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BIOMEDICAL APPLICATIONS OF NANOPARTICLES FOR DISEASES PREVENTIONS: A COMPREHENSIVE REVIEW

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Abstract

Nanotechnology is an evolving technology that addresses nanosized particles with important roles and applications in science. Accumulated nanotechnology expertise is provided by disciplines such as chemistry, biology, physics and engineering, materials science, and health sciences. Nevertheless, it has wide applications in genetics, electronics, and medicine in particular. Nanoparticles, targeted at the drug delivery system, are based on the mechanism of trapping the drugs or biomolecules into the particles' inner structure; another mechanism may be to absorb the drugs or biomolecules on the particles' outer surfaces. Nanoparticles (NPs) are currently used for drug delivery, proteins, genes, vaccines, polypeptides, nucleic acids, etc. Different applications of the drug delivery system through NPs have encountered a huge role in the pharmaceutical, medical, biological, and other sectors in recent years. This analysis focuses on the comprehensive profile of NPs, their effect on biology and medicine, and their commercialization prospects, taking into account the impact of NPs on drug delivery systems.

Keywords: *Applications, Drug, Nanotechnology, Nanoparticles, Particles.*

I. INTRODUCTION

Nanoparticles (NPs) provide effective means of delivery of time-controlled or site-specific drugs and bioactive agents. Pharmaceutical nanotechnology emphasizes the formulation of drugs in biocompatible nano forms that have drug delivery advantages. NPs improve drug efficacy and safety, such as enhancing bioavailability, providing targeted delivery of drugs, improving drug stability, and extending the impact of drugs on the target tissue[1].

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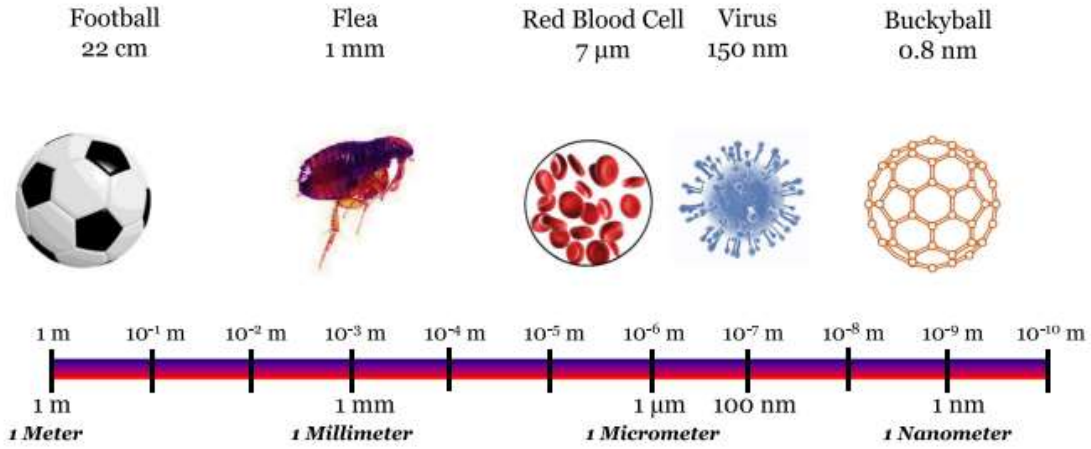

Figure 1: Illustrates relative dimensions of entities from meter to nanometer[2].

NPs such as lipid and polymeric-based NPs are also some of the most common vehicles for the delivery of small interfering RNA in addition to drug delivery. With specific physicochemical and biological activities, nanoparticles have a size ranging from 1 to 100 nm. As nanocarriers and nanodrugs, these particles are further broken up.

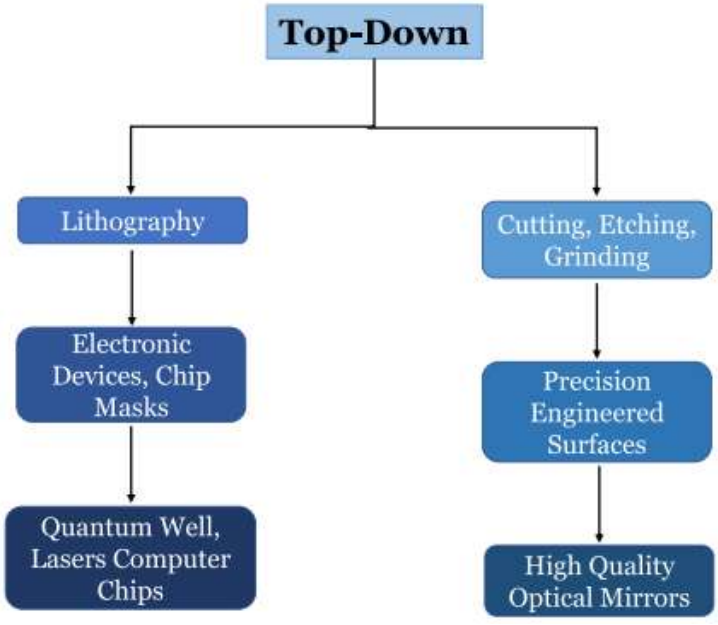

Figure 2: Illustrates the top-down method of nanoparticles preparation[3].

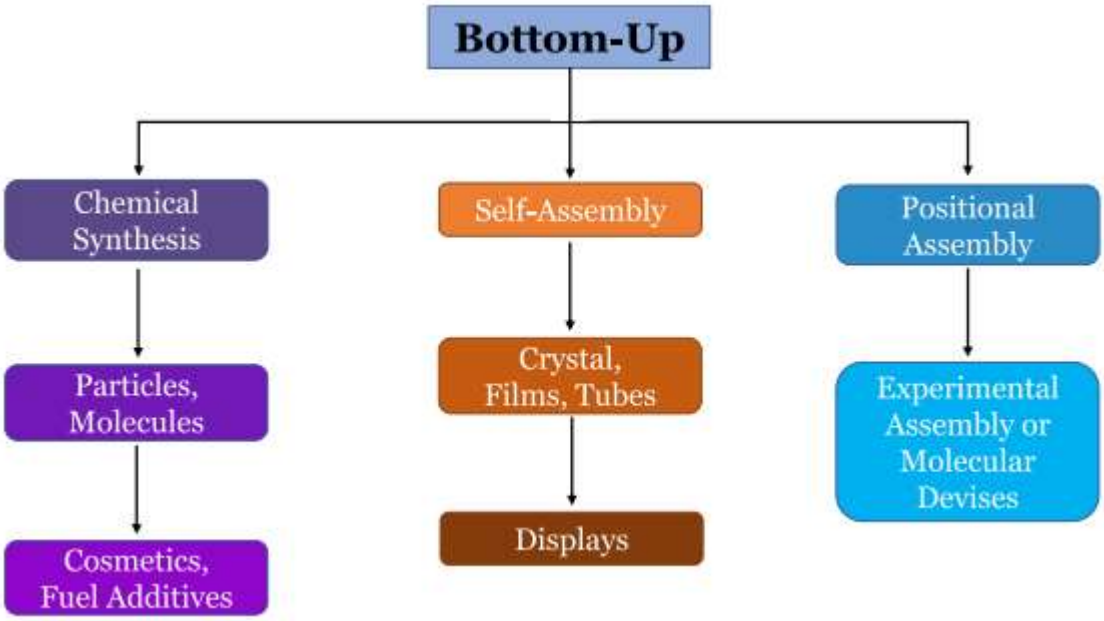

Figure 3: Illustrates the bottom-up method of nanoparticles preparation[4].

II. DISCUSSION

The key objectives are to advance the stability of nanoparticles in the biological environment; facilitation of the bio-distribution of active composites, in addition to contact with biological barriers, also extends drug loading, drug targeting to the active sites, drug transport, and drug release facilities[5]. Although the cytotoxic effects of some NPs or some minor degradation of the products remain a significant problem and the biocompatibility of the NPs is clearly the main concern of future exploration, the multiple as well as unique uses of NPs, for example, destroying cancer cells without affecting normal cells with minimal tumor cell recognition side effects, cell imaging, etc.[6].

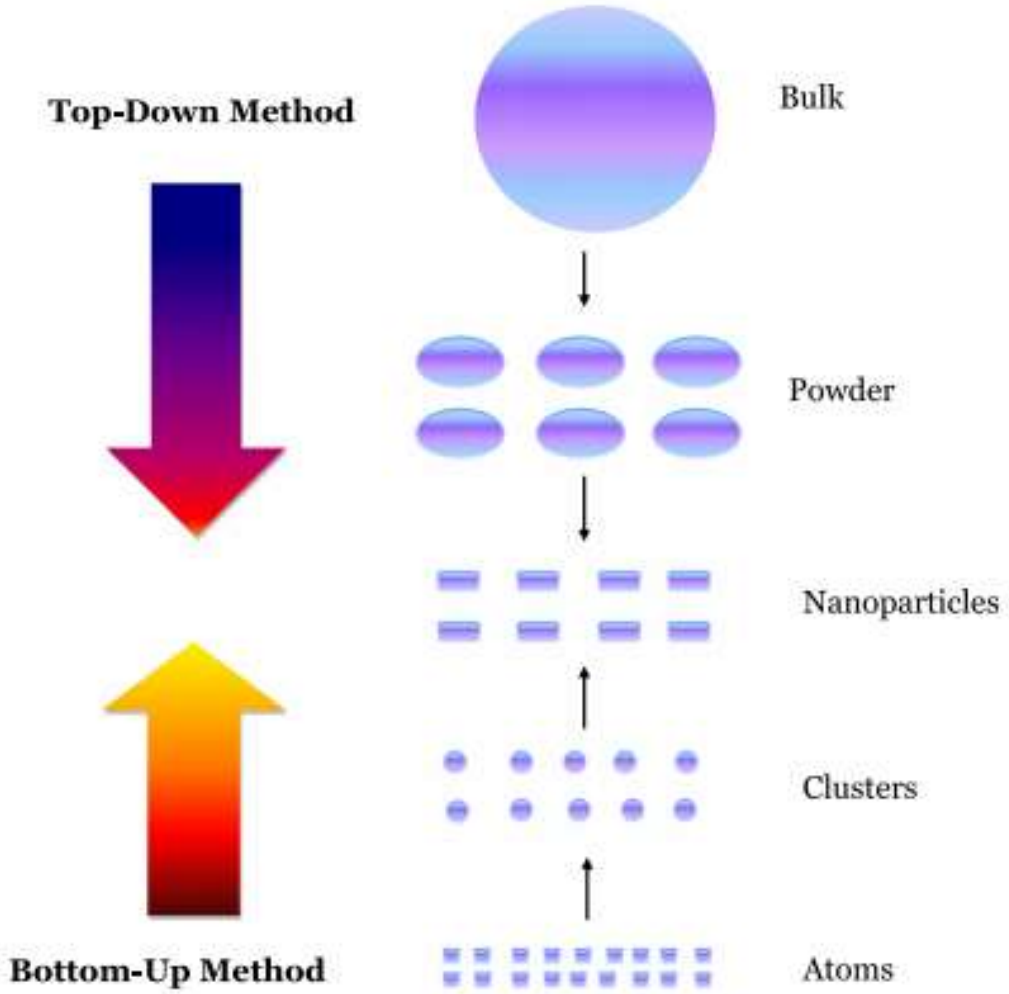

Figure 4: Illustrates the main theme of the top down and bottom-up methods of nanoparticles preparation[5].

Figure 1: Illustrates relative dimensions of some usual entities from meter to nanometer. Figure 2: Illustrates the top-down method of nanoparticles preparation. Figure 3: Illustrates the bottom-up method of nanoparticles preparation[7]. Figure 4: Illustrates the main theme of the top down and bottom-up methods of nanoparticles preparation. For both short-lived and prolonged dosages, NPs are able to deliver a variety of medicines to body parts such as the brain, arterial walls, lymphatic system, liver, spleen, lungs, or systemic circulation[8].

III. CONCLUSION

Not only in the pharmaceutical sciences, but also in other areas, nanoparticles serve a variety of applications. This analysis focuses primarily on the application of nanoparticles to the method of drug delivery. Nanoparticles with a prodigious potential effect on medicine and the pharmaceutical industry promote drug delivery systems. Nanotechnology has recently been used to treat cancer

and HIV/AIDS, where both non-invasive imaging and nutraceutical delivery are advanced. Eventually, with reduced dosing frequency and improved precision, the researchers can deliver the drugs for a longer period and penetrate the hard-to-get-to tissues where the molecular size, shape, and surface properties of the nanoparticles are regulated. This nanotechnology will dramatically enhance the quality of life of patients accompanied by healthcare facilities, diagnose preliminary pathological conditions and reduce the seriousness of the disease, and will serve patients with enhanced clinical outcomes.

IV. REFERENCES

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