Liver organoids: modelling complexity in homeostasis and disease

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Authors

Anna M. Dowbaj Meritxell Huch

Abstract

Liver is a complex organ, capable of incredible regenerative capacity in the mammalian body. In addition to well-known hepatocytes, liver is composed of a complex cell microenvironment, with each cell type contributing to homeostasis, regeneration and disease. Modelling of the liver in vitro has been hampered by 2D cell lines being too simple and whole animal models too complex to underpin the mechanisms of liver biology. Liver organoids are emerging as a great tool to study liver (patho)physiology. Increasing in complexity, organoids have successfully been used to understand the cellular interplay in genetic and metabolic liver diseases, as well as liver cancer. This review will discuss the advancement in modelling cell complexity, maturation and liver architecture in a Petri dish. It will also provide a state-of-the-art perspective of what is still lacking and how the models can be further improved. Finally, we will conclude with our personal vision of where the field is going.