Impact of Lipid Composition on Liposome Stability and Cannabinoid Drug Encapsulation Efficiency

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Recent literature has been increasingly supporting the therapeutic use of cannabinoids in the development of novel medicines. Cannabinoids have been shown to be beneficial in the treatment of various diseases such as Alzheimer’s disease and multiple sclerosis. However, such benefits are hindered by their poor aqueous solubility, limiting bioavailability. Lipid nanoparticles offer an effective alternative to improve pharmacokinetic and biodistribution profiles of drug payloads. Crucial considerations for these systems pertain to size and uniformity, which impact liposome circulation time and tissue penetration.

Here, the impact of phospholipid type (synthetic vs. organic, unsaturated vs saturated) and lipid components ratio on liposome drug retention, size, and stability was investigated. Microfluidic techniques were utilized in the formulation of liposomes which varied in cholesterol content, with either SoyPC, POPC, or DSPC as the primary bilayer constituent, and THC as the API.

Increases in the lipid-to-API ratio demonstrated decreasing trends in liposome size ranging from 120 nm to 60 nm and increasing EE from 40 to 100 %. Varying cholesterol concentration captured different size and stability trends depending on phospholipid selection, whereas THC encapsulation efficiency remained unimpacted. Our approach validates the significance of the type of lipid synthesis and cholesterol percentage as important parameters in fine-tuning liposome formulation for controlled cannabinoid delivery.