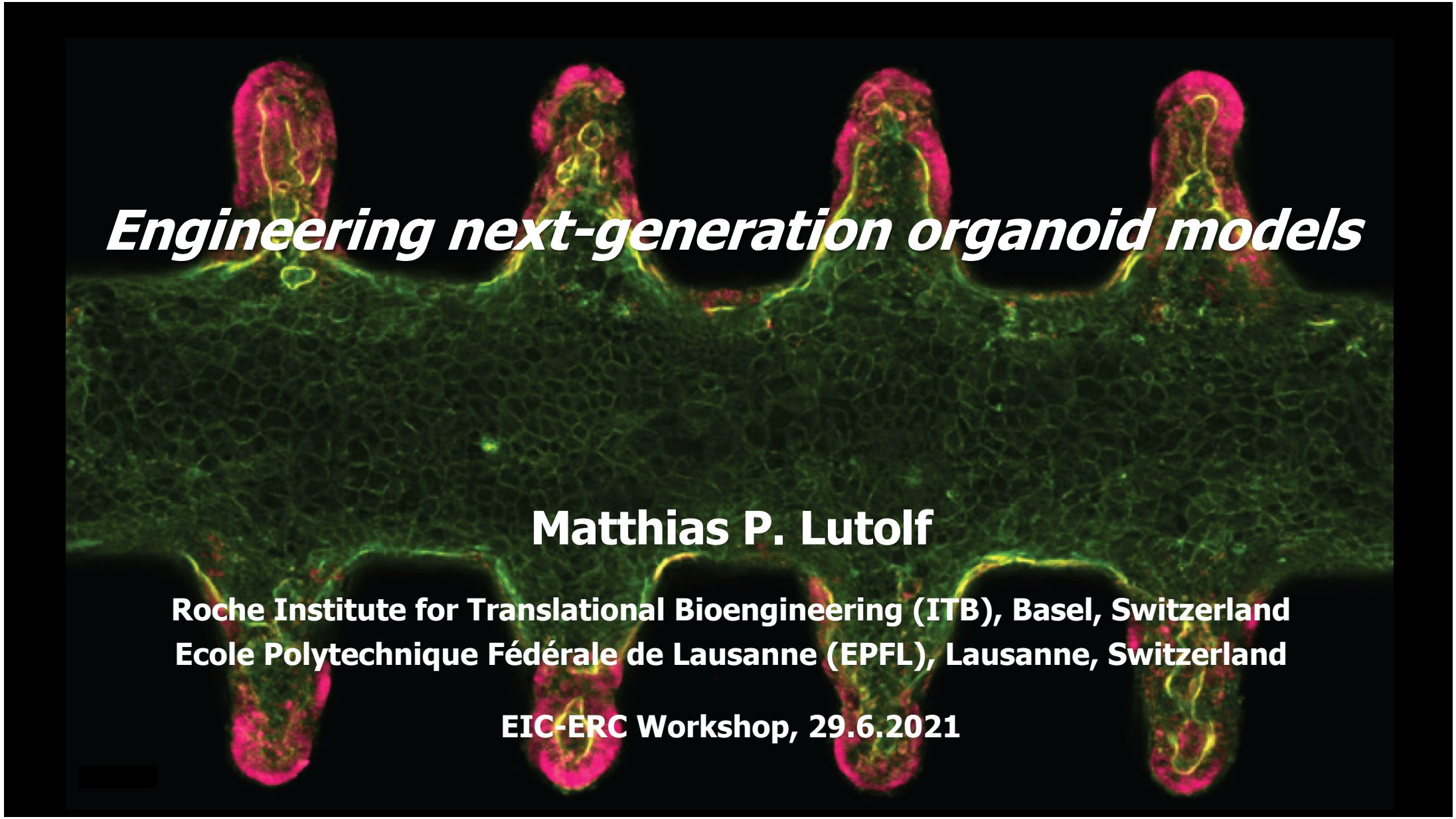

Engineering next-generation organoid models

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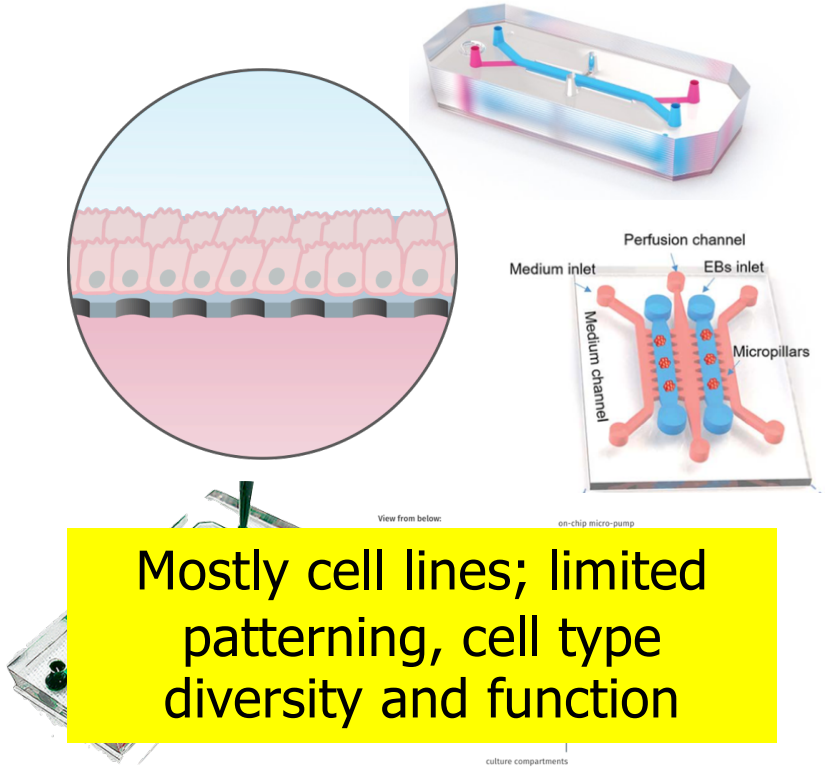
EIC-ERC Workshop, 29.6.2021

Organs-on-a-chip and organoids:
Can we combine the best of both in vitro *tissue engineering approaches?*

The engineer's approach:

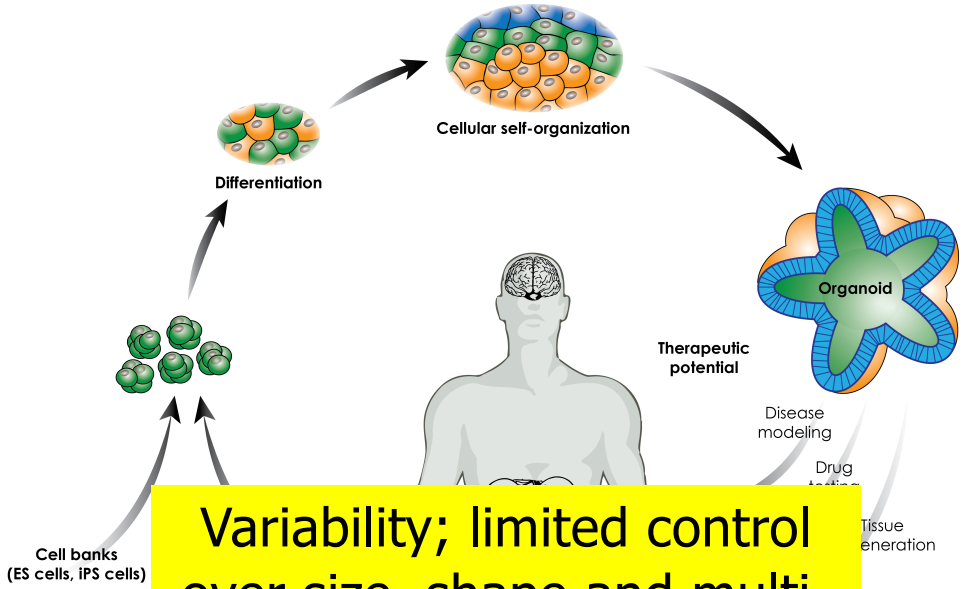
'Force cells to grow in a highly controllable, organ-like microenvironment



Mostly cell lines; limited patterning, cell type diversity and function

The biologist's approach:

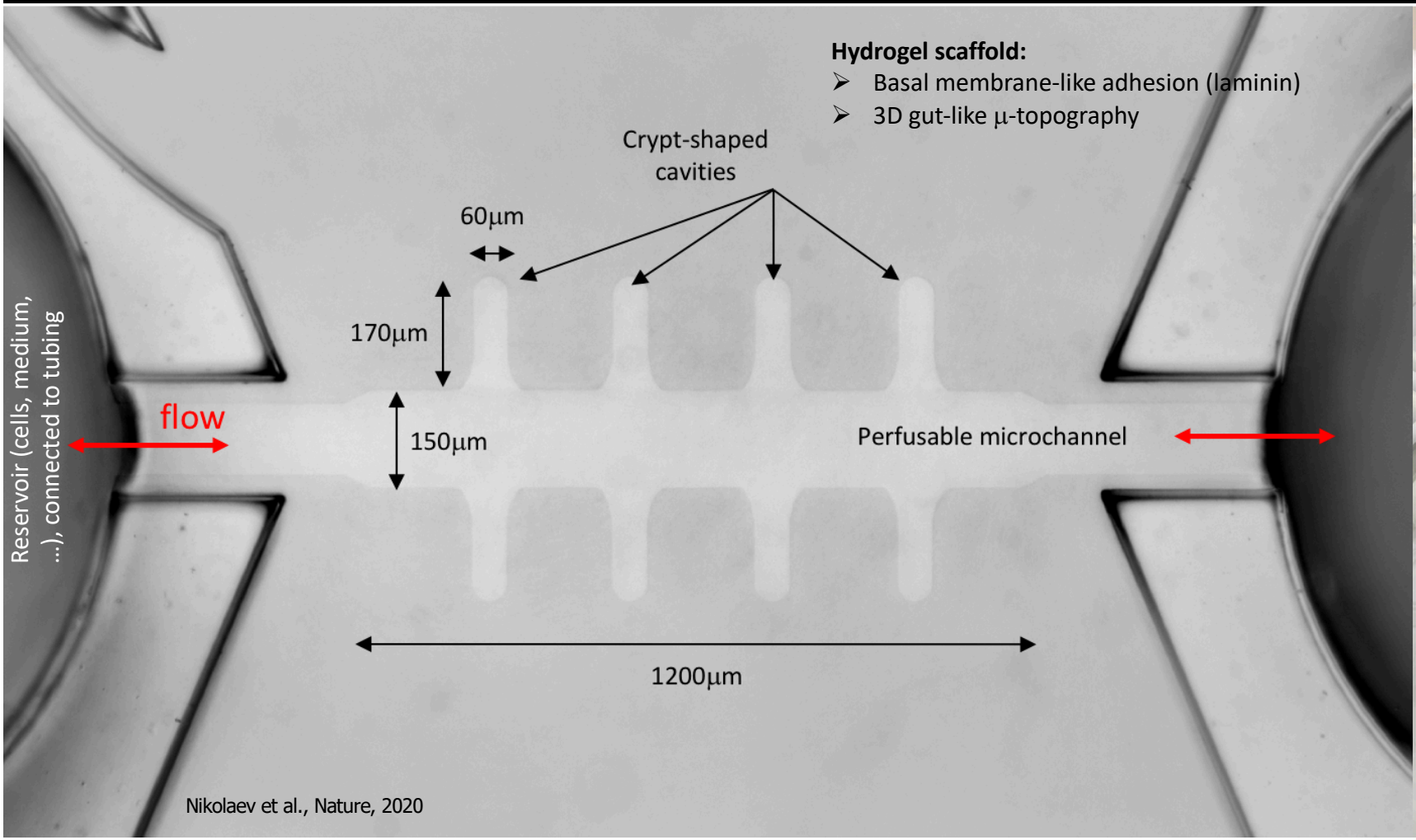
'Let the stem cells build the tissue by themselves'

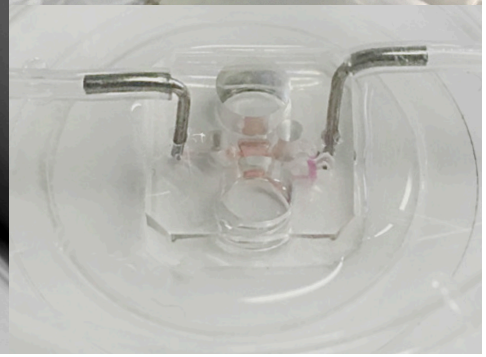


Variability; limited control over size, shape and multi-tissue complexity

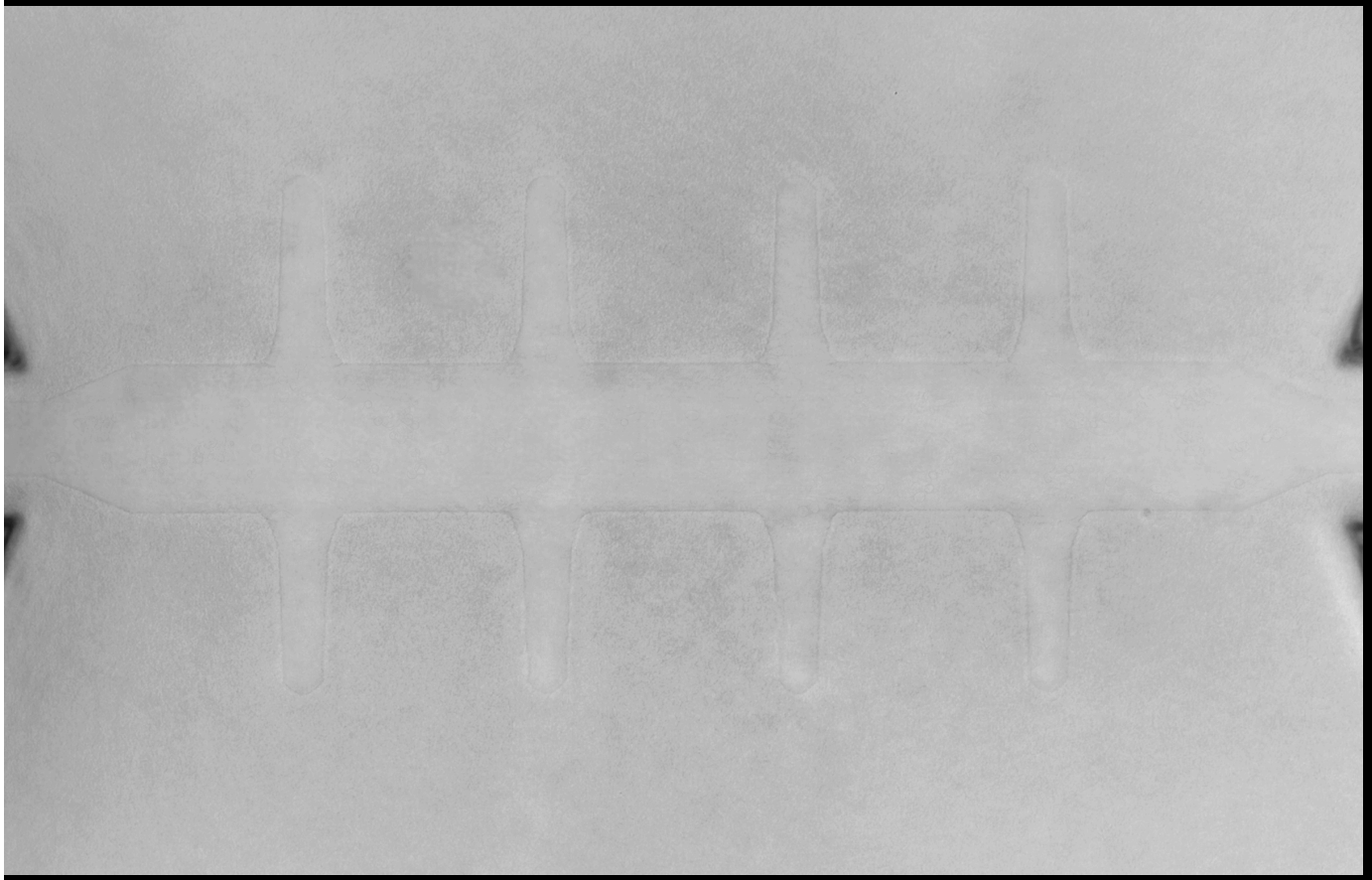
Lancaster and Knoblich, Science, 2014

Epithelial organoid culture in biomicrofluidic devices

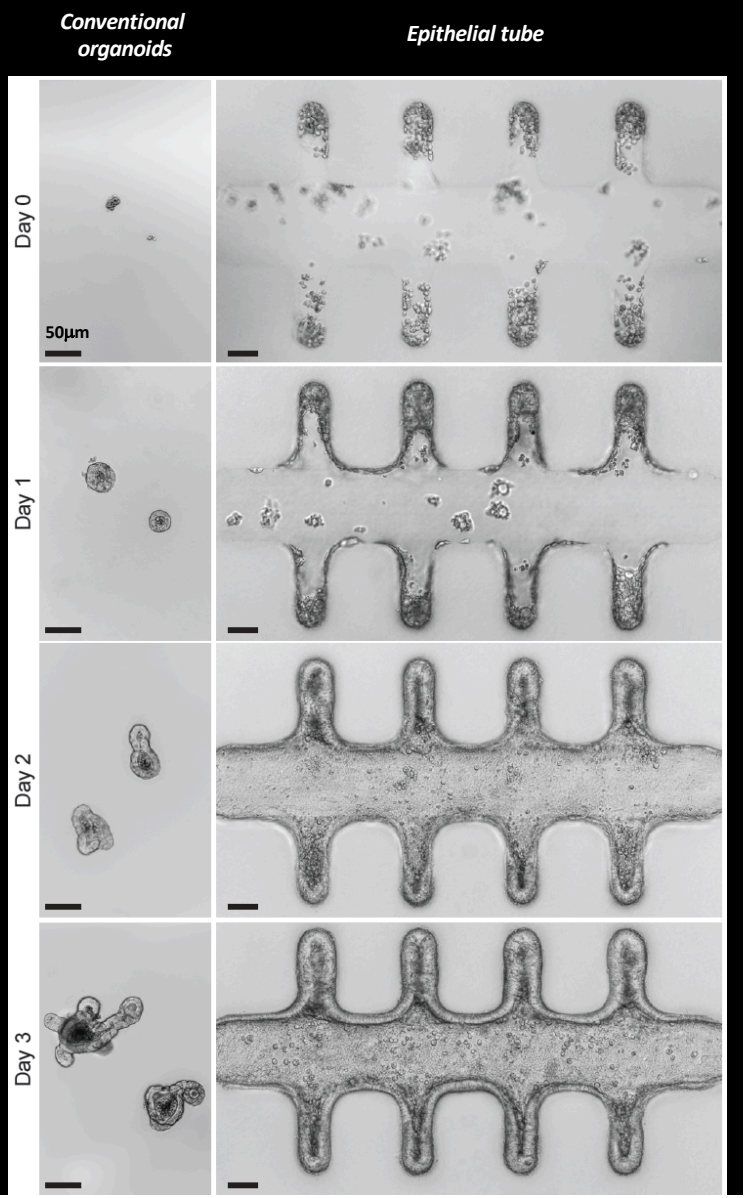




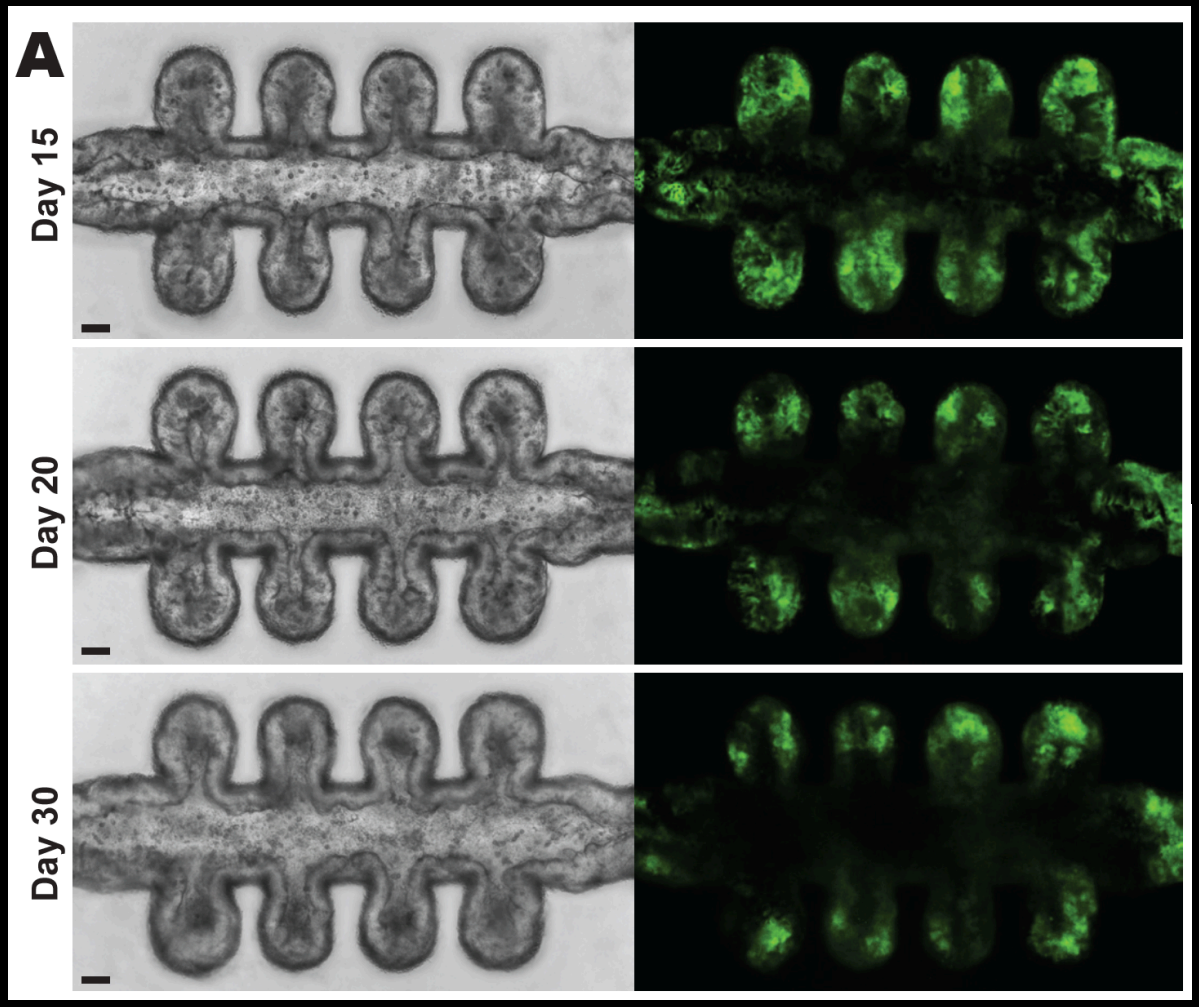
‘Scaffold-guided’ organoid morphogenesis

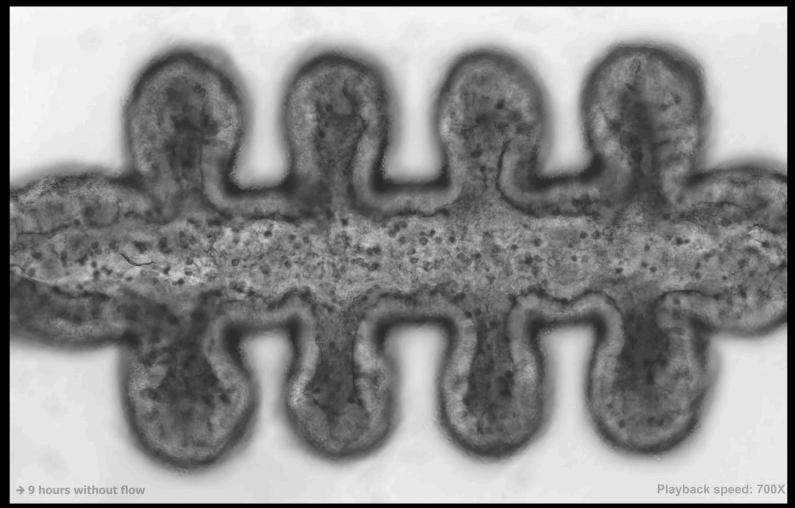


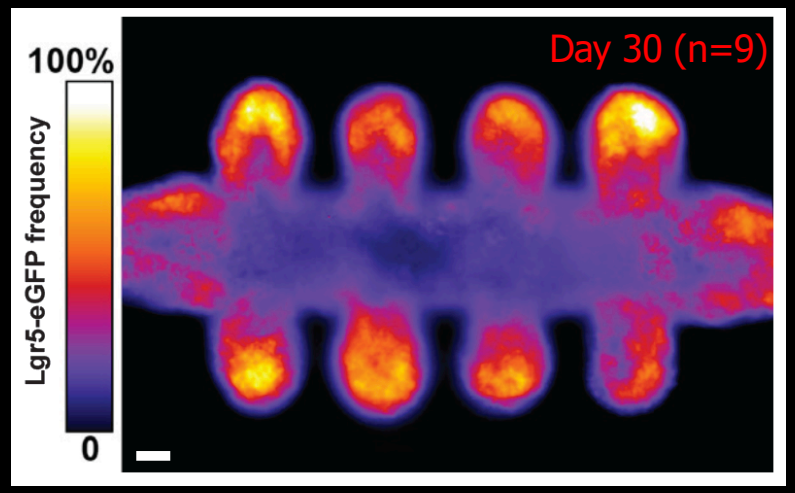
Stem cells isolated from Lgr5-eGFP-IRES-CreERT2 mice



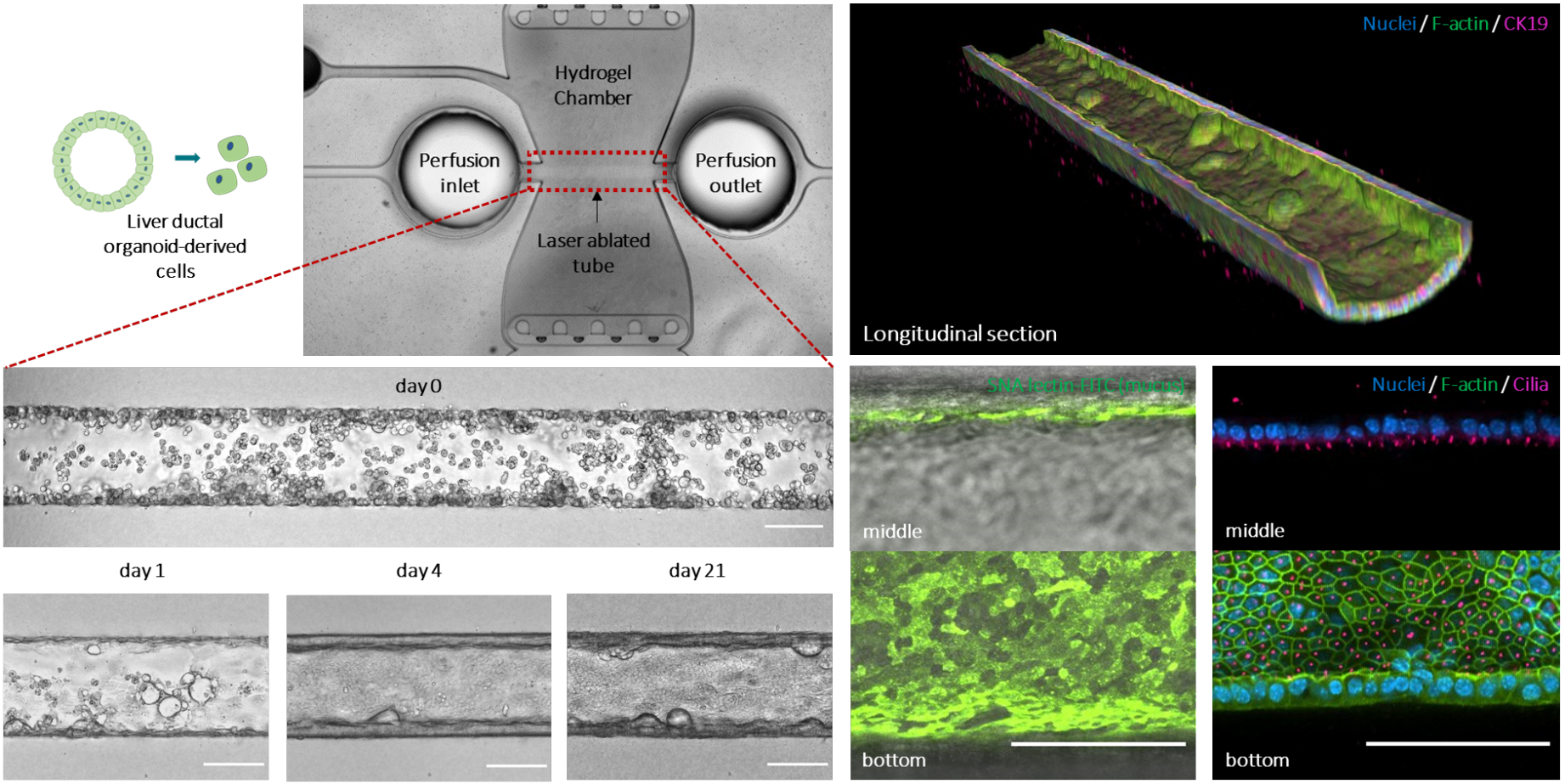
Mini-gut tubes are patterned and very long-lived





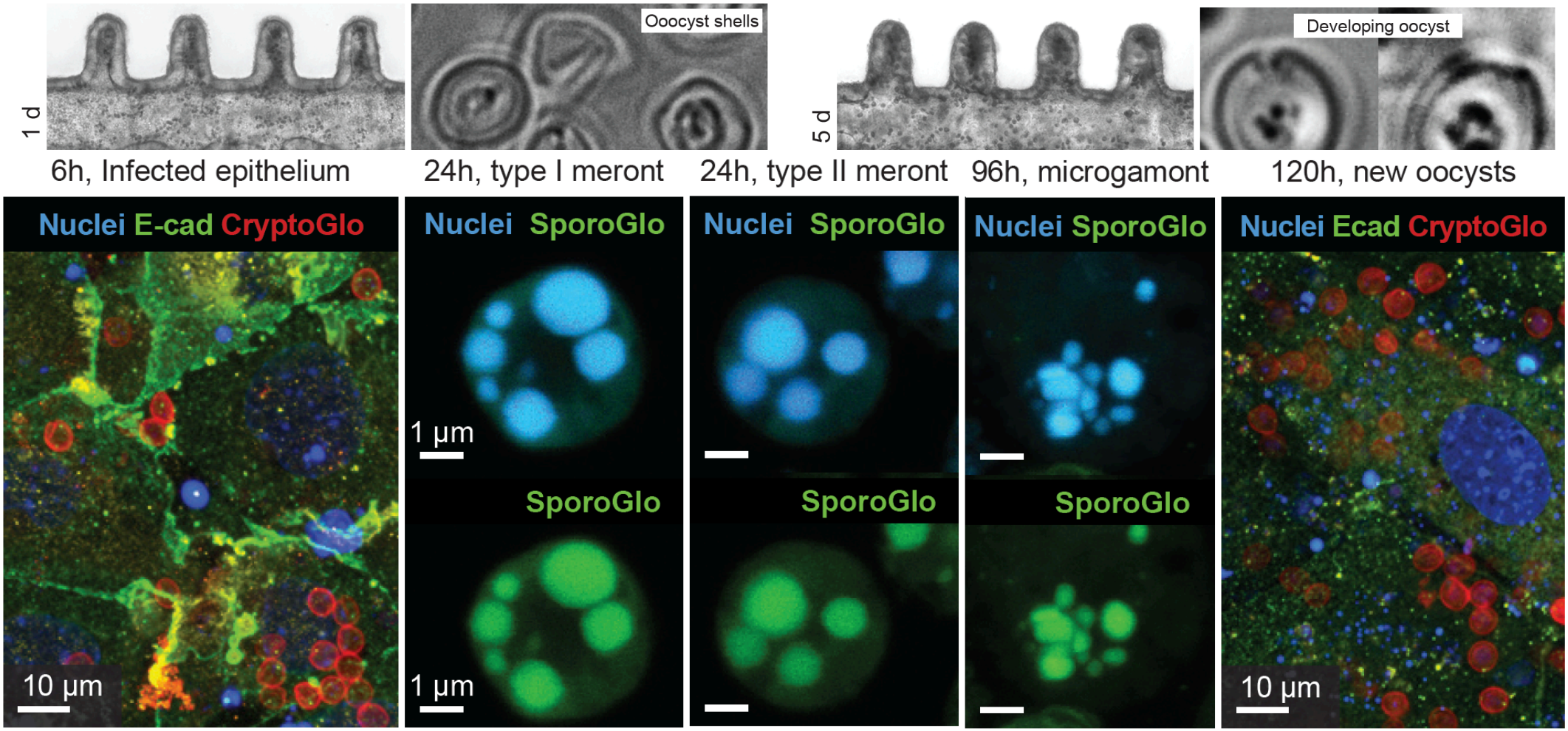


Concept is broadly applicable: GI and respiratory tract, liver (e.g., liver ductal organoids-on-a-chip)

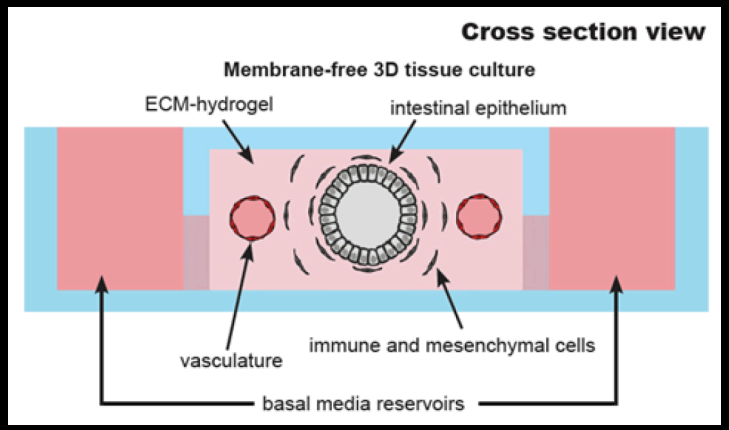


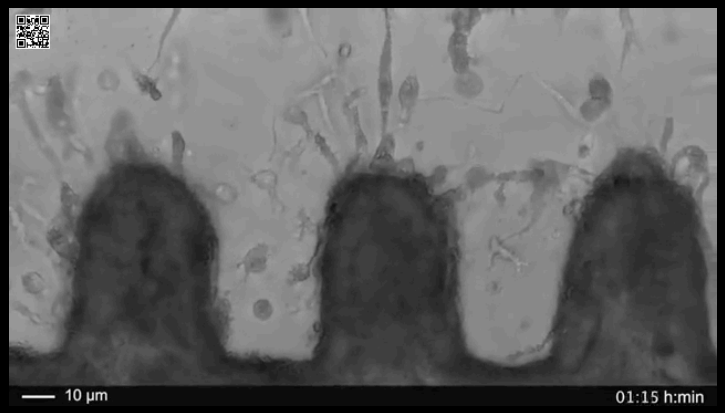
Bilge Elci, unpublished

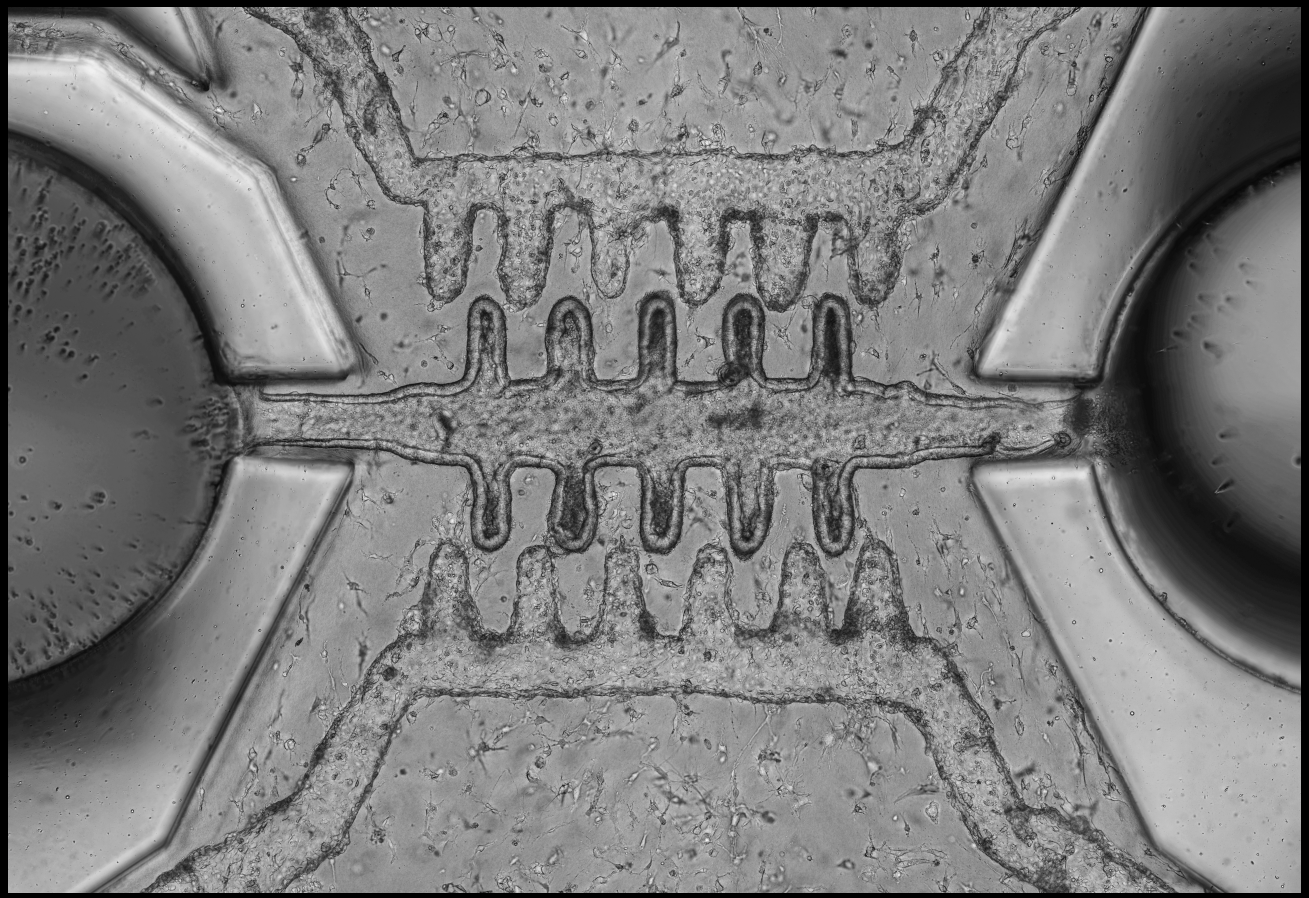
Approach is ideally suited for modeling host-microbe interactions (e.g., Long-term *cryptosporidium parvum* infection)



Approach is ideally suited for capturing 3D organ-level complexity (e.g., incorporation of vasculature, immune system component)







Hans Clevers and team
(Cryptosporidium infection)