The role of the peripheral immune system and LRRK2 in gut-to-brain spreading of alpha-synuclein pathology in Parkinson’s disease

A Data Management Plan created using DMPonline.be

Creator: Veerle Baekelandt

Affiliation: KU Leuven (KUL)

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Principal Investigator: Veerle Baekelandt

Data Manager: n.n. n.n.

Project Administrator: n.n. n.n.

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Project abstract:

Parkinson’s disease (PD) is the most common neurodegenerative motor disorder characterized by dopaminergic neurodegeneration in the midbrain and accumulation of α-synuclein (αSyn) aggregates. αSYN misfolding, aggregation, and prion-like propagation are considered key pathological events in the pathophysiology of PD.
Evidence suggests that synucleinopathy can initiate in peripheral tissues and spread from the enteric nervous system, via the vagus nerve. Notwithstanding, the role of the gut-brain axis in that process is still unclear and subject of intense research. In addition, the involvement of the peripheral immune system to PD pathophysiology
remains elusive, as well as its contribution in the peripheral progression of the disease to the CNS. Recent studies suggest that Leucine-rich repeat kinase 2 (LRRK2) is involved in regulating both
systemic and intestinal inflammation, and may influence αSYN-induced pathology at multiple levels, such as aggregation and propagation. The overall aim of this project is to investigate the role
of LRRK2 and the peripheral immune system in gut inflammation and gut-to-brain dissemination of αSYN pathology. Our findings will gain insight in the pathological events taking place during the early stages of the disease and may reveal new information on the therapeutic potential of LRRK2 inhibitors.

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Application DMP

Questionnaire

Describe the datatypes (surveys, sequences, manuscripts, objects …) the research will collect and/or generate and /or (re)use. (use up to 700 characters)

Obtained data will include nucleic acid sequencing data from newly generated plasmids, microscope images and derived quantifications, movies from behavioral tests that will be analyzed manually,
stereological and AI-based quantifications of histological stainings, graphs and excel-based data. It will also generate compiled data as research documentation (text, spreadsheets, protocols, notes and diaries) and manuscripts.

Specify in which way the following provisions are in place in order to preserve the data during and at least 5 years after the end of the research? Motivate your answer. (use up to 700 characters)

1. Designation of responsible person (If already designated, please fill in his/her name.) Joris Van Asselberghs is a senior technician in our lab that manages all data on a common storage
   drive that is automatically backed up.
2. Storage capacity/repository
   - during the research : All data are stored on a drive that is automatically backed up (capacity of 1 TB).
   - after the research : Storage of finished projects is transferred to a special storage drive (created by the KU Leuven) that can be expanded upon request.
     Manuscripts: will be published and archived in public repositories.
     All samples will be stored as appropriate: -80°C for nucleic acids, protein samples, vectors and cell lines; animal house for living organisms

What’s the reason why you wish to deviate from the principle of preservation of data and of the minimum preservation term of 5 years? (max. 700 characters)

NA

Are there issues concerning research data indicated in the ethics questionnaire of this application form? Which specific security measures do those data require? (use up to 700 characters)

NA

Which other issues related to the data management are relevant to mention? (use up to 700 characters)

NA

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FWO DMP (Flemish Standard DMP)

1. 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.

				Only for digital data	Only for digital data	Only for digital data	Only for physical data
Dataset Name	Description	New or reused	Digital or Physical	Digital Data Type	Digital Data format	Digital data volume (MB/GB/TB)	Physical volume
sequencing	Sequencing data of newly generated viral vector plasmids	Generate new data	Digital	Experimental	*.abi*	<100GB	
Microscope images	Confocal, fluorescent and light microscopic images of stained mouse tissue sections	Generate new data	Digital	Experimental	.tif .svs	<1TB	
Quantifications of microscope images	Stereological or AI-based quantifications of stained tissue sections via Stereologer platform or via HALO or Aiphoria digital image analysis	Generate new data	Digital	Experimental	.txt .STR	<100GB	
Movies	Movies of mouse behavioral tests	Generate new data	Digital	Experimental	.MTS	<1TB	
Western blot images	Western blot images of tissue homogenates or cultured cells to determine expression levels of protein of interest	Generate new data	Digital	Experimental	.TIF	<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:

NA

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? Describe these issues in the comment section. Please refer to specific datasets or data types when appropriate.

- Yes, animal data

We have an approved ECD for this project : P156/2022

Will you process personal data? If so, briefly describe the kind of personal data you will use in the comment section. Please refer to specific datasets or data types when appropriate.

- 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

We have good contacts and collaborations with several national and international companies, and there is a dedicated IOF research manager (Dr. Veronique Daniëls) in the group to assist with valorization. The models developed in this project could be used for drug discovery or testing other therapeutic purposes, and are in the interest of pharma or biotech companies like Janssen Pharmaceutica and ReMynd or other international companies.

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 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

2. 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).

All files will be clearly labeled, to include experiment number and conditions, sample and date. For microscopy images, metadata concerning the technical specifications of the images (e.g.laser/gain/dimensions/etc) are collected with the files, or else will be noted down by each experiment.
We have recently implemented the general use of electronic lab notebooks in the lab with clear guidelines for uniform use.

Will a metadata standard be used to make it easier to find and reuse the data? If so, please specify (where appropriate per dataset or data type) which metadata standard will be used. If not, please specify (where appropriate per dataset or data type) which metadata will be created to make the data easier to find and reuse.

- No

Currently the use of metadata standards has not been implemented in the daily routine of the research group. In case this will change in the course of the project this change and its timing will be reported at the end of the project. For all data common metadata are collected: (1) title, (2) author, (3) data type, (4) date created and date modified, (5) file size, (6) equipment reference (such as manufacturer and model identification). Depending on the nature of data additional metadata are collected.

3. Data storage & back-up during the research project

Where will the data be stored?

• During the research
Electronic lab books (OneNote) for which all entries (including changes) are recorded. (3) Large data set, such as images from microscopy are stored on the KU Leuven L drive (large storage server-ZD) or on the private computer attached to the microscope (20TB) and daily backup to an external drive (5T) (permanently connected to the computer using toolkit software for automatic backup (FV). In addition, the members of the laboratory use the OneDrive for daily backup of all personal folders.

• After the research
Storage of finished projects is transferred to a special storage drive (created by the KU Leuven) that can be expanded upon request.
Manuscripts: will be published and archived in public repositories.
All samples will be stored as appropriate: -80°C for nucleic acids, protein samples, vectors and cell lines; animal house for living organisms

How will the data be backed up?

All data are stored on a drive that is automatically backed up on central servers of the university (capacity of 1 TB).

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

The OneDrive does have limitation in storage capacity (2TB) and provides periodic backups. For large data the laboratory has reserved 5TB of storage capacity which can be extended upon request.

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

Data security and access is organized by KU Leuven

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

The OneDrive (2TB) comes without charge. For the large data storage (L-Drive) the current costs are €1138.40 per year, which is shared by the 4 PIs of the division of Molecular Medicine. These costs are financed through grant applications

4. 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 will be retained for at least 10 years after the project. Thus, complying to the data preservation rules of KU Leuven.

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

All data will be stored on large storage servers of KU Leuven which provide daily back-up.

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

Cost directly depend on the pricing of large storage drive of KULeuven. They will be covered through grant applications.

5. Data sharing and reuse

Will the data (or part of the data) be made available for reuse after/during the project? In the comment section please explain per dataset or data type which data will be made available.

- Yes, in a restricted access repository (after approval, institutional access only, ...)
- Other, please specify:

Data will be made publicly available post publication depending on the journals policy (postpublication data repository). Non-published data will remain confidential until a final decision on publication of the data has been taken.
Data will be available after signing a data sharing agreement which will be established with the support of KUL R&D after a request by mail. Once KU Leuven has established a university managed and owned data repository sharing of data (or a subset of data) on this repository will be evaluated depending on the policy and conditions of this repository.

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

Due to the potential commercial value of data no general and full open access to data will be provided by default. Data which will be shared with third parties will exclude commercial use and will require appropriate credit to the data owners.

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 in the comment section per dataset or data type where appropriate.

- No

With respect to the data produced/collected no restriction for data sharing apply.

Where will the data be made available? If already known, please provide a repository per dataset or data type.

Mostly in Zenodo or in KU Leuven RDR

When will the data be made available?

Data will be made available after publication in peer reviewed journals.
Additional data will be made available on basis of data sharing agreements if requested by third party. Additional material (and associated data) will be made available, on basis of material transfer agreements (MTAs) if requested by third party.

Which data usage licenses are you going to provide? If none, please explain why.

CC-BY-4.0

Do you intend to add a PID/DOI/accession number to your dataset(s)? If already available, you have the option to provide it in the comment section.

- Yes

DOI (automatically coupled to Zenodo) and for all research tools RRID

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

The KU Leuven repository will not request any cost contribution for KU Leuven researchers. Data shared through journal repositories will be covered by publication costs. Bilateral agreements for data sharing will be established through the services of KU Leuven R&D. The costs expected for data sharing are thus low and will be reported in the final DMP at the end of the project. They will be covered through funds of the project.

6. Responsibilities

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

The individual researcher producing data will have the final responsibility for data documentation and metadata. In case of PhD students and technical personal the collection will be supervised by the scientific project responsible.

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

Data storage and back-up underlies the responsibility of the individual researcher, who will be supervised by the scientific coordinator of each partner lab. Joris Van Asselberghs is a senior technician in our lab that manages all data on a common storage drive that is automatically backed up. The responsibility for maintaining the infrastructure access for data storage lies in the hands of the IT responsible of the research team. Finally, the maintenance of servers and integrity of data stored on these servers underlies the ITC services of the university.

Who will manage data preservation and sharing?

The PI (V. Baekelandt) will take responsibility to ensure data preservation, access and reuse.

Who will update and implement this DMP?

The PI bears the end responsibility of updating & implementing this DMP.