

Nanobiotechnology Market Assessment, By Type [0-10 Nm, 10-100 Nm], By Therapeutics [Dental Therapies, Cardiac Therapies, Orthopedic Therapies, Others], By Technology [Nanocrystals, Nanoparticles, Liposomes, Micelles, Nanotubes, Others], By Application [Therapeutics, Nano diagnostics, Tissue Engineering, Gene Therapy, Molecular Nanotechnology, Drug Delivery, Food Safety], By End-user [Pharmaceutical Companies, Research Institutes and Laboratories, Academic Institutions, Others], By Region, Opportunities and Forecast, 2017-2031F

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Abstracts

Global nanobiotechnology market size was valued at USD 75.8 billion in 2023, expected to reach USD 143.1 billion in 2031, with a CAGR of 8.27% for the forecast period between 2024 and 2031F. Technological advancements propel the growth of the global nanobiotechnology market, amplify R&D investments, expand uses in healthcare and medicine, and increase the need for personalized medicine and precise drug delivery systems. Moreover, the merging of nanotechnology and biotechnology has sparked advancements in diagnostics, therapeutics, and biomedical research, contributing significantly to market expansion.

The robust expansion of the global nanobiotechnology market relies on various pivotal factors. Foremost, the ongoing progression of technological advancements continually pushes the boundaries of innovation. Nanoscale science and engineering breakthroughs have unlocked unparalleled opportunities, fostering the emergence of

fresh tools and methodologies in the domain of nanobiotechnology. Concurrently, heightened investments in research and development (R&D) across diverse sectors have propelled the evolution of nanobiotechnology. These substantial investments drive explorations into novel applications, materials, and methodologies, amplifying the potential for groundbreaking discoveries in healthcare and medicine. The increasing integration of nanotechnology in healthcare and medicine serves as a linchpin for expanding the global nanobiotechnology market.

Nanotechnology's adaptability in these arenas facilitates notable strides in diagnostics, presenting highly sensitive and precise tools for early disease identification. Additionally, in therapeutics, nanobiotechnology transforms drug delivery systems by enabling targeted and controlled medication release, improving treatment effectiveness while minimizing adverse effects. The rising demand for tailored medicine and precise drug delivery systems further propels the growth of global nanobiotechnology market. Nanotechnology's ability to customize treatments and interventions aligns perfectly with the escalating need, fostering the development of therapies personalized to an individual's distinct genetic composition or specific health conditions. Moreover, the convergence of nanotechnology and biotechnology acts as a catalyst, driving breakthroughs in diagnostics, therapeutics, and biomedical research. This fusion fuels innovation, expanding the realm of possibilities in nanobiotechnology and significantly contributing to the expansion and progression of global nanobiotechnology market.

Expanding Uses in Healthcare and Medicine

The increasing incorporation of nanotechnology in healthcare and medicine is a fundamental catalyst for the growing global nanobiotechnology market. Nanotechnology's application in these domains encompasses diverse advancements, particularly in diagnostics, therapeutics, and biomedical research. In diagnostics, nanomaterials facilitate the development of exceptionally sensitive and precise diagnostic instruments, enabling early disease detection with outstanding accuracy. Nanobiotechnology transforms drug delivery systems regarding therapeutics, heightening effectiveness while reducing side effects through targeted and precise release of medicinal compounds. Moreover, nanoscale materials drive the innovation of novel treatments, encompassing nano-formulations for various illnesses, gene therapy, and advancements in regenerative medicine. The fusion of nanotechnology and biotechnology has spurred breakthroughs in biomedical research, fostering sophisticated tools to examine biological systems at a molecular level. These strides facilitate the creation of pioneering medical solutions, propelling the global nanobiotechnology market by promising to reshape healthcare delivery and improve

outcomes on a global scale.

Amplified Research and Development Investments

Augmented research and development funding significantly drives the global nanobiotechnology market forward. These increased investments stimulate innovative research, nurturing progress in nanoscale technologies, materials, and approaches. They spark pivotal advancements in healthcare, leading to the development of accurate diagnostic tools, specialized drug delivery systems, and tailored treatments. Through the amplification of R&D funding, the market gains from heightened innovation, expanding the frontiers of nanobiotechnology to provide groundbreaking solutions for healthcare, medicine, and biomedical research worldwide.

For instance, in July 2023, McGill University stated that it had agreements in place to fund two innovative research projects involving lipid nanoparticles (LNPs) with Moderna, Inc., a biotechnology company that is leading the way in messenger RNA (mRNA) therapies and vaccines. Since LNPs are the main means of delivering mRNA strands to the target cells, they play a crucial role in mRNA therapeutics like vaccinations.

Government Initiatives

Governments globally are proactively executing diverse strategies to drive the advancement of the global nanobiotechnology market. These initiatives involve significant financial commitments directed towards research and development, stimulating progress in nanoscale technologies. Furthermore, governments institute favorable policies, frameworks, and partnerships to propel nanobiotechnology forward. They foster collaborations between academia, industry, and research entities, fostering knowledge sharing and hastening market expansion. Additionally, governments allocate resources towards infrastructure and offer incentives, aiming to promote the uptake and commercial viability of nanobiotechnology. The concerted effort supports its broad-ranging implementation across sectors like healthcare, medicine, agriculture, and environmental sustainability.

For instance, the National Nanotechnology Initiative (NNI) in the United States was requested to receive USD 1.99 billion in the President's 2023 Budget in February 2023. Since the NNI's founding in 2001, the total requested, including the 2023 request, has exceeded USD 40.7 billion. The National Nanotechnology Initiative (NNI) is a research and development (R&D) program of the United States government. In addition to supporting a shared infrastructure, enabling resource leveraging without duplication,

and establishing shared goals, priorities, and strategies that support agency-specific missions and activities, the NNI improves interagency coordination of nanoscale R&D.

Use of Nanotechnology in Drug Delivery

The rising need for nanotechnology in delivering drugs serves as a key catalyst driving the growth of global nanobiotechnology market. Nanotechnology's role in drug delivery allows for precise, targeted drug application, improving effectiveness while reducing potential side effects. The growing demand arises from nanoscale materials' ability to encapsulate medications, ensure their safe delivery to precise cells or tissues. Additionally, nanotechnology enables controlled release methods, improving therapeutic results. The increasing dependence on nanotechnology in drug delivery underscores its importance, fostering advancements and growth in the nanobiotechnology market, reshaping medication administration for better healthcare outcomes worldwide. To speed up the development of nucleic acid-based medicines and vaccines, Mana.bio, a biotechnology startup that accelerates programmable drug delivery, for instance, announced its AI-based lipid nanoparticle (LNP) delivery platform in October 2023, underwritten by a USD 19.5 million oversubscribed seed rounds. With the funding, Mana.bio may continue developing its unique, specially designed AI LNP platform, which could potentially lead to the creation of novel treatments for a variety of unmet needs by delivering RNA and gene therapies to extrahepatic tissues in the body in a safer and more efficient manner.

Growing Popularity of Nanoparticles

The increasing requirement for nanoparticles acts as a substantial driving factor in advancing the global nanobiotechnology market. These tiny entities hold a central position across diverse fields, notably in healthcare, medicine, and materials science. Their distinct characteristics facilitate precise drug administration, improving treatment effectiveness while reducing adverse effects. Moreover, nanoparticles find utility in diagnostics, imaging, and various industrial domains. The rising interest in these adaptable particles emphasizes their significance in propelling nanobiotechnology, encouraging breakthroughs that transform healthcare methodologies, advanced material development, and a broad range of industrial applications, thereby impacting the market's growth and development. A benchtop instrument for detailed analysis of lipid nanoparticles and other nano-formulations, for example, is scheduled to be launched in September 2023 by SPARTA Biodiscovery, a spin-out company from Imperial College London. According to Jelle Penders, PhD, co-inventor of Single Particle Automated Raman Trapping Analysis (SPARTA), the instrument is the first to

simultaneously identify the composition and size of nano-formulations in an automated and label-free manner.

Future Market Scenario

The global nanobiotechnology market's future holds remarkable promise, driven by ongoing innovations and evolving applications. Nanobiotechnology leads the forefront of scientific advancement, offering revolutionary changes across numerous industries. In healthcare, it facilitates precise drug delivery, personalized medicine, and advanced diagnostics, improving treatments with reduced side effects. Its impact spans environmental remediation, agriculture, electronics, and energy sectors, revolutionizing material science and manufacturing processes. Continual research and development efforts, along with increased global investments, drive market expansion. Advancing technology and interdisciplinary collaborations further unlock nanobiotechnology's potential, addressing previously insurmountable challenges. Moreover, the convergence of nanotechnology, biotechnology, and information technology foretells a new era, where nanobiotechnology becomes pivotal in addressing global health, environmental, and societal concerns. The trajectory signifies a promising and transformative path for the global nanobiotechnology market.

Key Players Landscape and Outlook

Key players in the global nanobiotechnology market proactively participate in collaborative endeavors encompassing strategic alliances, joint research initiatives, and shared investments. Their goal is to collectively leverage resources, expertise, and technological advancements, driving innovation and broadening the horizons of nanobiotechnology applications. These collaborative initiatives allow for the harnessing of complementary strengths, enabling the creation of innovative products and solutions. Furthermore, these partnerships facilitate market exploration across diverse industries and consumer segments, fostering the widespread adoption of nanobiotechnology. It amplifies its influence not only in healthcare, materials science, and environmental sustainability but also in various other domains.

In March 2023, for example, Moderna announced that it had applied for Generation Bio's exclusive stealth cell-targeted lipid nanoparticle (ctLNP) delivery system to find and create non-viral genetic medicines for liver and immune system disorders. This partnership could bring in up to \$1.876 billion for Generation Bio. Moderna has obtained the option to license the closed-end DNA (ceDNA) novel build technology from Generation Bio as well as ctLNP.

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*Companies mentioned above DO NOT hold any order as per market share and can be changed as per information available during research work

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