Liste over 15 ECTS Empiriske bachelorprojekter forår 2021

Group leader / contact person: Christian Vægter - mail: cv@biomed.au.dk
Project 1 **Title of project: Changes in glial cell cholesterol synthesis following nerve injury – an involvement in neuropathic pain?** Project text: The project hypothesis is that satellite glia cells (SGCs) regulate sensory neuron cholesterol homeostasis. We have observed downregulation of cholesterol synthesis in SGC following nerve injury, but is this response involved in development of pain? The project will analyze nervous tissue from injured mice, potentially utilizing techniques such as immunohistochemistry, confocal microscopy, PCR, cell cultures and assays for cholesterol quantification.
Project 2 **Title of project: Biomarkers of diabetic neuropathy in a rodent type 2 diabetes model** Project text: This project focuses on validating target genes identified with RNA sequencing analysis in the sciatic nerves of a mouse model with peripheral neuropathy, secondary to induced type 2 diabetes with an HFD. The main goal is to validate candidates and find potential biomarkers or targets for therapy in type 2 diabetic neuropathy. Experimental approaches can include Schwann cells and/or sensory neurons dissected from rodent tissue, Western blot, immunocytochemistry and confocal microscopy, and qPCR.
Group leader/contact person: Rikke Nielsen – mail: rn@biomed.au.dk
Title: Can we avoid aminoglycoside induced nephrotoxicity by modulation of megalin O-glycans? Patients who are treated with aminoglycosides, to combat gram-negative bacterial infections, are in risk of nephrotoxicity. One group, which is highly exposed to aminoglycosides is preterm infants. We know that the toxicity is due to uptake by the receptor megalin and that O-glycans of megalin are important for ligand binding. In this project we will use gene-modified cell cultures, where we can regulate the extent of megalin glycosylation, to investigate if nephrotoxicity can be ameliorated by modulation of megalin glycosylation
Group leader/contact person: Tomonori Takeuchi – mail: tomonori.takeuchi@biomed.au.dk
Title: Novelty-induced memory boost The project will be aimed at investigating novelty-induced memory boost. Specifically, the student would conduct a behavioral study on rats, using the object dislocation task, to enhance retention of weak memory through exposure to environmental novelty. Hereafter, environmental novelty will be replaced by optogenetic stimulation, of a proposed noveltyrelaying region, to investigate the neurological underpinnings of this phenomenon.

Group Leader / contact person: Prof. Robert Fenton – mail: Robert.a.fenton@biomed.au.dk
web: (https://potassium-bloodpressure.org/lab-member/robert-a-fenton/)

Project 1

Project Title: Epigenetic regulation of renal NaCl transport

Description: The kidneys play a major role in body salt balance by controlling reabsorption of salt through membrane transport proteins. Altered activity of these proteins leads to several disorders and diseases, including hyper- and hypotension. The objective of this project is to investigate the epigenetic regulation of renal salt transport proteins as a basis for understanding these disorders. The project uses cell biology approaches and can be adapted to the student's interest.

Project 2

Project Title: How does potassium (K+) intake control blood pressure (BP)?

Description: Hypertension is the single greatest contributor to premature death in the world, but current treatments are suboptimal and effective new interventions are required. The objective of this project is to further our understanding of how increased dietary K+ can reduce BP. The project involves animal models or CRISPR/Cas9 and cell biology approaches and can be adapted and fitted to the students interests.

Project 3

Project Title: What is the effect of ageing on renal salt handling pathways in relation to blood pressure?

Description: Hypertension has a strong correlation with age, with older people having increased risk of adverse cardiovascular complications. Altered activity of specific membrane transport proteins contributes to hypertension, but the extent of changes in these proteins with age is unclear. This project will assess the relative expression of salt handling proteins in the kidneys of young and old mice using molecular biology techniques and how they influence other cardiovascular tissues.

Project 4

Project Title: Protein drivers of diabetic kidney disease.

Description: Diabetic kidney disease (DKD) develops in 40% of diabetics and is the leading cause of chronic kidney disease. To better understand cellular behavior in DKD, this project will generate a proteome map (entire set of proteins that is expressed by an organism at a certain time) of specific kidney cell types isolated from DKD patients and link it to disease progression. The project involves microscopy, state-of-the-art mass-spectrometry proteomics and associated bioinformatics.

Project 5

Project Title: A role of prostaglandin signaling in the progression of chronic kidney disease (CKD)?

Description: Current treatment of CKD is management of underlying causes e.g. diabetes and high blood pressure. This treatment is often insufficient due to a vicious cycle of inflammation, hence treatments that target inflammation could prove beneficial in CKD. This project will investigate how modulation of prostaglandin receptors will affect the progression of CKD. The primary methods used will be quantitative polymerase chain reaction (qPCR) and a mouse model of CKD.

Group leader / contact person: Holger Brüggemann – mail: brueggemann@biomed.au.dk

Project title: Genomics on cutaneous corynebacteria

Cutaneous bacteria belonging to the genus Corynebacterium are ubiquitously present on human skin, but their commensal and pathogenic properties are not understood. Recently, corynebacteria have been shown to be part of the tumor microbiome (Nejman et al. Science 368, 2020). The proposed bachelor project involves the bacterial cultivation of human skin swabs on selective agar for the identification of corynebacteria. Isolates will be further identified using 16S rRNA gene sequencing and whole genome sequencing and genomes will be compared with bioinformatic approaches.
Techniques: bacterial cultivation, DNA extraction, Whole genome sequencing, Bioinformatics

Group leader/Contact person: Helle H Damkier - hd@biomed.au.dk

Title of the proposed project: Investigation of membrane transporters in choroid plexus primary culture and/or organoids

Short description: The choroid plexus is a small tissue that secretes the majority of the cerebrospinal fluid (CSF) in the brain. In this project, the choroid plexus will be dissected from mice and cultured either as a primary cell culture where the tissue is enzymatically digested to a monolayer of epithelial cells or as so-called organoids where small pieces of the tissue are cultured. In these projects, the effect of changes in the composition of the CSF on the membrane transporters involved in the production of CSF will be investigated. The project involves dissection of choroid plexus from mouse brain, cell culture as well as techniques to evaluate the effect on the membrane transporters which includes quantitative PCR, immunocytochemistry and immunoblotting. The student will be trained in all techniques by either the supervisor or technical staff.

Group leader / contact person: David Olagnier - olagnier@biomed.au.dk

Title of the proposed project: Metabolites sensitize cancer cells to oncolytic virotherapy

Summary: Nrf2 is a transcription factor frequently activated in many types of cancer. Dysregulation of Nrf2 contributes to the development of aggressive and multi resistant tumors. Our preliminary work demonstrates that Nrf2 plays a pivotal role in the metabolic reprogramming of human cells hence possibly leading to the alteration of the antiviral defense machinery. With the current project, we seek to identify the molecular details of the antiviral defense impairment by Nrf2-driven metabolites; and propose a therapeutic strategy based on the use of an oncolytic virus in this subset of hard to treat cancer cells. Deciphering the metabolic alterations that renders Nrf2-addicted cancer cells defective in antiviral activity, hence sensitive to viral infection will significantly advance the knowledge on the biology of these cancer cells and open up new therapeutic perspectives for patients.
Methods to be used in the project: WB, qPCR, flow cytometry/Imagestream, cell death assay, confocal imaging