
Plan Overview

A Data Management Plan created using DMPOnline.be

Title: (C14/24/112) Closing the gap between cell mechanics and microvascular disease through Traction-Force-Microscopy-compatible vessel-on-a-chip

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Affiliation: KU Leuven (KUL)

Template: KU Leuven BOF-IOF

Principal Investigator: Hans Van Oosterwyck, Jyotsana Priyadarshani, Jorge Barrasa Fano

Project abstract:

Cerebral cavernous malformations (CCM) is a microvascular disease characterized by abnormal brain microcapillary beds resulting from mutations in CCM-complex genes, with no current cure. While recent research in simple in vitro models has shed light on the significance of biomechanics in CCM, much remains unknown. This project centers on deciphering the intricate interactions between endothelial cells (ECs) and pericytes within an advanced vessel-on-a-chip model. By integrating a 3D microfluidic platform with force quantification methods, the study aims to comprehensively elucidate the roles of EC and pericyte biomechanical forces in CCM progression, emphasizing the dynamic interplay between biochemical and biomechanical factors. Beyond advancing vessel-on-a-chip technology, the project holds promise for broader applications in vascular biology and disease research.

ID: 214129

Start date: 01-01-2024

End date: 30-09-2028

Last modified: 05-04-2025

(C14/24/112) Closing the gap between cell mechanics and microvascular disease through Traction-Force-Microscopy-compatible vessel-on-a-chip

Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.

Dataset name / ID	Description	New or reuse	Digital or Physical data	Data Type	File format	Data volume	Physical volume
		Indicate: <i>N</i> (ew data) or <i>E</i> (xisting data)	Indicate: <i>D</i> (igital) or <i>P</i> (hysical)	Indicate: Audiovisual Images Sound Numerical Textual Model Software Other (specify)		Indicate: <1GB <100GB <1TB <5TB >5TB NA	
Device fabrication	A new microfluidic device will be fabricated for disease modeling. For preparing the master mold for microfluidic channels, CAD geometry will be prepared to guide the 3D printer.	New	Digital and Physical	Hardware Numerical		<1Gb	
Microscopic data	Optical confocal microscopic data of device, cells, extracellular matrix (including nanobeads for traction force microscopy) and proteins of interest (immunofluorescence)	New	Digital	Images		<5Tb	
Rheology data	Data from mechanical characterization of hydrogels	New	Digital	Numerical		<1Gb	
Computational codes	Existing and new code for image and data processing/analysis and traction force microscopy	Existing & New	Digital	Software		<100 Gb	
Generated lab journal records and protocols for all experiments conducted.		New	Digital	Numerical	Office files, pdf	<100 Gb	
Presentations, abstracts, and manuscripts.		New	Digital	Numerical	Office files, bitmaps, pdf	<1Tb	

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:

Existing code from our group, as shared on <https://gitlab.kuleuven.be/MAtrix>.

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, refer to specific datasets or data types when appropriate and provide the relevant ethical approval number.

- No

Experiments are performed with commercially available (purchased) human endothelial cells and pericytes. Related EC approval

number S54744.

Will you process personal data? If so, please refer to specific datasets or data types when appropriate and provide the KU Leuven or UZ Leuven privacy register number (G or S number).

- No

Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, ...)? If so, please comment per dataset or data type where appropriate.

- Yes

The microfluidic device design and its application will be a patentable invention. Before necessary progress is made, we will seek guidance from LRD.

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material or Data transfer agreements, Research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.

- No

Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.

- No

Documentation and Metadata

Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g. in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, codebook.tsv etc. where this information is recorded).

The main results and methods will be published in peer-reviewed journals after filing application for the patentable part as per the KUL IP department and LRD guidance.

All generated data and metadata (experimental conditions, protocols used, reagents used, cells used) will be archived digitally. The templates for writing protocols and templates for Excel spreadsheets for raw data and data analysis will be noted and stored digitally. When we upload raw data to repositories, we will affix keywords and a readme file with the needed information for reuse. If any modification is adapted to the preexisting computational codes, KU Leuven's private Gitlab repository will be used for version control and ease of sharing (made available at <https://gitlab.kuleuven.be/MATrix>).

Will a metadata standard be used to make it easier to find and reuse the data?

If so, please specify which metadata standard will be used.

If not, please specify which metadata will be created to make the data easier to find and reuse.

- Yes

The metadata will be a combination of equipment-generated metadata (e.g. imaging conditions stored by the microscope software), standard operation procedures (SOP's), and lab journal records detailing all other relevant experimental details. The metadata will be included as keywords and all information about the data into readme files inserted with each dataset. The active Data Management Platform, ManGO from KU Leuven provides storage for metadata. In ManGO, metadata are stored as so-called AVUs (attribute-value-unit triples).

Data Storage & Back-up during the Research Project

Where will the data be stored?

- ManGO
- Large Volume Storage
- Other (specify below)
- Shared network drive (J-drive)
- Personal network drive (I-drive)

All data other than the large volume data sets (optical images and analyzed data) will be stored locally on the researcher's computer while being constantly synced to KU Leuven OneDrive. At the same time, all the data during the active research project will be stored on the university's Active Data Management Platform, ManGO. After the active research ends the data will be transferred either to a data repository for publication (e.g. RDR) or to a long-term storage service.

Large-volume data sets will be stored in the KU Leuven Large Volume Storage drive (L: drive).

How will the data be backed up?

- Standard back-up provided by KU Leuven ICTS for my storage solution

The researcher's computers will be permanently synced using KU Leuven OneDrive (cloud service available per KU Leuven researcher) and the data on the network drives will be kept secure and backed up by the university ICTS services.

Is there currently sufficient storage & backup capacity during the project?

If no or insufficient storage or backup capacities are available, explain how this will be taken care of.

- Yes

How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

Storage on university network drives are secure data storage solutions with security services managed by the University ICTS department. They provide the options to control data access by authorised persons and maintain backups in secure physical locations. The above-mentioned storage sites are compatible with GDPR regulations.

What are the expected costs for data storage and backup during the research project? How will these costs be covered?

Storage space on the ManGo platform during the active research period and afterward KU Leuven L: drives will be acquired based on project needs.

The storage on the ManGO platform costs €35 per TB per year and a maximum of 1 TB of storage is offered free of charge. Further, the cost for long-term storage L: drives are estimated at 104.42 €/yr./TB) and will be covered by the project consumables budget.

Data Preservation after the end of the Research Project

Which data will be retained for 10 years (or longer, in agreement with other retention policies that are applicable) after the end of the project?

In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).

- All data will be preserved for 10 years according to KU Leuven RDM policy

All digital data and metadata will be retained for at least 10 years.

Where will these data be archived (stored and curated for the long-term)?

- Large Volume Storage (longterm for large volumes)

All digital data will be archived on KU Leuven L: drive.

What are the expected costs for data preservation during the expected retention period? How will these costs be covered?

See before for estimated costs per year per Tb. Total data estimate for the entire project < 5 Tb

Data Sharing and Reuse

Will the data (or part of the data) be made available for reuse after/during the project?

Please explain per dataset or data type which data will be made available.

- Yes, as open data

The main findings of the research with all supporting processed data will be made available via publications in peer-reviewed journals. Publishing all raw data associated with published manuscripts on KU Leuven's Research Data Repository (RDR, free of cost for up to 50GB/year) will be considered.

The Van Oosterwyck's Gitlab repository will be used for sharing computational codes. Again the patentable data will only be published online as per IP regulations after patent application submission.

If access is restricted, please specify who will be able to access the data and under what conditions.

The supervisors and the researchers will have access to all the generated data. The data in the publications will be publicly available (at a cost though, if the journals require so). The availability of the other data to any requestor will be dealt with on a case-by-case basis. If a valid scientific or societal benefit and non-profit reason exist, the data will be freely shared, except to direct competitors.

Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)?

Please explain per dataset or data type where appropriate.

- Yes, intellectual property rights

The patentable data will only be shared online as per IP regulations after patent application submission and being published online.

Where will the data be made available?

If already known, please provide a repository per dataset or data type.

- KU Leuven RDR (Research Data Repository)
- Other data repository (specify below)

Publishing all raw data associated with published manuscripts on the Research Data Repository (RDR, free of cost for up to 50GB/year) will be considered.

The Van Oosterwyck's Gitlab repository will be used for sharing computational codes: <https://gitlab.kuleuven.be/MAtrix>

When will the data be made available?

- Upon publication of research results

The findings will be made available as publications at logical points during the project when the research questions have been sufficiently addressed. The other data would be made available upon request, where considered appropriate, after the publications.

Which data usage licenses are you going to provide?

If none, please explain why.

- GNU GPL-3.0 (code)

Codes will be shared under the terms of the GNU Lesser General Public License as published by the Free Software Foundation, either version 3 of the License, or any later version.

Do you intend to add a persistent identifier (PID) to your dataset(s), e.g. a DOI or accession number? If already available, please provide it here.

- Yes, a PID will be added upon deposit in a data repository

Data uploaded to the RDR will get a DOI that can be used to cite the data.

What are the expected costs for data sharing? How will these costs be covered?

KU Leuven ICTS provides a free of charge access to Gitlab for up to 25GB.

Responsibilities

Who will manage data documentation and metadata during the research project?

The researcher will be responsible for the documentation and the metadata.

Who will manage data storage and backup during the research project?

The researcher and the supervisors will jointly ensure proper data storage and back up during the project.

Who will manage data preservation and sharing?

Prof. Hans Van Oosterwyck.

Who will update and implement this DMP?

Prof. Hans Van Oosterwyck.