

A microscopic image showing a dense field of platelets, which are small, disc-shaped cells. They are stained with a blue/purple dye, likely Wright's stain, which highlights their granules and nuclei. The platelets are distributed across the field of view, with some appearing more distinct than others due to focus or staining intensity.

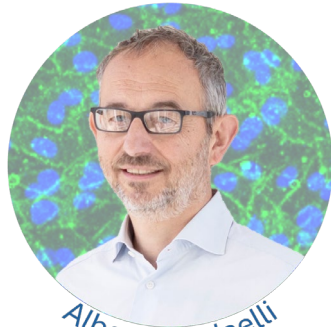
PLATELET FUNCTION AND THROMBOGENICITY

Labs



Th-Lab – Platelet function and thrombogenicity Lab

Team



Alberto Redaelli



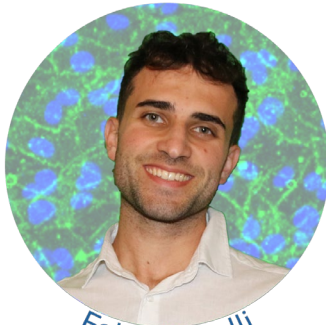
Giuseppe Passoni



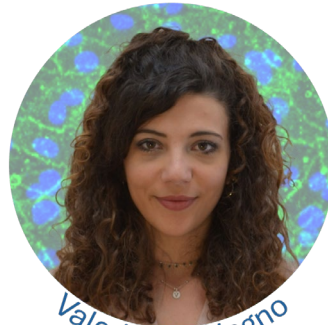
Silvia Bozzi



Tatiana Mencarini



Fabio Morelli



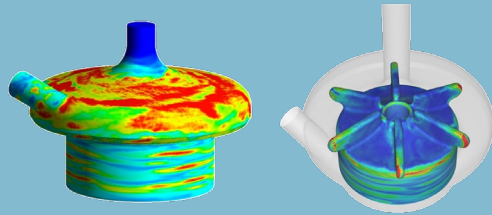
Valeria Guadagno



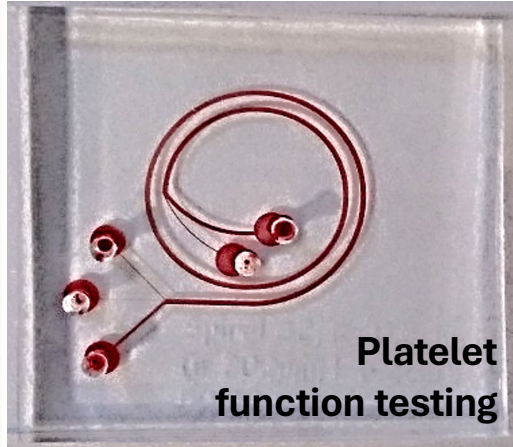
Francesca Vicinanza

Research Activities

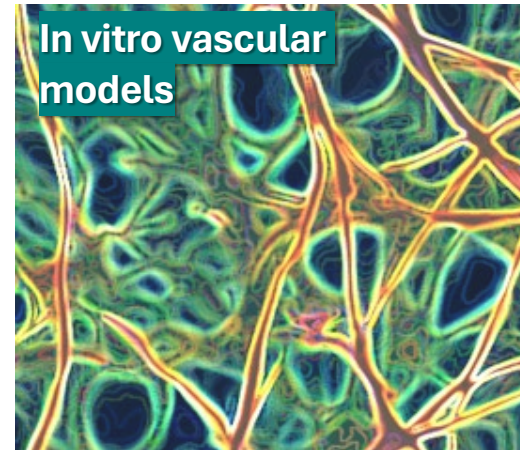
Thrombogenicity of blood-contacting medical devices



Platelet function testing



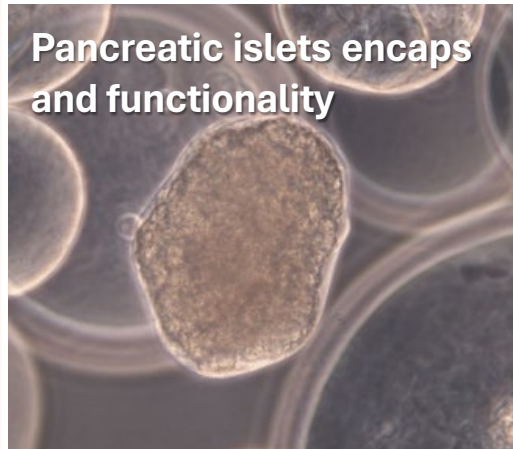
In vitro vascular models



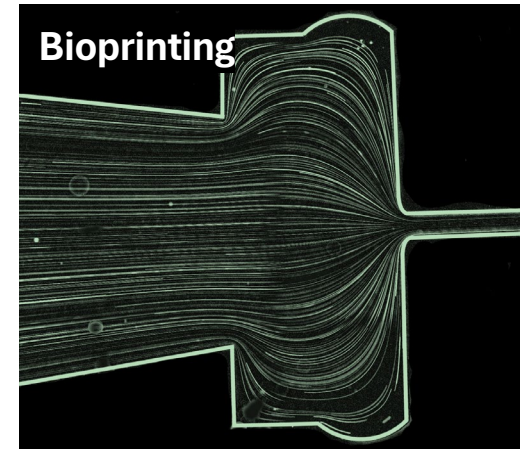
In vitro thrombogenicity testing



Pancreatic islets encaps and functionality



Bioprinting



Platelet function testing

THROMBOGENICITY OF BIOMATERIALS FOR BLOOD-CONTACTING MEDICAL DEVICES



Assess platelet adhesion and activation on biomaterials for blood-contacting medical devices

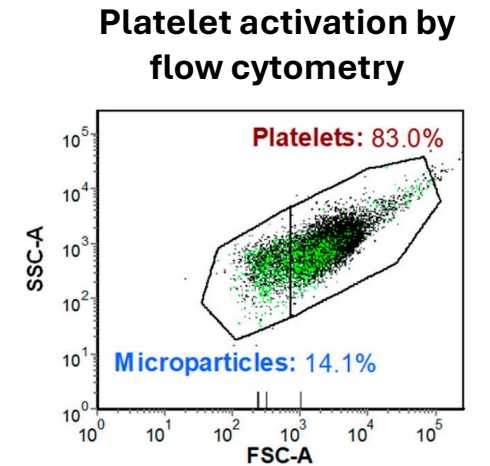
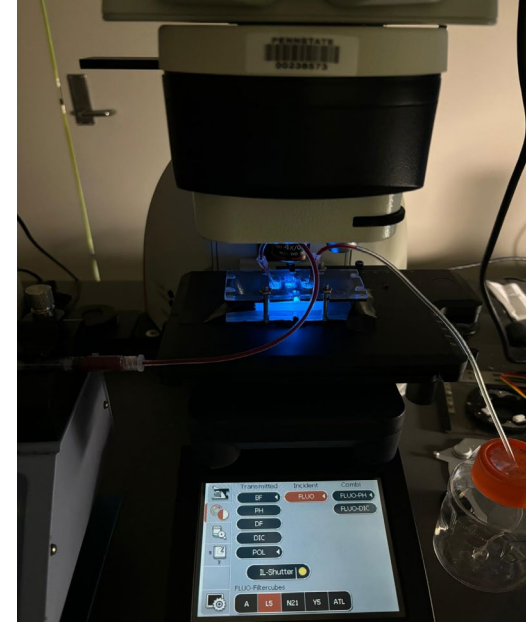
Activities

- Microfabrication
- Blood separation techniques
- Blood perfusion inside the microfluidic channels
- Investigate platelet adhesion by confocal fluorescence microscopy
- Image analysis
- Investigate platelet activation by flow cytometry

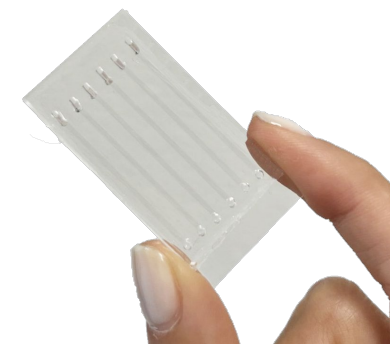
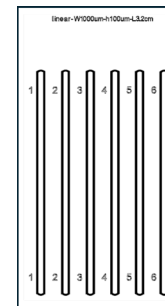
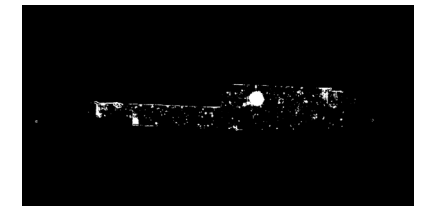
Applications

Stratification of the thrombotic risk of recipients of mechanical circulatory support devices

Background:
Jingying Lin et al., 2024



Imaging of platelet adhesion



Platelet function testing ATHEROGENIC FLOW DISTURBANCES AND VASCULAR INFLAMMATION IN A PERFUSABLE 3D STENOSIS MODEL



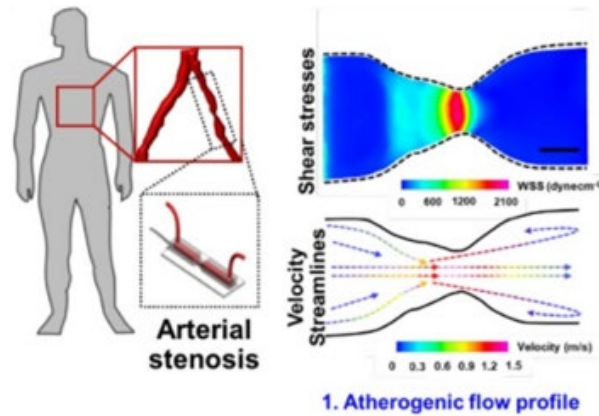
Assess the contribution of platelets and leukocytes in the development of thrombosis in a stenotic vessel model

Activities

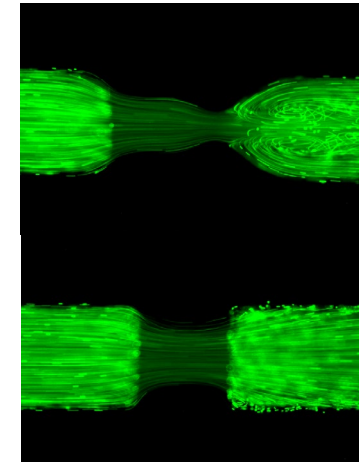
- Microfabrication
- Test different constriction geometries
- Evaluate platelets and leukocytes adhesion in stenotic channels with coating of different proteins
- Evaluate platelets and leukocytes adhesion in stenotic channels lined with endothelial cells
- Test anti-thrombotic and immunomodulatory efficacy of drugs

Applications

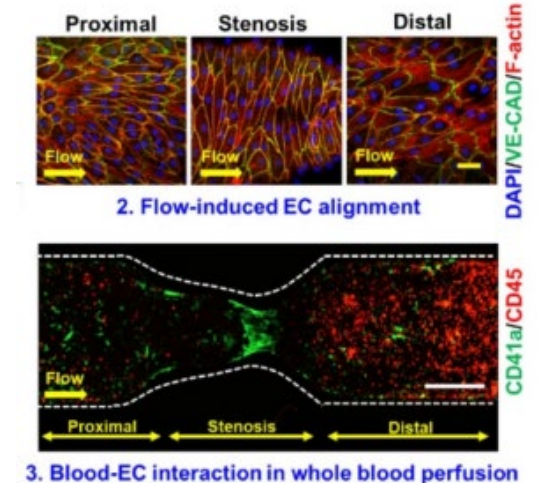
Atherogenesis



**Stenosis-on-chip:
blood flow disturbance**



**Fluorescent beads
perfusion**



**Platelets and
leukocytes adhesion**

Background:

Menon et al. Biofabrication 2021

Contacts:

Alberto Redaelli, Tatiana Mencarini

In vitro vascular models / Platelet function testing

ENDOTHELIAL CELLS - BLOOD INTERACTION



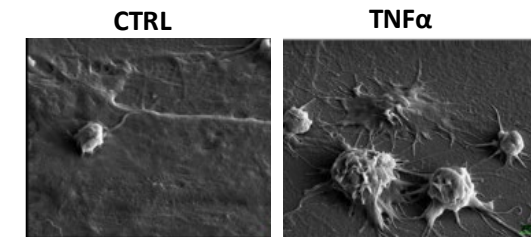
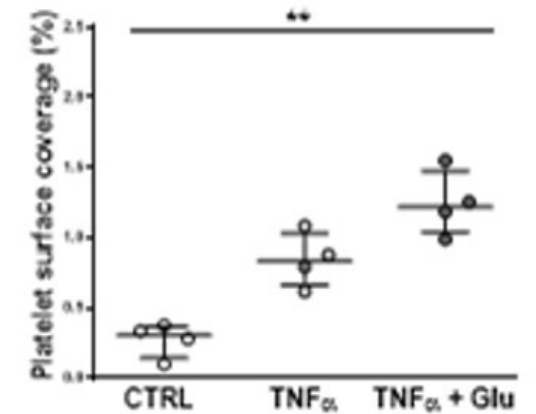
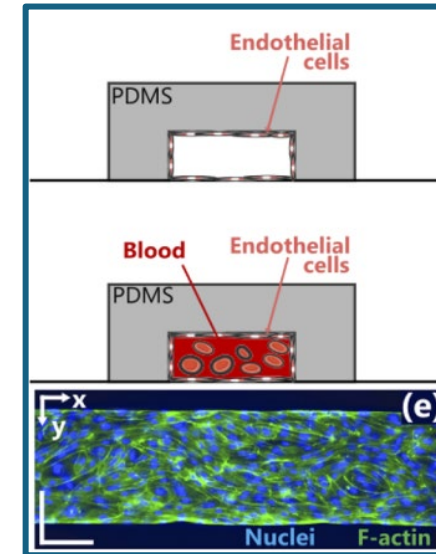
Develop and test microfluidic platforms for studying the interaction between pathological endothelium and blood components to assess thrombogenicity

Activities

- Microfabrication
- Seed endothelial cells into silicone microchannels
- Optimise protocols for endothelial cells treatment with inflammatory stimuli
- Assess monolayer maturation by fluorescent microscopy imaging
- Perfuse whole blood within the endothelialised channels at different shear stress conditions
- Investigate thrombus formation

Applications

Predict cardio-vascular disease progression in patients with diabetes and chronic kidney disease



Background:

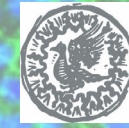
[Cuartas-Vèlez et al., 2023](#)

Contacts:

[Silvia Bozzi](#), [Tatiana Mencarini](#), [Francesca Vicinanza](#)

In vitro vascular models

ANGIOGENESIS-ON-A-CHIP



Fondazione IRCCS
Ca' Granda
Ospedale Maggiore
Policlinico



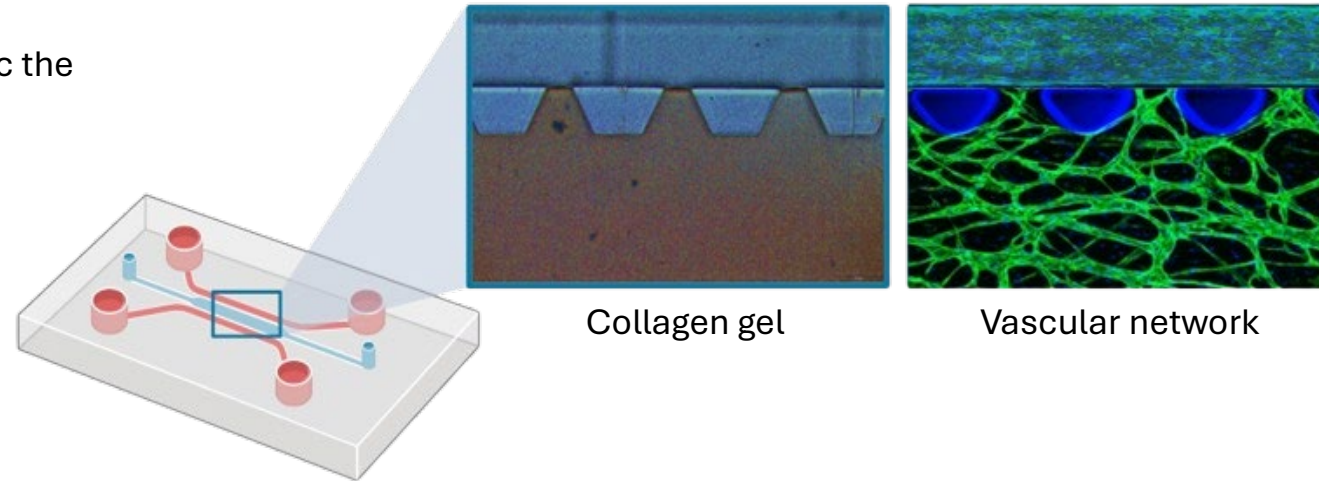
Develop and test microfluidic platforms for studying angiogenesis by optimizing hydrogel matrix and channel geometries

Activities

- Test different types of hydrogels (e.g., collagen, fibrin, PEG) to mimic the extracellular matrix
- Evaluate hydrogel mechanical properties
- Seed endothelial cells within the hydrogel
- Study how varying the distance between the pillars (trapezoidal structures in the image) affects vasculogenesis
- Monitor vascular network formation using microscopy and immunofluorescence staining

Applications

Investigate endothelial repair and regeneration after microvascular damage in patients with immune-mediated Thrombotic Thrombocytopenic Purpura (iTTP) and study how metabolic dysfunction affects angiogenesis in patients with Metabolic Associated Liver Disease (MASLD)



Background:

[Zheng Y et al., 2012](#)

Contacts:

[Silvia Bozzi](#), [Tatiana Mencarini](#), [Francesca Vicinanza](#)

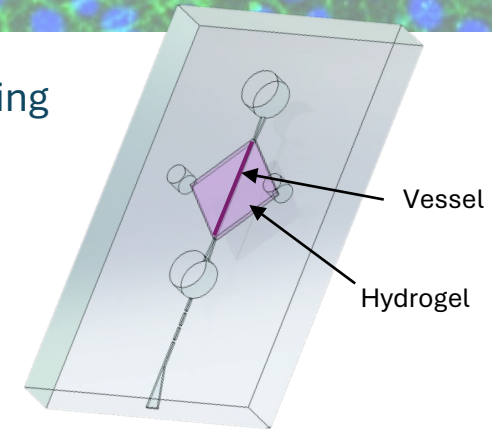
In vitro vascular models

3D PERFUSABLE VESSEL-ON-CHIP

The device: High-Fidelity Vessel-on-Chip model for *in vitro* studies of vascular diseases and drug screening

Features:

- PDMS platform
- Collagen I hydrogel constitutes the extracellular microenvironment
- Endothelial cells are seeded within the circular lumen shaped within the hydrogel



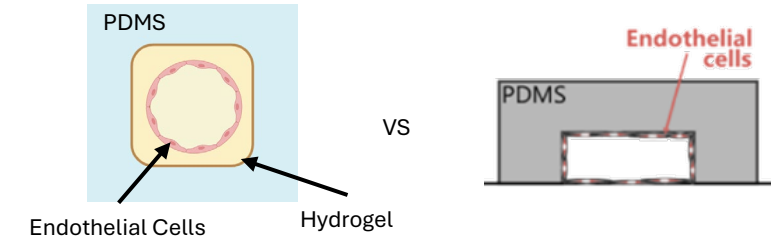
Project 1

Reconstructing the basal lamina for a realistic 3D vascular microenvironment



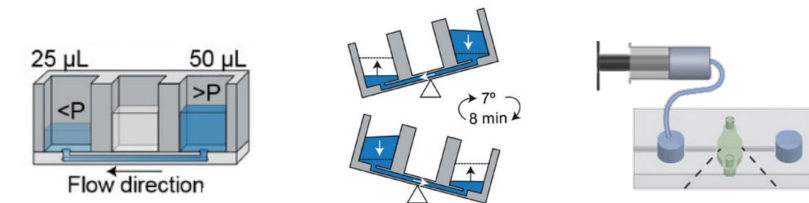
Project 2

Comparative analysis of endothelial cell response in a Vessel-on-Chip model with circular geometry and extracellular microenvironment vs. conventional rectangular PDMS channels



Project 3

Comparative analysis of different perfusion methods of a Vessel-on-Chip model



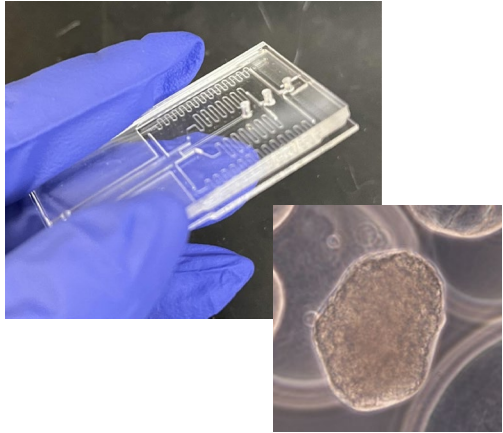
Background:

Cuartas-Vélez et al., Biomedical Optics Express 2023

Contacts: [Silvia Bozzi](#), [Valeria Guadagno](#)

Pancreatic islets

CONFORMAL ENCAPSULATION AND FUNCTIONALITY ASSESSMENT



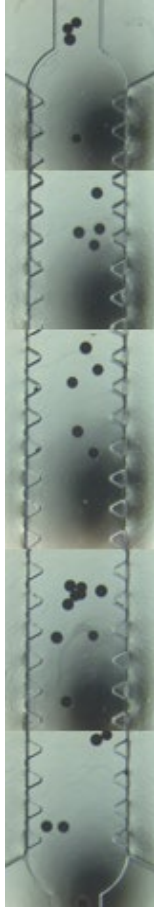
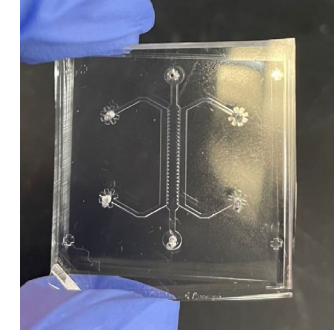
Encapsulation has the potential to allow islets transplantation without immunosuppression

↓
Microcapsules
may have failed because of **transport issues** associated with capsule **size**

↓
Conformal Coating
encapsulation addresses all the transport issues associated with capsule size

↓
Islets must be functional

↓
Assessment of islets' functionality in a **physiologically relevant microenvironment** prior to the implantation



• = islet

Activities

- CAD drawing (SolidWorks, autoCAD)
- Microfabrication
- Lab work (cell culture, flow loop, microscopy)

- Lab work (cell culture, gel prep)
- Microfabrication
- Lab assays (microscopy, FRAP, ELISA)

Contacts: [Alberto Redaelli](#), [Tatiana Mencarini](#)

3D extrusion-based bioprinting HIGH CELL DENSITY CONSTRUCTS



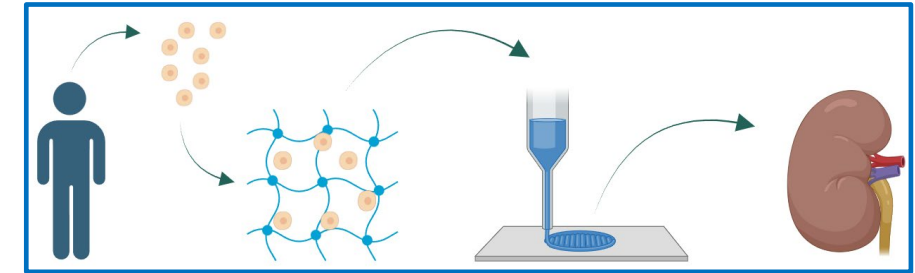
THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA



Optimization of the bioink-nozzle coupling

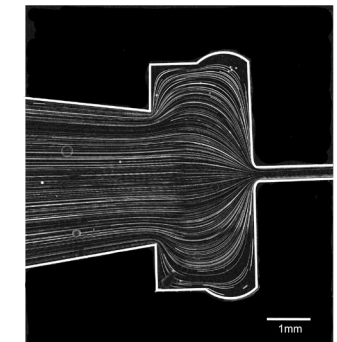
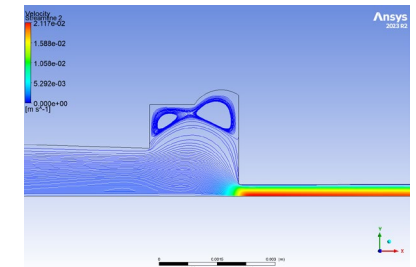
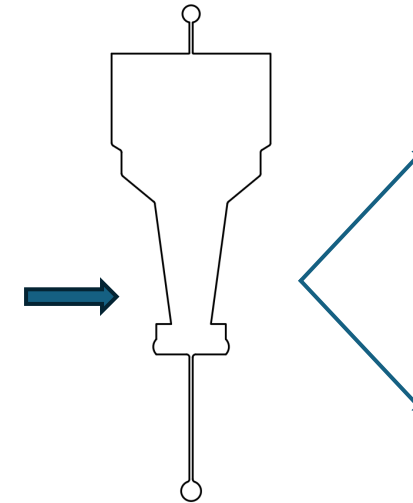
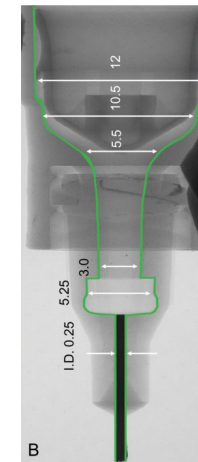
Task 1: Design of new gel precursors for bioink

Task 2: Design a new 3D printer nozzle, coupled with the bioinks



Activities

- Rheological characterization of the newly synthesised gels with/without cells
- Ansys fluid dynamics simulation of the flow in standard and in newly designed nozzles
- Microfabrication of nozzle model devices
- Validation of the model via fluorescent beads perfusion and imaging



Contacts: [Alberto Redaelli](#), [Tatiana Mencarini](#)

Active collaborations

