FWO DMP Template - Flemish Standard Data Management Plan

Project supervisors (from application round 2018 onwards) and fellows (from application round 2020 onwards) will, upon being awarded their project or fellowship, be invited to develop their answers to the data management related questions into a DMP. The FWO expects a **completed DMP no later than 6 months after the official start date** of the project or fellowship. The DMP should not be submitted to FWO but to the research co-ordination office of the host institute; FWO may request the DMP in a random check.

At the end of the project, the **final version of the DMP** has to be added to the final report of the project; this should be submitted to FWO by the supervisor-spokesperson through FWO's e-portal. This DMP may of course have been updated since its first version. The DMP is an element in the final evaluation of the project by the relevant expert panel. Both the DMP submitted within the first 6 months after the start date and the final DMP may use this template.

The DMP template used by the Research Foundation Flanders (FWO) corresponds with the Flemish Standard Data Management Plan. This Flemish Standard DMP was developed by the Flemish Research Data Network (FRDN) Task Force DMP which comprises representatives of all Flemish funders and research institutions. This is a standardized DMP template based on the previous FWO template that contains the core requirements for data management planning. To increase understanding and facilitate completion of the DMP, a standardized **glossary** of definitions and abbreviations is available via the following link.

	1. General Project Information
Name Grant Holder & ORCID	Cynthia Van Rompay ORCID: 0000-0002-0283-3204
Contributor name(s) (+ ORCID) & roles	Prof. Xavier Casadevall i Solvas ORCID: 0000-0002-3015-7178
	Prof. Marianne Carlon ORCID: 0000-0002-8263-0350
	Dr. Eng. Kevin Tabury ORCID: 0000-0002-8004-3718
Project number ¹ & title	3E221242: Long-term storage of Organ-on-Chip: from deep space exploration to organ preservation on
	Earth
Funder(s) GrantID ²	1S10523N
Affiliation(s)	XI KU Leuven
	☐ Universiteit Antwerpen
	☐ Universiteit Gent
	☐ Universiteit Hasselt
	☐ Vrije Universiteit Brussel
	X Other: Belgian Nuclear Research Centre (SCK CEN) - https://ror.org/020xs5r81
	Provide ROR ³ identifier when possible:

¹ "Project number" refers to the institutional project number. This question is optional since not every institution has an internal project number different from the GrantID. Applicants can only provide one project number.

² Funder(s) GrantID refers to the number of the DMP at the funder(s), here one can specify multiple GrantIDs if multiple funding sources were used.

³ Research Organization Registry Community. https://ror.org/

Please provide a short p	project description
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Space biological research studies the effects of the hostile space environment on the human body to enable future deep-space manned missions. As access to the ISS is limited, ground-based facilities are available on Earth to simulate different space stressors. Investigating the harmful effects of space on the human body is crucial to perform health risk assessments of astronauts during deep-space missions. Organ-on-chips (OoC) are complex 3D cell culture models derived from human cells and can be used to mimic adverse health effects occurring in the astronaut's body in space. OoCs require extensive resources and are time costly. To date, no off the shelf or long-term storage solutions are available for these OoCs. This PhD aims to develop a long-term storage method which extrapolation is not only relevant for deep-space manned missions, but also in organ preservation for transplantation purposes. During this project both cryopreservation (WP1) and hibernation-like state methodologies (WP2) will be developed for OoCs. Additionally, the effects of simulated space stressors on OoCs (WP3) and the protective mechanism from developed preservation methodologies on the effect of simulated space stressors (WP4) will be studied. This PhD proposal envisions to bring a solution to this medical need and would therefore benefits not only the space industry in Flanders but would also contribute to place Flanders biotech/pharma as leader in long-term storage of transplantation organs.

2. 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 data⁴.

				ONLY FOR DIGITAL DATA	ONLY FOR DIGITAL DATA	ONLY FOR DIGITAL DATA	ONLY FOR PHYSICAL DATA
Dataset	Description	New or Reused	Digital or	Digital Data Type	Digital Data	Digital Data	Physical Volume
Name			Physical		Format	Volume (MB, GB,	
						TB)	
		☐ Generate new	☐ Digital	☐ Observational	☐ .por	□ < 100 MB	
		data	☐ Physical	☐ Experimental	☐ .xml	□ < 1 GB	
		☐ Reuse existing		\square Compiled/	☐ .tab	□ < 100 GB	
		data		aggregated data	□ .csv	□ < 1 TB	
				☐ Simulation	\square .pdf	□ < 5 TB	
				data	☐ .txt	□ < 10 TB	
				☐ Software	☐ .rtf	□ < 50 TB	
				☐ Other	\square .dwg	□ > 50 TB	
				□NA	☐ .tab	□ NA	
					☐ .gml		
					\square other:		
					□ NA		
Microscopy	Fluorescent and	☐ Generate new	☐ Digital	☐ Experimental	\square other: .nd2, .tif	□ < 5 TB	
Images	Confocal microscopy	data					
	of Extracellular						
	matrix and						
	surrounding cells						
	inside the						
	microfluidic PDMS						
	chips						

⁴ Add rows for each dataset you want to describe.

Microscopy	Fluorescent and	☐ Generate new	☐ Digital	☐ Experimental	\square other: .mp4	□ < 5 TB	
movies	Confocal microscopy	data					
	of Extracellular						
	matrix and						
	surrounding cells						
	inside the						
	microfluidic PDMS						
	chips						
Transcriptomi	RNA sequencing and	☐ Generate new	\square Digital	☐ Experimental	\square other: FastQ;	□ < 5 TB	
c and	proteomics	data			.Rmd		
proteomic					□ .csv		
data							
TEXT	Protocols,	☐ Generate new	☐ Digital	☐ Observational	□ .txt	□ < 1 TB	1 laboratory
	description of	data	☐ Physical	☐ Experimental	□ .csv		book/year
	research results,				\square .pdf		
	literature studies,						
	data analysis and						
	presentation						

GUIDANCE:	
DATA CAN BE DIGITAL OR PHYSICAL (FOR EXAMPLE BIOBANK, BIOLOGICAL METHOD.	SAMPLES,). DATA TYPE: DATA ARE OFTEN GROUPED BY TYPE (OBSERVATIONAL, EXPERIMENTAL ETC.), FORMAT AND/OR COLLECTION/GENERATION
	SOR READINGS, SENSORY OBSERVATIONS); EXPERIMENTAL (E.G. MICROSCOPY, SPECTROSCOPY, CHROMATOGRAMS, GENE SEQUENCES); ARIABLES, 3D MODELLING); SIMULATION DATA (E.G. CLIMATE MODELS); SOFTWARE, ETC.
EXAMPLES OF DATA FORMATS: TABULAR DATA (.POR,. SPSS, STRUCTURED DATA, DOCUMENTATION & COMPUTATIONAL SCRIPT.	D TEXT OR MARK-UP FILE XML, .TAB, .CSV), TEXTUAL DATA (.RTF, .XML, .TXT), GEOSPATIAL DATA (.DWG,. GML,), IMAGE DATA, AUDIO DATA, VIDEO
DIGITAL DATA VOLUME: PLEASE ESTIMATE THE UPPER LIMIT OF THE VOLU	IME OF THE DATA PER DATASET OR DATA TYPE.
PHYSICAL VOLUME: PLEASE ESTIMATE THE PHYSICAL VOLUME OF THE RES AFTER).	EARCH MATERIALS (FOR EXAMPLE THE NUMBER OF RELEVANT BIOLOGICAL SAMPLES THAT NEED TO BE STORED AND PRESERVED DURING THE PROJECT AND/OR
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.	
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, please describe these issues further and refer to specific datasets or data types when appropriate.	 Yes, human subject data Yes, animal data Yes, dual use No If yes, please describe:

⁵ These data are generated by combining multiple existing datasets.

Will you process personal data ⁶ ? If so, briefly describe the kind of personal data you will use. Please refer to specific datasets or data types when appropriate. If available, add the reference to your file in your host institution's privacy register.	 Yes X No If yes: Short description of the kind of personal data that will be used: Privacy Registry Reference:
Does your work have potential for commercial valorization (e.g. tech transfer, for example spinoffs, commercial exploitation,)? If so, please comment per dataset or data type where appropriate.	☑ Yes ☐ No If yes, please comment: As of today, no long-term preservation methods for organ-on-chip are available commercially. The methods that will be developed during this PhD have therefore the potential to generate patents that can lead to commercial exploitation or even a spin-off.
Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material/Data transfer agreements, research collaboration agreements)? If so, please explain to what data they relate and what restrictions are in place.	 ✓ Yes ☐ No If yes, please explain: Research collaboration agreement between KU Leuven and SCK CEN. Developed methodologies and their dependent results will be shared. Reporter vectors (ownership of KU Leuven) will be transfer to SCK CEN for experimental purposes on the heart-on-chip within this project.
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 to what data they relate and which restrictions will be asserted.	☑ Yes ☐ No If yes, please explain: In this project two organ-on-chips will be used. Ownership of the lung-on-chip belongs to KU Leuven while the ownership of the heart-on-chip belongs to SCK CEN. The preservation methods will be co-shared between KU Leuven and SCK CEN (50/50).

⁶ See Glossary Flemish Standard Data Management Plan

3. 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).

At KU Leuven:

- 1) Protocols (containing info about both materials (setting, parameters, set-up, ...) and methods), the research progress and obtained data, what they represent and how they were generated, will be collected and stored on the shared drive (K: drive) of KU Leuven. Here, folders will be made for all subtasks of the project. In each folder, a new protocol will be made for each experiment, named with the date and subject, as well as version tracking. For each experiment, all raw and analysed data files will be stored in a folder on the shared server.
- 2) A physical sample inventory will be stored in freezers and a file with sample details will be saved on the shared server.

At SCK CEN:

- 1) Protocols (containing info about both materials (setting, parameters, set-up, ...) and methods), the research progress and obtained data, what they represent and how they were generated, will be collected in the data management software (Alexandria) and complemented with a physical notebook. In Alexandria, each item receives its own identifier which is used throughout the progress reporting. The hierarchical folder structure will follow the one from KU Leuven.
- 2) A physical sample inventory will be stored in freezers and fridges. A file with sample details will be saved on Alexandria.

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.

REPOSITORIES COULD ASK TO DELIVER METADATA IN A CERTAIN FORMAT, WITH SPECIFIED ONTOLOGIES AND VOCABULARIES, I.E. STANDARD LISTS WITH UNIQUE IDENTIFIERS.

☐ Yes

 \boxtimes No

If yes, please specify (where appropriate per dataset or data type) which metadata standard will be used:

If no, please specify (where appropriate per dataset or data type) which metadata will be created:

At KU Leuven:

No uniform metadata standard is available for all different aspects and disciplines of this project. Therefore, we will create a uniform system ourselves to enhance the use of secondary data. As mentioned above, we will use the shared drive (K:) of KU Leuven to store protocols (containing info about both materials (setting, parameters, set-up, ...) and methods), the research progress and obtained data, what they represent and how they were generated. The folders on the server facilitates searching for particular metadata through a search engine, as well as linking of the metadata to the actual data will be facilitated.

At SCK CEN:

The data management software Alexandria utilize three aspects when generating the metadata of each unique identifier:

- Classification: the classification divides documents into particular groups, based on the same characteristics. A classification may be created when documents have certain templates, workflows, policies or attributes which are necessary to identify them into the system.
- Categories: a category is a group of attributes. The attributes are grouped by a specific topic, e.g. all attributes related to events are grouped into the category Event Attributes.
- Attributes: attributes are additional information fields, which gives the document a certain context: e.g. the author of the document.

4. Data Storage & Back-up during the Research Project		
Where will the data be stored?	All biological material at both institutions are under the Biobank of KU Leuven. Labcollector is used for data storage at KU Leuven (KUL). Alexandria is used for data storage at SCK CEN	
How will the data be backed up? What storage and backup procedures will be in place to prevent data loss? Describe the locations, storage media and procedures that will be used for storing and backing up digital and non-digital data during research. ⁷ Refer to institution-specific policies regarding backup procedures when appropriate.	At KU Leuven: Labcollector is a database hosted on a password protected KUL server, automatically backed up by KUL services. All data are traceable and stored beyond the 5-year requirement. At SCK CEN: All data is hosted on the SCK CEN protected servers (3 Tiers, RAID 6 level with double parity disks). Only SCK CEN personnel with SCK CEN computer can have access to the server (access right are limited depending on the hierarchical position). All data are traceable and stored beyond the 5-year requirement.	
Is there currently sufficient storage & backup capacity during the project? If yes, specify concisely. If no or insufficient storage or backup capacities are available, then explain how this will be taken care of.	 ⊠ Yes □ No If yes, please specify concisely: KU Leuven and SCK CEN ICT provide sufficient storage and back-up capacity during and after the project. A dedicated folder will be made for the project. If no, please specify: 	

⁷ Source: Ghent University Generic DMP Evaluation Rubric: https://osf.io/2z5g3/

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

CLEARLY DESCRIBE THE MEASURES (IN TERMS OF PHYSICAL SECURITY, NETWORK SECURITY, AND SECURITY OF COMPUTER SYSTEMS AND FILES) THAT WILL BE TAKEN TO ENSURE THAT STORED AND TRANSFERRED DATA ARE SAFE. 7

At KU Leuven:

The network drive for the FWO-SB project folder and the large volume storage folder are secured by the ICTS service of KU Leuven with a mirror copy. Only other lab members, will have access to the shared folder. Unauthorized persons do not have access to this system.

At SCK CEN:

Data storage are secured by the ICTS service of SCK CEN. Access rights are managed by the data management software Alexandria prior the requirements. The project folder can be found in the Unit repertory (accessible by the lab members). The content of the project folder is however limited to the personnel working on the project and the head of the Unit.

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

At KU Leuven:

KU Leuven provides multiple options for (long term) data storage. Type 1 server backend storage with mirror backup for the FWO-SB project folder will cost € 270 per TB per year. The estimated maximal cost for the 4-year project would therefore be € 1080. Large datasets that do not require frequent access can be stored on a separate server for large volume storage, costing € 113,84 per TB per year. The estimated maximal cost for the 4-year project would therefore be € 455,36 if this type of data storage is required. All costs will be covered by the project budget.

At SCK CEN:

Data storage and backup costs are managed at the Unit level (not at the project level). Each stored TB cost € 35 per month + € 200 maintenance costs/year. The estimated maximal cost for the 4-year project would therefore be € 5000 (assuming the generation of 1TB data/year) and is covered by the Unit internal funds.

5. Data Preservation after the end of the Research Project		
Which data will be retained for at least five 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 obtained during this FWO project will be retained for the expected 5 year period.	
Where will these data be archived (stored and curated for the long-term)?	1) The digital data will be stored on the university's central servers (with automatic backup procedures) for at least 5 years, conform the KU Leuven RDM policy. SCK CEN operates similarly with the obtained data on their servers. 2) The physical data will be stored in freezers in the labs of the collaborators for up to 5 years after the project. 3) The accompanying metadata will be stored on the shared drive (K:) (KU Leuven) and on Alexandria (SCK CEN).	
What are the expected costs for data preservation during the expected retention period? How will these costs be covered?	At KU Leuven: Cost of the large volume storage will be € 128,39 per TB and year. We anticipate that we will need 1 TB for 5 years to keep the essential data available. This will amount to € 614,95 and will be covered by the project's budget. At SCK CEN: Assuming a total of 4 TB, the total cost will be € 1680 per year. The costs are covered by the Unit internal funds.	

	6. 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, in an Open Access repository ☑ Yes, in a restricted access repository (after approval, institutional access only,) ☐ No (closed access) ☐ Other, please specify:
NOTE THAT 'AVAILABLE' DOES NOT NECESSARILY MEAN THAT THE DATA SET BECOMES OPENLY AVAILABLE, CONDITIONS FOR ACCESS AND USE MAY APPLY. AVAILABILITY IN THIS QUESTION THUS ENTAILS BOTH OPEN & RESTRICTED ACCESS. FOR MORE INFORMATION: HTTPS://WIKI.SURFNET.NL/DISPLAY/STANDARDS/INFO-EU-REPO/#INFOEUREPO-ACCESSRIGHTS	Relevant digital data will be published and made available after the end of the project. Data with valuable IP will be protected prior to publication. We will comply with open access regulations of FWO.
If access is restricted, please specify who will be able to access the data and under what conditions.	Upon request by mail.
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, privacy aspects Yes, intellectual property rights Yes, ethical aspects Yes, aspects of dual use Yes, other No If yes, please specify: In this project two organ-on-chips will be used. Ownership of the lung-on-chip belongs to KU Leuven while the ownership of the heart-on-chip belongs to SCK CEN. The preservation methods will be co-shared between KU Leuven and SCK CEN (50/50).

Where will the data be made available?	Gene expression data will be deposited at the Gene Expression Omnibus.
If already known, please provide a repository	
per dataset or data type.	
When will the data be made available?	Upon publication of research results.
This could be a specific date (dd/mm/yyyy) or an indication	
SUCH AS 'UPON PUBLICATION OF RESEARCH RESULTS'.	
Which data usage licenses are you going to	Data from the project that can be shared will be made available under a creative commons attribution
provide? If none, please explain why.	license (cc-by 4.0), so that users have to give credit to the original data creators.
A DATA USAGE LICENSE INDICATES WHETHER THE DATA CAN BE REUSED	
OR NOT AND UNDER WHAT CONDITIONS. IF NO LICENCE IS GRANTED,	
THE DATA ARE IN A GREY ZONE AND CANNOT BE LEGALLY REUSED. DO	
NOTE THAT YOU MAY ONLY RELEASE DATA UNDER A LICENCE CHOSEN	
BY YOURSELF IF IT DOES NOT ALREADY FALL UNDER ANOTHER LICENCE	
THAT MIGHT PROHIBIT THAT.	
EXAMPLE ANSWER: E.G. "DATA FROM THE PROJECT THAT CAN BE	
SHARED WILL BE MADE AVAILABLE UNDER A CREATIVE COMMONS	
ATTRIBUTION LICENSE (CC-BY 4.0), SO THAT USERS HAVE TO GIVE	
CREDIT TO THE ORIGINAL DATA CREATORS." 8	
Do you intend to add a PID/DOI/accession	☐ Yes
number to your dataset(s)? If already available,	⊠ No
please provide it here.	If yes:
INDICATE WHETHER YOU INTEND TO ADD A PERSISTENT AND UNIQUE	
IDENTIFIER IN ORDER TO IDENTIFY AND RETRIEVE THE DATA.	

⁸ Source: Ghent University Generic DMP Evaluation Rubric: https://osf.io/2z5g3/

What are the expected costs for data sharing?	The expected data sharing costs are minimal and covered by university services (at KU Leuven) or by the
How will these costs be covered?	research Unit (at SCK CEN).

7. Responsibilities	
Who will manage data documentation and metadata during the research project?	The PhD student who will work on this FWO project will be responsible for the data collection, documentation and metadata. Supervisors will manage the data storage facilities.
Who will manage data storage and backup during the research project?	The PhD student who will work on this FWO project will be responsible to store the data on the appropriate accommodation provided by KU Leuven and SCK CEN. The ICTS service of KU Leuven and SCK CEN is responsible for the back-up of the network drives at KU Leuven. The folders will be managed by the supervisors.
Who will manage data preservation and sharing?	The PIs will be responsible for the data preservation and sharing of obtained data.
Who will update and implement this DMP?	The PIs bears the end responsibility of updating & implementing this DMP