisor: Dr. Matthias Bauwens: Maastricht University, Netherlands

Consultant: PharmDr. Jana Ramos Mandíková, PhD

Title of diploma thesis: Comparison of radiolabelled fatty acid (^{18}F-FTHA) and ^{18}F-FDG in imaging of brown adipose tissue

Brown adipose tissue (BAT) is highly metabolically active tissue, which consumes glucose and free fatty acids (FFA) during the process called thermogenesis. Due to these characteristic features, it is possible to quantify the activity of the BAT by non-invasive imaging methods (by using radiopharmaceuticals). Nowadays, one of the most frequently used substances is the radiopharmaceutical called ^{18}F -FDG (radiolabelled glucose by fluoride). The ^{18}F -FDG is in clinical practice used for metabolically active tissues diagnosis, notably tumours. We focused in this study on synthesis of radiolabelled fatty acid, namely on the radiopharmaceutical 14(R,S)-[^{18}F]Fluoro-6-thia-heptadecanoic acid (^{18}F -FTHA). Fluor-labelled fatty acid is used notably for myocardial metabolism observation. The goal of the thesis was a synthesis of radiopharmaceutical ^{18}F -FTHA using a semimanual module in an environment of sufficient purity and yield. Consequently, the goal was to reach molecular imaging of iBAT in case of a model of a mouse using two particular radiopharmaceuticals, ^{18}F -FDG and ^{18}F -FTHA. We tried to answer the question whether there is a link between radiopharmaceutical uptake and surrounding temperature and whether feeding with various nutrition has an impact on metabolism activity iBAT. After the detection of these radiopharmaceuticals we used μPET scanning and the scan was consequently assessed, using the PMOD™ module. We succeeded not to synthetize the radiopharmaceutical ^{18}F -FTHA in the sufficient yield (≥ 55%) and in the sufficient purity (≥ 94 %). Thanks to the results of this study, we can claim that the uptake of the radiopharmaceutical ^{18}F -FDG when there is an exposure of an organism to cold and when aliment with low rate of fat and glucose is served. In case of the radiopharmaceutical ^{18}F -FTHA is the uptake significantly lower and there was no relation to the temperature and nutritional conditions detected. We have reached the conclusion that better visualisation of iBAT provides the radiopharmaceutical ^{18}F-FDG.