Engineered 3D-Vessels-on-Chip to study effects of dynamic fluid flow on human induced pluripotent stem cell derived endothelial cells

Graaf, M.N.S. de

Stellingen behorend bij het proefschrift:

Engineered 3D-Vessels-on-Chip to study effects of dynamic fluid flow on human induced pluripotent stem cell derived-endothelial cells

1. **3D-VoCs produced with VFP can be used to apply uniform shear stress to all cells.**
   This thesis
2. **τEQ resistors improve the throughput of 3D-VoC perfusion by allowing variation instead of eliminating it.**
   This thesis
3. **hiPSC-derived endothelial cells can swiftly adapt to changing haemodynamic conditions.**
   This thesis
4. **Confined hiPSC-derived endothelial cells prefer to adopt a tubular morphology; unconfined hiPSC-derived endothelial cells prefer to form monolayers.**
   This thesis
5. **Vascular models without correct haemodynamics should be considered a pathophysiological model.**
   This has implications for the translation to *in vivo.*
   Ming He et al.(2020) APL Bioengineering 4, 010904
6. **3D-models can be better disease models than 2D models.**
   However the clues are well hidden.
   Orlova et al. (2022) Stem Cell Reports 12;17(7):1536-1545
7. **Sticking feathers to something does not make it a chicken**
   By only looking at the parameters a model should have, one could overlook the features it shouldn't.
   Tyler M. Lu et al. (2021) PNAS vol 118(8) e2016950118
8. **"It is evident that the use of human organ chips instead of animal models for drug development and as living avatars for personalized medicine is ever closer to realization."**
   Donald E. Ingber (2022) Nature Reviews Genetics, 23, pages 467–491
   Now legislation is in, the field must now deliver.
9. **Anything worth doing, is worth doing right**. *Raoul Duke (1971)*
   Refine and validate a proof of concept before generating data.
10. **Assumptions are the mother of all failures.** *Eugene Fordsworthe*
    For interdisciplinary research assumptions are essential, however it is vital to understand how to extrapolate other people's assumptions.
11. **"All problems in microfluidics are small".** *Lisa van den Hil (2020)*
    Most problems encountered in microfluidic prototyping are not intrinsic to the design but fabrication and are easy to solve. However, the smallest imperfection still has detrimental effects on success and morale.
12. **"Mother Nature is a mad scientist".** Kramer (1997)
    Attempting to recapitulate it on a chip, makes you appreciate it even more.