

Project: Vascularized tumor model: Nanoparticle delivery and macrophage clearance

Period: 6 months from February to July 2027

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Internship location: Cell Fate Lab (lab webpage <https://cellfatelab.squarespace.com/>), Biochemistry and Cell Biology, Department of Natural and Health Sciences, Faculty of Science and Engineering, Åbo Akademi University, Turku, Finland

Project description

Despite their therapeutic potential, the clinical translation of nanoparticles remains challenging. Nanoparticles administered systemically must overcome multiple biological barriers before they can successfully deliver their therapeutic cargo to tumor cells. They need to remain in circulation long enough to reach the tumor, avoid uptake by macrophages, cross the vascular endothelium, penetrate and disperse through the tumor ECM, and ultimately reach the target area to deliver the therapeutic cargo. This project aims to recreate these key barriers in vitro using 3D printing techniques to create an organ-on-a-chip model, enabling the study of nanoparticle extravasation, tissue penetration, and nanoparticle uptake by tumor cells. The model will consist of a vascular barrier adjacent to a 3D tumor spheroid embedded within an ECM, with macrophages introduced through the vascular compartment. Surface-engineered nanoparticles with different surface charges will be perfused through the vascular compartment in the presence of macrophages to investigate how nanoparticle surface properties influence macrophage uptake and subsequent tumor delivery. The model will allow direct comparison between macrophage sequestration, endothelial extravasation, ECM penetration, and nanoparticle accumulation within the tumor. The following techniques will be applied: 3D printing, primary cell culture, 3D tumor spheroid culture, immunofluorescence staining, confocal microscopy and quantitative image analysis

Supervisors: Dr. Ezgi Özliseli, Prof. Cecilia Sahlgren

Requirements:

- Scientific English (spoken and written)
- Autonomy, scientific curiosity, rigor
- Good interpersonal skills and willingness to work in an interdisciplinary team
- Students from outside UU who participate in the Tackling health challenges in the internationally linked Research HUBs module.

Applications:

Interested students can apply by emailing their motivation letter and CV to the project supervisor Dr. Ezgi Özliseli (ezgi.ozliseli@abo.fi), and ÅA CHARM-EU Module Coordinator, Prof. Annika Meinander annika.meinander@abo.fi after which an online interview will be planned. The deadline for applications is 15th of October 2026.