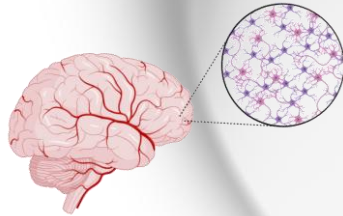




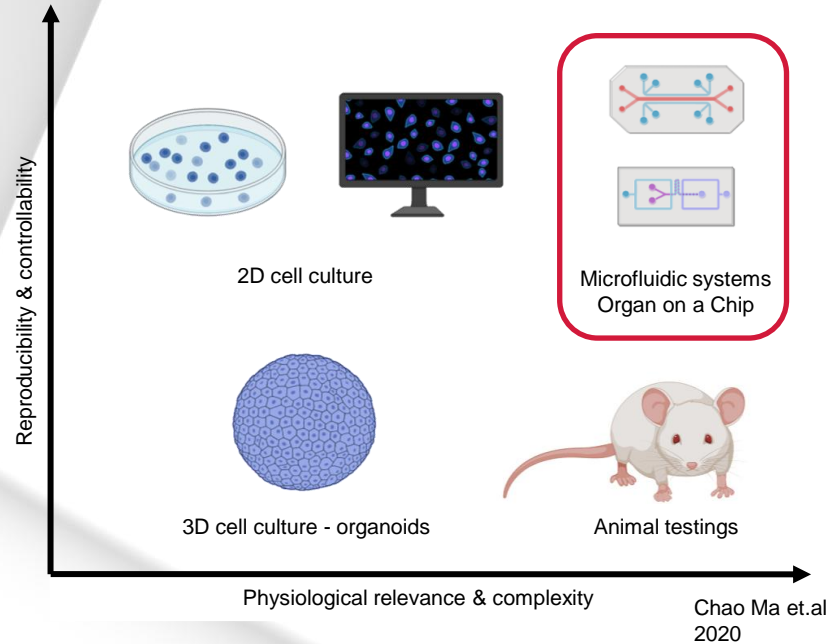
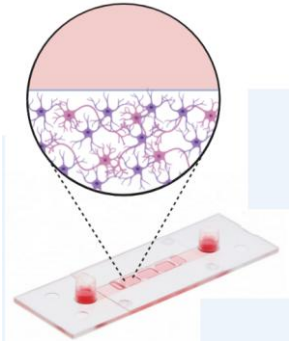
**ACCELERATE YOUR RESEARCH WITH OUR
INNOVATIVE ORGAN-ON-A-CHIP DEVICE**

ORGAN-ON-A-CHIP

- Organ-on-a-Chip experiments are run by cultivating human cells or tissue fragments inside a microfluidic chip which is perfused with cell culture medium, simulating the capillary shear forces, creating a vascularized, human tissue.



Brain on a Chip



YOUR BENEFITS FROM ORGAN-ON-A-CHIP

- The use of Organs-on-Chips (OoC for short) as substitute to animal testing results in **faster results** within a few days, outcomes much closer to the **human physiology** by the use of human 3D cell culture in a vascularized setting. Furthermore, the **reduction of animal testing** results in much more cost efficient and more ethical research. This substitution got enabled by the **FDA transormation act 2.0** and european equivalents.



Results within days
instead of years

[Estimation based on comparable experiments]



Save upto 3.000 mice per
newly development drug

[Estimate based on MPS Summit 2023]



Save \$200 Mio. in the drug
development process

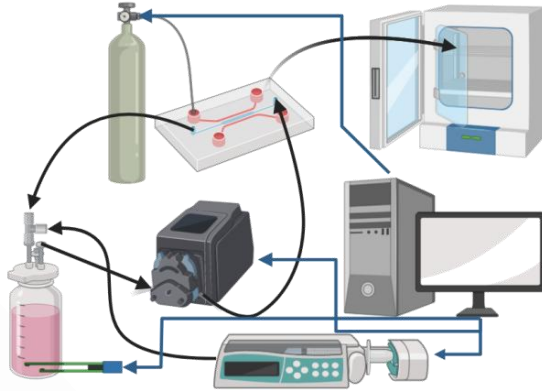
[Estimate by Nora Franzen et.al 2019]

The **BMBF offers funding** for the implementation technologies that pose an alternative to animal testing, such as Organ-on-a-Chip for further implementation of the 3R-rule.

THE PROBLEM WITH ORGAN-ON-A-CHIP

- Hardly any scientist uses the technology, DESPITE the great interest and the many advantages, since there is a fundamental lack of a standardized solution that meets all the requirements of scientists.

OoC WITHOUT US



Technically complex

Limited organ simulation

OoC WITH VitrofluidiX



Intuitive & simple operation

Simulation of any organ



VITROFLOW – THE UNIVERSAL OOC PLATFORM

- The platform is characterized by three unique selling points, which enable the easy-to-use simulation of any organ and thus the versatile use of OoC.

Fully integrated

First simulation of human organs with a **single platform device**.

Contains gas- & heat-incubation as well as two flowlines for double- and monolayer-flow experiments



Easy to use

Intuitive operation & with **IN/ON-Line** evaluation of the pH and automated medium exchange.

Live-microscopy with any conventional microscope

Adaptive

Any **cells & chips** and their material possible at your individual settings.

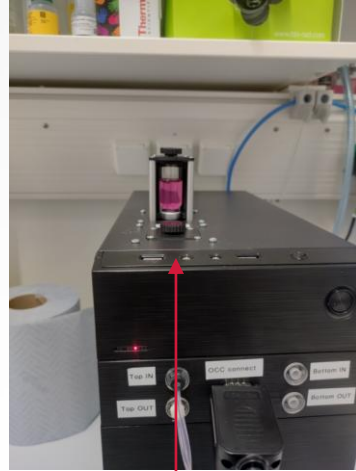
More technical details in the Appendix

VITROFLOW – UP & RUNNING

- Although the VitroFlow is not yet available in its final form, it is currently being manufactured in small quantities (3 devices) (see below). The current device already has all the features of the desired end product and is being tested in several universities and clinics.



Chamber connection



Medium insert

The medium bottles are inserted here and lowered manually.

Pilotcustomers



AG Arndt,
Dr. Frank Nitsche
University Cologne



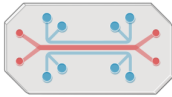
Pilot customers (in talks)
LMU Clinical Centre Munich
HIPS - Helmholtz Institute for
Pharmaceutical Research Saarland

EXPERIMENT JOURNEY: START YOUR OOC

After getting started the VitroFlow offers unique capabilities for in-, on- & at-line analysis of your OoC.

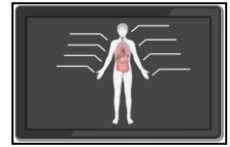
1 Choose your Chip

- a) Monolayer-Flow-Chips for easy single- & multi-organ experiments
- b) Doublelayer-Flow-Chips for vascularized tissues and blood-organ-interactions



3 Set your Parameters ~10 min

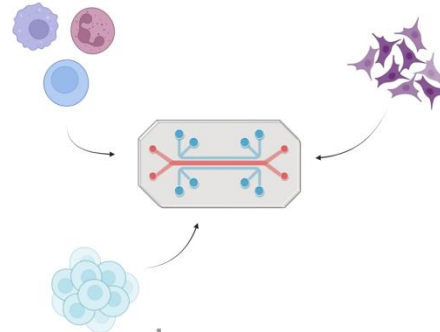
- a) Choose from respective protocols for established protocols
- b) Edit any parameter according to your need (i.e. body temperature, CO₂-concentrations, flow rate)



2

Seed your Chip ~48h

- a) With immortalized cell-lines
- b) With patient derived cells
- c) With Tissue-fragments
- d) With Stem cells



EXPERIMENT JOURNEY: ANALYZE YOUR OOC

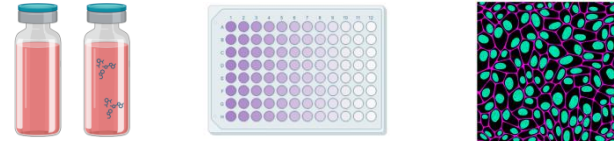
● The VitroFlow offers easy configuration, setup and adaption of your OoC.

After clicking „Run“, the VitroFlow does all the rest.

- Managing your set parameters
- Checking pH of the cellculture medium
- Changing cellculture medium when depleted

Analyze your OoC post experiment

- Substrate analysis
- Any genetic and biochemical analysis of the OoC
- Fixation and Histological analysis



4

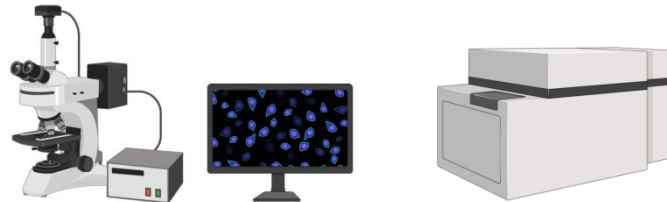
5

6



Analyze your OoC during the experiment ~1d – 7d

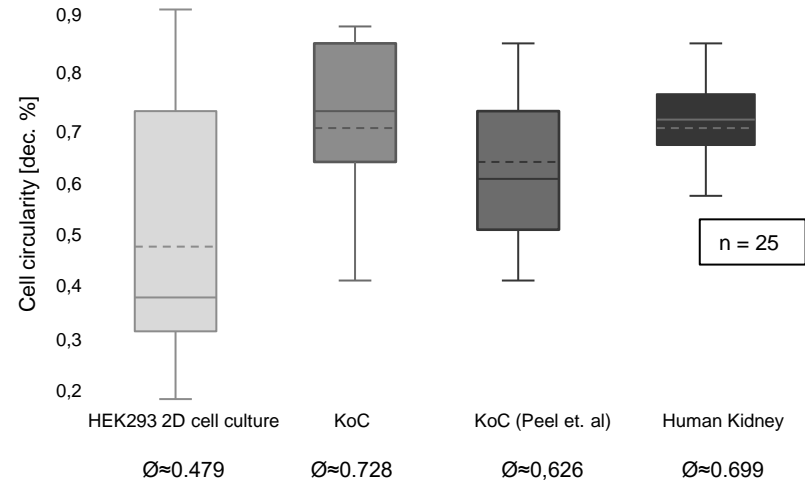
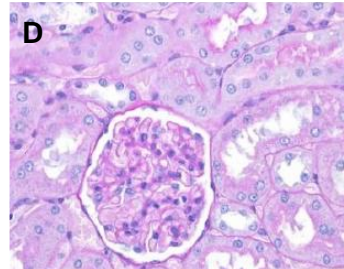
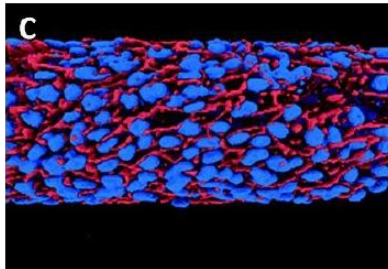
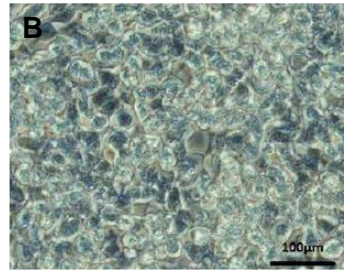
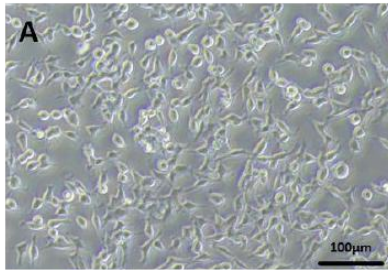
- With life imaging (any inverted microscope, incl. Phase contrast & Fluorescent microscopy)
- Substrate sampling
- Cell migration assays
- Physiological reactivity tests



7

REFERENCE CASE - Kidney-on-a-Chip

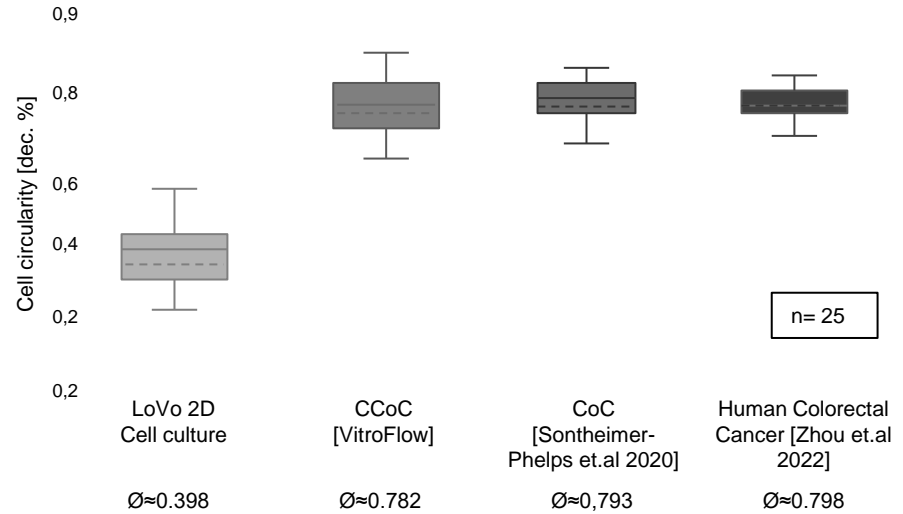
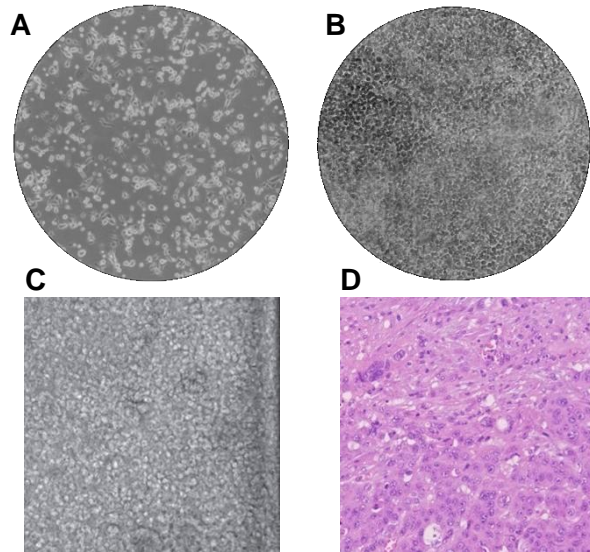
- We were able to successfully establish a kidney-on-a-chip model that comes closer to a human kidney than 2D cell culture and even than other OoC models.



Microscopic images: A HEK293 2D cell culture **B** Proof of concept: Kidney-on-a-chip **C** KoC model by Peel et al (Samanth Peel, 2019), Hoechst = blue, ZO1 = red **D** Histological cut of a human kidney. **Boxplot:** Cell circularity of HEK293 2D cell culture, different KoC models and human kidney.

REFERENCE CASE - Cancer-on-a-Chip

- We were also able to successfully create a cancer-on-a-chip model whose cell circularity comes closer to a human tissue than 2D cell culture.



Microscopic images: **A** LoVo 2D cell culture **B** Proof of concept: Colorectal-Cancer-on-a-chip (CCoC) **C** Colon-on-a-Chip model [A. Sontheimer-Phelps, Ingber et.al 2020] **D** Histological cut of a human colorectal cancer [P. Zhou et.al 2022]. **Boxplot:** Cell circularity of LoVo 2D cell culture, different C/CoC models and human colorectal cancer

CALL TO ACTION

- We offer a low entry barrier into the world of OoC and support you during the integration into your lab work flow at every step.



VitroFlow.Bio

One chip can be controlled with VitroFlow.Bio.

Up to **four organs** can be connected to each other and simulated.

Parameters are personalisable and **disease states** can be simulated.

Planned versions with higher throughput

Timeline:

Test VitroFlow.Bio
~4 weeks



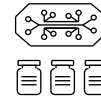
Rent VitroFlow.Bio
5.000€/6 months



**Sale / Extend
renting period**

At the same time, we support you from both the technical and biological side.

Further products:



VitroFluids

Cell culture Media
and other Consumables



Development Service

Further individualization
Establishment of your OoCs



VitroFlow.Connect

Live monitoring of cells
Remote adaptation of parameters

VALIDATION

- The first proof-of-concept of our OoC platform is very promising and shows that the requirements are met. This assumption will be further validated with pilot customers.

Projects:



University of Cologne (Start 01.02.2024)

- Beetle-gut-on-a-chip



CMMC (Start 01.07.2024)

- Bone-marrow-on-a-Chip, Leukaemia research



CECAD (Start 15.04.2024)

- Cancer-on-a-Chip, Drug testing

Pilot customers (in talks)

LMU Clinical Centre Munich

University of Utrecht

HIPS - Saarland

Vitrofluidix



Feel free to contact us!



info@vitrofluidix.com

+49 175 1176605

www.vitrofluidix.com

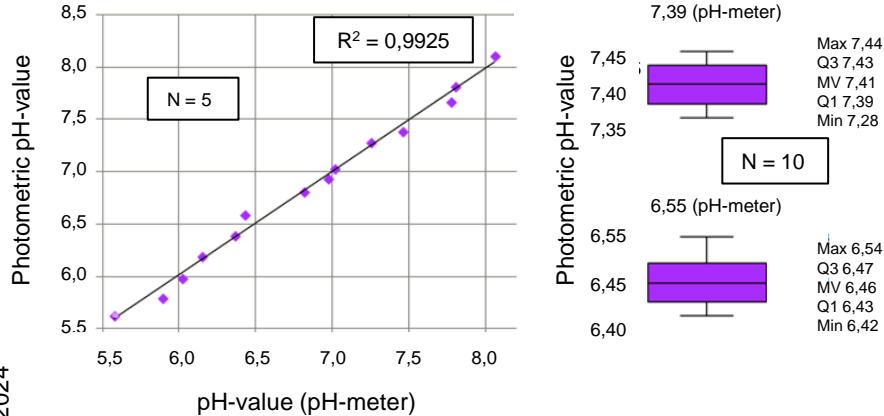
**BECOME ONE OF OUR PILOT CUSTOMERS AND DIVE INTO OOC TODAY
TO ACCELERATE YOUR RESEARCH**

We offer the possibility to rent VitroFlow.Bio as our pilot customer, whereby we support you in establishing your individual model.

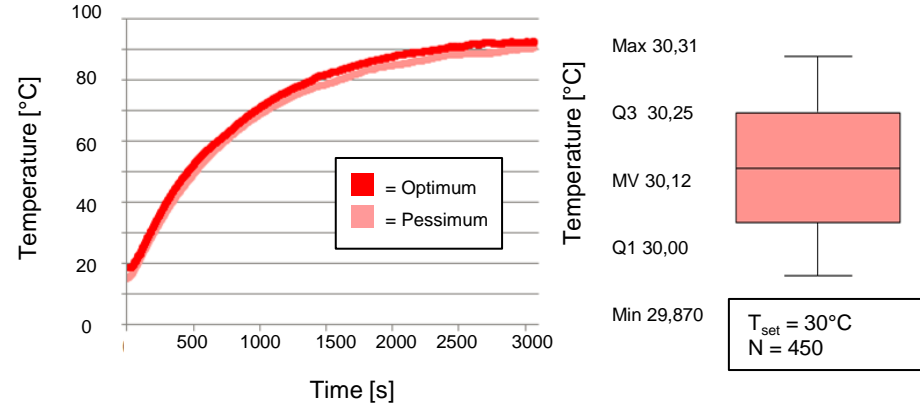
APPENDIX – TECHNICAL DATA OF THE VITROFLOW

For exact organ simulation, the device provides control over all the necessary parameters. As the graphs show, both pH of the cellculture medium and chip temperature are managed precisely.

Media changer: pH measurement



Incubationsystem: temperature



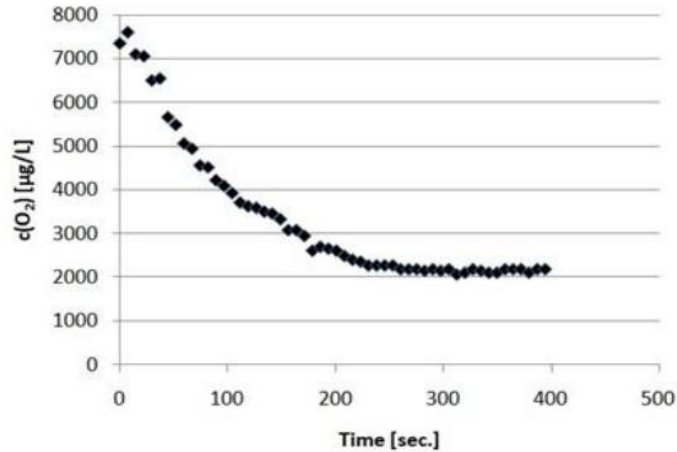
The data shows the functionality and that the device is able to accurately determine the pH value of a liquid over a longer period of time.

In addition, the technical feature of temperature control was checked: again functionality and precision.

APPENDIX – TECHNICAL DATA OF THE VITROFLOW

Oxygenation or oxygen enrichment and deoxygenation (oxygen deprivation) were analysed. As the graphs show, the incubation system developed is capable of both oxygenation and deoxygenation.

Deoxygenation



Reoxygenation

