The employment of systems biology in treatment of liver diseases

Abstract:

To develop novel strategies for prevention and treatment as well as to gain detailed insights about the underlying molecular mechanisms of liver associated diseases fatty liver disease, cirrhosis, type 2 diabetes and hepatocellular carcinoma, it is vital to study the biological functions of liver and how liver interacts with other human tissues as well as with the gut microbiota. Biological networks including metabolic, transcriptional regulatory, protein-protein interaction, signalling and co-expression networks can provide a scaffold for studying biological pathways operating in the liver in connection with disease development in a systematic manner. In my presentation, I will present our recent work where biological networks have been employed to identify the reprogramming in liver physiology in response to complex diseases including NASH/NAFLD. I will further discuss how this mechanistic modelling approach can contribute to the discovery of biomarkers and identification of drug targets which may lead to design of targeted and effective treatment strategies. Finally, I will present a roadmap for the successful integration of models of the liver and other human tissues with the gut microbiota to simulate whole-body metabolic functions in liver diseases.

Key points of my presentation

- Omics technologies are used in detailed characterization of human liver tissue in health and disease states.
- Biological network models are functional tools for exploring and integration of multiomics data.
- Systems biology uses a holistic and integrative approach for comprehensive analysis of the biological functions in healthy and diseased states
- Systems Biology approaches have been successfully employed in hepatology to identify biomarkers and drug targets.
- These integrative tools can be used for simulation of liver tissue functions and its crosstalk with other tissues for prediction of therapeutic and side effects.