

# Global Metabolomics Market – Technologies and Applications

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## Abstracts

### Metabolomics Market Trends and Outlook

Metabolomics is the comprehensive study of small molecules, known as metabolites, generated during cellular processes. It captures the chemical fingerprints left by metabolic activities, providing a real-time view of an organism's physiological condition. By analyzing metabolic profiles, researchers gain valuable insights into biological pathways, disease processes, and drug responses. Metabolomics collaborates with other omics technologies, such as genomics and proteomics, to deliver a more comprehensive understanding of cellular functions.

Analytical methods include separation techniques like gas chromatography (GC), high-performance liquid chromatography (HPLC), ultra-performance liquid chromatography (UPLC), and capillary electrophoresis (CE), which help to isolate metabolites, while detection methods such as mass spectrometry (MS) and nuclear magnetic resonance (NMR) identify and quantify these metabolites. These techniques support diverse applications, such as identifying biomarkers, developing drugs, creating personalized medicine, evaluating toxicity, and exploring nutrigenomics. Metabolomics additionally assists in clinical diagnostics, functional genomics, and the investigation of complex diseases such as cancer, diabetes, cardiovascular, and neurological disorders. With technological advancements, metabolomics is rapidly expanding, fostering innovations in precision medicine, diagnostics, and therapeutic development.

The global market for Metabolomics is estimated at US\$3.1 billion in 2024 and is projected to reach US\$6.3 billion by 2030, growing at a CAGR of 12.6%. The metabolomics market is witnessing rapid growth, fueled by significant funding from government and private sectors in research and development, alongside ongoing

technological progress in analytical methods such as mass spectrometry (MS) and nuclear magnetic resonance (NMR) spectroscopy. The rising incidence of chronic illnesses, such as cancer, diabetes, cardiovascular, and neurological disorders, is driving demand for metabolomics. Metabolomics plays a crucial role in biomarker identification, enabling early disease detection and facilitating personalized treatment approaches.

The rising emphasis on precision medicine, which individualizes therapies based on specific metabolic profiles, is another key factor contributing to the market growth. In the pharmaceutical and biotech industries, the increased research into metabolomics is being used for drug development, effectiveness assessment, and toxicity testing. This approach helps streamline clinical trials and reduce the likelihood of late-stage failures. Moreover, the expanding applications of metabolomics in agriculture, food science, and environmental research, along with the growing use of nutrigenomics and toxicological assessments, are opening new paths for market players. The integration of artificial intelligence (AI) and advanced data analytics in metabolomics is improving the analysis of complex datasets, fostering innovation, and accelerating discoveries across various fields, thereby strengthening the long-term growth prospects of the market.

### Metabolomics Regional Market Analysis

North America dominates the metabolomics market with an estimated 42% share, driven by a robust research infrastructure, substantial R&D investments, and leading pharmaceutical and biotech companies. The region's advanced healthcare system, increasing prevalence of chronic diseases, and growing emphasis on personalized medicine contribute to market growth, supported by NIH funding and preclinical activities. In contrast, Asia Pacific is anticipated to record the fastest growth rate with a 14.3% CAGR from 2024 to 2030, fueled by rising healthcare expenditures, government support, and expanding life sciences research. Countries such as China, India, and Japan are witnessing a surge in demand for precision medicine, advanced diagnostics, and improved healthcare infrastructure, further contributing to the market's expansion.

### Metabolomics Market Analysis by Analytical Techniques

The detection techniques segment leads the metabolomics market, holding a 53.3% market share in 2024 and experiencing the fastest growth rate with a CAGR of 13% during the forecast period 2024-2030. This growth is attributed to their advanced capabilities in identifying a diverse array of metabolites in biological specimens. Nuclear Magnetic Resonance (NMR) spectroscopy offers structural details, while mass

spectrometry, particularly when combined with gas or liquid chromatography, provides exceptional sensitivity, allowing for the detection of metabolites at femtomole concentrations without requiring separate extraction or purification processes. Continuous advancements, such as enhanced resolution, improved ionization, and tandem MS features, further improve the performance of this segment. Although separation techniques are growing at a comparatively slower rate, they remain essential for precise sample preparation, facilitating the isolation and purification of metabolites to enhance downstream analysis accuracy.

### Metabolomics Separation Techniques Market Analysis by Type

High-Performance Liquid Chromatography (HPLC) is the largest segment within the separation techniques market, capturing a 42.3% share in 2024. This dominance is due to its exceptional capability to separate complex mixtures of metabolites and its compatibility with advanced detection techniques such as mass spectrometry. The extensive application of HPLC in pharmaceutical and clinical research, particularly for biomarker identification and drug development, further strengthens its market strength. Conversely, Ultra-Performance Liquid Chromatography (UPLC) is the fastest-growing segment, expected to witness rapid growth with a 14% CAGR from 2024 to 2030, fueled by its enhanced resolution, quicker analysis times, and improved sensitivity, catering to the increasing demand for high-throughput metabolomics research.

### Metabolomics Market Analysis by Application

The biomarker discovery segment dominates the metabolomics application market, with an estimated share of 32.3% in 2024 due to the increasing use of metabolic biomarkers for assessing patient health and advancements in discovery technologies. The rising prevalence of chronic diseases, a growing demand for personalized healthcare, and partnerships between biotechnology and pharmaceutical companies further solidify this segment's leading position. In contrast, the personalized medicine segment is projected to experience rapid growth, with a CAGR of 13.9% from 2024 to 2030. This growth is fueled by the increasing demand for customized therapeutic solutions and ongoing advancements in precision healthcare.

### Metabolomics Market Analysis by Indication

The oncology segment leads the metabolomics market in 2024 with a share of 35.5% and is anticipated to experience the fastest CAGR of 13.3% from 2024 to 2030. This expansion is fueled by the increasing prevalence of cancer, enhanced funding for

research initiatives, and the critical need for early diagnosis and personalized treatment approaches. Metabolomics is essential in oncology as it uncovers metabolic signatures that aid in early diagnosis, tracking treatment efficacy, and informing therapy choices. Its roles in drug development, biomarker discovery, and precision medicine contribute to improved patient outcomes, emphasizing its vital role in enhancing global cancer care. The neurology sector is expected to witness significant growth, spurred by a surge in research on neurodegenerative disorders and the rising demand for early diagnostic biomarkers.

## Metabolomics Market Report Scope

This global report on Metabolomics analyzes the market based on Analytical Techniques, sub-types, applications and indication for the period 2021-2030 with forecast from 2024 to 2030 in terms of value in US\$. In addition to providing profiles of major companies operating in this space, the latest corporate and industrial developments have been covered to offer a clear panorama of how and where the market is progressing.

## Key Metrics

Historical Period: 2021-2023

Base Year: 2024

Forecast Period: 2024-2030

Units: Value market in US\$

## Metabolomics Market by Geographic Region

North America (The United States, Canada)

Europe (Germany, France, the United Kingdom, Italy, and Rest of Europe)

Asia-Pacific (Japan, China, India, South Korea, and Rest of Asia-Pacific)

Rest of World

## Metabolomics Market by Analytical Technique

Separation Techniques

High Performance Liquid Chromatography (HPLC)

Gas Chromatography

Ultra Performance Liquid Chromatography (UPLC)

Capillary Electrophoresis

Detection Techniques

Mass Spectrometry

Nuclear Magnetic Resonance Spectroscopy

Surface-Based Mass Analysis

## Metabolomics Market by Application

Biomarker Discovery

Drug Discovery

Personalized Medicine

Toxicology Testing

Nutrigenomics

Other Applications (Including Functional Genomics, and Clinical Diagnostics)

## Metabolomics Market by Indication

Oncology

Cardiology

Neurology

Inborn Errors of Metabolism

Other Indications (Including Inflammatory Diseases, Infectious Diseases, and Rare Diseases, and others)

## Contents

### **PART A: GLOBAL MARKET PERSPECTIVE**

#### **1. INTRODUCTION**

Product Outline

Metabolomics Defined

Metabolomics Analytical Techniques

Separation Techniques

High Performance Liquid Chromatography (HPLC)

Gas Chromatography

Ultra Performance Liquid Chromatography (UPLC)

Capillary Electrophoresis

Detection Techniques

Mass Spectrometry

Nuclear Magnetic Resonance Spectroscopy

Surface-Based Mass Analysis

Metabolomics Applications

Biomarker Discovery

Drug Discovery

Personalized Medicine

Toxicology Testing

Nutrigenomics

Other Applications (Including Functional Genomics, and Clinical Diagnostics)

Metabolomics Indications

Oncology

Cardiology

Neurology

Inborn Errors of Metabolism

Other Indications (Including Inflammatory Diseases, Infectious Diseases, and Rare Diseases, and others)

#### **2. Key Market Trends**

#### **3. Key Global Players**

Agilent Technologies, Inc.

BASF SE

Biocrates Life Sciences AG

Bio-Rad Laboratories, Inc.

Bruker Corporation

Danaher Corporation

Human Metabolome Technologies Inc.

LECO Corporation

Metabolomic Technologies Inc.

Metabolon, Inc.

Metabolon, Inc.

PerkinElmer, Inc.

Shimadzu Corporation

Sigma-Aldrich Co. LLC.

Stemina Biomarker Discovery, Inc.

Thermo Fisher Scientific Inc.

Waters Corporation

4. Key Business & Type Trends

5. Global Market Overview

Global Metabolomics Market Overview by Analytical Technique

Metabolomics Analytical Technique Market Overview by Global Region

Separation Techniques

Global Metabolomics Separation Techniques Market Overview by Type

Metabolomics Separation Techniques Type Market Overview by Global Region

High Performance Liquid Chromatography (HPLC)

Gas Chromatography

Ultra Performance Liquid Chromatography (UPLC)

Capillary Electrophoresis

Detection Techniques

Global Metabolomics Detection Techniques Market Overview by Type

Metabolomics Detection Techniques Type Market Overview by Global Region

Mass Spectrometry

Nuclear Magnetic Resonance Spectroscopy

Surface-Based Mass Analysis

Global Metabolomics Market Overview by Application

Metabolomics Application Market Overview by Global Region

Biomarker Discovery

Drug Discovery

Personalized Medicine

Toxicology Testing

Nutrigenomics

Other Applications

Global Metabolomics Market Overview by Indication

Metabolomics Indication Market Overview by Global Region

Oncology



Cardiology  
Neurology  
Inborn Errors of Metabolism  
Other Indications

## **PART B: REGIONAL MARKET PERSPECTIVE**

Global Metabolomics Market Overview by Geographic Region

### **REGIONAL MARKET OVERVIEW**

#### **6. North America**

North American Metabolomics Market Overview by Geographic Region  
North American Metabolomics Market Overview by Analytical Technique  
North American Separation Techniques Market Overview by Type  
North American Detection Techniques Market Overview by Type  
North American Metabolomics Market Overview by Application  
North American Metabolomics Market Overview by Indication  
Country-wise Analysis of North American Metabolomics Market  
The United States

United States Metabolomics Market Overview by Analytical Technique  
United States Separation Techniques Market Overview by Type  
United States Detection Techniques Market Overview by Type  
United States Metabolomics Market Overview by Application  
United States Metabolomics Market Overview by Indication  
Canada

Canadian Metabolomics Market Overview by Analytical Technique  
Canadian Separation Techniques Market Overview by Type  
Canadian Detection Techniques Market Overview by Type  
Canadian Metabolomics Market Overview by Application  
Canadian Metabolomics Market Overview by Indication

#### **7. Europe**

European Metabolomics Market Overview by Geographic Region  
European Metabolomics Market Overview by Analytical Technique  
European Separation Techniques Market Overview by Type  
European Detection Techniques Market Overview by Type  
European Metabolomics Market Overview by Application  
European Metabolomics Market Overview by Indication  
Country-wise Analysis of European Metabolomics Market  
Germany  
German Metabolomics Market Overview by Analytical Technique

German Separation Techniques Market Overview by Type

German Detection Techniques Market Overview by Type

German Metabolomics Market Overview by Application

German Metabolomics Market Overview by Indication

France

French Metabolomics Market Overview by Analytical Technique

French Separation Techniques Market Overview by Type

French Detection Techniques Market Overview by Type

French Metabolomics Market Overview by Application

French Metabolomics Market Overview by Indication

The United Kingdom

United Kingdom Metabolomics Market Overview by Analytical Technique

United Kingdom Separation Techniques Market Overview by Type

United Kingdom Detection Techniques Market Overview by Type

United Kingdom Metabolomics Market Overview by Application

United Kingdom Metabolomics Market Overview by Indication

Italy

Italian Metabolomics Market Overview by Analytical Technique

Italian Separation Techniques Market Overview by Type

Italian Detection Techniques Market Overview by Type

Italian Metabolomics Market Overview by Application

Italian Metabolomics Market Overview by Indication

Rest of Europe

Rest of Europe Metabolomics Market Overview by Analytical Technique

Rest of Europe Separation Techniques Market Overview by Type

Rest of Europe Detection Techniques Market Overview by Type

Rest of Europe Metabolomics Market Overview by Application

Rest of Europe Metabolomics Market Overview by Indication

8. Asia-Pacific

Asia-Pacific Metabolomics Market Overview by Geographic Region

Asia-Pacific Metabolomics Market Overview by Analytical Technique

Asia-Pacific Separation Techniques Market Overview by Type

Asia-Pacific Detection Techniques Market Overview by Type

Asia-Pacific Metabolomics Market Overview by Application

Asia-Pacific Metabolomics Market Overview by Indication

Country-wise Analysis of Asia-Pacific Metabolomics Market

Japan

Japanese Metabolomics Market Overview by Analytical Technique

Japanese Separation Techniques Market Overview by Type

Japanese Detection Techniques Market Overview by Type

Japanese Metabolomics Market Overview by Application

Japanese Metabolomics Market Overview by Indication

China

Chinese Metabolomics Market Overview by Analytical Technique

Chinese Separation Techniques Market Overview by Type

Chinese Detection Techniques Market Overview by Type

Chinese Metabolomics Market Overview by Application

Chinese Metabolomics Market Overview by Indication

India

Indian Metabolomics Market Overview by Analytical Technique

Indian Separation Techniques Market Overview by Type

Indian Detection Techniques Market Overview by Type

Indian Metabolomics Market Overview by Application

Indian Metabolomics Market Overview by Indication

South Korea

South Korean Metabolomics Market Overview by Analytical Technique

South Korean Separation Techniques Market Overview by Type

South Korean Detection Techniques Market Overview by Type

South Korean Metabolomics Market Overview by Application

South Korean Metabolomics Market Overview by Indication

Rest of Asia-Pacific

Rest of Asia-Pacific Metabolomics Market Overview by Analytical Technique

Rest of Asia-Pacific Separation Techniques Market Overview by Type

Rest of Asia-Pacific Detection Techniques Market Overview by Type

Rest of Asia-Pacific Metabolomics Market Overview by Application

Rest of Asia-Pacific Metabolomics Market Overview by Indication

9. Rest of World

Rest of World Metabolomics Market Overview by Analytical Technique

Rest of World Separation Techniques Market Overview by Type

Rest of World Detection Techniques Market Overview by Type

Rest of World Metabolomics Market Overview by Application

Rest of World Metabolomics Market Overview by Indication

## **PART C: GUIDE TO THE INDUSTRY**

## **PART D: ANNEXURE**

### **1. RESEARCH METHODOLOGY**

## 2. FEEDBACK

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