BOF research project C14/23/093

A Data Management Plan created using DMPonline.be

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Project abstract:

In this project we aim to develop stimulus responsive, artificial tissues based on polysaccharide nanoparticle-stabilized multiphase materials and optical nanoparticles, together with optical methods allowing in situ mechanostimulation of individual cells and simultaneous readout of cellular responses (i.e., electrical responses, contractility, and inflammation markers (e.g. pH, temperature)). We will explore the ability of these materials to support and guide cell growth by matrix generated mechanical stimuli and to monitor changes in cell activity, in situ, at single cell level, in 3D cultures of electrogenic cells (i.e. myogenic cells). Such optically addressable platforms would provide unique tools for probing cell-matrix interactions and subsequently understand cell and tissue morphogenesis and will find direct applicability in organ-on-chip systems and soft robotics.

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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: N(ew data) or E(xisting data)	Indicate: **D**(igital) or **P**(hysical)	Indicate: **A**udiovisual **I**mages **S**ound **N**umerical **T**extual **M**odel **SO**ftware Other (specify)		Indicate: <1GB <100GB <1TB <5TB >5TB NA	
	Optical and AFM microscopy data and images (WP1, 2 AND 3)	N	D	I, Video	TIFF, JPG, PNG mp4	> 5 TB	Project folder on Network storage at the Dept of Physics and Astronomy (fysad.fys.kuleuven.be/shares)
	Characterization raw data (NP and hydrogel properties) (wp1,2)	N	D	N	TXT	< 100GB	Project folder on Network storage at the Dept of Physics and Astronomy (fysad.fys.kuleuven.be/shares)
	Processed data (NP, hydrogel, calculated electrophysiology parameters etc. (WP1,2,3)	N	D	N, T, SO	xlsx txt mat	<5TB	Project folder on Network storage at the Dept of Physics and Astronomy (fysad.fys.kuleuven.be/shares)
	Analysis scripts and codes for data analysis	N	D	SO	m(at) py(w) .r, .dll	<1GB	Project folder on Network storage at the Dept of Physics and Astronomy (fysad.fys.kuleuven.be/shares)
	Presentation, protocols, reports	N	D	A, I, T	DOCX, PDF, PPTX	<1TB	Project folder on Network storage at the Dept of Physics and Astronomy (fysad.fys.kuleuven.be/shares)
	Hydrogel encapsulated or printed cells and derived RNA and protein lysate (WP1, 2 and 3)	N	P				500 samples
	Embedded cells and printed tissues with derived microscopy slides (WP1, 2 and 3)	N	P				500 samples
	Microscopy images of (immuno)histological stainings (WP3)	N	D	I	TIFF JPG PNG	<1TB	Project folder on Network storage at the Tissue Engineering Lab
	Bioprinting parameters (WP3)	N	D	T, SO	DOCX PDF G-code, STM	<1GB	Project folder on Network storage at the Tissue Engineering Lab
	Lab notebooks (WP1, 2 and 3)	N	D	T		<1GB	Benchling
	Chemical characterization data (SusMat)	N	D	N	.dx (NMR, FTIR), .vms (XPS), .ods (EA)	<100 GB	
	Physical characterization data (SusMat)	N	D	N	TIFF (SEM), TXT (TGA), TXT (Surface pressure), .edf/.h5 (SWAXS)	<100 GB	

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:

No reuse of existing data

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

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.

- No

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).

SusMat:
Detailed lab notes will be kept in an electronic lab notebook (RSpace) server, located on premise at KU Leuven. Serial numbers will be used to link these lab notes to data stored in the SET zone of the KU Leuven iRODS storage system (ManGO) through the metadata catalogue. Additional metadata will be extracted from data files and added to this catalogue (dependent on the experimental technique), along with the project identifier to ensure that all data is findable. All data will be exported from proprietary software in a format that is open-source and/or human readable to allow continued use in the event of deprecation of the proprietary software.

WP2, Department of Physics:
Data in WP2 and parts of data acquired in WP1 and 3 in the Nanobiophysics Labs (C. Bartic) will be kept on a shared secured network drive (fysad.fys.kuleuven.be) and will be uploaded and updated by a member of the research team every time a new experiment takes place or data is being generated.
The names of the files will be structured in a comprehensible way: Experiment type/date/main parameters used. In addition, data will be stored in a folder per experimental setup, the type of investigated sample and the acquision/generation date. The analysis files will contain notes describing the analysis procedure and mention which original data files are included. A readme file describing the goal of the experiment and

the analysis procedure will be stored in the folder where the data is saved.

WP3, Department of Development and Regeneration:

All experiments (for WP3, but also WP1 and WP2) will be documented in an electronic laboratory notebook using the online tool Benchling. The notes will include the experimental set-up and protocols used, information on the (biological) samoles used, the raw data obtained from the experiment, location of samples generated during the experiment and possible remarks by the researcher.

ManGo will be used to classify images from microscopes.

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

Metadata will be manually added in the experiment folders and files to label the experimental data, acquisition protocol and context within the project.

SusMat:

All data stored in ManGO will have the experiment identifier (linking to notes in the ELN), technique and project identifier attached. Additional, technique dependent metadata will be extracted from data files where possible.

Upon data publication in RDR, DataCite metadata standard will be used.

Data Storage & Back-up during the Research Project

Where will the data be stored?

- ManGO
- Shared network drive (J-drive)
- OneDrive (KU Leuven)
- Sharepoint online
- Large Volume Storage
- Other (specify below)

Time-stamped copies of the data will be kept on personal secured KU Leuven onedrive by individual users collecting the data and on the shared network drive at the Dept of Physics and Astronomy (fysad) and the Dept of Development and Regeneration.

SusMat:

Data will be stored in ManGO. Experimental notes (metadata) will be stored in the Gbiomed RSpace server (rspace.gbiomed.kuleuven.be) on KUL backend storage.

How will the data be backed up?

- Standard back-up provided by KU Leuven ICTS for my storage solution
- Personal back-ups I make (specify below)

Data acquired by C. Bartic's team will be backed up and stored on the servers at the Dept of Physics and Astronomy.

Data acquired by H. Declercq's team will have periodical exports saved on KU Leuven drives.

SusMat:

ManGO is mirrored at two physical locations, with snapshots taken outside the iRODS system in order to provide protection against unintended data loss. Additional monthly backup to KUL Archive storage will be performed by Samuel Eyley.

The RSpace server is managed by KUL ICTS, with mirroring and snapshotting to prevent data loss.

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?

For the Nanobiophysics data, only team members have access to the shared files. Access is controlled by the ICT team at the department of physics.
The data stored in Benchling and on the university's servers are password controlled and can only be accessed when granted permission.
SusMat:
Data stored in ManGO and RSpace is protected by KUL central login with mandatory MFA. Access to the data is strictly controlled to those working actively on the project and under exceptional circumstances, members of KUL ICTS to the extent necessary to maintain the proper functioning of the storage systems.

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

Data generated by C. Bartic's lab members: Sufficient storage volume is available in the recently updated departmental network storage infrastructure. The cost for additional storage volume following the current cost model is 1316 € for 20 TB for 5 years, which would give a cost of 2632 € for 20TB to be stored for 10 years.For active data management, the ManGO 1TB project folder will cost 35 €/Y, 140 € for the project duration. As an alternative/comparison, large volume storage from central ICTS amounts to 20884 € for 20TB to be stored for 10 years.
A yearly budget of ± 2500 euro/year will be reserved for data storage, to be provided by current project or running projects after current project completion.
Excepted costs for the data storage and backup for the team of H. Declercq is estimated at 2000 euro/year that will be provided by the current project.
SusMat:
ManGO: €140
Archive storage: €400
based on 1 Tb active data.

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

After project completion, data generated and treated by C. Bartic's team will be either preserved on the servers at the Dept of Physics and Astronomy or, if not possible, transferred to the large storage volumes of the KUL for 10 year preservation.
The team of H. Declercq will retain the data for at least 10 years. Due to physical preservation issues of biological samples, physical data that can be easily reproduced is not retained longer than necessary.
SusMat:
Unpublished data will be retained on KU Leuven archive storage (LVS) for 10 years. Published data will be retained for a minimum of 10 years on RDR according to their retention policy.

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

- Shared network drive (J-drive)
- Large Volume Storage (longterm for large volumes)
- KU Leuven RDR

SusMat:

Data related to published manuscripts will be published in RDR or a suitable subject specific repository.

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

The costs will be covered from the working costs of the running projects.

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

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

Not applicable

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.

- No

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)

When will the data be made available?

- Upon publication of research results

Which data usage licenses are you going to provide?

If none, please explain why.

- CC-BY 4.0 (data)

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

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

we estimate a cost of 2500 euro/year per research team to be covered from the current project.

Responsibilities

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

All researchers generating data for this project are responsible for its documentation and metadata. The supervisors (W. Thielemans, C. Bartic, H. Declercq) bear the responsibility for the data documentation and metadata.

SusMat:
Sinith Rashmin Withanage and Samuel Eyley are responsible for documentation and metadata related to their own data produced during the project.

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

The PI's and researchers involved in the project.
SusMat:
Sinith Rashmin Withanage and Samuel Eyley are responsible for the appropriate storage of their own data during the project (in line with this DMP). Additional data backup will be performed by Samuel Eyley.

Who will manage data preservation and sharing?

The corresponding author of the published data will be responsible for sharing the data appropriately.
SusMat:
Additional data preservation (past the end of the project) will be managed by Samuel Eyley and Wim Thielemans.

Who will update and implement this DMP?

The supervisors (W. Thielemans, C. Bartic, H. Declercq) of the project.
SusMat:
Samuel Eyley (on behalf of Wim Thielemans)