Project 9.1 Gut-liver axis in liver cirrhosis (NAWA Polish Returns)

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www: https://olab.com.pl/ ; https://shorturl.at/JNT69

Background:

Liver is particularly interesting in the context of the microbiome due to its anatomical connection to the gut, where majority of the microbes reside. Together with nutrients from digested food, microbiota-derived molecules and metabolites, reach the liver via portal circulation. This makes the liver uniquely exposed to microbiota, without having direct contact with live bacteria. On the other hand, the liver affects the intestinal environment, directly – for example through bile acid secretion and, more indirectly – for example by regulating metabolic homeostasis of the body. In liver disease such interaction architecture may lead to feedback loops, where liver function deterioration affects the gut physiology or microbiota, which in turn cause exacerbation of the disease.

Liver fibrosis, and its advanced stage - liver cirrhosis, that are the major unmet public health problem in both developed and developing societies. The major aetiologies of liver cirrhosis include prevalent alcoholic liver disease (ALD), non-alcoholic fatty liver disease (NAFLD) and viral hepatitis.

In NAFLD and ALD patients, configuration of gut microbes changes due to liver damage and metabolic derangement and particular microbiome signatures were shown to correlate with the disease. These changes are accompanied by variety of gastrointestinal symptoms such as pain, nausea, bloating, diarrhoea or constipation. It is hypothesised that altered microbiota may contribute to disease progression, however there are no studies showing that in a conclusive and mechanistic way. As, up to now, treatment options for liver cirrhosis are very limited, so understanding and reversing pathological changes in the intestine could be an avenue to alleviation of symptoms and potentially limiting disease progression.

Aim:

In this project we aim to examine the gut-liver axis in a mouse model of chronic liver disease, specifically (1) to elucidate the role of microbiota in the progression of liver disease and (2) to understand how liver damage affects microbiota and gut physiology. To address these questions, we will use in vitro and in vivo models of disease and its aspects and advanced genomics (such as single cell RNA sequencing, metagenomics) and bioinformatics.

Requirements:

Position 1

- MSc degree in biology, biotechnology, biochemistry, genetics, medicine or related field,
- knowledge of molecular and cell biology,
  proficiency in written and spoken English,
- excellent interpersonal skills, initiative, good work organization, good collaboration skills,
- hands-on experience in laboratory work,
- prior experience in following techniques will be an advantage (but not prerequisite):

- sequencing libraries generation (Illumina, RNAseq, single cell genomics, metagenomics),
- cell culture (cell lines, organoids, CRISPR-based cell line modification techniques),
- microbiology (culturing bacterial isolates, phenotyping, working anaerobically)

- working with mice
- FACS, cell sorting

Position 2

- MSc or MEng degree in biology, biotechnology, engineering, computer science, mathematics, physics or related fields,
- interest in molecular biology and physiology,
- proficiency in written and spoken English,
- excellent interpersonal skills, initiative, good work organization, good collaboration skills,
- ability to code in R and/or Python,
- experience in data science,
- prior experience in Illumina sequencing data analysis or writing pipelines will be an advantage

Number of positions available: 2

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