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

A Data Management Plan created using DMPonline.be

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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 PD. Evidence suggests that synucleinopathy can initiate in peripheral tissues and spread from the enteric nervous system, via the vagus nerve to the brain. However, the role of the gut-brain axis in that process is still unclear and a subject of intense research. In addition, the involvement of the peripheral immune system in PD pathophysiology remains elusive. Mutations in the leucine-rich-repeat kinase 2 (LRRK2) gene have been widely linked with familial and sporadic PD cases. Even if the actual role of LRRK2 in PD pathophysiology is far from understood, evidence indicates that it may be involved in αSYN pathology and immune cell regulation, while it has also been associated with inflammatory diseases such as inflammatory bowel disease.
The overall aim of this project is to investigate the role of LRRK2 in αSYN pathology and its regulatory role in peripheral inflammation. More specifically, we will investigate how the G2019S LRRK2 pathogenic mutation regulates intestinal inflammation and alters peripheral and cerebral αSYN pathology. Our findings will provide insight into PD pathophysiology and its association with other inflammatory diseases and may reveal new therapeutic targets.

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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 quantifications based on histological staining, 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)

N/A

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)

N/A

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

N/A

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DPIA

DPIA

Have you performed a DPIA for the personal data processing activities for this project?

- Not applicable

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

GDPR

Have you registered personal data processing activities for this project?

- Not applicable

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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	
		Please choose from the following options: • Generate new data • Reuse existing data	*Please choose from the following options:* • Digital • Physical	*Please choose from the following options:* • Observational • Experimental • Compiled/aggregated data • Simulation data • Software • Other • NA	*Please choose from the following options:* • .por, .xml, .tab, .cvs,.pdf, .txt, .rtf, .dwg, .gml, … • NA	*Please choose from the following options:* • <100MB • <1GB • <100GB • <1TB • <5TB • <10TB • <50TB • >50TB • NA		
Microscopy images	Transmitted-light microscopy, epifluorescent microscopy and confocal microscopy of mouse brain and intestine	Generate new data	Digital	Experimental	Digital images in raster formats: uncompressed TIFF (.tif/.tiff), JPEG (.jpg), JPEG 2000 (.jp2), Adobe Portable Document Format (.pdf), bitmap (.bmp), .gif;	<100GB		
Analysis of microscopy data (mouse colon and brain tissue sections)	immunohistochemical, immunofluorescent staining	Generate new data	Digital	Experimental	.xls, .pzfx	<100GB		Quantification of microscopy image data performed using Fiji, QuPath and cloud-based Aiforia, in microsoft excel and GraphPad prism
Mouse brain tissue sections	immunohistochemical, immunofluorescent staining	Generate new data	Physical	Experimental			150 plates with sections	The plates with the section will be stored at 4 °C.
Mouse colon tissue sections	immunohistochemical, immunofluorescent staining	Generate new data	Physical	Experimental			1000-5000 slides	Slides with colon sections will be stores at room temperature.
Western blot images	Characterization of the protein levels in different mouse tissues	Generate new data	Digital	Experimental	.tiff, .ometiff	500 MB		Tif images of chemiluminiscent signal taken using ImageQuant LAS 4000 instrument
Western blot membranes	Characterization of the protein levels in different mouse tissues	Generate new data	Physical	Experimental			Less than 50 PVDF membrane pieces	Small PVDF membrane pieces
Analysis of western blot images	Characterization of the protein levels in different mouse tissues	Generate new data	Digital	Experimental	.xls, .pzfx	50-100 MB		Compilation and quantification of western blot images performed using Fiji, in microsoft excel and GraphPad prism
Mouse colon and brain lysates	Protein lysates coming from the tissues	Generate new data	Physical	Experimental			300 tubes	The tubes with the lysates are stored in -20
Analysis of Meso Scale V-plex assay	Cytokines quantification from mouse lysates	Generate new data	Digital	Experimental	.xls, .pzfx			Analysis was performed with the Discovery Workbench 4.0 software

Analysis of motor behaviour tests	Recorded videos and analysis	Generate new data	Digital	Experimental	Avchd (video recordings),.xlsx, .pzfx	<100GB		- .docx for protocol on how to perform the tests - Video recordings of animal behaviour - Measures associated with motor performance on paper records will be transferred to digital .xlsx format as soon as possible - Quantification with statistical analysis will be performed
Presentations of data	Presentations compiling analysed data and images to disseminate project results	Generate new data	Digital	Compiled/aggregated data	.pptx	500 MB		
Lab Book and protocols	Paper notes, OneNote	Generate new data	Digital	Compiled/aggregated data	OneNote	<100MB		Dated written notes about everyday tasks associated with carrying out experimental procedures. Protocols
Manuscript	summarizing results	Generate new data	Digital	Compiled/aggregated data	Text files: Rich Text Format (.rtf), plain text data (Unicode, .txt), MS Word (.doc/.docx), eXtensible Markup Language (.xml), Adobe Portable Document Format (.pdf), LaTex (.tex) format ;	<100MB		

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:

N/A

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 will perform experiments on mice. All necessary safety measures for laboratory and animal work will be taken. The animal experiments will comply with the relevant ethical principles and applicable international, EU, and national law EU Directives 2010/63/EU and 86/609/EEC. The permission to perform the animal experiments covered by this project has been approved by the Animal Ethics Committee at KU Leuven. Ethical approval reference number: 156/2022

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

N/A

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

N/A

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

N/A

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

N/A

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).

Metadata will be documented by the research and technical staff at the time of data collection and analysis, by taking careful notes in the electronic laboratory notebook (E-notebook) and/or in hard-copy lab notebooks that refer to specific datasets. All datasets will be accompanied by a README.txt file containing all the associated metadata (see more details below). The data will be generated following standardized protocols. Clear and detailed descriptions of these protocols will be stored in our lab protocol database, and published along with the results.

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

Digital files will be named following a standard procedure so that all the names of all files in a given dataset will be in the same format: All names will start with the date (and time if applicable), followed by the project acronym, a short but specific descriptive name and a version number (containing leading zeros as needed) if applicable. Whenever possible names will be kept under 32 characters. Names will only contain letters, numbers, and underscores. Dots will only be used for version control indicators (minor revisions indicated by decimal numbers, and major revisions by whole numbers): YYYYMMDD_HHmm_Project_Experiment_ version.format. All changes in the files will be recorded. Data files will be stored in suitably labeled and organized folders and sub-folders, accompanied by a README.txt file in the top-level directory of the dataset, containing all the associated metadata. This will allow the data to be understood by other members of the laboratory and add contextual value to the dataset for future reuse. File names
and locations will be recorded in the E-notebook to allow electronic records to be linked to the raw data.
Metadata will include the following elements:
• Title: free text
• Creator: Last name, first name, organization
• Date and time reference
• Subject: Choice of keywords and classifications
• Description: Text explaining the content of the data set and other contextual information needed for the correct interpretation of the data, the software(s) (including version number) used to produce and to read the data, the purpose of the experiment, etc.
• Format: Details of the file format,
• Resource Type: data set, image, audio, etc.
• Identifier: DOI (when applicable)
• Access rights: closed access, embargoed access, restricted access, open access.

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

Where will the data be stored?

All digital data will be stored on servers centrally managed by ICTS KU Leuven and with back-up capacities (Large Volume-storage). During the project, we will also use KU Leuven OneDrive for Business for active use of the data.The researchers working on the project will have copies of the data files as well as of the derived and compiled data stored on their personal computers.
Mouse Samples: Tissues will be stored at -80°C and stained sections will be stored at room temperature or/and 4°C
Other biological and chemical samples: storage at 4°C, -20°C, or -80°C and/or as frozen samples in cryovials as appropriate.

How will the data be backed up?

We will use the backup facilities of KU Leuven ICTS with automatic daily backup procedures that allow for disaster recovery.

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

Standard back-up provided by KU Leuven ICTS is sufficient to store the data collected for this project.

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

All network storage is hosted in the KU Leuven ICTS data center, with a mirror in the second ICTS center, to provide disaster recovery and additional back-up capacity, thus guaranteeing longterm data availability. Access to data is conditioned by KU Leuven security groups. All notebooks and physical data are stored in the labs. Entry to the lab requires ID-card and key. Access to the digital data is u-number and password controlled.

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

Data storage and backup costs are included in general lab costs. The cost includes sufficient data storage, not only the data belonging to the present project.
Electricity costs for the -80° and -20° freezers and refrigerators present in the labs as well as the cost of liquid nitrogen cryostorage are included in general lab costs.

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...).

The minimum preservation term of 5 years after the end of the project will be applied to all datasets.

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

As a general rule, datasets will be made openly accessible, whenever possible at the latest at the time of publication. For all other datasets, long-term storage will be ensured as follows:
-Digital datasets will be stored in storage space of a standard back-up provided by KU Leuven ICTS as an online data-backup service for at least 10 years, conform the KU Leuven RDM policy.
-Mouse Samples: Tissues will be stored at -80°C and stained sections will be stored at room temperature or/and 4°C.
-Other biological and chemical samples: storage at 4°C, -20°C or -80°C and/or as frozen samples in cryovials as appropriate.

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

Electricity costs for the -80° freezers in the labs are included in general lab costs. The cost of the laboratory's professional subscription to the online data backup service is 10.000 Euros per year (50.000 Euros for 5 years). This cost includes unlimited data storage, not only the data belonging to the present project. Data storage and backup costs are included in general lab costs.

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 an Open Access repository

Participants to the present project are committed to publish research results to communicate them to peers and to a wide audience. All research outputs supporting publications will be made openly accessible. Depending on their nature, some data may be made available prior to publication, either on an individual basis to interested researchers and/or potential new collaborators, or publicly via repositories (e.g. negative data). We aim at communicating our results in top journals that require full disclosure upon publication of all included data, either in the main text, in supplementary material or in a data repository if requested by the journal and following deposit advice given by the journal. Depending on the journal, accessibility restrictions may apply. Physical data will be distributed to other parties if requested.

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

N/A

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

N/A

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

- The data will be shared upon request by mail.
- Possible ways of sharing the generated data
  - manuscripts: bioRxiv (https://www.biorxiv.org/)
  - mouse material: (snap frozen) direct mailing on dry ice
  - microscope images: Image Data Resource (http://idr.openmicroscopy.org/about/)

When will the data be made available?

- Upon publication of the research results

Generally, research outputs will be made openly accessible at the latest at the time of publication. No embargo will be foreseen unless imposed e.g. by pending publications, potential IP requirements – note that patent application filing will be planned so that publications need not be delayed - or ongoing projects requiring confidential data. In those cases, datasets will be made publicly available as soon as the embargo date is reached.

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

Metadata will contain sufficient information to support data interpretation and reuse and will conform to community norms. These repositories clearly describe their conditions of use (typically under a Creative Commons CC0 1.0 Universal (CC0 1.0) Public Domain Dedication, a Creative Commons Attribution (CC-BY) or an ODC Public Domain Dedication and Licence, with a material transfer agreement when applicable). Interested parties will thereby be allowed to access data directly, and they will give credit to the authors for the data used by citing the corresponding DOI. For data shared directly, a material transfer agreement (and a non-disclosure agreement if applicable) will be concluded with the beneficiaries in order to clearly describe the types of reuse that are permitted.

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.

- No

N/A

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

It is the intention to minimize data management costs by implementing standard procedures e.g. for metadata collection and file storage and organization from the start of the project, and by using free-to-use data repositories and dissemination facilities whenever possible. Data management costs will be covered by the laboratory budget.
The receiving party will pay for sharing physical data.

6. Responsibilities

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

Metadata will be documented by the research and technical staff at the time of data collection and analysis, by taking careful notes in the electronic laboratory notebook (E-notebook) that refer to specific datasets.

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

The researcher, the supervisor of the project, and technical staff will ensure data storage and back up.

Who will manage data preservation and sharing?

The main researcher, Georgios Tsafaras, and the supervisor of the project ,Prof. Veerle Baekelandt, is responsible for data preservation and sharing, with support from the research and technical staff involved in the project, including Joris Van Asselberghs.

Who will update and implement this DMP?

The main researcher, Georgios Tsafaras, is responsible for all data management during and after data collection, including implementing and updating the DMP. The PI (Prof. Veerle Baekelandt) bears the end responsibility of updating and implementing this DMP.