Developmental BioEngineering

UNIVERSITY OF TWENTE.

Development of a Ligament on Chip

MASTER THESIS PROPOSAL

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PROJECT DESCRIPTION

Ligaments, critical components of the musculoskeletal system, play a fundamental role in providing stability and support to joints. However, studying ligament behavior in controlled laboratory settings has been challenging due to the intricate and dynamic nature of their microenvironment. Current *in vitro* models frequently lack the essential mechanical forces and cellular interactions necessary to preserve the inherent properties of ligaments. Therefore, there is a need for advanced models capable of accurately mimicking *in vivo* ligament conditions.

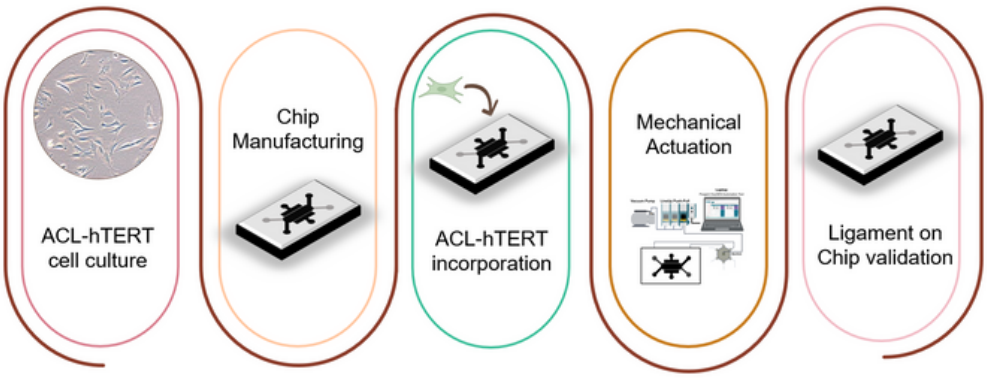
Organ-on-chip technology has emerged as a promising drug screening and disease modeling platform. These microfluidic devices offer a controlled environment that can mimic the mechanical, biochemical, and cellular components of human tissues. This research aims to develop a Ligament-on-chip (LoC) model that closely mimics the *in vivo* ligament environment to investigate new therapeutics and ligament diseases. By creating an accurate in vitro model, we can enhance our understanding of ligament pathophysiology and identify novel treatment options for patients with ligament injuries.

PROJECT OBJECTIVES

The master's student will focus on validating a recently designed LoC device. This will involve acquiring proficiency in microfabrication techniques for chip production, conducting cellular studies utilizing immortalized Anterior Cruciate Ligament Cells (ACL-hTERT), and assessing the effects of mechanical actuation on cell alignment and interaction within the chip. The objective is to create a model that closely mirrors the *in vivo* architecture of the ligament, thus achieving the highest level of physiological relevance.

Laboratory Techniques that the Master's student will acquire:
Cell culture and differentiation techniques, qPCR, ELISA, immunofluorescence, immunohistochemistry, microfabrication, microfluidics, microscopy (bright field, fluorescence, and confocal).
Competences/Skills:
Problem-solving, experimental design, planning and execution of experiments, data recording, data analysis, presentation to expert and non-expert audiences, scientific writing, and teamwork.

SUMMARY OF THE PROJECT



If you are interested of being part of the Developmental Bioengineering Group please contact **a.c.serranolarrea@utwente.nl**