REVIEW ARTICLE

Nano-Delivery Systems for Improving Therapeutic Efficiency of Dietary Polyphenols

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ABSTRACT

Dietary polyphenols, primarily categorized into flavonoids (flavanols, flavones, flavan-3-ols, anthocyanidins, flavanones, and isoflavones) and nonflavonoids (stilbenes and phenolic acids) are reported to have health-promoting effects, such as antioxidant, anti-inflammatory, antitumor, antibacterial, antiviral, and cardioprotective properties. However, their applications in functional food and medications are limited due to their low bioavailability and insufficient systemic delivery. Nano-delivery system conveyances frameworks astoundingly influence the take-up properties of the stacked atoms because the molecule small shape, size, and surface properties of the nanoparticles apply a vital role in the improvement of the systemic delivery of polyphenols This includes nano-emulsion, nano-encapsulation, polymer nanoparticles (NPs), nano-liposomes, solid liquid nanoparticles, cyclodextrins, and polyphenol-loaded hydrogels.

Nano-technology is a rapidly developing area that guarantees the improvement of materials with novel measurements, new properties, and more extensive scope for utilization. This review reports the different therapeutic applications of dietary polyphenols, their biological activities, and different nano-delivery systems successfully developed for overcoming the delivery challenges. These applications also seek to improve their bioavailability, reduce toxicity, and enhance dietary polyphenol uptake across the gastrointestinal tract. (*Altern Ther Health Med.* 2021;27(S1):162-177).

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Phenolic compounds (PCs) are ubiquitously distributed phytochemicals found in most plant tissue, including fruits and vegetables. They are secondary metabolites synthesized through the shikimic acid and phenylpropanoid pathways. PCs have various bioactive properties and, despite the fact that they are not supplements, dietary admission offers wellbeing defensive impacts. In this manner, postharvest medicines have been utilized to improve or safeguard the substance of PCs in fruits and vegetables. Phytochemicals compounds include polyphenols, alkaloids, saponins, organo-sulfur, phytosterol, monoterpenes, and capsaicinoids, which provide health benefits for humans. They can assist in the curing and prevention of numerous medical disorders such as diabetes mellitus, cardiovascular disease, ulcers, cancer and bacterial infections.[1]

POLYPHENOLS

Polyphenols are a huge and heterogeneous group of phytochemicals containing phenol rings.[2] Different polyphenols are found in plant-based nourishment, including vegetables (especially broccoli, onions, and cabbage), organic produce (grapes, pears, apples, cherries, and different berries, which contain up to 200 - 300 mg polyphenols per 100 g new weight), vegetables (soybean), grains, plant-determined refreshments, and chocolate. Polyphenols perform a key role in solid cancer prevention due to their various hydroxyl bunches.[3] Their chemical structure is contains at least one hydroxyl bunch, with at least one aromatic ring. Polyphenols can be organized fundamentally into flavonoids and non-flavonoids, which establishes a different class of optional plant mixes or phytochemicals. The primary subclasses of dietary flavonoids are flavanols, flavones, flavan-3-ols, anthocyanidins, flavanones, and isoflavones. The nonflavonoids incorporate different classes of polyphenols, for example, stilbenes and phenolic acids (Figure 1).