

## BSc/MSc-project

**Title:** Effects of menopause and high-intensity training on insulin-stimulated intestinal and liver glucose uptake determined by [ $^{18}\text{F}$ ]FDG PET/CT.

**Description:** Impaired insulin sensitivity is the first sign of development of metabolic dysregulation, type 2 diabetes mellitus (T2DM) and cardiovascular disease. In women, the postmenopausal period is associated with a decline in skeletal muscle mass as well as increased risk of T2DM and cardiovascular disease.

We have recently reported reduced insulin-stimulated glucose uptake in skeletal muscle in early postmenopausal women using positron emission tomography (PET) / computed tomography (CT) and [ $^{18}\text{F}$ ]FDG<sup>1</sup>. The insulin-stimulated glucose uptake in muscle was increased after 3 months of high-intensity exercise training in the postmenopausal women. Similar to muscles, the intestine is insulin resistant in obese subjects and subjects with impaired glucose tolerance. Two weeks of moderate intensity exercise training have been shown to increase insulin-stimulated intestinal glucose uptake measured by [ $^{18}\text{F}$ ]FDG PET/CT in sedentary men<sup>2</sup>.

Using image data obtained from the [ $^{18}\text{F}$ ]FDG PET/CT scans performed in the above mentioned study on postmenopausal women<sup>1</sup>, we now want to investigate whether 3 months of high-intensity exercise training also enhances intestinal substrate metabolism in these women. In addition, we would like to investigate liver glucose metabolism. Data are obtained by drawing regions of interest (ROIs) on sections of the descending duodenum, the jejunum, the transverse colon, and liver using CT images as anatomical reference. Subsequently, time activity curves (TACs) can be extracted and regional glucose uptake is calculated. All PET/CT image analyses are performed using PMOD 3.304 (PMOD Technologies, Zurich, Switzerland).

The project will bring the student a thorough understanding of the physics and image processing based on real clinical cases. Furthermore, the student is provided some of the necessary competences for understanding and developing medical imaging and data analyses.

Co-authorship on a scientific paper based on the data is a possibility.

### References

1. Effects of menopause and high-intensity training on insulin sensitivity and muscle metabolism, Mandrup CM et al., Menopause, 2017.
2. Two weeks of moderate-intensity continuous training, but not high-intensity interval training, increases insulin-stimulated intestinal glucose uptake, Motiani K.K. et al, J. Appl. Physiol., 2017, 122(5): 1188-1197.

**Required qualifications:** Qualifications within medical imaging and radiation physics are beneficial.

### Responsible institution:

Department of Clinical Physiology, Nuclear Medicine and PET, KF-section 4011

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**Allowed no of students per report: 1**

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