MetaboNews

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MetaboNews is a monthly newsletter published in partnership between The Metabolomics Innovation Centre (TMIC) and Metabolomics Society.

Metabolomics Society News

Conference Corner

Metabolomics 2019 – The Hague

Thank you for your participations in Metabolomics 2019 at the Hague, Netherlands.
We hope you look back at a great Metabolomics 2019 conference experience! We thank all the participants for making it a vibrant event full of talks, posters, ePosters, and other initiatives such as the Career Night and the BioInformaticsHub!

Pictures are now available here:
http://metabolomics2019.org/program/conference-photos

With this year's meeting successfully completed as our largest ever meeting, we hope we'll see our current members and welcome new faces at our next annual meeting at Shanghai for Metabolomics 2020.
Please stay tuned for more updates on the website for next year's meeting. http://metabolomics2020.org

Members Corner

Early-Career Members Network (EMN)

The 2019 EMN Webinar Series!

Please stay tuned for our upcoming webinars!
You can access the recorded videos of the past webinars on the Metabolomics Society website. 2019 April (Dr. Tsugawa), May (Dr. Powers) and July (Dr. Fedorova) webinars have been recently made available.

EMN Bursary Program
Conference reports given by the EMN travel award grantees 2019 after their participating to the Metabolomics 2019 at The Hague, The Netherlands include one graduate student, Maria-Konstantina Ioannidi with her oral presentation titled "Profiling the effect of Adult Onset Hypothyroidism (AOH) on the mouse heart in both sexes integrating untargeted GC- and LC-MS metabolomics", and two postdoctoral fellows, Oana Zeleznik with her poster presentation on "A genome-wide association study of circulating plasma metabolite levels identifies differences by sex and suggests that metabolites represent polygenic traits" and being one of the discussants for "Obtaining a postdoctoral position" in the career night, and Caroline Birer with her poster presentation on "A high-throughput method for obtaining microbial exometabolomics data using a 3D printed platform". The grantees appreciated the chance to present their works and the networking opportunities which will serve for the next career steps after graduation.
You can find the conference reports from 3 of the winners of the travel grant here.

International Affiliates Corner

French-speaking Metabolomics and Fluxomics Network (RFMF)

Visit http://www.rfmf.fr/

https://rfmf-mpf-2020.sciencesconf.org/

The French-speaking Metabolomics and Fluxomics Network (RFMF), Metabolomics Profiling Forum (MPF, Metabomeeting) and European regional metabolomics networks (Scottish Metabolomics Network, Swiss Metabolomics Society, Nordic Metabolomics Society, Netherlands Metabolomics Centre, Italian Metabolomics Network, Spanish Metabolomics Society, German Society for Metabolomics Research) are pleased to announce a joint conference taking place from 22nd to 24th January 2020 in Toulouse (France).

This event will be the opportunity to strengthen scientific collaborations between European regional networks in the field of metabolomics and fluxomics.

Thematic sessions dedicated to:

- Analytical developments in Metabolomics & Fluxomics
- Computational and statistical developments in Metabolomics & Fluxomics
- Cutting edge applications of Metabolomics and Fluxomics in:
  - Human health
  - Agriculture & food
  - Environmental science
  - Microbiology & biotechnologies

Confirmed plenary and keynote speakers:

- Pr. Warwick (Rick) Dunn, University of Birmingham, UK.
- Dr. Maria Fedorova, Universität Leipzig, Germany.
- Pr. Zoran Nikoloski, Max Planck Institute, Germany.
- Dr. Emma Schymanski, University of Luxembourg, Luxembourg.
- Pr. Marcel Utz, University of Southampton, UK.

Other News

2019 Honorary Fellows of the Metabolomics Society Announced

An Honorary Fellowship is a significant lifetime award granted by the Board of Directors of the Metabolomics Society to recognize exceptional members of the community who have either made outstanding contributions to the Metabolomics Society over a sustained period of time, and/or made a pioneering and sustained contribution to the science of metabolomics at an international level. With up to two lifetime Fellowships awarded each year, the Board is pleased to recognize the following individuals as the lifetime Honorary Fellows of the Metabolomics Society for 2019:

Krista Zanetti
In recognition of her dedication and leadership that have enabled the success of important initiatives within the Metabolomics Society and the broader metabolomics community. Her skilled diplomacy has helped unify and steady the development of the metabolomics community during a period of rapid growth. She deserves particular credit for her mentorship of the EMN.

Eiichiro Fukusaki
In recognition of his pioneering work in the field of food metabolomics and developing powerful analytical methods that have enabled the expansion of metabolomics in many different research areas. His strong passion and efforts to promote the metabolomics field resulted in further growth of the field in Asia.

We congratulate both esteemed scientists and look forward to their continued contributions in the years to come.

2019 Career Medal Recipients

The Metabolomics Society seeks to recognize outstanding contributions to the field of Metabolomics through the presentation of Metabolomics Society Medals. They are open to all Society members who meet the eligibility criteria outlined below. While research contributions are of primary importance, other contributions, including to the teaching of metabolomics and/or service to the field or the society will also be strongly considered. There are up to two medals awarded each year in the following categories:

- The Metabolomics Society Medal is for mid-career members of the society and is open to those members who have been awarded a PhD 10-15 years prior to the closing date for nominations in each round.
- The President's Award recognizes outstanding achievements in metabolomics by younger members of the Society or society members. It is available for Society members who have been awarded a PhD no more than 5-10 years prior to the closing date prior to the closing date for nominations in each round.

The Board of Directors is pleased to recognize the following individuals as the award recipients for 2019:

The Metabolomics Society Medal
Darren Creek, Monash University, Melbourne, Australia

The President's Award
Daniel Dias, Royal Melbourne Institute of Technology, Melbourne, Australia

We congratulate both award recipients and look forward to their continued contributions in the years to come.

Voting for Directors of the Metabolomics Society

Voting for the next Board of Directors will open in August; be on the lookout for an e-mail with instructions on how to vote. We appreciate the participation of all members to help the future formation of the Metabolomics Society!

SpOtlight

Software Spotlight: CliqueMS

Feature article contributed by Oscar Yanes, Oriol Senan and Marta Sales

Universitat Rovira i Virgili, Tarragona, Spain.

Liquid chromatography coupled to mass spectrometry (LC/MS) is the technique most frequently used to perform untargeted metabolomic studies. This technique allows for the detection of typically tens of thousands of ionized species (ion signals or features) from a biological extract. Most of these features, however, do not correspond to unique metabolites of biological origin, mainly because metabolites can be detected as multiple ions of different mass in either positive or negative ionization mode. The multiplicity of signals corresponding to a metabolite in a mass spectrum is mostly due to in-source phenomena, including cation adduction, multimerization, and in-source fragmentation, but also naturally occurring isotopes, contaminants, and instrument noise. This redundancy of ion signals produces a large amount of "junk" MS/MS spectra either in data-dependent acquisition (DDA) and data-independent acquisition (DIA) modes, which complicates metabolite identification by LC-MS/MS.

An efficient strategy for increasing the coverage of metabolite identifications by LC-MS/MS would be to target only selected and annotated features in MS1 mode for MS/MS fragmentation. With reliable annotation, questions as fundamental as, for example, how many metabolites are there in a given complex biological sample or what is the best adduct for MS/MS experiments could be properly addressed. In line with this strategy, Senan and collaborators have developed CliqueMS (Senan et al., Bioinformatics 2019).

CliqueMS is a novel computational tool that annotates redundant LC-MS1 features using the similarity between coelution profiles and a calculated natural frequency of adduct formation observed in real complex biological samples and pure compounds. In contrast to most existing tools, CliqueMS can produce accurate annotations for a single LC-MS1 spectrum. CliqueMS implements a novel mathematical approach to obtain the most plausible groupings of features according to a similarity network. Then, CliqueMS annotates features and ranks annotations using an estimated frequency of dominant adducts and in-source fragments (**Figure 1**).

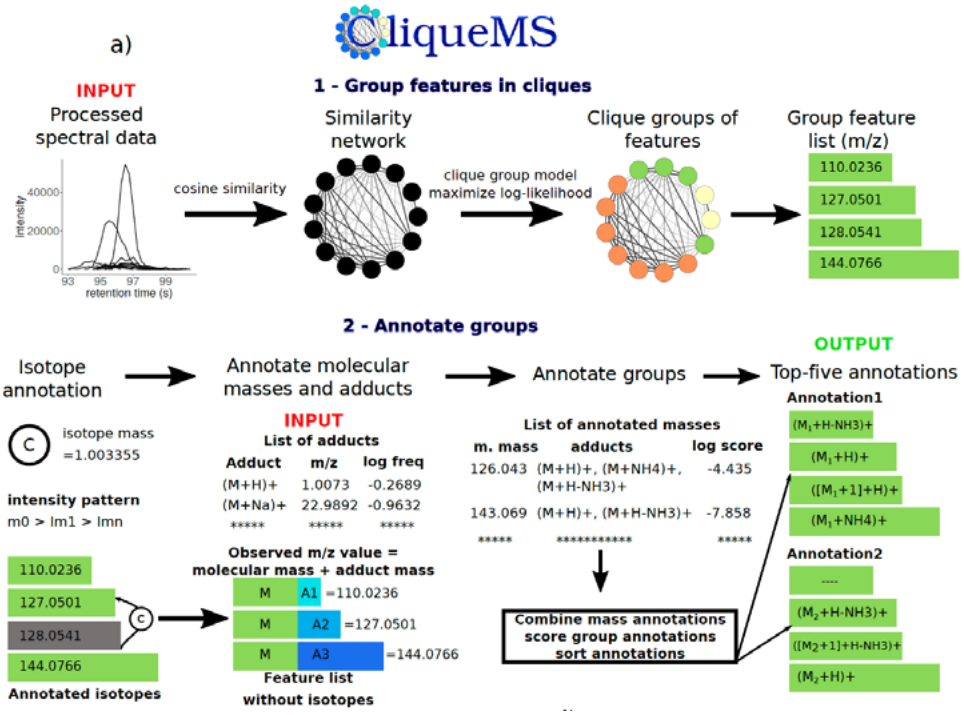

Figure 1. CliqueMS is a network-based algorithm that annotates isotopes, in-source adducts, and fragments from LC/MS data. CliqueMS **(i)** uses a highly discriminatory feature similarity metric; **(ii)** it treats the similarities between peaks in a transparent way by means of a simple generative model; **(iii)** it uses a well-grounded maximum likelihood inference approach to group features; **(iv)** it uses empirical adduct frequencies to identify the parental neutral mass; and **(v)** it deals flexibly with the identification of the parental neutral mass by proposing and ranking alternative annotations.

CliqueMS is available as a web application (http://cliquems.seeslab.net/App/) (**Figure 2**) or as a R package in GitHub (https://github.com/osenan/cliquems).

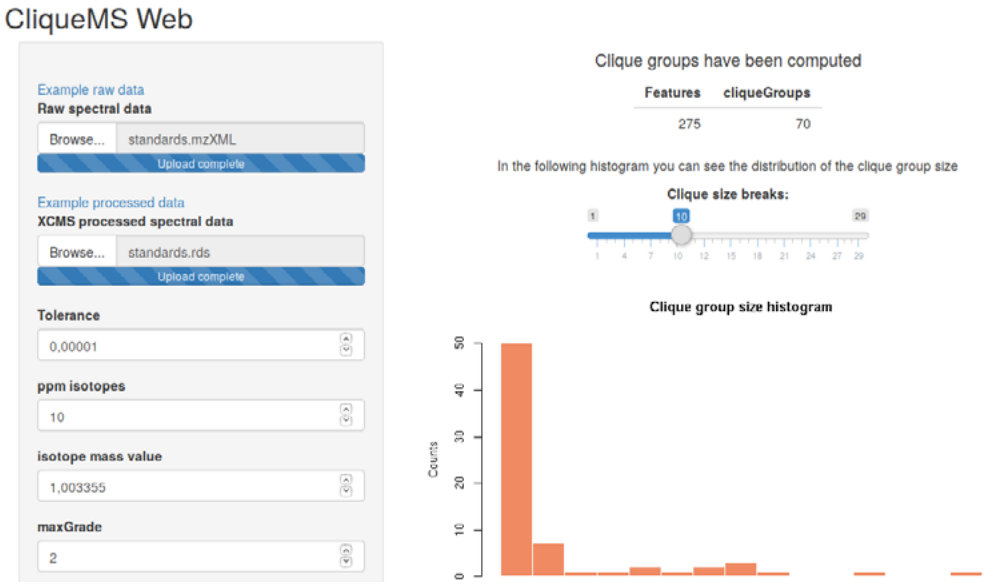

Figure 2. CliqueMS Web is a Shiny Web application (GLP-3); easy and intuitive, with all the features of CliqueMS in a graphical application.

Please let the CliqueMS authors know what you would like to see in future versions of CliqueMS. Your feedback and suggestions are very helpful and help to improve CliqueMS' overall quality and usefulness. Please email your feedback and suggestions to the CliqueMS authors (Óscar Yanes, Marta Sales-Pardo, and Oriol Senan Campos).

Recent Publications

Recently published papers in metabolomics

- Impaired branched chain amino acid oxidation contributes to cardiac insulin resistance in heart failure.
- Transformation of polyphenols found in pigmented gluten-free flours during in vitro large intestinal fermentation.
- Metabolomic profiling of the excretory-secretory products of hookworm and whipworm.
- NMR Spectroscopy for Metabolomics Research.
- Metabolic Perturbations from Step Reduction in Older Persons at Risk for Sarcopenia: Plasma Biomarkers of Abrupt Changes in Physical Activity.
- Measurement of gut microbial metabolites in cardiometabolic health and translational research.
- Portable exhaled breath condensate metabolomics for daily monitoring of adolescent asthma.
- Uncovering mechanisms of global ocean change effects on the Dungeness crab (Cancer magister) through metabolomics analysis.
- A metabolomics-guided approach to discover Fusarium graminearum metabolites after removal of a repressive histone modification.
- Identification of Potential Metabolites Mediating Bird's Selective Feeding on Prunus mira Flowers.
- WiPP: Workflow for improved Peak Picking

Metabolomics Events

9-13 Sep 2019

5th Metabolomics Sardinian Summer School: "Metabolomics in Cancer Biomarkers and Therapy: Promise and Future"

Venue:
Polaris Technology Park, Pula, Sardinia, Italy

Course Objectives and Targets

Participants will attend theoretical sessions with lectures by experts, and practical sessions to deepen the theoretical and practical knowledge for using the main tools available to better understand the role of metabolism in cancer from a metabolomics point of view. The School is mainly targeted to researchers at an early stage in their career (but not only), from Biological Sciences, Health Sciences and other different background (including Bioinformatics) who are interested in learning about the role of metabolism in cancer by using a metabolomics approach.

Topics Covered

- Analytical approaches in metabolomics: application of MS and NMR
- Metabolite identification
- Data analysis and integration with omics
- Metabolic reprogramming and vulnerability of tumors
- Oncogenes, oncometabolites, and tumor metabolism
- Metabolomics for discovery of new cancer drugs

Applications

The course is funded by the Regional Sardinian government and **registration will be free of charge for all attendees.** Selection will be based on CV and a letter stating the motivations for attending the course and future research plans of candidates. Registration includes course material, lunches and coffee breaks (not accommodation expenses).

Organising Committee

- Atzori Luigi, Università Cagliari, Cagliari , Italy
- Caboni PierLuigi, University of Cagliari, Italy
- Griffin Jules, University of Cambridge, Cambridge, UK
- Pastorelli Roberta, Istituto di Ricerche Farmacologiche Mario Negri, IRCCS, Milano, Italy

Program: http://sites.unica.it/metabolomicaclinica/events/scientific-school-2019/program-2019/

Registration: http://sites.unica.it/metabolomicaclinica/events/scientific-school-2019/

Summer School Contact: latzori@unica.it; metabolomicschool2019@gmail.com

Metabolomics Events

16-20 September 2019

The EMBO Practical Course "Metabolomics Bioinformatics in Human Health"

Venue:
The International Agency for Research on Cancer (IARC), Lyon, France

Application Deadline:
April 15. 2019

Registration:
https://training.iarc.fr/embo-practical-course-metabolomics-bioinformatics-in-human-health/

Overview

The EMBO Practical Course "Metabolomics Bioinformatics in Human Health" will be held in the International Agency for Research on Cancer on September 16-20, 2019 and will provide an advanced overview with hands-on practical on key issues and challenges in metabolomics, handling datasets and procedures for the analysis of metabolomics data using bioinformatics tools. Combining lectures from experts, computer-based practical sessions and interactive discussions, the EMBO Practical Course will provide a platform for discussion of the key questions and challenges in this field, from study design to metabolite identification.

This five-day course is aimed at PhD students, post-docs and researchers with at least one to two years of experience in the field of metabolomics who are seeking to improve their skills in metabolomics data analysis. Participants ideally must have working experience using R (including a basic understanding of the syntax and ability to manipulate objects).

During this course you will learn about:

- Metabolomics study design, QC, workflows and sources of experimental error, targeted and untargeted approaches
- Metabolomics data processing tools: **hands on open source** R based programs, XCMS, MetFrag, and MetFusion
- NMR and Computer-assisted structure elucidation
- Metabolomics data analysis: Using R Bioconductor, understanding usage of univariate and multivariate data analysis, data fusion concepts, data clustering, machine learning and regression methods
- Metabolomics downstream analyses: KEGG, BioCyc, and MetExplore for metabolic pathway and network analysis with visualisation of differential expression, understanding metabolomics flux analysis

Metabolomics Events

23 Sept - 18 Oct 2019

Metabolomics: Understanding Metabolism in the 21st Century

Venue:
Birmingham Metabolomics Training Centre, School of Biosciences, University of Birmingham, Birmingham, UK

Overview
Metabolomics is an emerging field that aims to measure the complement of metabolites (the metabolome) in living organisms. The metabolome represents the downstream effect of an organism's genome and its interaction with the environment. Metabolomics has a wide application area across the medical and biological sciences. The course provides an introduction to metabolomics, describes the tools and techniques we use to study the metabolome and explains why we want to study it. By the end of the course you will understand how metabolomics can revolutionise our understanding of metabolism.

Topics Covered
- Metabolism and the interaction of the metabolome with the genome, proteome and the environment
- The advantages of studying the metabolome
- The application of hypothesis generating studies versus the use of traditional hypothesis directed research
- The use of targeted and non-targeted studies in metabolomics
- An interdisciplinary approach with case-studies from clinical and environmental scientific areas
- Important considerations in studying the metabolome
- Experimental design and sample preparation
- The application of mass spectrometry in metabolomics
- An introduction to data processing and analysis
- Metabolite identification

Course link:
https://www.birmingham.ac.uk/facilities/metabolomics-training-centre/courses/Metabolomics-MOOC.aspx

25-27 Sep 2019

Multiple Biofluid and Tissue Types, From Sample Preparation to Analysis Strategies for Metabolomics

Venue:
Birmingham Metabolomics Training Centre, School of Biosciences, University of Birmingham, Birmingham, UK

Overview
This three-day course provides a theoretical overview and hands-on training to apply multiple sample preparation and UPLC-MS methods to characterise the metabolomes of complex biological samples using the mass spectrometer (Xevo QToF G2-XS - a maximum of 4 people working on the instrument in a session). The course is led by experts in the field who have experience of the analysis of microbial, plant and mammalian samples, and illustrates the different approaches that are available to analyse a range of biological samples and applying complementary liquid chromatography approaches to maximise the coverage of the metabolome.

Metabolomics Events

Topics Covered

- Introduction to dealing with the complexity of biological samples using UPLC-MS
- Overview of different sample collection, sample quenching and sample extraction methods
- The challenges of working with cellular and tissue samples
- Overview of different UPLC methods including HILIC and reversed phase methods
- Hands-on sample preparation of plasma, urine, cell and tissue samples
- Monophasic and biphasic solvent extraction methods to target polar and non-polar metabolites
- SPE and liquid-liquid sample clean-up methods
- Hands-on HILIC and reversed-phase liquid chromatography
- Hands-on UPLC-MS analysis for untargeted studies (maximum of 4 people)
- Overview of data analysis and metabolite identification
- Problem solving and tips and tricks session with the experts

Course link: https://www.birmingham.ac.uk/facilities/metabolomics-training-centre/courses/sample-analysis.aspx

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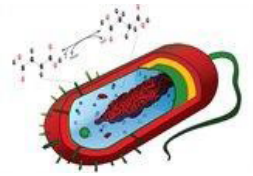
BIRMINGHAM METABOLOMICS TRAINING CENTRE



9-11 Oct 2019

Introduction to Metabolomics for the Microbiologist

Venue:

Birmingham Metabolomics Training Centre, School of Biosciences, University of Birmingham, Birmingham, UK

Overview

This three-day course introduces how untargeted metabolomics can be applied to study microbial systems in academic and industrial research. The course provides an overview of the metabolomics pipeline, experimental design, sample preparation and data acquisition. The course is led by experts in the field of metabolomics and will include lectures, hands-on laboratory sessions in sample preparation and data acquisition and computer workshops focused on data processing and data analysis.

Topics Covered

- Introduction to metabolomics, both targeted and untargeted approaches
- Experimental design and the importance of quality control samples in untargeted metabolomics
- Analytical strategies applied in metabolomics with a focus on mass spectrometry
- Hands-on laboratory sessions focused on sample preparation and to include metabolic quenching and extraction procedures, intracellular and exometabolome samples and polar and non-polar extraction methods
- Hands-on laboratory sessions focused on sample analysis for untargeted metabolomics studies using an Acquity UPLC coupled to a Xevo QToF mass spectrometer
- Hands-on workshop focused on data processing and data analysis
- Hands-on workshop focused on an introduction to metabolite identification
- Question and answer session with the experts

Course Link: https://www.birmingham.ac.uk/facilities/metabolomics-training-centre/courses/introduction-metabolomics-microbiologist.aspx

Metabolomics Events

21 Oct - 15 Nov 2019

Metabolomics Data Processing and Data Analysis

Venue:
The University of Florida Clinical & Translational Science Institute, Gainesville, Florida USA

Overview
This online course explores the tools and approaches that are used to process and analyse metabolomics data. You will investigate the challenges that are typically encountered in the analysis of metabolomics data, and provide solutions to overcome these problems. The course is delivered using a combination of short videos, articles, discussions, and online workshops with step-by-step instructions and test data sets. We provide quizzes, polls and peer review exercises each week, so that you can review your learning throughout the course.

The material is delivered over a four-week period, with an estimated learning time of four hours per week. We support your learning via social discussions where you will be able post questions and comments to the team of educators and the other learners on the course. In the final week of the course there is a live question and answer session with the entire team of educators. If you do not have time to complete the course during the 4-week period you will retain access to the course material to revisit, as you are able.

Topics Covered
- An introduction to metabolomics
- An overview of the untargeted metabolomics workflow
- The influence of experimental design and data acquisition on data analysis and data quality
- Processing of NMR data
- Processing direct infusion mass spectrometry data
- Processing liquid chromatography-mass spectrometry data
- Reporting standards and data repositories
- Data analysis, detecting outliers and drift, and pre-treatment methods
- Univariate data analysis
- Multivariate data analysis (including unsupervised and supervised approaches)
- The importance of statistical validation of results
- Computational approaches for metabolite identification and translation of results into biological knowledge
- What are the future challenges for data processing and analysis in metabolomics

Course link: https://www.birmingham.ac.uk/facilities/metabolomics-training-centre/courses/Metabolomics-Data-Processing-and-Data-Analysis.aspx

25 Oct 2019

Introduction to Metabolomics for the Clinical Scientist

Venue:
Birmingham Metabolomics Training Centre, School of Biosciences, University of Birmingham, Birmingham, UK

Overview
This one-day course in partnership with the Phenome Centre Birmingham provides clinicians with an overview of the metabolomics pipeline highlighting the benefits of this technique to the medical field and an introduction to the Phenome Centre Birmingham and the MRC-NIHR National Phenome Centre.
The course provides a suitable introduction to metabolomics prior to taking additional training courses at either the Birmingham Metabolomics Training Centre or the Imperial International Phenome Training Centre.

Metabolomics Events

Topics Covered

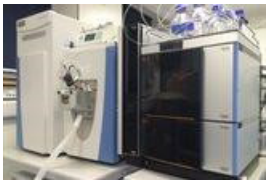
- Introduction to the Phenome Centre Birmingham and the Imperial MRC-NIHR National Phenome Centre showcasing facilities and expertise available.
- Introduction to metabolomics
- Importance of experimental design and sample collection
- Overview of technologies available for data acquisition highlighting discovery phase profiling technologies and targeted platforms for the validation of biomarkers
- Overview of technologies available for data analysis
- Case studies – large-scale metabolic phenotyping, translation to targeted assays, clinical practice
- Question and answer session with the experts

Course link:
https://www.birmingham.ac.uk/facilities/metabolomics-training-centre/courses/introduction-metabolomics.aspx

BIRMINGHAM METABOLOMICS TRAINING CENTRE

6-8 Nov 2019

Metabolomics with the Q Exactive



Venue:

Birmingham Metabolomics Training Centre, School of Biosciences, University of Birmingham, Birmingham, UK

Overview

This three-day course introduces you to using the Q Exactive mass spectrometer in your metabolomics investigations. The course is led by experts in the field of metabolomics and includes lectures, laboratory sessions and computer workshops to provide a detailed overview of the metabolomics pipeline applying the Q Exactive mass spectrometer.

Topics Covered

- Introduction to Metabolomics on the Q Exactive, the metabolomics workflow, and case studies using the Q Exactive
- Using the Q Exactive family of instruments in your metabolomics investigations
- Experimental design and the importance of quality control samples
- Sample preparation including polar and non-polar preparation methods on biofluids (urine and plasma) and tissue samples
- Preparation of samples for profiling and targeted analyses on the Q Exactive
- Hands-on data acquisition for profiling and targeted studies, setting up the Vanquish UHPLC coupled to the Q Exactive MS
- Data processing workshop
- Data analysis workshop (univariate and multivariate analysis)
- Introduction to metabolite identification applying Data Dependent Analysis and Data Independent Analysis
- Question and answer session with a panel of experts
    - Tips and Tricks
    - Problem Solving

Course link:
https://www.birmingham.ac.uk/facilities/metabolomics-training-centre/courses/q-exactive.aspx

Metabolomics Events

BIRMINGHAM METABOLOMICS TRAINING CENTRE

20-21 November 2019

Metabolite identification with the Q Exactive and LTQ Orbitrap

Venue:
Birmingham Metabolomics Training Centre, School of Biosciences, University of Birmingham, Birmingham, UK

Overview

This two-day course will provide a hands-on approach to teach the attendees about the latest techniques and tools available to perform metabolite identification in non-targeted metabolomics studies. The course will be led by experts working within the fields of metabolomics and chemical analysis and will include a significant proportion of hands-on experience of using mass spectrometers, software tools and databases. A maximum of four people will be working on each mass spectrometer in a session. We will apply these tools on the Q Exactive and LTQ-Orbitrap family of mass spectrometers.

Topics Covered

- Importance of mass spectral interpretation
- Types of data which can be collected on the QE and LTQ-Orbitrap (m/z, retention time, MS/MS, MSn)
- Conversion of raw data to molecular formula and putative metabolite annotations
- MS/MS experiments in metabolic phenotyping for on-line data acquisition using the QE (DDA, DIA, all-ion)
- MS/MS and MSn experiments for sample fractions using the LTQ-Orbitrap
- Mass spectral libraries (using mzCloud)
- Searching mass spectral libraries
- Tools for mass spectral interpretation
- Reporting standards for metabolite identification
- Question and answer session with the experts

Course link: https://www.birmingham.ac.uk/facilities/metabolomics-training-centre/courses/metabolite-identification.aspx

Metabolomics Jobs & Collaborations

If you have a job you would like posted, please email Ian Forsythe (metabolomics.innovation@gmail.com).

Jobs Offered

Job Title	Employer	Location	Posted	Closes	Source
Various Positions			3-July-19		Metabolomics Association of North America Jobs
Metabolite Scientist	Olaris, Inc.	Cambridge, MA, U.S.A.	14-May-19	Until filled	LinkedIn
Post-doctoral Researcher Metabolomics-Microbiome	Georgia Institute of Technology	Atlanta, Georgia, USA	3-Jun-19		American Society for Mass Spectrometry
Tier 2 CIHR Canada Research Chair (CRC) in Clinical Omics and Diagnostics	Concordia University	Montreal, Quebec, Canada	11-Jun-19	31-Aug-19	Concordia University
PhD and postdoctoral fellow positions in Metabolomics and Lipidomics	Technion – Israel Institute of Technology	Haifa, Israel	5-Jun-19	31-Aug-19	Metabolomics Society
Postdoctoral position in mass spectrometry		San Diego, California, USA	3-Jun-19	1-Sep-19	Metabolomics Society
W3-Professor of Metabolomics in Aging and W3-Professorship for Microbiota in Aging - CECAD Cologne	University of Cologne	Cologne, Germany	26-Jul-19	11-Aug-19	Metabolomics Society Jobs
Test Engineer / Analytical Chemist	Ginkgo Bioworks	Boston, MA, USA	23-Jul-19	31-Aug-19	Metabolomics Society Jobs
PhD in Metabolomics (BBSRC iCASE with Unilever)	University of Birmingham	Birmingham, United Kingdom	27-Jul-19	18-Aug-19	FindaPhD

Jobs Wanted

This section is intended for very highly qualified individuals (e.g., lab managers, professors, directors, executives with extensive experience) who are seeking employment in metabolomics.

We encourage these individuals to submit their position requests to Ian Forsythe (metabolomics.innovation@gmail.com). Upon review, a limited number of job submissions will be selected for publication in the Jobs Wanted section.

- **There are currently no listings**