

Breathing life into in vitro models

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Propositions

Accompanying the dissertation

Breathing life into *in vitro* models – Exploring the respiratory landscape of bioinspired culture substrates for pulmonary research

by

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Maastricht, 3rd October 2023

1- "Innovation is seeing what everybody has seen and thinking what nobody has thought." - *Dr. Albert Szent-Györgyi* (Nobel Laureate 1937)

2- The relationship between (geometrical) form and function is a fundamental principle in biology that gets increasing attention in a more biomimetic generation of organs on chips. *This thesis*

3- The observed capacity of lung epithelial cells to populate and establish monolayers on differently curved substrates is a positive indication that further investigation should be conducted to understand how geometrical form relates to biological function in biomimetic *in vitro* systems. *This thesis*

4- The bioengineering paradox: aiming at creating realistic yet simple *in vitro* models; the increase in realism means an inherent increase in complexity, which competes with the desired simplicity.

5- Formerly, progress in the organ-on-chip field was heavily dependent on the advent of micro(bio)fabrication, however, currently, it is being partially hindered by unanswered biological questions.

6- "Organ-on-chip" might be considered as an overpromising jargon that will become more reasonable as we move towards an approach where the on-chip "organ" consists of multiple tissues on the chip.

7- Microthermoforming is a valuable approach to create curved, thin-walled, porous culture substrates at a scale that cells can sense, in a controlled and tunable way. *This thesis*

8- The next generation of biomimetic organs-on-chips can become the first step in drug screening benefiting from micro-anatomical and physiological mimicry, higher throughput and patient-specificity.

9- The comparison between the process and state of epithelialization of curved and flat cell culture substrates has an intrinsic bias. *This thesis*

10- "The truth is found neither in the thesis nor the antithesis, but in an emergent synthesis which reconciles the two." – *Georg Wilhelm Friedrich Hegel*