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# Nano medicines and Drug Delivery-A Review

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Review Article

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## ABSTRACT

Nanomedicine is the medical application of nanotechnology. In other word it is the combination of science and technology which is used for diagnosis, treatment and prevention of diseases and providing better human health. Five major sub classifications are:

- Analytical Tools
- Nanoimaging
- Nanomaterials and Nanodevices
- Novel Therapeutics and Drug Delivery Systems
- Clinical, Regulatory and Toxicological Issues

Delivering drugs to specific cells with the help of nanoparticles is possible due to nanotechnology. Due to similar size and structure of most of the biomolecules nanomaterials are used for both in vivo and in vitro biomedical research and applications. This helps in integration of nanomaterials with biology, which results in the development of diagnostic devices, contrast agents, analytical tools, and applications for physical therapy and vehicles for delivery of drug.

## INTRODUCTION

Application of nanotechnology in healthcare is Nano medicine which is used for diagnosis, monitoring, treatment, and control of biological systems. Nanoparticles are used to improve the effect of drug substance. Nano medicines are used worldwide for better treatment of patients suffering from various diseases like cancer, kidney diseases, fungal diseases, multiple sclerosis, chronic pain etc [1-10]. Namomedicine identify cells and receptors related to specific disease and choice of the appropriate nanocarriers quick and safer treatment with minimizing the side effects. The Nano medicines are used to overcome the problem of drug delivery by normal medical approaches, since Nano medicines re providing targeted drug delivery [11-14]. For example: As we know in some cases drugs solubility will be less in water and due to which human body has to struggle in absorbing drugs for treatment. In some cases drug molecules can be absorbed by body properly but they can't stay in body for longer time as per need of body. Sometimes drugs may cause side effects due to poor drug delivery also. Nano medicines are playing very important role in ensuring drug delivery in the body and also drug can stay in body for long time and it targets the particular areas in body which require treatment. Current problems associated with the use of nanomedicine involve understanding of issues related to nanoscale materials environmental impact and toxicity [15-23].

### Nanocarriers

Nano carriers are used for transport of drug. Commonly used Nano carriers are micelles, polymers, carbon-based materials, liposomes and other substances. Lipid-based nanocarriers include: Liposomes and micelles (Able to contain both hydrophobic and hydrophilic drug) [24-29]. Size of Nanocarriers ranges from diameter 1-1000 nm. Nanomaterial being used in nanocarriers allows hydrophobic and hydrophilic drugs delivery in body. Since human body contains more water quantity delivery of hydrophobic drugs are more effective and it gives better therapeutic benefits of nanaocarriers. Sometimes nanomaterials being used in nanocarriers are causing unwanted toxicity. Some advantages and disadvantages of common Nano carriers are listed below **(Table 1)** [30-38].

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**Table 1:** Advantages and disadvantages of common Nano carriers.

| Nanocarrier | Advantage | Disadvantage |
|---|---|---|
| **Gold nanoparticles** | Less Invasive | Toxicity |
| | More contrast | Tumor targeting efficacy is low |
| | No photo bleaching | Biocompatibility |
| | | Optical signal not strong |
| **Quantum dots** | Multiple molecular target simultaneously | Toxicity effect of metal core |
| | Fluorescence of high quality and energy | |
| **Nanocapule** | Efficient drug accumulation at site | |
| | Sustained drug release for weeks | |
| **Carbon Nanotube** | Less cytotoxic | |
| **Liposomes** | Biocompatibility | |
| | Biodegradability | |
| | Isolation of drug from surrounding environment | |
| | Ability to entrap both hydrophilic and hydrophobic drugs | |

*Application of nanomedicine* [39-46]

- Naomedicines are used for Imaging and identification of cells
- Naomedicines are used for delivering medicine in exact location
- Naomedicines are used for destruction of bacteria, viruses and cancer cells
- Naomedicines are used for repairing of damaged cells

*Advantage of naomedicine* [47-69]

- Targeted drug delivery
- Fewer side effects of nanomedicine
- Molecular targeting by nano engineered device
- Detection using nanomedicine is relatively easy
- Nanomedication do not require surgery
- Disease can be cured faster, safer and more accurate with nanomedicine.
- Improved Bioavability
- Sustained and controlled release
- Do not occlude blood to brain and intracellular compartment
- Protected fragile drugs
- Inexpensive
- Larger scale production is feasible

*Disdvantage of naomedicine* [70-77]

- Nanomedicnes are cost effective
- Implementation of nanomedicine is difficult
- No implementation is done for nanomedicine yet

## Nanomedicine in Cancer

As we know cancer which is one of the main causes of death worldwide. In USA and western countries cancer is the second main cause of death. In treatment of cancer, nanotechnology has given significant advances in the diagnosis treatment and prevention of cancer. It is one of the more efficient and more targeted therapies which have provided new tools and possibilities for treatment of disease [78-86] is less due to which detection of cancer cells is not significant. Nanoparticles are used as targeted delivery into tumor which can induce a local interaction with tumor cells and helps to increase the production of biomarkers.

Nano medicines are used for accurate cancer imaging. Iron oxide nanoparticles are used as one of the tool for cancer imaging. Due to specific coating of iron nanoparticles are binding particularly to the tumor cells and due to Cancer biomarkers are used as indicator in cancer detection. In early phase of cancer, concentration of biomarkers their magnetic properties they are used as imaging agents in MRI-scans and providing a very high resolution and accurate mapping of lesions [87-94].
For cancer therapy nanoparticles are injected in the tumour cells and activated for producing heat which results in the destruction of cancer cells locally with the help of magnetic fields, X-Rays or light. Along with this encapsulation of existing chemotherapy drugs or genes are allowing more localized delivery.

## FUTURE ASPECTS OF NANOMEDICNE

In areas of drug delivery and therapy application of nanotechnology has a great impact on public health. Nanotherapeutics is providing targeted drug delivery, improve drug solubility, extend drug half-life, improve a drug's therapeutic index, and reduce a drug's immunogenicity which has resulted in the potential to transform the treatment of many diseases [95-97].
The fields of nanomedicine and public health will accelerate each other in a number of ways to improve human health more efficiently than either could do individually. To maximize individual gains and population health, inclusion of public health expertise is essential. Aadvancment in the field of nanomedicine will help to identify the major areas of need for technological innovation [98-100].

## CONCLUSION

The great advantage of nanomedicine is its promising and unique properties of using nanosize materials in addressing most of the challenging difficulties in clinical diagnosis and therapy. Nanomedicine is clearly collaborative and raised on the expertise in varied fields of science. There is an immediate need to articulate Nanomedicine benefits more clearly to the general public. Involvement of the scientific research groups at the earliest with public is pivotal in order to find out any common concerning Nanomedicine. When nanotechnology is applied to medicine it is highly important to ensure safety evaluation and efficacy of particular product that is developed along with n any new technologies used for manufacturing and it is also crucial to review their impact on environment. In each case risk-benefit evaluation has to be done.
In coming years, the benefits of nanomedicines and new diagnostic tools will be felt by an increasing number of patients with considerable impact on global health.

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