

Data Management and Sharing Plan

Element 1: Data Type:

A. Types and amount of scientific data expected to be generated in the project:

Summarize the types and estimated amount of scientific data expected to be generated in the project.

The study is expected to generate multimodal data from 50 to 80 mouse subjects. The data types include electrophysiology, behavioral, and imaging modalities. Specifically, the estimated data volumes are as follows:

- Electrophysiology data: 100–1000 GB, including raw extracellular voltage recordings and processed spike time data.
- Behavioral data: 10–100 GB, comprising raw video frames of freely moving mice and processed positional and heading data for each frame.
- Imaging data: 1–10 GB, consisting of confocal microscopy image stacks of immunostained mouse brain tissue.

B. Scientific data that will be preserved and shared, and the rationale for doing so:

Describe which scientific data from the project will be preserved and shared and provide the rationale for this decision.

All generated scientific data from this project will be preserved and shared. The rationale is to promote transparency, reproducibility, and collaboration within the scientific community, particularly in understanding hippocampal function. Sharing these multimodal datasets can facilitate new insights into neural mechanisms and behavioral correlations, potentially advancing research in neurobiology and aging.

C. Metadata, other relevant data, and associated documentation:

Briefly list the metadata, other relevant data, and any associated documentation (e.g., study protocols and data collection instruments) that will be made accessible to facilitate interpretation of the scientific data.

To facilitate interpretation of the scientific data, the following metadata and documentation will be made accessible:

- Study protocols
- Data collection instruments (e.g., electrode probe specifications, arena setup for behavioral tests)
- Imaging parameters (microscopy settings, staining protocols)
- Data processing pipelines (scripts for spike time extraction, video analysis software)
- Mouse subject information (strain, age, sex)

Element 2: Related Tools, Software and/or Code:

State whether specialized tools, software, and/or code are needed to access or manipulate shared scientific data, and if so, provide the name(s) of the needed tool(s) and software and specify how they can be accessed.

Specialized tools and software are needed to access or manipulate the shared scientific data. These include:

- Electrophysiology analysis software (e.g., Spike2, MATLAB with specific toolboxes)
- Video analysis software for behavioral data (e.g., EthoVision, Python libraries such as OpenCV)

- Image processing software for microscopy images (e.g., Fiji/ImageJ, Adobe Photoshop)
- These tools and software can be accessed through their respective vendors or open-source repositories.

Element 3: Standards:

State what common data standards will be applied to the scientific data and associated metadata to enable interoperability of datasets and resources and provide the name(s) of the data standards that will be applied and describe how these data standards will be applied to the scientific data generated by the research proposed in this project. If applicable, indicate that no consensus standards exist.

To enable interoperability of datasets and resources, the following common data standards will be applied:

- Electrophysiology data will be stored in standardized formats such as Neurodata Without Borders (NWB) or HDF5.
- Behavioral data will follow the principles outlined by the Organization for Economic Cooperation and Development (OECD) for behavioral testing, with data formatted in CSV or JSON files.\
- Imaging data will adhere to the Open Microscopy Environment (OME) standards for microscopy data, utilizing OME-TIFF format.
- Metadata will be documented using a standardized ontology where applicable (e.g., Experimental Conditions Ontology for electrophysiology).

Element 4: Data Preservation, Access, and Associated Timelines:

A. Repository where scientific data and metadata will be archived:

Provide the name of the repository(ies) where scientific data and metadata arising from the project will be archived.

The scientific data and metadata arising from this project will be archived in publicly accessible repositories such as the National Institutes of Health's (NIH) National Library of Medicine (NLM) databases (e.g., PubMed Central for publications, and appropriate data-specific repositories like NeuroElectro for electrophysiology data or Dryad for broader datasets).

B. How scientific data will be findable and identifiable:

Describe how the scientific data will be findable and identifiable, i.e., via a persistent unique identifier or other standard indexing tools.

The scientific data will be made findable and identifiable through the use of persistent unique identifiers (e.g., DOIs) assigned by the selected data repository, along with detailed metadata descriptions that include keywords related to hippocampal function, aging, electrophysiology, behavioral analysis, and confocal microscopy.

C. When and how long the scientific data will be made available:

Describe when the scientific data will be made available to other users (i.e., no later than the time of an associated publication or end of the performance period, whichever comes first) and for how long data will be available.

The scientific data will be made available no later than the time of publication of the main findings or upon completion of the project, whichever comes first. The data are expected to remain accessible for a minimum of 10 years following the completion of the project to allow for long-term research and validation studies.

Element 5: Access, Distribution, or Reuse Considerations:

A. Factors affecting subsequent access, distribution, or reuse of scientific data:

NIH expects that in drafting Plans, researchers maximize the appropriate sharing of scientific data. Describe and justify any applicable factors or data use limitations affecting subsequent access, distribution, or reuse of scientific data related to informed consent, privacy and confidentiality protections, and any other considerations that may limit the extent of data sharing.

Since this study involves animal subjects (mice) and not human participants, factors related to informed consent, privacy, and confidentiality protections typical of human subject research are not applicable. However, considerations for the appropriate use of shared data in compliance with animal welfare regulations and guidelines will be emphasized.

B. Whether access to scientific data will be controlled:

State whether access to the scientific data will be controlled (i.e., made available by a data repository only after approval).

Access to the scientific data will generally not be controlled, as it will be deposited into public repositories. However, users may need to register or agree to terms of use that respect the intellectual property rights of the researchers and institutions involved in generating the data.

C. Protections for privacy, rights, and confidentiality of human research participants:

If generating scientific data derived from humans, describe how the privacy, rights, and confidentiality of human research participants will be protected (e.g., through de-identification, Certificates of Confidentiality, and other protective measures).

Data shared from this project can be reused for research purposes, including but not limited to, secondary analyses, methodological improvements, and integration with other datasets. Any reuse must appropriately cite the original data sources and respect any licensing terms associated with the data or software tools used in its generation.

Element 6: Oversight of Data Management and Sharing:

Describe how compliance with this Plan will be monitored and managed, frequency of oversight, and by whom at your institution (e.g., titles, roles).

Compliance with this Data Management and Sharing Plan will be monitored and managed by the Principal Investigator (PI) of the project, in collaboration with the institution's research office and library services. Regular oversight meetings (at least bi-annually) will ensure that data are properly archived, accessible, and that any issues related to data sharing or reuse are addressed promptly. The PI will also be responsible for reporting on data sharing activities as part of annual progress reports to funding agencies.