Plan Overview

A Data Management Plan created using DMPTool-Stage

Title: Action of statins on cognitive impairment induced by sleep deprivation in rats

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Funder: São Paulo Research Foundation (fapesp.br)

Template: Digital Curation Centre (português)

Project abstract:

Chronic sleep deprivation has become increasingly common these days. It is known that sleep is essential for cognitive functions such as memory consolidation and decision making. The hippocampus and prefrontal cortex are structures particularly affected by sleep deprivation due to their great plasticity. At the same time, neuroprotective factors also tend to have notable repercussions in these brain regions. Statins are widely used and extremely pleiotropic lipid-lowering drugs that have diverse pharmacokinetic characteristics depending on their hydrophilic or lipophilic nature and have demonstrated beneficial effects on cognition. However, the effect of statins on the nervous system against sleep deprivation has not yet been investigated. The aim of this work is to observe the effect of rosuvastatin, atorvastatin and simvastatin on memory, hippocampus and prefrontal cortex of Wistar rats submitted to chronic sleep deprivation. After authorization by the animal ethics committee, young adult male Wistar rats will be divided into eight groups (N=15 per group): control group (GC), sleep deprivation group (GP), treated with the vehicle; sleep deprivation + rosuvastatin groups, which will receive a single daily dose of 2.1 mg/kg (GPR4) and 20mg/kg (GPR10) of the drug; sleep deprivation + atorvastatin groups, which will receive a single daily dose of 4.2 mg/kg (GPA8) and 20mg/kg (GPA20) of the drug; sleep deprivation + simvastatin groups, which will receive a single daily dose of 4.2 mg/kg (GPS8) and 20mg/kg (GPS20). Treatments from the 90th day of postnatal life will be concomitant, with a duration of 45 days. After 21 days of treatment, the animals will undergo behavioral tests in the open field, elevated plus maze, Barnes maze and radial maze. Then, six animals from each group will be euthanized by transcardiac perfusion, the brains will be collected and the histological sections of the hippocampus submitted to immunohistochemistry protocols for NeuN, BDNF and doublecortin (DCX). The brains of the remaining nine animals in each group will be freshly collected for quantification by western-blotting of the expression of serotonin receptors (5HT1a, 5HT2a and 5HT7) and acetylcholine (M1, M4 and Nn) and for RNA sequencing. Differential expression analysis and functional enrichment of transcriptomic data will be performed. Blood will be collected for serum

cholesterol, triglycerides and HDLA. Comparison between groups will be performed using statistical methods considering $\alpha = 0.05$.

Start date: 12-31-2022

End date: 02-28-2025

Last modified: 12-16-2022

Copyright information:

Action of statins on cognitive impairment induced by sleep deprivation in rats

Data obtained by behavioral observation, biometric parameters (weight, size) and morphological brain parameters of rats will be collected. The animals will be randomly divided into 8 groups by draw (n=15 per group). The number of animals per group is the minimum possible considering the high variability of the behavioral tests with the eventual exclusion of outlayers (92). The following groups will be studied: control group (CG), without any intervention; sleep deprivation group (SG), treated with the vehicle for statins (20% dimethylsulfoxide (DMSO) in distilled water) and sleep deprived from 4:00 pm to 10:00 am, with a maximum possibility of 6 hours of sleep per day; sleep deprivation + rosuvastatin groups, which will receive a single daily dose of 2.1 mg/kg (GPR4) and 20mg/kg (GPR10) of the drug, by gavage, diluted in vehicle during the period of sleep deprivation; sleep deprivation + atorvastatin groups, which will receive a single daily dose of 4.2 mg/kg (GPA8) and 20mg/kg (GPA20) of the drug, by gavage, diluted in vehicle during the period of sleep deprivation; sleep deprivation + simvastatin groups, which will receive a single daily dose of 4.2 mg/kg (GPS8) and 20mg/kg (GPS20). Quantitative and qualitative data will be organized into data sheets and documents. Data will be expressed by images, tables, charts, graphs, two and three-dimensional models of the rat Brain.

Data will be obtained by systematic observation of rats in behavioral tests, before the euthanasia for brain collection and biometric parameters. Each animal will receive an experiment registration number at the Neuromorphology Laboratory and all the data obtained will be informed in a laboratory chart (printed and digital) built in a database (filemaker software). All data collected will be linked to the experiment registration number. The captured images will be named by the experiment's registration number, followed by informative parameters about the sample being analyzed (histological series, slide, position of the histological section on the slide, foographed structure and objective used for capture). Morphometric data will be collected using scales, rulers, compasses and tissue morphometry will be performed with computer programs (Image J and Neurolucida), with images captured in the optical microscope.photomicrographs

Data sheets and documents (tables, diagrams, figures, 3D brain models and photomicrographs). The main metadata will be the Neuromorphology Laboratory records where each experiment will be identified with a unique registration number and all information about the experiment will be documented in the laboratory database (filemaker software).Each brain collected will give rise to 10 series of histological sections, numbered from 1 to 10 and regularly spaced, which will be stored in a tissue bank of the Laboratory of Neuromorphology under de the experimental registration number.

All animal and data aquisition procedures were approved by the Committee on Ethics in the Use of Animals of the Faculty of Medicine of Botucatu (CEUA-1414/2022)

Copyrights and IPR of the research will be determined by the research group to communicate the results in scientific meetings and during the manuscript writing of articles, chapters or books that will be published.

The data will be stored and backed up during the course of research activities on cloud storage (Google Drive) as well on hard drives in university's computers.

Data will be available to all researchers involved in the project. However, edition and backup will be restricted to project administrator and the principal investigator.

All Data collected will be stored in backup hard drives. The data better discussed and organized will be published (proceedings of meetings, articles, chapters and books) in order to share the results with scientific community. Also, it will could be create new projects from the results and samples collected.

This data management plan will be permanently archived, under an open access regime, in the Institutional Repository of the Universidade Estadual Paulista "Júlio de Mesquita Filho" - UNESP. Data presented in publications will be available to the editorial board of the journals and may be included as supplementary data. The backup of unpublished data will be kept by the research group until the results are published. All slice remaining obtained from brain parrots will be storage in the parrot brain database from Laboratory of Neuromorphology in Biosciences Institute at Sao Paulo State University (UNESP).

Data will be shared in scientific events (conferences, congress, webinar, etc) or/and will be published as articles, chapters and books.

There are no restrictions of sharing the published data. Thus, it will be available as dataset at Institutional Repository of the Universidade Estadual Paulista "Júlio de Mesquita Filho" - UNESP or other repository of data asked by publishers (for exemple: Harvard Dataverse site https://dataverse.harvard.edu/).

All data management will be restricted to project administrator and the principal investigator.

The Neuromorphology Laboratory has the necessary IT resources (software and computers) to execute this data management plan. We also have institutional support for internet access, cloud data storage and permanent institutional data repository. In addition, this data management plan will be important for collaboration with other researchers to improve collection and analysis procedures.
