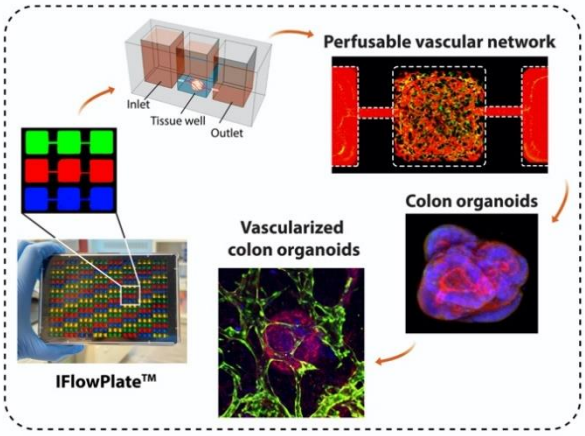
IFlowPlate: Platform Technology for Vascularizing Organoids



IFlowPlate facilitates the scalable production and testing of vascularized human stem cell derived organoids

Abstract

Organoids are mini organs that are grown in a dish over time from a single or a small cluster of human stem cells. Organoids have a biological complexity that resembles real human organs, using actual human cells. Though organoids cannot replace human clinical trials in drug development, they can offer valuable insights into the function of drugs, the mechanism of disease progression, and the process of organ development that cannot be provided by single-cell assay or animal models in the pre-clinical trial stage. However, there is one critical biological component that is missing in all organoids – a perfusable blood vessel network. Blood vessels are the most prevalent structures in the human body and are closely associated with many diseases and immunological response in our body. They are present in all organs, and all organs rely on them to function correctly. To solve this problem, a platform technology (**IFlowPlate™**) has been developed for growing arrays of perfusable blood vessel networks to vascularize organoids on demand.

Advantages

The IFlowPlate™ platform is based on the traditional microwell plate, e.g. 384-well plate, with a simple modification. As such, it is easy to use by non-engineering experts as well as compatible with both well-based organoid culture and high-throughput assay formats typical in biological study workflows. Importantly, the open-top configuration of the IFlowPlate™ platform preserves the 3D organ-level structure of an organoid while providing surrounding vasculature and allows for the tissue model to be easily extracted for external downstream analysis (e.g. immunohistochemistry, sequencing, etc.) or making direct comparisons with patient samples for clinical validation. Since the dominant cost of organoid production is the culture media (due to the various growth factors needed), the IFlowPlate™ allows creation of a small tissue to use the least amount of media in comparison to other vascularization systems without compromising biological function.

Applications

- Drug Discovery, Research & Development
  - Vascularizing 3D organoid models for biological studies (e.g. human colon organoids)
  - Studying disease progression and immune cell response in the presence of vasculature (e.g colon inflammation)
  - Studying vascularized organoid response to new drug candidates (e.g novel antiviral for colon viral infection)

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Stage of Research

Proof of principle data available

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