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Nanotechnology Enhances the Function of Plants Used for Medicine

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Introduction

People have traditionally used plants for medicinal purposes, either directly or through extraction, ever since ancient times. Due to their low cost, low side effects, and widespread acceptance, plants have been utilized for human health. Additionally, they provide a variety of phytochemicals. Plant-produced phytochemicals, or secondary metabolites, play a significant role in traditional medicine. The use of spices in traditional medicine is supported by the fact that optional metabolites have been shown to exhibit various natural actions. They have pharmacological effects that can be used to treat long-term degenerative diseases like diabetes and cancer as well as infections caused by fungi and bacteria. Because they are regarded as safe, cost less than modern conventional medicines, and have the potential to treat, maintain, and improve health as well as prevent and treat a number of diseases, herbal medicines are becoming increasingly popular worldwide. However, there are limitations to the majority of these phytochemical components with biological activity; Particularly, because of their low absorption and distribution as well as their generally low target specificity, their low bioavailability results in decreased biological activity. Additionally, these phytochemical compounds require large doses to exert their activity, and some of them are acid-sensitive and unstable. Their clinical application is ruined by these cutoff points [1].

Description

The primary active ingredient that was found isolated from Pueraria lobata (Willd.) roots is known as puerarin. Ohwi, which has many different pharmacotherapeutic effects. Puerarin is used to treat cancer, diabetes, osteonecrosis, endometriosis, Parkinson's disease, and Alzheimer's disease. Puerarin has a low solubility in water: 0.46 mg/mL, and its maximum solubility in phosphate buffers with a pH of 7.4 is 7.56 mg/mL. Puerarin's use is constrained by its low solvency. In recent years, research into increasing puerarin's bioavailability has expanded rapidly. Puerarin's bioavailability can be improved through a variety of nanotechnology approaches, one of which is the solid lipid nanoparticle (SLN) carrier system. Puerarin suspension is absorbed more slowly than SLN-puerarin. A Tmax that is more restricted confirms this. In addition, in terms of bioavailability, SLN-puerarin performed better than puerarin suspension [2].

Phytochemical bioavailability and bioactivity can be increased by using nanotechnology-based conveyance frameworks as medication transporters to overcome natural medication's various limitations. Nanotechnology has the potential to be a promising new technology for increasing the phytotherapy efficacy of herbal medicines when applied to phytochemical components. Different scientists want to develop a medication delivery system that is efficient and safe. Natural restorative strategies have regained popularity as a result of ongoing advancements in nanotechnology. Phytosomes, solid lipid nanoparticles (SLN), nanostructured lipid carriers (NLC), polymeric nanoparticles, and nano emulsions are among the numerous drug delivery strategies proposed. The nanotechnology approach is anticipated to increase the bioavailability and bioactivity of herbal medicines because nanoparticles have been used to alter and enhance the pharmacokinetic properties of various drugs. The objective of this article review is to provide an overview of the most recent developments in the development of nanotechnology-based herbal drug formulations that enhance herbal activity. The nanoscale system's particle diameter is 0.1 m, or a submicrometer. This makes this nanotechnology more advanced and widely studied by researchers. Additionally, it has a number of advantages in relation to various aspects, such as improved therapeutic effects and the route of administration. Because nano-sized structures can increase action, reduce doses, and limit secondary effects, numerous studies have combined homeopathic medicine with nanotechnology.

Utilizing nanotechnology-based conveyance frameworks, home-grown prescriptions have a lot of potential and interesting properties, such as the ability to transform ineffective, poorly absorbed, and less dissolvable substances into promising medications. Consequently, nanotechnology-based delivery systems have the potential to enhance herbal activity and address herbal medicine's drawbacks. New technology has been used to make phytochemical compounds more bioavailable and bioactive. For the development of new nanotechnology-based therapies, it is of the utmost importance to be able to create drug delivery formulations that are suitable. The delivery of phytochemicals is essential for effective disease treatment and prevention. Polymer-based and lipid-based delivery systems are two types of these delivery systems that have the potential to enhance the bioactivity of phytochemical compounds. Vesicular drug delivery systems are highly sought-after assemblies made up of at least one concentric bilayer formed by self-association in the presence of water. Both the SLN and the NLC are types of nanoparticle frameworks made up of lipid centers made of strong lipids or mixtures of strong and fluid lipids. Drugs that are hydrophobic and have a high first-pass metabolism are made more bioavailable through the use of nano emulsions. The nanoemulsion system is made up of water, water-soluble cosolvents, oils, lipids, surfactants, and other components [3-5].

Conclusion

In conclusion, nanotechnology-based delivery systems are utilized in public healthcare settings worldwide to deliver phytochemical constituents. Despite the fact that the use of herbal medicines is on the rise all over the world, their clinical limitations as medicines include being physically and chemically unstable, easily degraded, and lacking in solubility, bioavailability, and pharmacological activity. Additionally, herbal medicines are not approved for human consumption. Consequently, developing herbal medicines with nanotechnology-based delivery systems could be a different strategy for increasing their pharmacological activity. However, additional research into the development of these nanotechnology-based delivery systems is required, particularly in terms of safety and toxicity profiles, in order to guarantee their safety and effectiveness in treating a variety of diseases.

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