OOACT Network Sabbatical Funding/Round 1/Initial report: Lay summary of findings

Development of a microvascularised brain organoid on a chip model

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Organoids are small groups of cells that are cultured *in vitro* and display some of the features (structure and function) of organs. Scientists study organoids to identify some of the parameters influencing cell biology and organ functioning and development, but also for the testing of therapeutics. Indeed, organoids can be formed from human cells and therefore can provide information about the way human tissues will respond to treatment. This contrasts with animal testing typically used for novel therapeutics, as human physiology is not always accurately predicted by animal models. Cerebral organoids are a class of organoids in which the early development of the brain is recreated. These organoids are particularly interesting for the study and treatment of diseases and conditions such as autism, schizophrenia, and Alzheimer's and Parkinson's diseases.

Another strategy to recreate some of the structure and function of tissues is to combine microfabrication technologies with advanced cell and stem cell cultures. These are known as organ-on-a-chip technologies and have been particularly successful at recreating some of the complexity and function of organs such as lung, gut and liver, but also for the creation of the microvasculature. The vasculature is important as the functioning of most organs directly depends on it *in vivo*, but also because therapeutics are often accessing tissues through the vasculature and the blood circulation.

This project proposed to combine a model of cerebral organoid (from the Lancaster laboratory) and a model of microvasculature-on-a-chip (from the Gautrot laboratory), to create the first microvascularised model of brain early development on a chip. Thanks to this project funded by the Organ-on-a-chip Technologies Network, we have studied some of the factors that control the interaction of the two models and the formation of a mature interface between a microvascularised network and a cerebral organoid, in a microfluidic chip.

This model will be used to mimic neurodegenerative conditions and diseases, and for the development of therapeutic strategies.