Title: The microbiome on the gut-liver axis.

Supervisor: Aleksandra A Kołodziejczyk, PhD
Institute: International Institute of Molecular and Cell Biology in Warsaw
Laboratory: Laboratory of Cellular Genomics
www: https://olab.com.pl/ https://shorturl.at/JNT69

Project description:

The impact of the gut microbiota on human health is undeniable. The gastrointestinal tract is particularly interesting in the context of the microbiota because of the volume and complexity of the bacterial populations in this niche. The gut is directly exposed to bacteria and their products. 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.
Such architecture leads to a myriad of interdependencies between the intestine, gut microbiota and liver that need to be in balance with each other to maintain homeostasis. In intestinal and liver disease, the loss of balance on the gut-liver axis may lead to feedback loops, where one system's function deterioration affects the physiology of the other, which in turn causes exacerbation of the initial disease.
Our overarching aim is to gain a comprehensive understanding of the molecular and cellular mechanisms underlying the gut-liver axis in health and disease with the goal in mind to improve clinical outcomes.

Aim:

The goals of this study are: (1) to test for a potential role of microbiota on the host, (2) to find bacteria that elicit specific responses in the host, and (3) to characterise mechanisms. To address these questions, we will use *in vitro* and *in vivo* models of disease.
In this project, you will learn – advanced genomics (RNAseq, single-cell genomics, metagenomics), mammalian cell cultures, and advanced microbiological techniques such as anaerobic bacteria culturing. There will be an opportunity to work with mice as animal models of gastrointestinal diseases. The details of the project will be tailored to the skills and interests of the successful applicant.

Requirements:

- 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 a prerequisite):
  - ✓ Sequencing libraries generation (Illumina, ONT, 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 (handling, injections, oral gavage, dissection, perfusion)
  - ✓ FACS, cell sorting

- This is a mainly ‘wet-lab’ position, however experience in sequencing data analysis will be a plus

Number of positions available: 1

Contact: akolodziejczyk@iimcb.gov.pl