Ramón y Cajal position at CEMBIO – CEU Universidad San Pablo

1. Research Area

☒ Chemistry (CHE)	☒ Life Sciences (LIF)

2. The Center/group

CEMBIO (www.metabolomica.uspceu.es), a Research Center located at CEU San Pablo University in Madrid, has been awarded an eligible Center to host a Ramón y Cajal Fellow.

CEMBIO is a leading lab in Metabolomics using mass spectrometry coupled to different separation techniques (GC-MS, LC-MS and CE-MS).

Briefly, Metabolomics is the study of the unique chemical fingerprints related to small-molecules (metabolites) that specific cellular processes leave behind when they are altered due to diseases, medical treatments, environment, or nutrition, among others.

At CEMBIO we work by differential analysis of sample profiles (metabolic fingerprinting).

We offer: searching of metabolic changes without a priori hypothesis to unveil drug mechanisms of action, toxicity or resistance; patient's stratification based on non-target metabolomics, as well as targeted pathway analysis.

CEMBIO has capacity for tackling all the aspects related to metabolomic analysis, from experimental design, to selection of analytical methods, appropriate statistical methods for data treatment and final biochemical interpretation.
Techniques for target analysis are also available and method development is part of the expertise.

CEMBIO counts with about 20 specialists in different fields (Chemistry, Pharmacy, Biochemistry, Statistics) ranging from technicians to PhD students and senior researchers. Since 2008 CEMBIO has published more than 70 articles in Metabolomics applied to different areas such as CVD, Blood studies, Lung Diseases, Diabetes, Leishmania, or Oncology. In addition we have a wide range of experience in cooperation projects with foreign Universities (Imperial College, Toulouse University, Universidade de Sao Paulo, and University of Bialystok, among others) as well as several companies, hospitals and research centers in Spain.

The following **equipment** is available at our laboratory:
LC-QTOF-MS (Agilent 1200-Agilent 6520)
LC-QQQ-MS (Agilent 1290-Agilent 6490)
LC-MS (Ion trap) (Agilent 1100-Squire 3000)
GC-MS (Ion trap) (Varian)
GC-MS (Quadrupole) (Agilent 7890A-Agilent 5965C)
GC-QTOF-MS
CE-TOF-MS (Agilent 7100-Agilent 6210)

3. Project Description

Metabolomics, understood as the global profiling of metabolic changes in a biological system under specific conditions, has already proved to be a perfect tool in many different aspects of biomedical research including: Understanding disease mechanisms; Elucidating mechanism-of-action of a drug/ingredient; Identifying biomarkers; or Establishing/supporting product claims, among others.

However, there are still limitations that preclude obtaining all the benefits from the methodology. In our work we have identified some of the most important bottlenecks and propose to progress in their improvement.

Objectives:

1.-IDENTIFICATION OF UNKNOWNS.

Almost 50% of the signals that are obtained as statistically significant in a study, cannot be identified. We propose to establish protocols to facilitate the identification process.

2.-DATA TREATMENT.

A thorough data treatment is necessary in metabolomics and it can completely modify the outcome of the investigation.

3.-ADVANCING IN BIOLOGICAL INTERPRETATION.

Currently multiplatform approaches for a specific assays are informed as a list of metabolites, however much more information could be obtained if correlations could be used among all the platforms. This is a field where proper data treatment and algorithms should be explored. Moreover, correlations among metabolites and between them and genomic changes will improve biological interpretation.

4.- PUSHING THE LIMITS IN SEPARATION CAPABILITIES.

Chiral metabolites are still quite unknown. We pursuit to prove the usefulness of the analysis of the chiral pairs in order to obtain valuable information that permits to elucidate the real impact of the microflora metabolism as well as to track the metabolism of the real metabolized compounds (D- or L-). We pursuit therefore to establish the validity of chiral compounds as possible biomarkers of different conditions

Ion mobility mass spectrometry adds an orthogonal dimension to current analytical methods. We will investigate the use of this really new technique as a tool to aid metabolite identification.

5.- APPLICATIONS

In parallel to technical and methodological improvements we will work on applications to health issues, searching for markers of disease, markers of response or resistance to treatments and mechanisms of disease. Projects include, but are not limited to: diabetes; mother-fetus interactions; mental diseases; bariatric surgery; coronary diseases; or cancer, among others.

The Researcher will work with the very latest technology in mass spectrometry coupled to different separation techniques and state-of-art software to develop metabolomics projects in different fields.

She/he will be in charge of coordinating a team of researchers involved in the projects and supervising PhD and master students.

Experience or willingness in performing omics data integration to obtain a global overview of the situation under study will be welcome.

At the same time, as there are still bottlenecks that should be tackled before obtaining all the potential benefits and information coming from metabolomics techniques the Researcher can suggest his/her own proposal fitting into the global project in the group.

Researcher will receive all support for her/his consolidation at CEMBIO, after fellowship finalization.

4. Who can apply?

A Ramón y Cajal fellowship holder with background in Bioinformatics, Biochemistry and/or Analytical Chemistry.

5. Contact person

Coral Barbas: cbarbas@ceu.es