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Peptide Synthesis Market – Global Industry Size, Share, Trends, Opportunity, and Forecast, 2018-2028F Segmented By Product (Equipment, Reagents and Consumables, Others), By Technology (Solid-Phase Peptide Synthesis (SPPS), Solution-Phase Synthesis (SPS), Liquid-Phase Peptide Synthesis (LPPS)), By Application (Therapeutics, Diagnosis, Research), By End-User (Pharmaceutical and Biotechnology Companies, Contract Manufacturing Organization (CMO), Academic and Research Institutes), By Region, Competition

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Abstracts

The Global Peptide Synthesis Market was valued at USD 4.2 billion in 2022 and is projected to experience robust growth in the forecast period, with a CAGR of 5.8% through 2028. Peptides are synthesized through the coupling of the carboxyl group of one amino acid with the amino group of another amino acid molecule. Protective measures are commonly employed to avoid unintended reactions. Chemical peptide synthesis typically starts from the carboxyl end of the peptide, progressing towards the amino terminus, contrary to the direction of protein biosynthesis. Peptides act as highly effective and selective signaling molecules, binding to specific cell surface receptors such as ion channels or G protein-coupled receptors (GPCRs), triggering intracellular reactions. Their exceptional pharmacological profile and intrinsic characteristics make peptides an ideal starting point for the development of new therapies. Notably, peptides demonstrate exceptional safety, tolerability, and efficacy in humans due to their specificity. When compared to protein-based biopharmaceuticals, peptide therapeutics

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exhibit lower processing complexity, resulting in production costs more akin to small molecules.

Key Market Drivers

Increasing Use in Pharmaceutical Industry

Peptides are highly potent and targeted pharmacological ingredients, exhibiting a diverse range of biological actions. Their broad chemical space, remarkable biological activity, and specificity, coupled with their relative simplicity of synthesis, ready availability, and low toxicity, position peptides as promising candidates for active medicinal components. Peptides can be designed to specifically target certain receptors, enzymes, or proteins in the body, allowing for highly targeted and precise therapeutic interventions. This targeted approach reduces the risk of off-target effects and enhances therapeutic efficacy. Peptides have a wide range of therapeutic applications, including the treatment of cancer, metabolic disorders, cardiovascular diseases, autoimmune disorders, and infectious diseases.

Peptides make a significant contribution to the therapeutic landscape, particularly in the fields of oncology, diabetes, and obesity, generating billions of dollars in revenue. Moreover, the demand for peptides is steadily increasing for the treatment of renal failure, rare disorders, as well as cardiovascular and neurological conditions. Currently, there are over 100 peptide-based medications available, and with nearly 700 peptide medicines and therapeutic peptides in preclinical development, this number is projected to grow substantially.

Application of Peptides in Diabetes

The significant market growth can be attributed to the notable increase in the adoption of peptides in the consumer healthcare industries. Peptides have a diverse range of applications in treating various lifestyle disorders, including cancers, diabetes, and obesity. The rising prevalence of these metabolic and lifestyle disorders has opened up opportunities for the utilization of peptide therapeutics in oncology and metabolic disorders. For instance, according to the 2021 statistics published by the International Diabetes Federation, there were 537 million adults (20-79 years) living with diabetes worldwide, accounting for 1 in 10 individuals affected by diabetes. Additionally, the same source reported that 541 million adults had Impaired Glucose Tolerance (IGT), placing them at high risk of developing type 2 diabetes. Several peptide therapies, such as Glucagon-like peptide-1amide, are known to stimulate insulin secretion

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postprandially and are widely used in pancreatic therapy. As a result, the demand for peptide drugs is expected to rise in parallel with the increasing number of diabetic patients, thereby driving the market throughout the forecast period.

Focus on New Peptide-Based Treatments:

The growing interest in peptides as potential therapeutics and their diverse applications in various fields, such as pharmaceuticals, biotechnology, and diagnostics, has led to increased research activities. Researchers are exploring new peptide-based treatments and developing peptide drugs for a wide range of medical conditions, driving the demand for peptide synthesis. The successful development and approval of new peptide-based drugs have generated enthusiasm in the pharmaceutical industry. As more peptide-based therapies gain regulatory approval, the market for peptide synthesis equipment and services expands to meet the demand for these innovative drugs.

The peptide synthesis market has experienced significant growth, attributed to increased research activities, novel product approvals, and the rise in funding for research and development. Advanced peptide synthesizers have played a crucial role in this growth. Notably, in April 2021, ISSAR Pharma announced the licensing of their peptide-based New Chemical Entities (NCEs), along with pre-investigational new drug (IND) filing and a United States patent. These remarkable developments in peptide drugs are anticipated to drive market demand.

Expanding Applications in Diagnostics and Imaging

Peptide-based biosensors are specifically designed to detect biomolecules or analytes in biological samples. These biosensors have significant potential in early disease detection, monitoring treatment responses, and measuring various biochemical parameters. By incorporating peptide sequences with high affinity and selectivity for target molecules, accurate and sensitive detection can be ensured.

Peptides are utilized in the development of imaging agents that can bind to disease-related targets in the body. These imaging agents play a crucial role in molecular imaging techniques such as positron emission tomography (PET), single-photon emission computed tomography (SPECT), and magnetic resonance imaging (MRI). Offering non-invasive and targeted visualization of disease sites, peptide-based imaging agents greatly aid in diagnosis and treatment planning. The advancement of peptide-based biosensors, imaging agents, and biomarkers is pivotal in diagnostic applications.

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The growing demand for non-invasive and targeted diagnostic tools, including peptide-based imaging agents and biosensors, is driving market growth.

Key Market Challenges

Purification and Quality Control

During peptide synthesis, the formation of impurities and side reactions may occur, impacting the purity of the final product. Achieving high purity necessitates careful optimization of synthesis conditions to minimize impurity formation. However, maintaining high purity can be resource-intensive, requiring substantial amounts of reagents, solvents, and specialized equipment. The cost of purification contributes to overall production expenses. Scaling up from small-scale to large-scale peptide synthesis poses challenges in maintaining consistent purity levels. Factors such as reaction kinetics and mass transfer can differ at larger scales, requiring additional process optimization. The successful application of peptides in research and therapeutics relies on obtaining high-purity peptides. Purification methods like high-performance liquid chromatography (HPLC) can be time-consuming and require optimization for each peptide sequence. Ensuring accurate, consistent, and safe synthesized peptides calls for quality control measures. Meeting high-quality standards and implementing efficient purification processes presents a challenge for the peptide synthesis market.

Regulatory Issues

Peptides are highly sought after for the treatment of cardiovascular and neurological disorders, renal failure, and rare diseases. Currently, the market offers over 100 FDA-approved peptide-based medications. The number of peptide medicines in clinical trials or preclinical research surpasses 700, indicating significant potential for expansion. These peptide-based medications are classified as both small-molecule and large-molecule biologics. Yet, their unique position between small molecules and large proteins poses regulatory challenges. While most of these medications are chemically synthesized, their mechanisms of action vary widely.

Developing comprehensive regulatory rules that sufficiently address the safety and quality requirements for such a diverse range of molecular entities with distinct modes of action is a complex task. The absence of established regulatory criteria for this class of medications further complicates matters. Moreover, there is a disparity between the Food and Drug Administration (FDA) and the European Medicines Agency (EMA)

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regarding the regulatory clearance of peptide-based medications. The FDA classifies peptide medications as small-molecule pharmaceuticals under the authority of the FDA's Center for Drug Evaluation and Research (CDER), while the EMA favors a centralized approach over the mutual recognition procedure.

This lack of uniform regulatory guidelines hampers the acquisition of permits for therapeutic peptides, limiting their application areas. Consequently, it serves as a significant barrier to the growth of the global peptide synthesis industry.

Key Market Trends

Expanding Opportunities in Therapeutics for Rare Diseases

Peptides can be strategically designed to target specific molecular pathways or genetic mutations associated with rare diseases. This precision-oriented approach enables more effective and tailored therapeutic interventions. Peptides can be customized to address specific rare mutations or genetic variants, allowing treatments to be personalized to individual patients through personalized medicine approaches. Peptide-based therapies often offer non-invasive delivery options, making them an attractive choice for patients with rare diseases who may have limited tolerance for invasive procedures. Regulatory agencies provide incentives and special designations for drugs developed to treat rare diseases, creating opportunities for companies to pursue research and development in this field.

Peptides offer promising solutions for the treatment of rare genetic disorders and orphan diseases. The growth of the peptide synthesis market presents an opportunity to develop and manufacture peptide-based therapeutics targeting these conditions. Companies can focus on designing and synthesizing peptides that specifically target molecular targets associated with rare diseases, thereby addressing unmet medical needs.

Utilization of Peptides in the Advancement of Personalized Medicine

The concept of individualized therapy aimed at achieving the best response and maximizing safety margins to enhance patient care has generated significant interest in personalized treatment. Proteomic analysis presents an appealing and effective approach for deciphering the molecular profiles of distinct tissues, whether healthy or diseased. The emergence of personalized proteomics or proteomic profiling represents a significant stride forward in understanding disease path mechanisms.

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Within the framework of the EU-funded ElectroMed project, researchers have proposed the development of a user-friendly platform to facilitate electrochemically guided peptide synthesis. This innovative platform will be based on a microfluidic multiplexing system, controlled by software, thus promoting the broader application of proteomics in personalized medicine.

Additionally, label-free sensors utilizing nanomaterials will be employed to detect and quantify ligand-receptor complexes. This technological advancement will enable the automated injection of various reagents required for ligand synthesis, thereby facilitating personalized and controlled peptide synthesis in the context of personalized treatment.

The increasing investments in personalized medicine can be largely attributed to the rising prevalence of diseases such as cancer and cardiovascular disease (CVD), along with the growing demand for treatments with minimal adverse effects. Personalized medicine has the potential to enhance healthcare quality while simultaneously reducing costs. Consequently, players in the peptide synthesis market stand to benefit from these advancements in the field of customized medicine.

Segmental Insights

Technology Insights

Liquid-Phase Peptide Synthesis (LPPS) has been the dominant segment in the global market throughout the forecast period, while solid-phase peptide synthesis has exhibited the highest growth rate. The integration of automation and advancements in both liquid and solid-phase peptide synthesis has significantly contributed to cost reduction in peptide synthesis. As a result, it is anticipated that this will drive the global adoption of peptide synthesis, leading to increased revenue on a global scale during the forecast period. Conventional studies suggest that solid-phase peptide synthesis is a suitable approach for GMP manufacturing and API process development due to its cost-effectiveness in synthesizing long peptide sequences (more than 10 amino acids) with smaller volumes. However, it is important to note that purification costs associated with solid-phase peptide synthesis can potentially increase manufacturing costs at any scale of production. On the other hand, liquid-phase peptide synthesis is commonly employed for developing shorter peptide sequences and larger volumes. In certain cases, hybrid approaches are utilized for synthesizing long sequences at large volumes.

End User Insights

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The pharmaceutical and biotechnology sector accounted for a significant portion of the revenue share in 2022. In recent years, there has been a substantial surge in the development of biologic drugs, biomolecules, and biopharmaceutical therapeutics. Consequently, the biotech and pharmaceutical industries are increasingly focusing on peptides and proteins as targets for drug discovery. Although proteins and peptides share several characteristics with substantial therapeutic potential, they possess fundamental distinctions. Companies are now providing tailored peptide synthesis, protected amino acids, peptide libraries and reagents, Active Pharmaceutical Ingredient (API) production, Good Manufacturing Practice (GMP) manufacturing, as well as unnatural amino acids and derivatives. The specialized requirements of peptides drive extensive research, particularly in the realm of drug delivery systems. Numerous life sciences companies are adopting innovative strategies for peptide-based drug development to formulate stable, bioavailable, and manufacturing-friendly compositions. Notable advancements in administration systems, such as nasal, parenteral, controlled-release, transdermal, pulsatile, and oral delivery, are being made to enhance the effectiveness of peptide administration. Peptides often exhibit minimal toxicity, high specificity, and fewer toxicological challenges compared to other small molecule drugs, thereby facilitating the development of therapeutics that would otherwise pose commercial challenges.

Regional Insights:

North America emerged as the dominant region in the market in 2022. Its significant contribution to the global market can be attributed to the strong presence of major players. Moreover, the region's heightened awareness regarding peptide synthesis technologies and increasing focus on commercial-scale production of peptide drugs have further reinforced its position.

Also, the Asia Pacific region is projected to experience the highest growth rate during the forecast period. This can be attributed to the growing investments by market players in the region, rising awareness about innovative peptide treatments, increased healthcare spending by governments and patients, collaborations between multinational companies and local players for distribution, and the escalating incidence of chronic diseases in low- and middle-income countries.

Key Market Players

PolyPeptide Group

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Merck KGaA

Thermo Fisher Scientific

Enamine Ltd.

Alfa Chemistry

CEM Corporation

GenScript

AAPPTec

Bachem Holding

AnaSpec, Inc.

Report Scope:

In this report, the Global Peptide Synthesis Market has been segmented into the following categories, in addition to the industry trends which have also been detailed below:

Peptide Synthesis Market, By Product:

Equipment

Reagents and Consumables

Others

Peptide Synthesis Market, By Technology:

Solid-Phase Peptide Synthesis (SPPS)

Solution-Phase Synthesis (SPS)

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- Liquid-Phase Peptide Synthesis (LPPS)

Peptide Synthesis Market, By Application:

- Therapeutics
- Diagnosis
- Research

Peptide Synthesis Market, By End User:

- Pharmaceutical and Biotechnology Companies
- Contract Manufacturing Organization (CMO)
- Academic and Research Institutes

Peptide Synthesis Market, By Region:

- North America
  - United States
  - Canada
  - Mexico
- Europe
  - France
  - United Kingdom
  - Italy
  - Germany

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Spain

Asia-Pacific

China

India

Japan

Australia

South Korea

South America

Brazil

Argentina

Colombia

Middle East & Africa

South Africa

Saudi Arabia

UAE

Competitive Landscape

Company Profiles: Detailed analysis of the major companies present in the Global Peptide Synthesis Market.

Available Customizations:

Global Peptide Synthesis market report with the given market data, Tech Sci Research

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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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