

Title

Integration and analysis of exposomic and metabolomic data in observational studies: application to the link between chemical exposure and human health

Background

The exposome concept has been coined to integrate all those exposures affecting humans during their lifespan that can influence human health. Specifically, the study of the "internal exposome" involves the characterization of chemical exposure markers to which the individual or a population has been exposed but also, as mirror of these parameters, the potential alteration of phenotypic or physiopathological biomarkers (eg the metabolome). In parallel, during the last decades high-throughput mass spectrometry (HRMS) platforms have evolved to characterize a large number of biomarkers of different natures and generating large data sets.

Some of the main challenges in this area includes the integration of these data, often multidimensional (number of variables much higher than observations), sometimes redundant (linked to multicollinearity) and often noisy (high associated interindividual variance related to confounding factors). New statistical methods have been proposed in recent years to integrate omics' data of different types (e.g. multi-omics). These type of multi-block approaches, however, remain little explored when it comes to the aggregation of exposomic and metabolomic data for observational studies.

Objectives

The overall objective of the project is to develop and implement a strategy to integrate and analyze data on exposure biomarkers (eg exposome) and effect (eg metabolome) allowing progress in the observational research of functional associations between chemical exposure and human health. Specifically, the PhD candidate will identify and apply a set of models aimed at classifying observations based on exposure profiles and/or associated clinical phenotypes in simulation and real-case studies. In a second step, the development of an open access (R) package with a set of functions allowing routine application is expected

Skills

Strong knowledge in statistics and data analysis (Master 2 in statistics / bioinformatics). Proficiency in R programming language. Interest in biological and health data. Ability to analyze and interpret critically.

Hosting laboratory

- LABERCA, UMR 1329 ONIRIS, INRAE, La Chantrerie 44307 Nantes (laberca.org). France
Contact: German Cano-Sancho <german.cano-sancho@oniris-nantes.fr>
- Unité Statistique, Sensométrie et Chimiométrie (StatSC) ONIRIS, Site de la Géraudière 44322 Nantes. Contact: Evelyne Vigneau <evelyne.vigneau@oniris-nantes.fr>

Send application (CV motivation letter) to: german.cano-sancho@oniris-nantes.fr