

Bachelor / Master Thesis Proposal

Development of Flow-Stretch Bioreactor for Endothelial Cells



Universität
Zürich^{UZH}

 The Interface Group

Background

Von Willebrand Factor (vWF) is a large protein that plays a key role in coagulation and wound closure. It is secreted by endothelial cells (EC) into the blood stream, a process that is influenced among other factors by the strain and shear stress acting on the ECs. Patients with unphysiological blood flow conditions (e.g. through circulatory support pumps) often suffer from disrupted levels of vWF. Current studies suggest that impaired secretion of vWF could play a role. A better description of the correlation between mechanical stimuli on ECs and the secretion of vWF would help to understand underlying mechanisms and allow for new treatments. A detailed study of these effects in vitro requires a bioreactor to contain the cells while applying controlled levels of flow and stretch.

Project Goal

In this project, a bioreactor is to be developed which allows the culture of endothelial cells under flow and stretch. The envisioned system should be capable of covering a range of flow rates and strains.

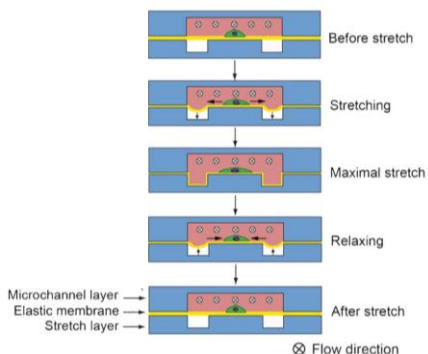
The project presents the opportunity of experiencing and driving the complete development process, including the design of the bioreactor and its manufacturing. Implementing the system into an existing flow loop and investigating interactions between unsteady flow rates and strains will complete the project.

You will

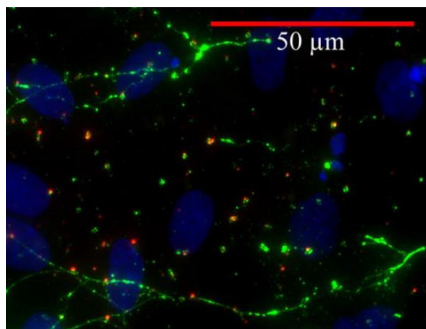
- experience the complete development process of a bioreactor
- gain insights into cell culture and bio-engineering lab work
- benefit from an interdisciplinary work environment

You bring

- basic experience with CAD
- basic knowledge of fluid dynamics
- interest for experimental work
- ability to work independently and reliably
- systematic and methodical approach to problem solving



Envisioned setup of bioreactor [1]



vWF strings on endothelial cells [2]

About us

The Interface Group addresses clinical needs through the convergence of engineering, biological, and medical research. The interdisciplinarity of our projects is reflected in our team and approach to problem solving.

We regard the link between research and education as the key to excellence in training.

Facts

Type: Bachelor / Master Thesis
Start: as of now
Duration: 3 / 6 months

Contact

Jonas Abeken
Interface Group
UZH Irchel, Y23 J78
jonas.abeken@uzh.ch

References:

- [1] Zheng, W., et al. (2012). Lab Chip, 12, 3441-3450
- [2] Turner, N. A., et al. (2009). Blood, 114(24), 5102-5111.



<https://interfacegroup.ch/>