

Emulsion Systems Stabilized with Biopolymers to Improve Lipophilic Bioactive Compounds Oral Bio Accessibility and Bioavailability

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Abstract

Food lipophilic bioactive compounds are susceptible to degradation due to stimuli environments during processing, storage, and passage through the gastrointestinal tract. These lipophilic bioactive components have poor digestibility and oral bioavailability. Colloid-based delivery systems can improve the lipophilic bioactive compounds' solubility, stability, and bioavailability. This review article summarises recent research on the development of bio polymeric emulsions as delivery vehicles for lipophilic bioactive compound encapsulation, protection, and enhancement of bio accessibility and bioavailability. Proteins, polysaccharides, and their conjugates are also highlighted as emulsifiers in the development of stable emulsions.

Keywords: Emulsion; Biopolymers; Bioactive compounds

Introduction

The incorporation of bioactive compounds extracted from various edible bio resources into food, pharmaceutical, and nutraceutical products has recently gained a lot of attention. The majority of these bioactive substances, such as carotenoids, phytosterols, unsaturated fatty acids, fat-soluble vitamins, and so on, are lipophilic in nature. These food-derived bioactive ingredients are said to improve human health and lower the risk of certain noncommunicable diseases (NCDs) like cardiovascular disease, diabetes, obesity, and cancer. Nonetheless, the majority of lipophilic bioactive compounds (LBC) have low solubility and are susceptible to degradation in harsh environments such as high temperatures, the presence of oxygen, light, and so on during food processing, storage, and extreme pH changes throughout the gastrointestinal tract (GIT). These significantly limit their dissolution in food and absorption in the small intestine. [1].

Lipophilic bioactive compound encapsulated emulsion delivery systems' bio accessibility and bioavailability

Three major parameters influence the overall bioavailability of lipophilic bioactive compounds: bio accessibility, absorption, and transformation. The fraction of LBC released from the delivery system and dissolved into the GI fluids in a form suitable for absorption is referred to as bio accessibility. The bio accessibility of an LBC-loaded emulsion is commonly defined as the amount that is solubilized within the mixed micelle particles composed of hydrophobic cores [2, 3].

These barriers can be overcome by colloidal delivery systems that have emerged as a novel delivery method for LBC, such as emulsion, liposome, and micro-/ Nano capsules. Emulsion-based delivery systems, in particular, have received a lot of attention due to their ease of production, wide range of applications, and effective performance delivery. Emulsifiers are necessary for the formulation of stable emulsions with appropriate shelf-life and the ability to withstand environmental stresses. Food biopolymers such as proteins and polysaccharides are now widely used as natural emulsifiers in the food industry to replace synthetic surfactants. When used alone for emulsion stabilisation, these biopolymers have some limitations [4, 5].

Their synergistic effects are recognised as a promising approach to developing potent colloidal delivery systems. The addition of one or more polysaccharides to cover the interfacial layer of protein-coated droplets can improve emulsion stability against aggregation.

Polysaccharides are widely used in food emulsions due to their functions as thickening and gelling agents. The stability of a protein-stabilized emulsion, on the other hand, can be improved by forming an interfacial protein-polysaccharide complex, which results in a decrease in van der Waals attraction and an increase in electrostatic and steric repulsions between droplets. Furthermore, surface modification of emulsified droplets with various biopolymers has a significant impact on the bio accessibility and bioavailability of entrapped bioactive compounds via a variety of mechanisms. [6, 7, 8].

Conclusion

The lipophilic natural antioxidants are difficult to use because of their poor solubility, chemical instability, low bioavailability, and other factors. Emulsion systems are commonly used to deliver lipophilic bioactive compounds. Emulsion-based delivery systems significantly improve oral bioavailability by improving aqueous solubility, preventing physiological and physicochemical degradation, and encouraging the formation of mixed micelles. [9, 10].

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Conflict of Interest

The authors affirm that they have no known financial or interpersonal conflicts that would have appeared to have an impact on the research presented in this study.

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