Exploring nanotechnology for diagnostic, therapy and medicine

T. Chithrakumar¹, M Thangamani¹, and S.Pon miruthu vasini³
¹Assistant professor, Computer Science and Engineering, Sri Ramakrishna engineering college, Coimbatore
²Associate Professor, Information Technology, Kongu Engineering College, Tamilnadu, India
³Student of Computer and Technology, Kongu a Engineering College, Tamilnadu
E-mail: manithangamani2@gmail.com

Abstract. In current days, knowledge enhancement is growing more. Nanotechnology can applied to self-repeating machines and mechanical technology, compound designing, mechanical designing, science, natural designing, and electrical designing. Nanotechnology has the great preference to improves produce new and superior product. Nanomaterials to perceive avoid and eliminate pollution. Nanotechnologies are blueprint, invention and applied in medicine, therapy, diagnostic, sequencing and environmental protection. The usage of nanotechnology is rapidly increases in entire future market. This article explore the nanotechnology for medicine, diagnostic and therapy.

Keywords: Nanotechnology, drug delivery, Medical diagnosis and Therapy and Medicine using nanomaterials.

2. Introduction

Nanotechnology is wide as to be unhelpful as a show to tackling challenges of risk governance, risk management and insurance. The main properties of nanotechnologies are nanoparticles, carbon nanotubes and quantum dots. For the most part, when individuals talk about nanotechnology, they mean structures of the size 100 nanometers or more modest. There are 1,000,000 nanometers in a millimeter. Nanotechnology attempts to make materials or machines of that size. Individuals are doing various kinds of work in the field of nanotechnology. Most flow work takes a gander at making nanoparticles that have exceptional properties, for example, the manner in which they dissipate light, ingest X-beams, transport electrical flows or warmth, and so on At the more "sci-fi" end of the field are endeavors to make little duplicates of greater machines or truly novel thoughts for structures that make themselves. New materials are conceivable with nano size structures. It is even conceivable to work with single particles.

There has been a ton of conversation about the eventual fate of nanotechnology and its threats. Nanotechnology might have the option to develop new materials and instruments which would be extremely valuable, for example, in medication, PCs, and making clean power is helping plan the up and coming age of sun based boards and proficient low-energy lighting. Then again, nanotechnology is new and there could be obscure issues. For instance, if the materials are awful for individuals' well
being or for nature. They may badly affect the economy or even huge regular frameworks like the Earth itself. A few gatherings contend that there ought to be rules about the utilization of nanotechnology.

3. Related Works
Nanotechnology today [1] has spread out in countless various territories of sciences in light of its huge advantages as far as improving the exhibition in numerous fields. Various types of nano-sized structures are nanowires, nanorods, nanoribbons, nanotubes, nanobelts, nanofibers, quantum spots and nanoparticles. Nanotechnology manages [2] materials and collaborations at sub-atomic and nuclear level, measured somewhere in the range of 0.1 and 100 nm. The little size of the nanoparticles and the progressions of their physical and substance properties contrasted with that of their macromolecular analogs offer numerous preferences for contemporary medication, including improved medication conveyance, open doors for a superior and noninvasive diagnostics, and focused on treatment with decreased unfavorable and fundamental impacts. Improved biomedical collections are used [3]. Directed medication conveyance is a technique for conveying drug in a remarkable manner so that the grouping of the medication at the objective site is enhanced, weight of the medication to different tissues is diminished and poisonousness limited. There are different novel ways to deal with convey medications to the objective locales as nanocapsules, nanocrystals, nanoemulsions, dendrimers, polymeric micelles, nanotubes and monoclonal antibodies. Undoubtedly, development of nanotechnology [5] has set exclusive standards in natural science and translational medication, which is perhaps because of the way that the extents of useful components in science are in the nanometer run and consequently advance the association among nanomaterials and organic frameworks.

Nanotechnology [6] has improved medication conveyance to those regions which be negative for macromolecules. It is suggesting new implantable detecting innovations along these lines giving exact clinical data. The mix of nanotechnology and medication has made another field nanomedicine to upgrade human medical services. In this investigation, a portion of the nanotechnology is used for diabetes mellitus somewhere in the range of 0.1 and 100 nm. Electrospinning create [7] an empowering nanotechnology level to producing a rich nonmaterial in biosensing, drug conveyance, regenerative medication and tissue designing. Another angle enthralls [8] their utilization in food bundling materials that have very high gas boundaries and antimicrobial properties and nanosensors which can distinguish microorganisms. There are enormous possibilities of nanotechnology in farming wherein the majority of the examination projects are in their beginning stage, and it will doubtlessly blast all entryways of agri-food area with solid plans and purposes. Ebb and flow modalities [9] of assurance and therapy of various sicknesses, particularly malignant growth have critical obstructions, for model, helpless affectability or particularity and Medicine poison levels independently. Nanoparticles are created for malignancy identification and medicines are focused for antibodies.

In clinical sciences [10] they are utilized for symptomatic or helpful purposes. They can likewise be applied in the readiness of nanovaccines and nano adjuvants. Their utilization in the therapy of malignant growth and in quality treatment opened the entryway for another period in medication. As of late, different utilizations of nanotechnology began to discover their way in the veterinary area. They progressively attack animal therapeutics, diagnostics, creation of veterinary immunizations, ranch disinfectants, for animal rearing and generation, and even the field of animal nourishment.

Pomegranate tree [11] is one of the most established organic product trees known to people (4000 and 3000 BCE). Pomegranate blossoms as an image of life, lastingness, prosperity, femaleness, ripeness, information, everlasting status, and blessedness. In endeavors to sort out the best wellspring of phenolic mixes in human eating routine, pomegranate gets a lot of fame attributable to the natural impacts that applies through free extremist rummaging abilities by its phenolic mixes. Pomegranate has ascended to notoriety for its clinical applications since antiquated occasions. Advances in computerized advances [12] have release new open doors for making additional dependable, cost and time successful, more secure and versatile techniques for diagnosing, overseeing and curing illnesses.
A couple of instances of cutting edge nano and computerized innovations are approved for identifying and curing illnesses. Plasma therapy is as yet arising as another medical services innovation, however antimicrobial resistant diseases and tumors with practically zero unfavorable results. Nanotechnology [13] is applied for cardiovascular infections treatments.

The fate of nanomedicine [14] is energizing! It includes the designing of materials for researching basic organic issues and identifying and curing infection. Notwithstanding unprecedented [15] advances that have been made in disease treatment, the quantity of malignant growth cases keep on flooding, making it the main source of death across the world. Therefore, early recognition is one of the vital viewpoints in the fight against the illness. Screening and early conclusion assume a urgent part for compelling therapy and to bring down the malignancy death rate. Malignancy nanotechnology is another branch in science that gives a connection among nanotechnology and clinical disease research.

Surendiran, A., et al.[16] Treatment of various diseases and diagnosis of current modalities, particularly cancer have key constraints such as specificity, drug toxicities, lack of sensitivity respectively. Nanoparticles are being developed for detecting cancer. For disease identifying uses paramagnetic nanoparticles, nanoshells, quantum dots and nanoparticles. In diagnostics and therapeutics the nanotechnology is being used. Patil, M., et al.[17] to medicine there is increasing optimism in nanotechnology and significant advances in the identify, cure and anticipation of sickness is brought by dentistry. Nanomedicine is called as producing attention in the nanotechnology and future medical field. The core technology is destined by Molecular technology and future impact of nanotechnology in medicine and dentistry is predicted. In science and technology [18] nanomedicine is a virtually latest field.

Singh, M., et al.[19] suggested a nanotechnology atomic scale tailoring of materials to battle and prevent the diseases. In the 21st century nanomedicine [20] is in infancy and Nanotechnology in modern medicine are the potential to change medical research. Procedures, such as gene delivery systems, drug delivery etc and therapeutic purposes, imaging, detection, etc are applied by Nanomedical devices. In many aspects, for cancer therapy [21] Nanotechnology has revolutionized. The treatment pattern is changing radically. The main role of nanotechnology is rectifying the lack of the conventional chemotherapies and on discriminating identifying of the cancerous cells. The traditional chemotherapies side effects are removed effectively. Hofmann-Amtenbrink et. al.[22] discussed about pharmaceutics (nanopharmaceutics) and nanoparticles. The key of this the examining the industrial applications, legal and regulatory frameworks and influence of research funding.

Martis, E. A., et al [23] with the application of nanotechnology Many devices are developed at a lightning speed. Nanotechnology is minimizing the toxicities and it is boon in making the treatment. This paper describes the nanotechnology in medicine and their devices and their applications. Lavenus, S., et al[24]For surface modifications Nanotechnologies are used increasingly in dental implants. Improve their clinical success rate and to direct the nature of peri-implant tissues nanometer-controlled surfaces are directed. At the betterment of human life nanomedicine [25] and Nanotechnology are complementary disciplines. Devices of size 1–100 nm and for designing tools, the emerging branch of science are Nanotechnology. Nanomedicine is defined as study of using clinical practice and nanotechnology in medical research.

Saini, R., et al. [26] described the definition of nanotechnology is involved in application of materials, characterization, synthesis and design. In medicine there are many for nanotechnology applications and some are discussed in this paper. The science and engineering consists of application of materials, synthesis, devices and design, which has lowest amount functional association in at least 1 dimension on the nanometer scale or 1 billionth of a meter is known as nanotechnology. Degree of specificity can probably [27] be converted into tissue explicit medical fields and targeted cellular designed to achieve maximal therapeutic affected with nominal side effects and great promise to biomedicine is
nanotechnology [28]. In the previous decade the nanotech [29] gave the chance for molecular disease imaging, therapeutic intervention tools, sensing clinically relevant markers, which have the tendency to convert the pasture of medicine.

The components of a nano toolbox are quantum dots, nanoparticles, nanowires, cantilevers and nanopores for sensing. The latest field of technology improvement in medicine and human biology is nanotechnology. The study of toxicity of nanoparticles [30] on human health is nanotoxicology. Nanoparticles are developed by devices and medical field. In the area of tissue culture, genetic side effect, bio materials and molecular biology the nanomedicines are used. Dolomatov, M. Y., et al. [31], monitor the real time pollutants nanoparticles are used. In water treatment the use of nanomaterials is cost effective. The medical imaging and the controlled drug delivery is represented by nanostructures. The nanomedicine application was done by Ayurvedic Bhasma which throws the light on the living beings. In therapeutics, the usage of nanoparticulate metal is common in Ayurveda. Organometallic ethno nanomedicine in nanomedicine is the concept of Ayurvedic Bhasma.

The frontier of medicine [33] is nanotechnology which plays an significant position in reaching the drug and in diversity expansion. The protected transport vehicle for hydrophobic drugs such as siRNA, DNA and mRNA are not bioavailable which are called nanoparticles and suggested about the challenges for effective delivery and various forms of disease treatment. Owen, A., et al [34] using novel CLB, this paper is concentrated on biodegradable nanoparticles and biocompatible with the tunable biodegradation kinetics and hydrophobicity synthesized. In the organic nanoparticles in medicine, change of gold salt to the communicating with gold nanoparticles is achieved by the simple mixing of EGCG with the gold precursor because the development is different. Mishra, S., et al [35] human attention is concentrated on meter level and fraction. Range of RBC is \(10^{-6}\) m, the range of protein molecules is \(10^{-9}\) m and range of atom is \(10^{-11}\). The RBC is 10 times smaller than drug particles. So that majority of drugs are wasted with the decrease in the efficiency.

4. Conclusion
Advances in nanotechnology assure latest materials and structures that are the root of solutions for humanizing strength and optimizing accessible power and resources, sustaining a lively wealth, increasing the standard of living and enhancing national security. Life sciences and health care applications use emerging medical devices and nano-enabled pharmaceuticals. The diagnostics and nanoagents are intelligences to identify human cancer at earliest level. In future investigation can be extends by applying the nano technology to drug discovery from protein to protein interaction network.

References
[1] Kargozar, S. and Mozafari, M., 2018. Nanotechnology and Nanomedicine: Start small, think big. Materials Today: Proceedings, 5(7), pp.15492-15500. Nikolova, M., et al. (2020). "Nanotechnology in medicine." Drug Discovery and Evaluation: Methods in Clinical Pharmacology: 533-546.
[2] Hui, E., Di Carlo, D. and Pennathur, S., 2019. Guest editorial special section on IEEE EMBS Conference on Micro and Nanotechnology in Medicine. IEEE Transactions on NanoBioscience, 18(2), pp.214-215.
[3] Mostafavi, E., Soltantabar, P. and Webster, T.J., 2019. Nanotechnology and picotechnology: A new arena for translational medicine. In Biomaterials in translational medicine (pp. 191-212). Gupta, R. (2017).
[4] Chen, S., Li, R., Li, X. and Xie, J., 2018. Electrosprining: An enabling nanotechnology platform for drug delivery and regenerative medicine. Advanced drug delivery reviews, 132, pp.188-213.
[5] Saxena, S.K. and Singh, Y.K., A review of the emerging nanotechnology applications in medicine treatment.
[6] Liu, D., Szili, E.J. and Ostrikov, K., "Plasma medicine: Opportunities for nanotechnology in a digital age." Plasma Processes and Polymers 17(10), 2020.
[7] Shwetha, K. and Deveswaran, R., “The use of nanotechnology in cardiovascular disease.” Applied Nanoscience 8(7): 1607-1619, 2018.
[8] Cheon, J., Chan, W. and Zuhorn, I., "The Future of nanotechnology: cross-disciplined progress to improve health and medicine." Accounts of chemical research 52(9). 2019 2405-2405.
[9] Kargozar, S. and Mozafari, M., "Nanotechnology and Nanomedicine: Start small, think big." Materials Today: Proceedings 5(7), 15492-15500, 2018.
[10] Surendiran, A., Sandhiya, S., Pradhan, S.C. and Adithan, C., "Novel applications of nanotechnology in medicine." Indian Journal of Medical Research 130(6), 2009.
[11] Patil, M., Mehta, D.S. and Guvva, S., "Future impact of nanotechnology on medicine and dentistry." Journal of Indian society of periodontology 12(2), 2008.
[12] Boisseau, P. and B. Loubaton, "Nanomedicine, nanotechnology in medicine." Comptes Rendus Physique 12(7), 2011, 620-636.
[13] Singh, M., Singh, S., Prasad, S. and Gambhir, I.S., "Nanotechnology in medicine and antibacterial effect of silver nanoparticles." Digest Journal of Nanomaterials and Biostructures 3(3), 2012, 115-122.
[14] Logothetidis, S. "Nanotechnology in medicine: the medicine of tomorrow and nanomedicine." Hippokratia 10(1), 2006, 7-21.
[15] Sutradhar, K. B. and M. Amin, "Nanotechnology in cancer drug delivery and selective targeting." International Scholarly Research Notices 2014.
[16] Hofmann-Amtenbrink, M., Hofmann, H., Hool, A. and Roubert, F., "Nanotechnology in medicine: European research and its implications." Swiss medical weekly, 2014.
[17] Martis, E.A., Badve, R.R. and Degwekar, M.D., "Nanotechnology based devices and applications in medicine: An overview." Chronicles of young Scientists, 3(1), 2012.
[18] Lavenus, S., Louarn, G. and Layrolle, P., "Nanotechnology and dental implants." International journal of biomaterials 2010.
[19] Basavaraj, K, "Nanotechnology in medicine and relevance to dermatology: Present concepts." Indian journal of dermatology 57(3), 2012.
[20] Saini, R., Saini, S. and Sharma, S., "Nanotechnology: the future medicine." Journal of cutaneous and aesthetic surgery 3(1), 2010.
[21] Silva, G. A., “Introduction to nanotechnology and its applications to medicine." Surgical neurology 61(3): 2004, 216-220.
[22] Van Tassel, P. R. "Nanotechnology in medicine: nanofilm biomaterials." The Yale journal of biology and medicine 86(4), 2013.
[23] Lin, H. and R. H. Datar., "Medical applications of nanotechnology." The National Medical Journal of India 19(1): 27-32, 2006.
[24] Abdussalam-Mohammed, W., “Review of Therapeutic Applications of Nanotechnology in Medicine Field and its Side Effects.” Journal of Chemical Reviews, 243-251, 2019.
[25] Dolomatov, M. “Electron phenomenological spectroscopy and its application in investigating complex substances in chemistry, nanotechnology and medicine.” Journal of Materials Science and Engineering, 2013.
[26] Sharma, R. and P. Prajapati “Nanotechnology in medicine: Leads from Ayurveda.” J Pharm Bioallied Sci 8(1), 2016, 80-81.
[27] Mukherjee, A. and S. Bhattacharyya Nanotechnology in medicine. Biotechnology Business-Concept to Delivery, Springer, 2020, 57-64.