Plan Overview

A Data Management Plan created using DMPTool

DMP ID: https://doi.org/10.48321/D1X324

Title: Accumbal adaptations that contribute to weight regain after weight loss

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Template: NIH-Default DMSP

Project abstract:

Losing weight can be life saving for people with obesity. However, among patients that do lose significant weight, most have trouble keeping the weight off. People with obesity that lose weight experience physiological, neural, and behavioral changes that drive weight regain. These changes resemble adaptive mechanisms that defend body weight during periods of food scarcity, but for people trying to achieve a healthy body weight and stay there, these mechanisms are decidedly maladaptive. Intervening to counteract them has the potential to revolutionize the clinical approach to weight loss for people with obesity. **The objective of this proposal** is to understand how the function of a brain area known as the nucleus accumbens is altered following weight loss in mice. **Our central hypothesis** is that obesity is associated with adaptations in the brain's reward circuitry that enhance the pursuit of palatable foods, promoting weight regain after obese animals lose weight. In Aim 1, we will use *ex vivo* electrophysiological approaches to monitor changes in intrinsic and synaptic properties of accumbal neurons as obese mice lose weight, critically determining adaptations that persist after weight loss. In Aim 2, we will emply *in vivo* optical recordings of calcium activity to measure the activity of accumbal neurons as obese mice lose weight. Finally, in Aim 3 we will use viral genetic strategies to selectively silence specific populations of accumbal neurons to determine whether this: 1) facilitates weight loss in obese mice that remain on a high-fat diet; and/or 2) inhibits weight re-gain in formerly obese mice who have lost weight. **Our long-term goal is** to understand how obesity alters reward circuitry and discover methods for reversing these changes. This research will provide a critical foundation to advance efforts to improve weight loss outcomes in people with obesity.

Start date: 09-01-2023

End date: 08-31-2028

Last modified: 01-19-2024

Copyright information:

Accumbal adaptations that contribute to weight regain after weight loss

This project will produce brain recording data, behavioral data, and physiological data from approximately 188 mice.

1. Slice electrophysiological data from an estimated 160 neurons in Aim 1. These data will include raw electrical traces in .apv format (typically <10MB), as well as processed traces in .csv format (typically <10MB). Data will be stored and shared at the level of individual neurons.

2. An estimated 144 calcium imaging movies will be collected in Aim 2. These data include 2-3 hour long raw video files (stored as .mp4 files, typically ~10GB). Video data will be processed and extracted cell signals will be stored as .csv files (typically <100MB).

3. Also in Aim 2, behavioral data on how mice are performing on the task will be stored and shared as .csv files (typically <10MB).

4. Across all 3 Aims, weights and physiological data will be collected on each mouse, and stored as .csv files (typically <10MB).

In this proposed project, the processed and cleaned data for all variables will be shared openly, along with example quantifications and transformations from initial raw data. Final files used to generate specific analyses to answer the Specific Aims and related results will also be shared. The rationale for sharing only cleaned data is to foster ease of data reuse.

To facilitate the interpretation and reuse of the data, a README file and data dictionary will be generated and deposited into a repository along with all shared datasets. The README file will include the project title, funder ID, grant number, author name and ORCID iD, date in ISO 8601 format, method description, instrument settings, RRIDs of resources such as antibodies, model organisms, cell lines, plasmids, and other tools (e.g., software, databases, services), and Protocol DOIs issued from protocols.io. The data dictionary will define and describe all variables in the dataset. If multiple datasets are deposited into a repository, a README file will include a list of file names and descriptions and will be deposited along with datasets. All associated documents such as a data dictionary file, a study protocol, a README file can be freely downloaded along with datasets from a repository.

In Aim 1, the raw data generated from an electrophysiology rig made by Scientifica is stored in the .ABF format. ABF files can be opened by commercial software from the manufacturer, or with a specialized Python library. Python is a free software environment for data science and statistical analysis. We will import the data into Python for statistical analysis. Scripts used to process and analyze .ABF files will be made available on the Open Science Framework (OSF.io).

In Aim 2, the raw data generated from the calcium imaging microscope will be saved in .mp4 format, and the imaging movies can be analyzed with multiple Python-based analysis programs. These programs will output data in the open and easily readable .CSV format. Both .CSV files, and scripts used to process and analyze these files will be made available on the Open Science Framework (OSF.io).

Also in Aim 2, we will generate .CSV files containing data from behavioral tasks mice are performing. These files will be processed with Python scripts. Both .CSV files, and scripts used to process and analyze these files will be made available on the Open Science Framework (OSF.io).

Finally, in all 3 Aims, physiological measures such as body weight of mice will be collected and stored in .CSV files. These CSV files, and scripts used to process and analyze these files will be made available on the Open Science Framework (OSF.io).

To improve interoperability of datasets, we will use open file formats (e.g., csv, txt, mp4, pdf) whenever possible and convert proprietary file format (.apv) to an open file format (.csv). The neuroscience community has yet to agree on a single standard data format that is generated by all acquisition systems, so we will use.csv where possible for data that will be preserved and shared. We will collect metadata using common standards (e.g.,ISO 8601 for date/time, instrument settings, software name and version) and PIDs (e.g., ORCID iDs for researchers, funder ID, grant number, DOI for protocols, RRID for resources) to facilitate interpretation of data and interoperability.

All data and related scripts/codes will be deposited into the Open Science Framework (OSF) repository.

The OSF will collect relevant metadata (e.g., resource type, title, authors, date, funder ID, keywords, etc.) and issue a DOI linking all PIDs collected during data submission such as ORCID iDs for authors, Funder IDs so data will be easily findable and identifiable via Google search. The DOIs for datasets will also be referenced in the publications and preprints linking to the data.

All scientific data generated from this project will be made available as soon as possible, and no later than the time of publication or the end of the funding period, whichever comes first. All data will be preserved and accessible to the public according to the OSF retention policy.

To address safety and security concerns related to capturing and distributing pictures or video of vertebrate research animals, access and distribution of behavioral video files generated in our lab will be limited as described and justified in the IACUC protocol governing the project and in compliance with the "Image Recordings of Research Animals" Standard Operating Procedure at our institution. There are no other factors that will impact access, distribution, and reuse for all other scientific data generated by this study.

The data and code shared via the OSF will be made available for re-use and licensed as Creative Commons-Attribution (CC-BY 4.0) to allow for the maximum dissemination and use of the licensed materials.

Not applicable. This study does not include research on human participants

Lead PI Alexxai Kravitz, ORCID: 0000-0001-5983-0218, will be responsible for the day-to-day oversight of lab/team data management activities and data sharing. Dr. Kravitz and research contributors will ensure that the metadata are sufficient and appropriate, and that the data management and sharing plan follows FAIR data principles. Dr. Kravitz will report the DMS-related activities as outlined in this DMS plan in RPPR and request approval for a revised plan if there is any deviation from the approved DMS plan.