Opinion/Perspective
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NanoPhytoformulations: What Is So Interesting About the Nanoscale?

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Abstract: Nanotechnology is on the threshold of providing a host of new materials and approaches in revolutionizing the medical and pharmaceutical fields. The incorporation of nanotechnology in herbal formulation investigation has a huge number of benefits for phytomedicine such as enhancement of solubility and bioavailability, reinforcement of pharmacological activity, improvement of stability, protection from toxicity, sustained delivery, and safeguarding from physical or chemical degradation. This opinion paper briefly highlights the authors perspective on herbal nanotechnology through few key points.

Introduction

Nature is an alluring source of novel therapeutic entities with plants, animals, marine, and microorganisms all contributing to drugs with potential applications in the prevention of many diseases (1). Apart from all these sources, plants have been convincing as a crucial origin of drugs since ancient times with over 50-60 % of currently used therapeutic agents borrowed from natural sources (2, 3).

Nanotechnology and Phytocompounds

Entrusted blueprints reported in Ayurvedic medicines are particularly phytochemical extracted components, used alone or in combination from historic times. The herbal phytochemicals or phytomedicine show their potency in various ways viz., inhibition of overexpressed enzymes, proteins amino acids, hormones and simultaneously accelerating the production of protective enzymes. Moreover, phytochemicals have proven antioxidant and relative oxygen generation capacity by regulating various pathways. These physicochemical characteristics help to boost immunity and do not affect healthy cells to a certain concentration resulting in the usage of phytomedicine have been increased (4). However, the therapeutic potency of any drug that may be obtained from plants or synthetic sources is fully dependent upon the ability of the dosage form to deliver the medicament to the desired site at a sufficient rate and bulk to evoke the pertinent pharmacological response. The phytomedicines display excellent in vitro activity but inferior in vivo efficiency due to their less water solubility, inappropriate molecular size, and lipophilicity leading to low absorption and hence poor systemic availability. A better perceptive of the pharmacokinetics, as well as biopharmaceutics of phytomedicines, can also help in engineering rational dosage forms (5). Nanotechnology is on the threshold of providing a host of new materials and approaches in revolutionizing the medical and pharmaceutical fields. The incorporation of nanotechnology in herbal formulation investigation has a huge number of benefits for phytomedicine such as enhancement of solubility and bioavailability, reinforcement of pharmacological activity, improvement of stability, protection from toxicity, sustained delivery, and safeguarding from physical or chemical degradation. There are diverse forms of nanotechnological approaches available for the delivery of

phytomedicines like polymeric, lipid, metal or inorganic, magnetic, quantum dot, carbon nanotube, and vesicular nanocarriers. As these nanocarrier-constructed materials are architected at the molecular, atomic, and macromolecular levels, they are generally small-sized particles (1-1000 nm) with unique physicochemical characteristics like size, surface properties, and shape. The particle size and surface properties of the nanocarriers can be modified easily for both passive (by coating certain types of polymers) and active targets (by attaching target ligands to the outer surface of the nanocarrier which will help to attain site-specific delivery). Being nano ranged, these tiny particles can efficiently penetrate the tissues or cells, expedite more uptake of the phytoconstituents, directly interreact with diseased cells or tissues with improved efficiency and ensure better therapeutic action. Besides these impressive facts about nanotechnology, extensive research and clinical studies are still needed to properly justify the nanotechnological approach for phytoformulations regarding the optimization of phytoconstituents during preparation, scale-up, and toxicity issues (6, 7).

Conclusion

Finally, in the end, the authors are optimistic that in near future, nanophytoformulation will surely find its place in the repository of advanced therapy.

Declarations

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Conflict of Interest

The authors declare no conflicting interest.

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