
Plan Overview

A Data Management Plan created using DMPonline

Title: Multi-Omics Approach to Childhood Obesity, Insulin Resistance, and Erythroid Metabolism: Combination of Metabolomics, Microbiomics and Metallomics Techniques

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Template: DMPOnline Template (NWU)

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Project abstract:

Childhood obesity is one of the main health problems today, as it is associated with higher risk of developing other pathologies in adulthood. The characteristic pathogenic events behind obesity are normally related to various comorbidities, among which insulin resistance stands out. However, the specific molecular mechanisms that underlie the development of obesity and comorbidities are still unknown, so there is great need to discover potential biomarkers for early detection in pediatric age, as well as to monitor their progression. In this Research Project, we propose the application of a multi-omics analytical approach to study the pathogenesis of childhood obesity. The study population will consist of obese children, with and without insulin resistance, as well as normal weight control subjects, from whom plasma and erythrocyte samples will be extracted. In parallel, we will also study an animal model to decipher the metabolic failures underlying obesity in a multi-compartmental way. These biological samples will be analyzed using metabolomics, microbiomics and metallomics techniques in order to holistically characterize the pathogenic disturbances associated with childhood obesity, as well as the implication of insulin resistance in these processes. Likewise, we will also investigate blood samples collected during an oral glucose tolerance test, as well as erythrocyte samples submitted to an insulin intervention study, which will allow us to unravel the causality of the hyperinsulinemia state in the alterations detected.

ID: 152303

Start date: 01-01-2023

End date: 31-12-2025

Last modified: 22-05-2024

Grant number / URL: PI22/01899

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Multi-Omics Approach to Childhood Obesity, Insulin Resistance, and Erythroid Metabolism: Combination of Metabolomics, Microbiomics and Metallomics Techniques

Data Collection

What data will you be collecting ?

Multi-omics data (metabolomics, metallomics, microbiomics) in plasma and erythrocyte samples from a case-control population in childhood obesity. The raw data (vendor-specific files) will be converted into tabulated data in the format of .csv files.

Who will be involved in your data collection ?

The data associated to this project will be collected by a multidisciplinary team led by Dr. Raúl González-Domínguez (expertise in omics and analytical chemistry), in collaboration with clinicians from Hospital Universitario Puerta del Mar at Cádiz, Spain (Dr. Alfonso Lechuga). Data collection, processing and quality control will be performed by adhering methodologies that have previously been validated and published by the research team and collaborators (DOI: 10.1007/978-1-0716-2699-3_11; 10.1007/978-1-0716-2699-3_12; 10.3390/metabo10040135; 10.1021/acs.analchem.3c03660). We will implement a standardized naming of the data generated along the consecution of the research project, according to the format: "acquisition date"_ "project code"_ "experiment"_ "researcher name"_ "versión of the document"; e.g., "20240522_PI22/01899_Metabolomics_RGD". Moreover, the data from the project will have descriptive metadata according the DataCite Metadata scheme 4.0.

The raw data is expected to have a total volume around 50 GB (in vendor-specific format, i.e., .d Agilent files). The data will be converted into the open data format .mzXML and then processed using open access webtools (i.e., MS-DIAL) to generate .csv files, containing tabulated concentrations of each of the analytes under investigation (i.e., metabolites, metals, microbiota compounds) in the study population. These tables are expected to have a volume below 200 MB, thus facilitating their storage and sharing. The storage, preservation and sharing of the data will not imply additional costs.

Along the consecution of the project, the data generated will be uploaded into an online shared folder (Google Drive) to facilitate its finding and use by authorized participating researchers, and the principal investigators (Drs. Raúl González Domínguez and Alfonso Lechuga) will retain a backup copy in external hard drives. Furthermore, within the context of FAIR principles, the data will be deposited into a specialized and open access repository (Metabolomics Workbench), which allows the deposition of omics data without expiration dates neither additional costs. This deposition will be performed at the moment of publication of our results in peer-reviewed journals. We will use CC-BY license (<https://creativecommons.org/licenses/by/4.0/>).

Dr. Raúl González Domínguez, with assistance from personnel from the Research Management Office at the affiliation entity, will be responsible for developing, implementing, overseeing, and updating this Data Management Plan during and after the project ending.

Ethics

Give a description of your Ethics

The study was performed in accordance with the principles contained in the Declaration of Helsinki. The Ethical Committee of "Hospital Universitario Puerta del Mar" (Cádiz, Spain) approved the study protocol (Ref. PI22/01899), and all participants and/or legal guardians provided written informed consent.