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Stable Isotopes Labeled Compounds Market - Global Industry Size, Share, Trends, Opportunity, and Forecast, 2018-2028F Segmented By Compounds (Carbon (13C), Nitrogen(15N), Deuterium, Oxygen(18O), Others), By Application (Diagnosis, Drug Discovery, Imaging, Sterilization, Others), By Substances (Nucleic Acids, Amino Acids, Drugs/Metabolites, Fatty Acids /Lipids, NMR Solvents and Others), By Indication (Cardiology, Neurology, Inflammation, Metabolic Disease and Others), By Method (Chemical, Cell-culturing), By End-User (Pharmaceutical and Biotechnology Companies, Academic Institute and Others), By Region and Competition

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Abstracts

Global stable isotopes labeled compounds market is expected to grow at a significant rate during the forecast period 2024-2028. Stable isotopes are extensively used in environmental studies, such as tracing the sources of pollutants and studying climate change. The growing demand for environmental studies is expected to drive the growth of the stable isotopes labeled compounds market. For example, stable isotope labeled compounds are used to study the carbon cycle and the impact of human activities on the environment. As the demand for environmental studies continues to increase, the demand for stable isotopes labeled compounds is expected to grow.

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Stable isotopes are non-radioactive isotopes that have the same number of protons but different numbers of neutrons in their atomic nuclei. They are used extensively in a wide range of scientific and industrial applications, including research, medicine, agriculture, and environmental studies. Stable isotopes labeled compounds are synthetic molecules that incorporate one or more stable isotopes, often carbon-13, nitrogen-15, and oxygen-18, into their chemical structure. These labeled compounds are used to investigate metabolic pathways, study protein-protein interactions, and develop new drugs, which will propel the global stable isotopes labeled compounds market.

Increasing Demand for New Drugs and Therapies

The demand for new drugs and therapies is constantly increasing, driven by the rising prevalence of chronic diseases such as cancer, cardiovascular diseases, and diabetes. According to the World Health Organization (WHO), cancer is a major factor for the cause of death across the world, accounting for approximately 10 million deaths in 2020, or about one in six deaths. The most common cancers are lung, breast, colon and rectum, and prostate cancers. There were over 1.91 million new cancer cases in the United States in 2022, according to data from the American Cancer Society report, publsihed in 2022. With 395,600 and 343,040 new cases, respectively, it is anticipated that malignancies of the genital and digestive systems will account for the majority of cancer cases. Stable isotope tracing is a crucial method for understanding the molecular mechanisms by which nutraceuticals affect and target cancer metabolism, according to data that was published by PubMed in August 2021.

Stable isotopes labeled compounds enable researchers to study drug metabolism and potential toxicity with unparalleled precision. By putting a labeled compound into a drug candidate, scientists can track its breakdown and identify metabolites. This knowledge is crucial in predicting drug-drug interactions, evaluating potential adverse effects, and designing drugs with improved bioavailability and reduced toxicity.

Moreover, stable isotopes labeled compounds offer valuable insights into the absorption, distribution, metabolism, and excretion (ADME) of drugs in the human body. By introducing a labeled compound during drug development, researchers can track its fate, elucidate metabolic pathways, and assess the efficiency of drug clearance. This information aids in optimizing drug dosage, minimizing potential side effects, and improving overall drug safety.

Stable isotope labeled compounds are synthetic molecules that incorporate one or more

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stable isotopes, such as carbon-13, nitrogen-15, and oxygen-18, into their chemical structure.

The use of stable isotope labeled compounds in drug discovery and development has several advantages. Firstly, stable isotopes are non-radioactive, which makes them safer to handle and use in experiments. Secondly, stable isotopes are chemically identical to their non-labeled counterparts, which means that their behavior in biological systems is the same. This allows researchers to study the effects of drugs on the body more accurately. Finally, stable isotope labeling provides a unique way to track the fate of a drug in the body, which is essential for understanding its pharmacokinetics and optimizing its dosage.

Stable isotope labeled compounds are also used in preclinical studies to investigate the pharmacokinetics and toxicology of new drugs. These studies are essential for obtaining regulatory approval for new drugs.

Growing Interest in Proteomics and Metabolomics

Proteomics and metabolomics are two rapidly growing fields in life sciences that have the potential to revolutionize our understanding of biological systems and develop new therapies for a wide range of diseases. These fields rely heavily on the use of stable isotope labeled compounds, which are synthetic molecules that incorporate one or more stable isotopes, such as carbon-13, nitrogen-15, and oxygen-18, into their chemical structure. The growing interest in proteomics and metabolomics is driving the growth of the global stable isotopes labeled compounds market, as these compounds play a crucial role in these fields. For example, they are a part of stable isotope labeling techniques, such as Stable Isotope Labeling with Amino Acids in Cell Culture (SILAC) and Isotope-Coded Affinity Tag (ICAT). Stable isotope labeling also plays a crucial role in studying Post-Translational Modifications (PTMs), which are essential for protein functionality and regulation. Proteomics is the study of the proteome, which is the entire set of proteins produced by a cell, tissue, or organism. Proteomics research involves the identification, quantification, and characterization of proteins and their interactions with other molecules. Proteomics research can provide insights into the molecular mechanisms underlying diseases and identify new targets for drug development. Stable isotopes labeled compounds are used in proteomics research to study protein turnover, protein-protein interactions, and protein localization.

Metabolomics is the study of the metabolome, which is the entire set of small molecules produced by a cell, tissue, or organism. Metabolomics research involves the

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identification, quantification, and characterization of metabolites and their interactions with other molecules. Stable isotopes labeled compounds are used in metabolomics research to study metabolic flux, metabolic pathways, and metabolic regulation.

Stable isotopes labeled compounds are essential for many proteomics and metabolomics applications. For example, stable isotope labeled amino acids are used in quantitative proteomics experiments to compare protein expression levels between different samples. Stable isotope labeled lipids and carbohydrates are used in metabolomics experiments to study metabolic pathways and metabolic flux. Stable isotope labeled nucleotides are used in nucleic acid sequencing experiments to improve accuracy and reduce errors.

The growing interest in personalized medicines and precision medicines is also driving the growth of the global stable isotopes labeled compounds market. Personalized medicine and precision medicine aim to develop treatments that are tailored to an individual's genetic makeup, lifestyle, and environment. Proteomics and metabolomics research can provide valuable information for developing personalized and precision medicine treatments. Stable isotope labeled compounds are essential for many of these applications.

Technological Advancements

Technological advancements are driving the growth of many industries, and the global stable isotopes labeled compounds market is no exception.

One of the key technological advancements driving the growth of the stable isotopes labeled compounds market is the development of new labeling techniques. Traditional labeling techniques, such as isotopic exchange and chemical synthesis, are time-consuming, expensive, and require specialized equipment. However, new labeling techniques, such as metabolic labeling, enzymatic labeling, and biorthogonal labeling, are more efficient, cost-effective, and can be used in a wider range of applications.

Metabolic labeling is a technique that involves incorporating stable isotope labeled precursors, such as amino acids, nucleotides, or sugars, into living cells or organisms. These precursors are then incorporated into proteins, nucleic acids, or other biomolecules, allowing for the production of stable isotope labeled compounds in vivo. Metabolic labeling is a powerful technique for studying metabolic pathways, protein turnover, and protein-protein interactions.

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Enzymatic labeling is a technique that involves using enzymes to selectively incorporate stable isotope labeled substrates into specific biomolecules. For example, a protease enzyme can be used to selectively incorporate stable isotope labeled amino acids into specific proteins, allowing for the production of site-specifically labeled proteins. Enzymatic labeling is a powerful technique for studying protein function, protein-protein interactions, and post-translational modifications.

Biorthogonal labeling is a technique that involves using non-natural chemical reactions to selectively label biomolecules. For example, a biorthogonal reaction can be used to selectively incorporate stable isotope labeled sugars into specific glycoproteins, allowing for the production of site-specifically labeled glycoproteins. Biorthogonal labeling is a powerful technique for studying complex biomolecules, such as glycoproteins, and for developing new diagnostic and therapeutic agents.

Another technological advancement driving the growth of the global stable isotopes labeled compounds market is the development of new analytical techniques. Analytical techniques, such as mass spectrometry and nuclear magnetic resonance (NMR) spectroscopy, are essential for analyzing stable isotope labeled compounds and their interactions with other molecules. The adoption of new analytical techniques, such as high-resolution mass spectrometry and NMR spectroscopy, is enabling the production of high-quality, high-throughput, and high-resolution stable isotope labeled compounds.

High-resolution mass spectrometry is a technique that can be used to accurately measure the mass-to-charge ratio of stable isotope labeled compounds, allowing for the identification and quantification of these compounds. High-resolution mass spectrometry is a powerful technique for studying protein expression, metabolic pathways, and metabolic flux.

Nuclear magnetic resonance spectroscopy is a technique that can be used to determine the three-dimensional structure of stable isotope labeled compounds and their interactions with other molecules. NMR spectroscopy is a powerful technique for studying protein-protein interactions, protein-ligand interactions, and protein-nucleic acid interactions.

Recent Developments

> In October 2022, Oak Ridge National Laboratory (ORNL) announced that it would contribute to the construction of new facilities to produce isotopes used in a variety of industries, including medicine.

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The novel stable isotope-labeled and unlabeled Crude Lipid Yeast Extract was made available in September 2022, thanks to a collaboration between Cambridge Isotope Laboratories Inc. (CIL) and ISOtopic Solutions.

The first commercially accessible 12C-enriched methane-grade gas for quantum applications was released by Cambridge Isotope Laboratories, Inc. (CIL), a member of the Otsuka Group and the world's leading producer of stable isotopes and stable isotope-labeled chemicals, in July 2021.

In 2020, Cambridge Isotope Laboratories (CIL) announced the launch of a new range of stable isotope labeled compounds for drug development. This range includes deuterium-labeled analogs of commonly used drugs, such as ibuprofen and naproxen, which are designed to improve drug efficacy and reduce toxicity. These compounds have potential applications in the development of new therapeutics for a range of diseases.

In 2020, a team of researchers from the University of Glasgow developed a new stable isotope labeled compound for the analysis of the citric acid cycle, a key metabolic pathway.

In 2020, Isotope Technologies Garching (ITG) announced a partnership with the German Cancer Research Center (DKFZ) to develop new radiopharmaceuticals for cancer diagnosis and treatment.

Market Segmentation

The global stable isotopes labeled compounds market is segmented by compounds, application, substances, indication, method, end-user, region and company. Based on compounds, the market can be segmented into carbon (13C), nitrogen(15N), deuterium, oxygen(18O), and others. On the basis of application, the market can be categorized as diagnosis, drug discovery, imaging, sterilization, and others. Based on substances, the market can be fragmented into nucleic acids, amino acids, drugs/metabolites, fatty acids /lipids, NMR solvents and others. On the basis of indication, the market can be further segmented into cardiology, neurology, inflammation, metabolic disease, and others. Based on method, the market can be split into chemical and cell-culturing. On the basis of end-user, the market can be categorized into pharmaceutical and biotechnology companies, academic institutes, and others.

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Market Players

Major players of the global stable isotopes labeled compounds market include PerkinElmer Inc., Merck KGaA, 3M Company, Cambridge Isotope Laboratories, Inc., JSC Isotope, Creative Proteomics, Medical Isotopes, Inc., Omicron Biochemicals, Inc., Trace Sciences International, and Nippon Sanso Holdings Corporation.

Report Scope:

In this report, global stable isotopes labeled compounds market has been segmented into following categories, in addition to the industry trends which have also been detailed below:

Stable Isotopes Labeled Compounds Market, By Compounds:

Carbon (13C)

Nitrogen(15N)

Deuterium

Oxygen(18O)

Others

Stable Isotopes Labeled Compounds Market, By Application:

Diagnosis

Drug Discovery

Imaging

Sterilization

Others

Stable Isotopes Labeled Compounds Market, By Substances:

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Nucleic Acids

Amino Acids

Drugs/Metabolites

Fatty Acids/Lipids

NMR Solvents

Others

Stable Isotopes Labeled Compounds Market, By Indication:

Cardiology

Neurology

Inflammation

Metabolic Disease

Others

Stable Isotopes Labeled Compounds Market, By Method:

Chemical

Cell-culturing

Stable Isotopes Labeled Compounds Market, By End-User:

Pharmaceutical and Biotechnology Companies

Academic Institute

Others

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Stable Isotopes Labeled Compounds Market, By Region:

- Asia-Pacific
  - China
  - India
  - Japan
  - South Korea
  - Australia
- Europe
  - France
  - Germany
  - United Kingdom
  - Italy
  - Spain
- North America
  - United States
  - Mexico
  - Canada
- South America
  - Brazil
  - Argentina

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Colombia

Middle East & Africa

South Africa

Saudi Arabia

UAE

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the global stable isotopes labeled compounds market.

Available Customizations:

With the given market data, TechSci Research offers customizations according to a company's specific needs. The following customization options are available for the report:

Company Information

Detailed analysis and profiling of additional market players (up to five).

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