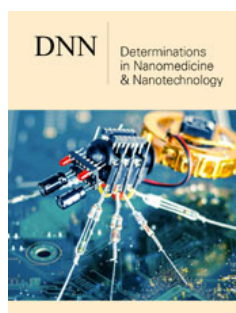


# Nanotechnology: A Successful Future with Endless Possibilities and Applications

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ISSN : 2832-4439



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**Submission:**  March 01, 2023

**Published:**  June 14, 2023

Volume 3 - Issue 1

**How to cite this article:** Riella H Gracher. Nanotechnology: A Successful Future with Endless Possibilities and Applications. Determ in Nanomed & Nanotech. 3(1). DNN. 000555. 2023.  
DOI: [10.31031/DNN.2023.03.000555](https://doi.org/10.31031/DNN.2023.03.000555)

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## Opinion

How the nanotechnology is manipulation of matter on atomic, molecular and supramolecular scale dimensions, have high surface-to-volume ratios and thus very specific properties, therefore a broad field application. Nanotechnology is a new and expanding technology, its main applications are the development of innovative methods to fabricate new products, to formulate new chemicals and materials, and to substitute the current generation of equipment with improved performance equipment, resulting in a lower consumption of materials and energy and decreased harm to the environment, as well offering environmental remediation. It has extensive range of applications in various branches of science including molecular biology, Health and medicine, materials, electronics, transportation, drugs and drug delivery, chemical sensing, space exploration, energy, environment, sensors, diagnostics, microfabrication, organic chemistry and biomaterials. Nanotechnology involves innovations in drug delivery, fabric design, reactivity and strength of material and molecular manufacturing.

The term nanomedicine encompasses a broad range of nanotechnologies and nanomaterials which are used in modern medicine. Therefore, is very relevant or importante to understand the place and significance of nanomedicine one must first understand, Medicine and Nantechnology. as the book of Tibbals, H.F. "Medical Nanotechnology and Nanomedicine", [1] an introduction for non-specialists.

## Perspectives and Trends in Nanotechnology: Global Market Size

The global nanomaterials market size was valued at USD 9.39 billion in 2021 and is expected to register at a CAGR of 14.9% during the forecast period. The market is expected to be driven by increasing demand for the product in electronic applications owing to its increased surface area at the time of application coupled with its high superparamagnetic properties. The application of nanomaterials is also increasing in the medical industry on account of the utilization of products in various in-vitro and in vivo applications.

The rising investment by various research laboratories and biomedical industries for increasing product penetration in targeted drug delivery, gene therapy, and treatment of malignant tumors is expected to boost the growth of the nanomaterials market growth [2]. Nanotechnology in medicine is a very targeted field. It is no wonder that, in 2020, the US National Institute of Health invested approximately US\$ 445 million in nanomedicine, and the expectation is that its potential in health will only grow: it is expected that in 2026 the medical nanotechnology market should reach US\$461,252 million, according to data gathered by Seed Scientific [3]. The medical application segment accounted for a major share of around 30.4% of the global revenue in 2021 and is also the fastest-growing market on account of the high penetration of the product for use in the treatment of cancer and other malignant tumors. Furthermore, nanomaterials are used for various specific tasks in the medical sector including imaging, targeted drug delivery, nanorobots for surgery, nano diagnostics, cell repair, and nano biosensors. Bhuiyan MTH et al. [4] describes studies for diferents nanomaterials and their

physiochemicals properties which are used in modern medicine. The increase in research and development in the medical field for cancer treatment using nanoparticles has a huge growth prospect. According to the executive summary of Grand View Research [2], the demand for nanomaterials is expected to grow up at a CAGR of 14.1% from 2020 to 2028 in the biomedical industry.

### Potencial nanomaterials in modern medicine

Advancement in the field of nanotechnology and its applications to the field of medicines and pharmaceuticals has revolutionized the twentieth century. Nanotechnology. At the European Conference on nanomedicine held by the European Technology Platform at the end of 2015, the following topics for discussion were already highlighted: nano carriers for delivery of macromolecules, nano and micromedical devices, nanomedicine for tissue regeneration, non-specific toxicological problems, nanomedicine and imaging with a new generation of contrast agents [4].

Nanotechnology applications are spread over almost all surgical specialties and have revolutionized treatment of various medical and surgical conditions. Clinically relevant applications of nanotechnology in surgical specialties include development of surgical instruments, suture materials, imaging, targeted drug therapy, visualization methods and wound healing techniques. Management of burn wounds and scar is an important application of nanotechnology. Prevention, diagnosis, and treatment of various orthopedic conditions are crucial aspects of technology for functional recovery of patients. Improvement in standard of patient care, clinical trials, research, and development of medical equipment's for safe use are improved with nanotechnology. They have a potential for long-term good results in a variety of surgical specialties including orthopedic surgery in the years to come.

The advancement of nanotechnology has brought many benefits to the health sector. For example, nanorobots in the treatment of cancer, making the patient suffer less, because they act directly on cancer cells. Certainly the microwaves that act in the repair of cells in the bloodstream and in the diagnoses with more precise information. Drug delivery is a strategy to increase the efficiency of nanomedicine in treatments. This concept aims to administer drugs in a controlled manner, minimizing risks and maximizing results. For this, nanomaterials are used as packaging for drugs. This means they are able to deliver the drug more safely and more targeted to the affected tissues. Nanomedicine is an application of nanotechnology which works in the field of health and medicine. Nano-medicine makes use of nano materials, and nano electronic biosensors. In the future, nano medicine will benefit molecular nanotechnology. The medical area of nano science application, has many projected benefits and is potentially valuable for all human races. With the help of nano medicine early detection and prevention, improved diagnosis, proper treatment and follow-up of diseases is possible [5-8]. Finally, Nanotechnology in medicine represents a major advance for the sector, with benefits ranging

from increasing the efficiency of treatments to the creation of surgical nanorobots in cancer patients. As we have seen, there are really many applications. And this generates many gains, such as reducing the time of treatment of the disease, less pain and invasion of the patient's body, and even more security in the diagnosis and prescriptions. Concluding, the rapid growth and escalation in manufacturing of nanomaterials necessitate still establishing control and withstanding possible adverse health effects that many take place throughout the production or use. The unique characteristics of nanomaterials; e.g. high surface area or reactivity, ability to bind and deliver other molecules to target objects; that are essential applications, might lead to negative health impacts.

However, even though it is a big bet for the future of health, there are some challenges and risks, such as environmental impacts and nanotoxicity. All of this is essential to observe within the context of healthcare businesses that want to innovate and keep up with new solutions. Managers from the most diverse areas must follow these transformations and trends, and the health area should be no different [9-12].

### References

1. Tibbals HF (2011) Medical nanotechnology and nanomedicine 1<sup>st</sup> (edn), CRC Press, Florida, USA, p. 527.
2. Relatório do site Grand View Research Base Year 2020: Nanomaterials Market Analysis 2017-2028.
3. (2023) Nanotechnology Statistics: State of the Industry and Jobs.
4. Bhuiyan MTH (2016) ACR Journal of Cancer Science 2(2): 25-33.
5. Rosen JE, Yoffe S, Meerasa A, Verma M, Gu FX (2011) Nanotechnology and diagnostic imaging: New advances in contrast
6. agent technology. J Nanomedicine & Nanotechnology 2(5): 2-5.
7. Zhang L, Pornpattananangku D, Hu CMJ, Huang CM, (2010) Development of nanoparticles for antimicrobial drug delivery. Current Medicinal Chemistry 17(6): 585-594.
8. Jabir NR, Tabrez s, Ashraf G, Shakil S, Damanhour GA, et al. (2012) Nanotechnology-based approaches in anticancer research. International Journal of Medicine 7: 4391-4408.
9. Ahamed M, Alsalhi MS, Siddiqui MKJ (2010) Silver nanoparticle application and human health. Clin Chim Acta 411(24): 1841-1848.
10. Amtenbrink MH, Grainger DW, Hofmann H (2015) Nanoparticles in medicine: Current challenges facing inorganic nanoparticle toxicity assessment and standardizations. Nanomedicine: Nanotechnology Biology and medicine 11(7): 1689-1694.
11. Shvedova AA, Kisin ER, Porter D, Schulte P, Kagan VK, et al. (2009) Mechanism of pulmonary toxicity and medical applications of carbon nanotubes: Two faces of Janus?. Pharmacology & Therapeutics 11( 2): 192-204.
12. Golinska P, Wypij M, Ingle AP, Gupta I, Dahm H, et al. (2014) Biogenic synthesis of metal nanoparticles from actinomycetes: biomedical applications and cytotoxicity. Appl Microbiol Biotechnol 98: 8083-8097.
13. Kora AJ, Beedu SR, Jayaraman A, (2012) Size-controlled green synthesis of silver nanoparticles mediated by gun ghatti and its biological activity. Org Med Chem Lett 2(1): 17.