

Customer Spotlight

Phenome Centre Birmingham Making a Phenomenal Impact in Metabolomics



Mark Viant, Ph.D.,
Professor of Metabolomics
Director of Phenome Centre Birmingham, University of Birmingham, UK

Chemical Safety Testing is transitioning to automated high-throughput in vitro workflows due to the rapid growth of the chemical industry and the need for more efficient, ethical testing of their effects on human health.

Traditional animal-based tests are increasingly being replaced by New Approach Methodologies (NAMs) due to rising support for alternative testing methods.¹ NAMs provide safe and sustainable ways to assess the impact of everyday chemicals on our health. These methods include:

- Advanced biological systems, such as 2D and 3D in vitro models, microtissues and organ-on-chip technology
- Molecular technologies, including omics-based techniques
- Computational methods, like machine learning and artificial intelligence

Metabolomics is central to NAMs, as it measures and statistically analyzes low-molecular-weight endogenous metabolites within biological specimens, providing insights into physiological conditions, disease states, and responses to external stimuli such as diet and chemical exposure. Unlike traditional techniques, metabolomic methods profile thousands of metabolites simultaneously, making it indispensable for understanding complex processes in both animal and plant biology.

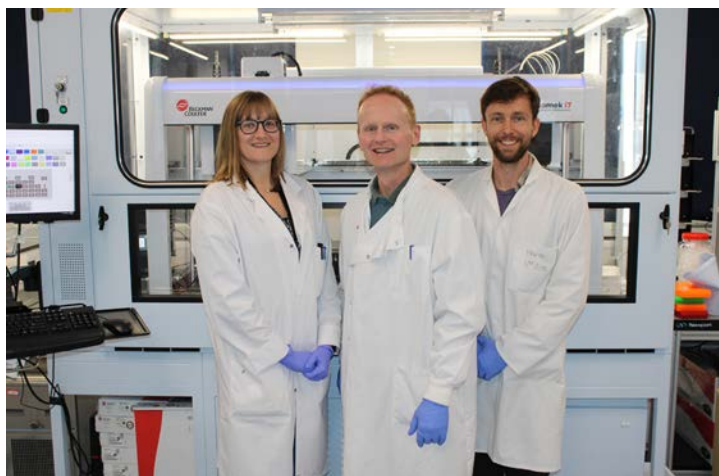
Legislative changes in the EU and US support this transition, with significant funding and policies promoting NAMs. Major initiatives like the European Partnership for the Assessment of Risks from Chemicals (PARC) and efforts by the US EPA aim to enhance global chemical risk assessments.

Where Chemistry, Biology, and Computer Science Converge

Phenome Centre Birmingham stands at the forefront of metabolomics research, offering extensive expertise from experimental design through to data analysis and biological interpretation in the areas of toxicological metabolomics and cancer metabolomics.

Leading their toxicological metabolomics research is Professor Mark Viant. With nearly two decades of experience, he has significantly advanced metabolomics in human and environmental toxicology. A former President and Lifetime Honorary Fellow of the Metabolomics Society, he collaborates with scientists at regulatory agencies like the European Chemicals Agency, UK Food Standards Agency, Health Canada and the US EPA. He has also partnered with Unilever and AstraZeneca on chemical safety and drug safety, and led international efforts to set best practices and standards for metabolomics in toxicology, including the OECD's Omics Reporting Framework project.

Professor Mark Viant's research team focuses on metabolomics in human and environmental toxicology, developing innovative solutions for chemical safety. By utilizing metabolomics to perform untargeted measurements of small molecules, they uncover toxicity pathways of chemicals, drugs, and nanomaterials, aiding in the development of Adverse Outcome Pathways (AOPs) and exploring chemical metabolism. The laboratory advances analytical and bio-chemo-informatic methods, including automated sample preparation and high-resolution mass spectrometry, to enhance toxicology research.



Metabolomics Services That Hit the Mark

Phenome Centre Birmingham offers expert advice and guidance from leading scientists to design and plan your study. You get:

- Face-to-face meetings or teleconferences with your scientific lead
- Analysis is performed using state-of-the-art instrumentation, automation and data analysis tools
- A team of post-doctoral-level researchers is on standby with guidance on how to interpret and understand results and ensure you have all the information to answer your biological questions

Untargeted Metabolomics Service

Ideal for broad surveys in discovery-based studies, their untargeted metabolomics service uses complementary chromatography methods and both positive and negative ion modes to maximize metabolite detection, relatively quantifying thousands of metabolites with robust quality assurance.

Hybrid Metabolomics Service

Their hybrid metabolomics service is state-of-the-art, enabling the targeted measurement of a set of pre-selected metabolites—using the MTox700+ toxicological biomarker panel—while also benefiting from untargeted detection.

Overcoming Sample Preparation Bottlenecks With Automation

Metabolomics workflows are complex, requiring separate processes for different classes of metabolite, such as polar and non-polar compounds.

Challenges include:

- Increasing throughput without compromising repeatability
- Enabling the extraction of polar metabolites and lipids
- Maintaining sample integrity through strict processing requirements
- Ensuring appropriate use of quality control samples

“Having conducted research in metabolomics for over 20 years, I’ve experienced firsthand the labor-intensive nature of metabolite extractions as well as the importance of repeatable extractions to achieve high data quality,” he says.

To tackle these challenges, Professor Viant and his team rely on the **Biomek i7 Automated Workstation**.



“Establishing our extraction protocols on the Biomek i7 has opened a new horizon for high-throughput metabolomics, enabling the preparation of thousands of cell extracts for mass spectrometric analysis within just a few days.”

Phenome Centre Birmingham is poised to drive future discoveries in metabolomics, offering new insights into chemical safety and cancer biology. Their innovative approaches and advanced automation technologies uniquely position them to conduct impactful metabolomics studies in human health.

Looking ahead, their commitment to advancing the field is sure to shape the future of metabolomics research and its applications, and Beckman Coulter Life Sciences is excited to continue to provide them with the solutions they need to achieve groundbreaking discoveries.

Learn more about Phenome Centre Birmingham at birmingham.ac.uk/research/centres-institutes/phenome-centre-birmingham.

Learn more about Biomek i-Series automated workstations at beckman.com/liquid-handlers/biomek-i-series-automated-workstations



1. National Research Council. Toxicity Testing in the 21st Century: A Vision and a Strategy. Washington, DC: National Academies Press; 2007. Available from: <https://www.nap.edu/catalog/11970/toxicity-testing-in-the-21st-century-a-vision-and-a>

© 2024 Beckman Coulter, Inc. All rights reserved. Beckman Coulter, the stylized logo, and the Beckman Coulter product and service marks mentioned herein are trademarks or registered trademarks of Beckman Coulter, Inc. in the United States and other countries.

For Beckman Coulter's worldwide office locations and phone numbers, please visit Contact Us at beckman.com
2024-GBL-EN-106940-v1

