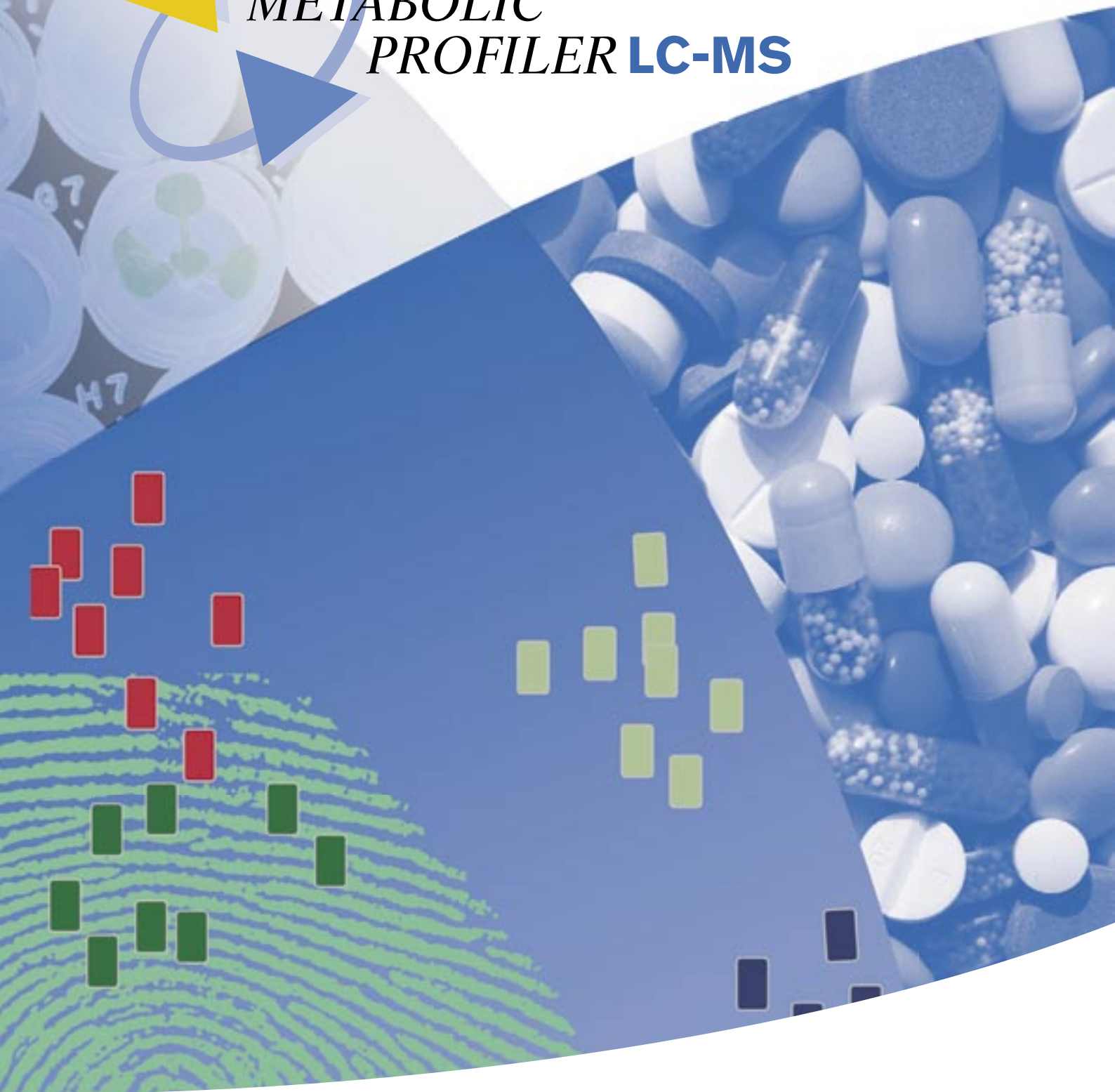




METABOLIC
PROFILER **LC-MS**



BRUKER
DALTONICS[®]

Enabling Life Science Tools Based on Mass Spectrometry™

Open the door to metabolomics

Metabolomics represents the end point of the cascade from Genomics to Transcriptomics and Proteomics.

Changes in the metabolome are the ultimate response of a biological system to genetic alterations, disease, environmental or drug influences and perturbations.

Metabolic Profiling catalyzes basic research in systems biology utilizing all "omics" data to elucidate the connectivity within complex systems and unravels new pathways and mechanisms.

Metabolic Profiling is a key technology in the pharmaceutical industry to study drug efficacy or toxicology. It is inspiring clinical research by expanding biomarker profiling applications to the metabolome.

Metabolic Profiling is an advanced technology in food, chemical & nutraceutical industries, for research, process- and quality control.



genomics



transcriptomics



proteomics



metabolomics

"Metabolomics: The measurement of metabolite concentrations and fluxes and secretions in cells and tissues in which there is a direct connection between the genetic activity (gene expression), protein activity (proteome) and the metabolic activity itself."

J. Nicholson Nature Rev. Drug Discov. 2, 668-676 (2003)



LC-MS

Identification

LC-MS/NMR

with groundbreaking tools...

Advanced ESI-TOF mass spectrometry

Bruker Daltonics sophisticated micrOTOF technology provides state-of-the-art combination of mass accuracy, resolution, sensitivity and isotopic fit.

Integrated Statistics Tools

ProfileAnalysis is the platform for fast and comprehensive multivariate statistical analysis and interpretation of LC-MS data.

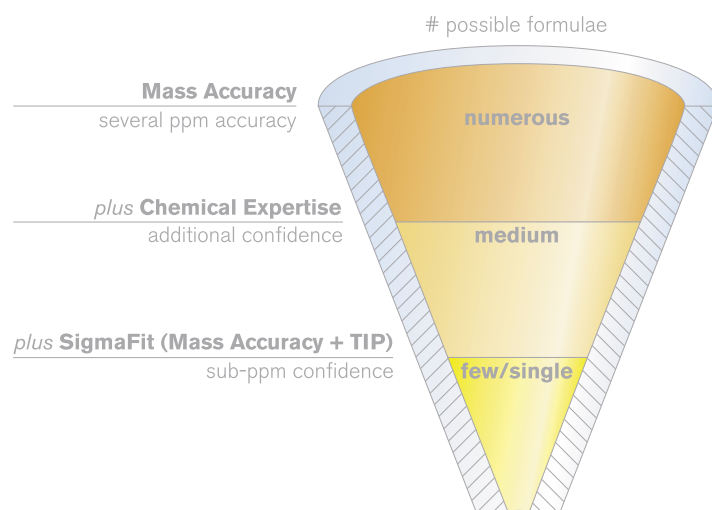
Generate Molecular Formula

Accurate mass and SigmaFit™ isotopic pattern analysis allows the intelligent identification of compounds - providing sub-ppm confidence!

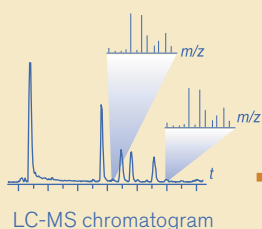
Store & Find in the Library

Additional structural information can be retrieved from MS/MS data and saved in the Library Editor.

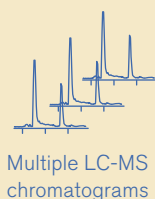
The system can be readily expanded with Bruker BioSpin's Avance NMR technology in the MetabolicProfiler™ LC-MS/NMR systems solution. Structural data may lead to the exclusion of structural isomers of a compound and validate the LC-MS results.



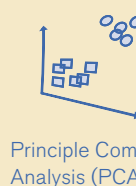
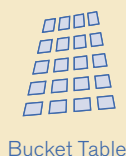
Molecular Formula Generation: Mass accuracy, chemical knowledge and SigmaFit clearly limit the number of possible formulae - for confident determination of the elemental makeup of a given peak.

Workflow: Evaluation of LC-MS based Profiling Experiments**Acquisition:**

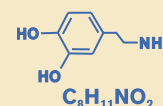
Multiple LC-MS analyses are acquired in a sequence of measurements.

**Evaluation:**

LC-MS data are prepared for statistical analysis in a bucket table. The bucket table consists of retention time (RT)-m/z-pairs with corresponding intensities for each sample. The data set in the bucket table is analyzed using principle component analysis (PCA).

**Interpretation:**

PCA provides information about distribution of variance in data sets and simultaneously highlights RT-m/z-pairs responsible for variation.



Data Interpretation

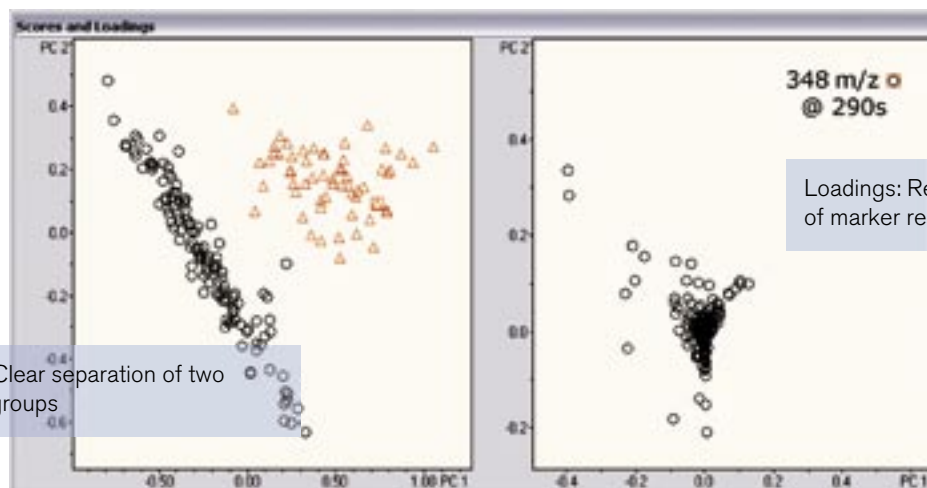
Feedback:

Compounds are readily identified by SigmaFit™ using accurate mass and TIP™.

...for performance in profiling and compound identification

Profiling of baby urine samples. 184 samples were analyzed on the micrOTOF and subjected to analysis with ProfileAnalysis and DataAnalysis.

The PCA analysis revealed a clear separation of two groups in the scores plot with a compound with $[M-H]^- = 348$ m/z (ESI negative mode) being responsible for group formation as indicated in the loadings plot.



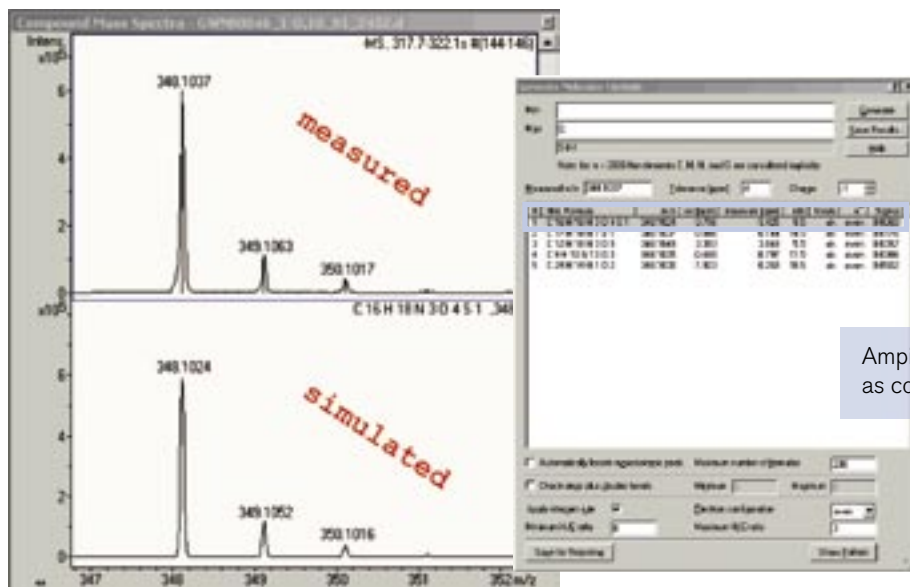
Scores: Clear separation of two sample groups

Loadings: Retention times and m/z values of marker responsible for group formation

The PCA analysis of "real-life" baby urine samples clearly discloses separation of two sample groups.

Samples by courtesy of Prof. Dr. M. Nauck and Prof. Dr. C. Fusch, Greifswald University Medical School. *

Formula generation is performed including micrOTOF's accurate mass measurement capabilities and the unique SigmaFit isotopic pattern analysis. By comparison of the measured spectrum with the simulated isotope pattern for a compound, the number of possible formulae can be reduced dramatically – for highest precision down to sub-ppm confidence in compound identification!



Ampicillin C₁₆H₁₉N₃O₄S as confirmed by MS & NMR

...and step into a *new dimension of information*



The **METABOLIC PROFILER LC-MS** is a unique modular system based on Bruker Daltonics renowned LC-MS accurate mass capabilities, namely the micrOTOF™ and micrOTOF-Q™ time-of-flight (TOF) mass spectrometry (MS).

The system is completed by sophisticated and integrated software tools:

- ProfileAnalysis™ for pattern recognition and
- DataAnalysis™ for generate molecular formula challenges.



The Metabolic Profiler platform opens the door for mining metabolic profiles for small molecule **biomarkers** in various applications:

In pharmaceutical industry, drug discovery benefits from metabolomics technologies in toxicology and efficacy studies. In clinical applications, metabolite profiles can help to study genetic differences e.g. inborn errors of metabolism. Small molecules can be very efficient clinical biomarkers and new markers for diseases and their progression status are desperately needed to speed up and enhance diagnosis.



In plant science, metabolomics is well established to investigate the effect of genetic modifications to the phenotype. The field of nutrition will benefit largely from the comprehensive analysis of ingredients. Environmental toxicology is another important application of metabolomics.

Systems biology in the end will bring all "-omics" sciences together in mechanistic studies and provide a deeper understanding in biological networks of gene regulation, protein expression and metabolites.

Any sample matrix can be applied, ranging from blood, urine, cerebrospinal fluid or tissue and tissue extracts to food and beverages.



Metabolic Profiler LC-MS at a glance

- Comprehensive solution: Unique Generate Molecular Formula capabilities, Multivariate statistical tools and Library search options
- Sub-ppm confidence from accurate mass and SigmaFit for formula generation
- Unique structure elucidation capabilities with LC-MS/NMR

System Configuration

- various HPLC, fastLC models
- micrOTOF focus or micrOTOF-Q
- Compass, a common user interface to all Bruker Daltonics Life Science software
- ProfileAnalysis, Multivariate statistics of LC-MS data
- DataAnalysis, Profound post-processing of LC-MS data
- Optional MetaboliteTools, Software for Metabolite Identification

Optional expansion to Metabolic Profiler LC-MS/NMR with Bruker Biospin Avance NMR solution, the world's only fully-integrated solution for metabolic profiling.

For research use only. Not for diagnostic procedures.

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