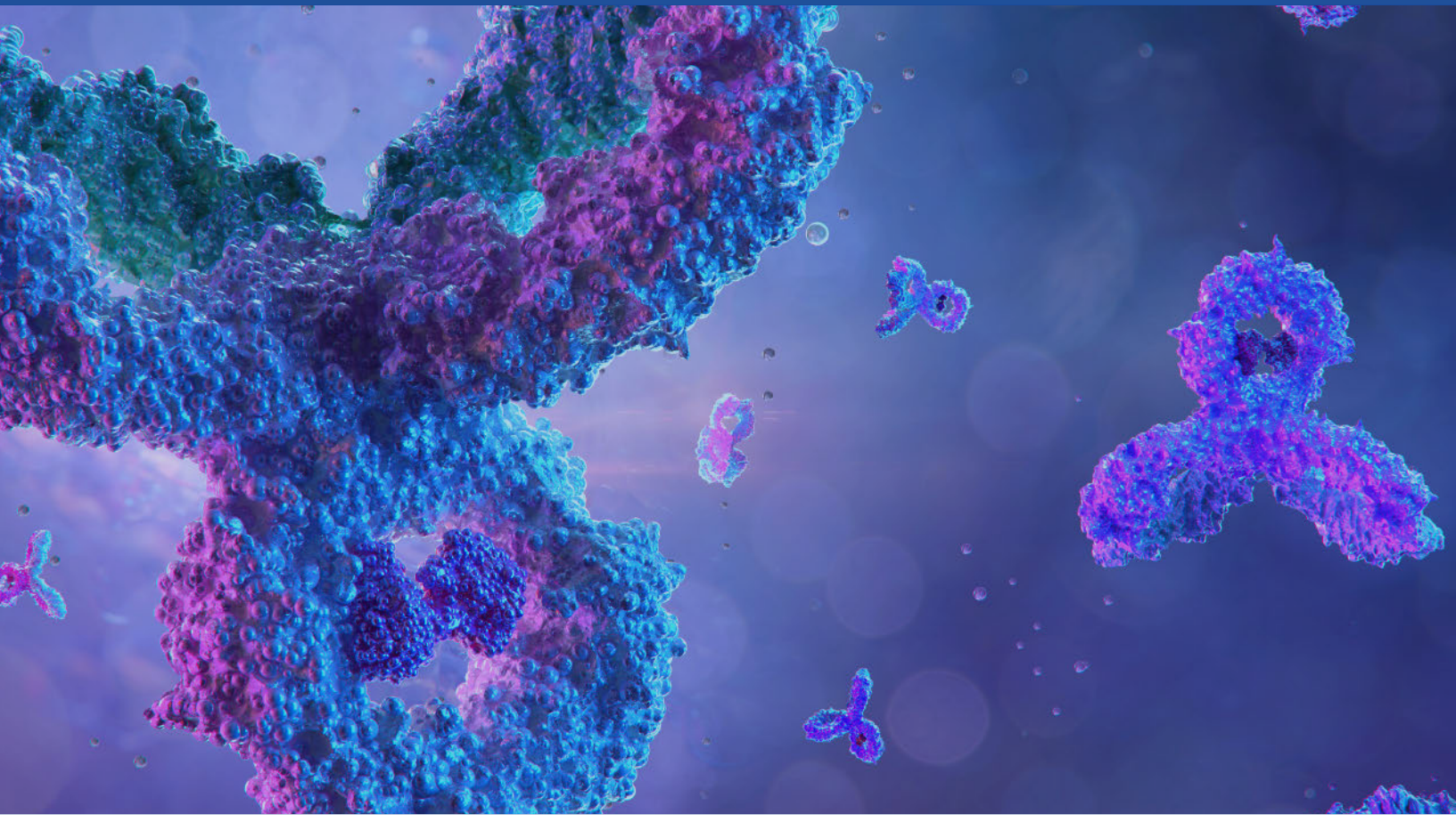




# Creative Proteomics

Metabolomics Solutions





Thermo Q Exactive™ series



AB Sciex 6500+



Thermo Orbitrap Fusion Lumos



Thermo TRACE 1310-ISQ LT



Thermo TSQ 9000



Agilent 6495 Triple Quadrupole  
LC/MS Coupled with the Agilent  
1290 Infinity II LC System

## Metabolomics Solutions

A deeper understanding of the mysteries of life and a new era of health science.

In most metabolomic studies, two types of analysis are used: untargeted metabolomics (also called "metabolite profiling") and targeted metabolomics (quantitative analysis of targeted small molecules). Untargeted metabolomics is first used to unbiasedly detect and analyze all of the metabolites in a sample to screen for differential metabolites. Identification of the differential metabolites is performed, and the results are confirmed using standards to complete the elucidation of their biological significance. Targeted metabolomics is then used to validate and analyze the meaningful metabolites, providing strong support for in-depth research and the exploitation of biomarkers.

# Untargeted Metabolomics



Waters Xevo TQ-s

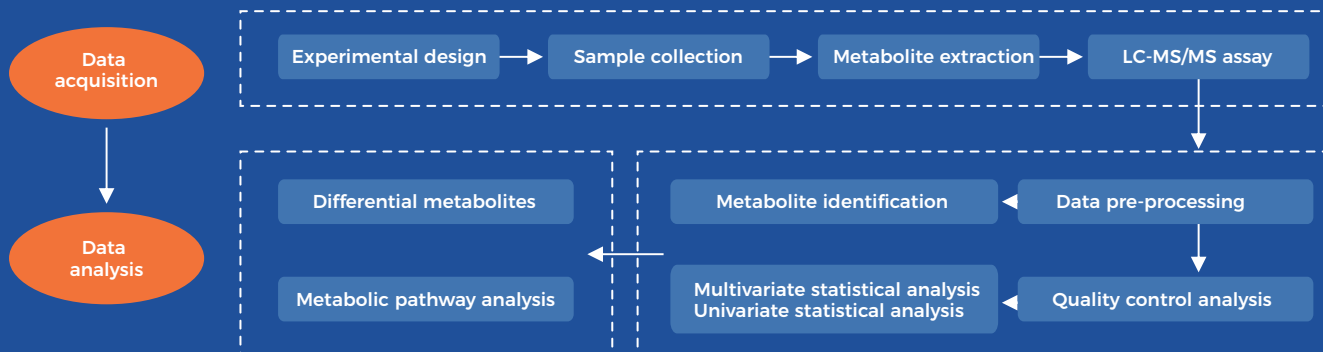


ACQUITY UPLC

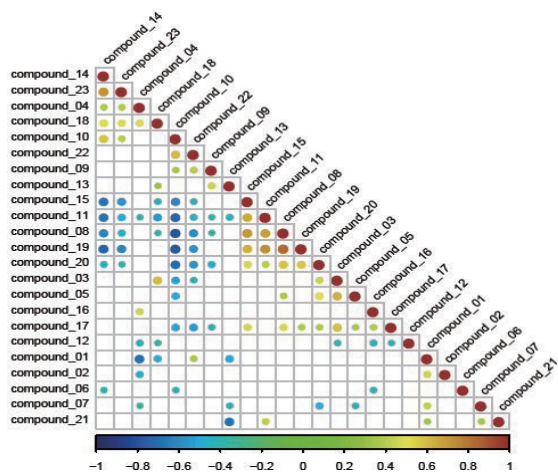
Creative Proteomics uses liquid mass spectrometry (LC-MS) technology for untargeted metabolomics assays. All small molecule metabolites in the organism before and after stimulation or perturbation are detected by LC-MS, and bioinformatics analysis is performed by metaX, a self-developed metabolomics software package, to screen out the differential metabolites between the experimental and control groups. Metabolic pathway analysis of the differential metabolites was performed, and then the correlation between metabolites and physiopathological changes could be investigated.

Detection Technology	Instrument Model	Software	Project Cycle
LC-MS	Thermo Q Exactive Series	Compound Discoverer	25 working days
	Waters Xevo G2-xS Q-ToF	Progenesis Q1	25 working days

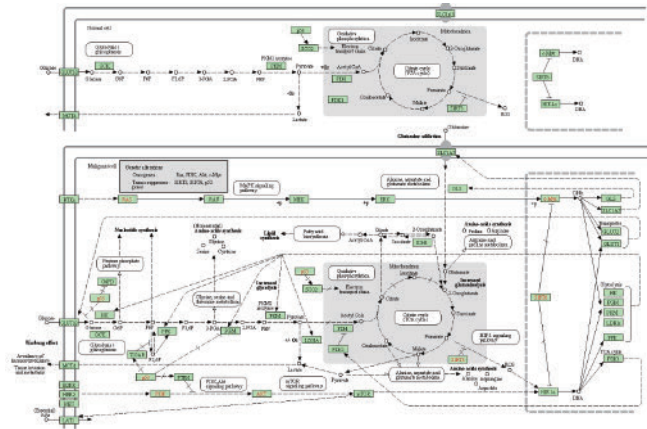
## Workflow of Untargeted Metabolomics Analysis



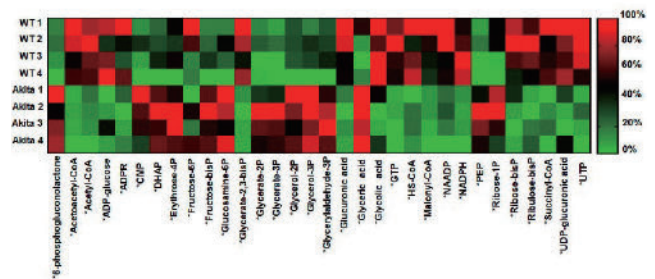
# BIOINFORMATICS ANALYSIS AND RESULTS PRESENTATION



Correlation diagram



Metabolic pathway signaling diagram



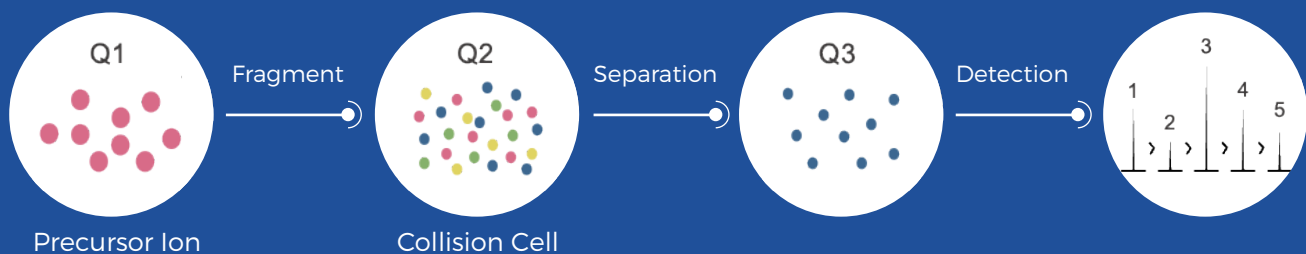
Heatmap indicating percent change of individual metabolites

## Targeted Metabolomics

Targeted metabolomics is the analysis of the detection of well-targeted metabolites, specifically for one or several pathways. The analytical approach is to validate quantitative information on pre-identified metabolites or identified potential biomarkers using a large number of natural and biologically variable samples. Accurate qualitative and quantitative analysis using analytical standards is required.

### - Targeted Metabolomics Technology Platform

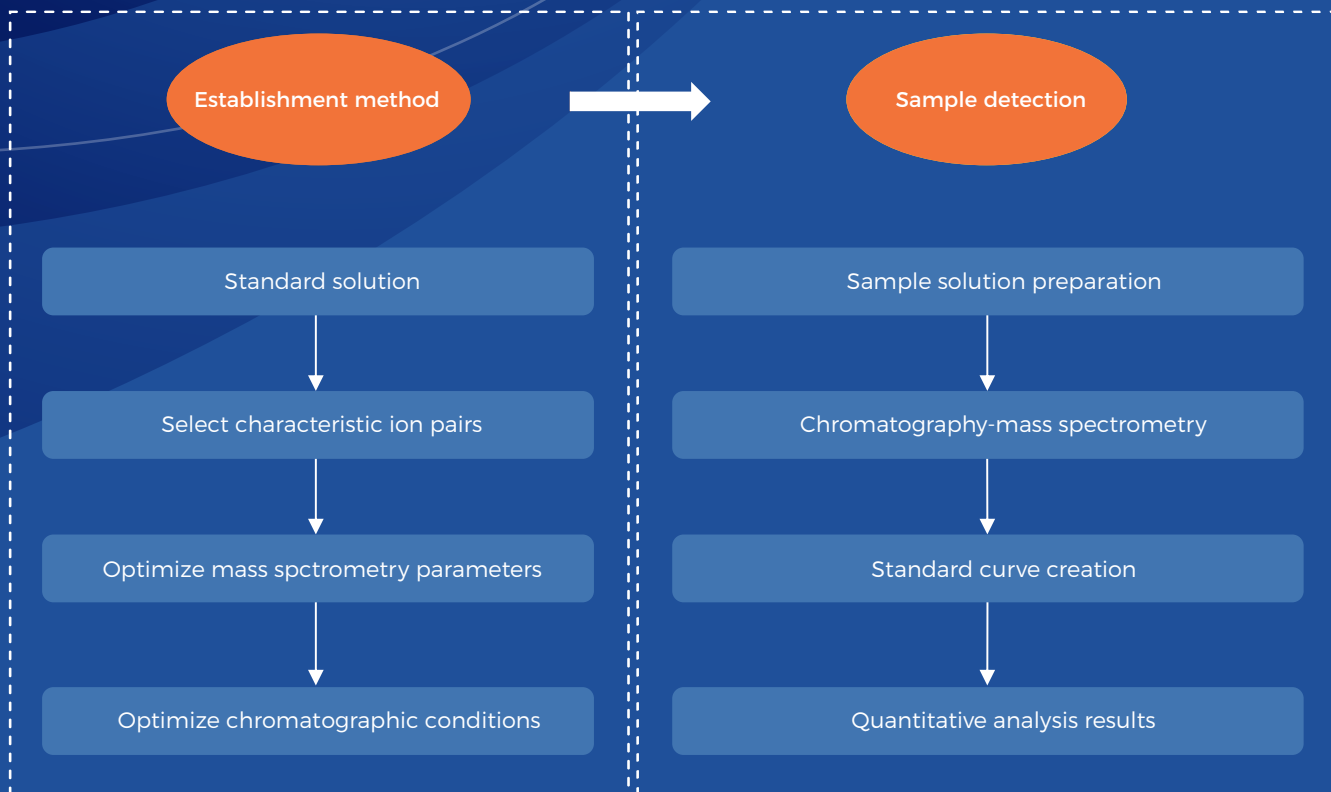
A common analytical method for targeted metabolomics is multiple reaction monitoring (MRM) technology.



- High throughput: Dozens of the same kind of metabolites can be detected simultaneously, saving time.
- Accurate quantification: sensitivity up to pg level, allowing accurate quantification of metabolites with low abundance.
- Standards: method establishment by standards for each metabolite to ensure the accuracy of results.
- Long-term method establishment: no need to repeatedly establish methods, the characteristic ion pair of each metabolite is established once and applied for a long time.
- Good reproducibility: multiple guarantees (multiple signature ion pairs per metabolite, multiple assays per signal), high reproducibility even in different laboratories.

DETECTION TECHNOLOGY	INSTRUMENT MODEL	PROJECT CYCLE
LC-MS	SCIEX QTRAP 4500/5500/6500 series, Waters Xevo TQ-s	25-35 working days
GC-MS	Thermo TSQ 9000, Agilent 7890B-5977A	25-35 working days

**- Workflow of Targeted Metabolomics Analysis**



# CATEGORIES OF TARGETED METABOLOMICS ASSAYS

The metabolites we can detect include, but are not limited to, the following categories:

CATEGORIES	REPRESENTATIVE COMPOUNDS
TARGETED METABOLIC PATHWAYS	Glycolysis Pathway, TCA Cycle, Central Carbon Metabolism, Pentose Phosphate Pathway, Tryptophan Metabolism, Mevalonate Pathway, One-carbon Metabolism, Methionine Cycle, Urea Cycle Metabolism, Isoprenoid Biosynthesis, Carnitine Biosynthesis, Pyrimidine Biosynthesis, Energy Metabolic Pathways, etc.
ANTHOCYANINS	Cyanidin, Delphinidin, Pelargonidin, Petunidin, Malvidin, Peonidin
CAROTENOIDS	$\alpha$ -Carotene, $\beta$ -Carotene, $\gamma$ -Carotene, Violaxanthin, Antheraxanthin, Canthaxanthin, Astaxanthin, Lutein, Lycopene, Fucoxanthin,
PLANT HORMONE	Auxins, Abscisic acid (ABA), Strigolactone (SL), Cytokinins (CTK), Ethylene (ETH), Melatonin, Jasmonic acid (JA), Brassinosteroid (BR), Gibberellins (GA)
FLAVONES	Apigenin, Lignanin, Lutveolin, Baicalin, Baicalein, Tangeritin
FLAVONOL	Prunetin, Isorhamnetin, Hammaritin, Kaempferol, Quercetin, Myricetin, Fisetin
FLAVANONE (DIHYDROFLAVONE)	Hypericin, Hesperidin, Eriodictyol, Naringenin
FLAVANONOL (DIHYDROFLAVONOL)	Dihydrokaempferol, Taxifolin, Sangenone C/D
ISOFLAVONE	Genistein, Puerarin, Soy isoflavones, Glycitein, Daidzein
AMINO ACIDS AND THEIR DERIVATIVES	Arginine, Histidine, Isoleucine, Leucine, Lysine, Methionine, etc.
NEUROTRANSMITTERS	Catecholamines, Dopamine (DA), Norepinephrine (NE), 5-Hydroxytryptamine (5-HT), $\gamma$ -aminobutyric acid (GABA), Glycine, Glutamate, Histamine, Acetylcholine (ACh)

CATEGORIES	REPRESENTATIVE COMPOUNDS
ACYL-CARNITINE	Free Carnitine, Acetyl Carnitine, Propionyl Carnitine, Malonyl Carnitine, Butyryl Carnitine, etc.
FATTY ACIDS	Short-chain Fatty Acid, Free Fatty Acid, Fatty Acid Methyl Esters
BILE ACIDS	Cholic Acid, Chenodeoxycholic Acid, Glycocholic Acid, Glycodeoxycholic Acid, Taurocholic Acid, etc.
STEROID HORMONES	Corticosterone, Progesterone
VITAMINS	Vitamin B1, Pyridoxic Acids, 5-Methyltetrahydrofolate, Vitamin A (Retinol), Alpha-Tocopherol (Vitamin E), Vitamin K, etc.
ORGANIC ACIDS	Malic Acid, Oxalic Acid, Quinic Acid, Citric Acid, Malonic Acid, Succinic Acid, Acetic Acid, Lactic Acid, Pyruvic Acid, Shikimic Acid, $\alpha$ -ketoglutaric Acid, Cinnamic Acid, Fumaric Acid, Glyoxylic Acid, Ferulic Acid, Isoferulic Acid, Tartaric Acid, Glycolic Acid, Aconitic Acid, Formic Acid, Propanoic Acid, Butyric Acid, Isobutyric Acid, Valeric Acid, Isovaleric Acid, Maleic Acid, etc.
TERPENOIDS	Citronellol, Cinene, (R)-Camphor, Germacrone, Phytol, Squalene, Lutein, Coenzyme Q10
LIGNANS	Cubebin, Arctigenin, Isotaxiresinol, Phillyrin
SAPONINS	Ginsenoside, Soyasaponins
CARBOHYDRATE METABOLITES	Mannitol, Mannose, Fructose, Maltose, Raffinose, Xylose, Glucose, Lactose, Sorbitol, Sucrose, Galactose
ALKALOIDS	Ephedrine, Colchicine, Monocrotaline, Arecoline, Berberine, Morphine, Vincristine, Scopolamine, Pilocarpine, Dichroine, Theophylline, Aconitine, Magnoflorine
TRIMETHYLAMINE OXIDE AND RELATED METABOLITES	Trimethylamine, Oxidized Trimethylamine, Betaine, Choline, L-Carnitine
OXIDATIVE STRESS COMPOUNDS	GSH and GSSG
INORGANIC COMPOUNDS	Aldehydes, Polyphenols, Metals (Metallomics)

