**Title**: Studying the microbiome on the gut-liver axis with bioinformatic tools.

**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 perform multi-omic analyses of both host and microbiota.
The prospective PhD student will analyze data from high-throughput experiments performed in the lab. There will be two potential paths for the student: (1) analysis of the microbiota, which entails gut microbiota metagenomic analyses from both Illumina and nanopore sequencing data coupled with culturomics approaches and bacterial strain characterization and (2) multi-omic analysis of the host, which entails mostly analysis of data from Illumina sequencing (RNAseq, single-cell genomics) coupled with other types of data such as proteomics.

**Requirements:**

- MSc degree in biology, biotechnology, engineering, computer science, mathematics, physics or related fields
- Strong interest in molecular biology, microbiology 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 sequencing data analysis or writing pipelines will be an advantage

Number of positions available: 1

**Contact**: akolodziejczyk@iimcb.gov.pl