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Nano-cannabis products: emulsions, conjugates and particles. Are they all created equal?

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Abstract: Due to the lipophilic nature of cannabinoids, they present significant challenges both for bioavailability and formulation. A viable solution is the creation of hydrophilic nano-dispersed systems ("water soluble cannabinoids"). The cannabis industry has a true need for products with superior pharmacokinetic properties combined with simple administration, straightforward integration and good taste. Oral delivery is particularly challenging for nano drug delivery systems (DDS). Orally-administered DDS first face the hostile environment of the stomach, rich with enzymes and low pH, usually requiring a protective coating to withstand what naturally breaks down xenobiotics. If the DDS successfully navigates the stomach, it then must overcome the absorption challenge, which depends on physicochemical parameters such as diameter, surface potential and recognition by endogenous transport mechanisms. Multiple types of nano-DDS are available; however, only a select few have made their way into pharmaceutical or consumer products. Nano-DDS can generally be divided into three categories: i) nanoemulsions; ii) nanoconjugates; and iii) nanoparticles. All three categories have their associated advantages and disadvantages. While, some cannabis products currently use nanoemulsions, they absolutely require inclusion of multiple additional excipeints to support the nanostructure. Nanoconjugates are prohibited under current cannabis regulation due to the molecular change in the chemical structure of the active ingredients. Nanoparticles are common in food industry and only recently emerged as suitable nano-DDS for cannabis. Nanoparticles combine both the desired pharmacokinetic profile and excipient-free manufacturing. Ultimately, there is significant need for a cannabinoid nano DDS platform with virtually no restrictions on formulation or route of administration.