White Paper by Lexaria Bioscience Corp.

"*DehydraTECH™ vs. NanoEmulsion*"

Presented by:

Hill Avenue Cannabis is the exclusive worldwide owner of the rights to use DehydraTECH™ technology in the production and sale of THC products

To learn more, please visit our website at www.dehydratech-thc.com

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DEHYDRATECH™ vs. NANOEMULSION

Cannabidiol (CBD or hemp oil) is hydrophobic (water opposing) and this presents a great problem in introducing it to human physiology. Oral delivery of many hydrophobic ingredients such as CBD is challenging to formulators due to their poor solubility and thus bioavailability. Limitations in solubility leads to less solubilization in the gastrointestinal tract and absorption by the body.

Many solutions have been used in an attempt to overcome this, including the use of surfactants, lipids, permeation enhancers, micronization, salt formulation, cyclodextrins, nanoparticles and solid dispersions.

The latest trend in CBD delivery methods is "nanoemulsion". Nano technology essentially seeks to reduce the size of the CBD particle and, when combined with an emulsion, enhances dissolubility. But does it enhance bioavailability?

Comparisons

DehydraTECH™ is an elegant technology with Self-Emulsifying Drug Delivery System (SEDDS) properties that can be applied to the cannabidiol molecule and its derivatives. This system is used in high-end pharmaceutical biodelivery processes. Self-emulsifying drug delivery systems are a proven scientific means of enhancing oral bioavailability of poorly soluble drugs.

As CBD is lipophilic, association with the right fats is critical to high bioabsorption and availability. DehydraTECH™ coats the CBD molecule with a specific long chain fatty acid (LCT) and through a precise and calculated dehydration process combines it with a normal, dissolvable, powdered substrate – from dextrose, d- ribose, lactose, tapioca starch, gum arabic and a host of others. The CBD is temporarily "locked" within the substrate like a Trojan Horse.

In the body, micelles act as delivery trucks and help the body absorb lipid and fat-soluble vitamins. They also carry complex lipids to the small intestine away from first pass liver metabolism. In addition, chylomicrons form in the intestinal epithelium to transport long-chain triglycerides (LCT) directly to the bloodstream and tissues via the thoracic lymph duct. In comparison, medium and short-chain fats (MCT) are transported directly to the liver. Chylomicrons are not interested in them. But DehydraTECH™'s long chain fatty acid is very similar to chylomicrons, and as such, the LCT-associated CBD molecule is sent directly to the tissues, mimicking the chylomicrons and, we believe, avoiding first pass metabolism in the liver and thus preserving the CBD's bioavailability.

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The emulsion of choice for nano technology is usually a medium chain triglyceride (MCT), and when the nano CBD and emulsion combination break apart in the stomach, the CBD is directed to the liver. The liver metabolizes between 35% to 45% of the CBD greatly affecting bioavailability. Some nano technologies use Polysorbate 80, an emulsifier that has serious and known adverse effects on the mucous lining of the stomach among other undesirable side effects.

Simply making something smaller and soluble in solution outside the body does not necessarily make it highly bioavailable inside the body. DehydraTECH™ approaches solubility and CBD absorption from the perspective of existing human physiology, not what happens in the solution in a beaker and does not try to defeat the body's eons-old systems of absorbing nutrients.

Nano technology creates smaller particles in the manufacturing process, but once in the stomach these particles recombine to randomly different sizes. Additionally, nano-scale particles may create significant health concerns in areas of the body not designed for such wholesale particle-size reduction. Nanoemulsion is built around reducing the size of the CBD molecule before combining it with the emulsifier.

DehydraTECH™ technology combines a unique long chain triglyceride (LCT) with the CBD oil and binds it to a common substrate such that when the LCT coated CBD molecule is released in the stomach it is sent to the lymphatic system and straight into the bloodstream without metabolic degradation. And this happens very rapidly: clinical studies have shown DehydraTECH™'s onset is comparable to vaping, with CBD measurable in the bloodstream within two minutes of ingestion.

In nanoemulsion, the value and benefits of size relative to human physiology is not quantified in any clinical or laboratory study. Efficacy is affected by diet, and dosing is thus imprecise – the more fats you eat, the better the absorption. Absorption is greatly reduced in low fat diets. The amount of CBD available in the bottle is not necessarily the amount of CBD that will be available to the body, especially after passing through the liver.

DehydraTECH™ has been clinically proven in independent studies to effectively enter the bloodstream without metabolic degradation by the liver. Absorption and effectiveness are not dependent on the amount of fat in the diet. Dosing is precise: virtually all of the CBD enters the bloodstream and becomes available to the endocannabinoid system. Further, Nanoemulsion can fall out of suspension and as an oil is used as the carrier, is not evenly dispersed in the form factor. When in the stomach, once released from the emulsifier, the nano particles of CBD reduced in the Nanoemulsion process recombine and defeat the purpose of micronization. The body's physiological processes endemic to bioabsorption are not addressed by merely changing particle size.

DehydraTECH™ remains in suspension in the form factor (for more than two years in shelf life studies) because the CBD becomes one with the substrate until it is released in the body to the bloodstream.

Nanoemulsion formulas require flavoring, added sweeteners, and other agents to mask CBD's unpleasant organoleptics. DehydraTECH™ eliminates CBD's unpleasant organoleptics by enrobing the CBD within the chosen substrate with fatty acids. Nothing more is required.

The advantages of DehydraTECH™ include: enhanced oral biodelivery, the ability to reduce dosage without reducing efficacy, more consistent absorption, and protection of the cannabidiol from the hostile environment in the gut, enabling selective targeting specific absorption windows in the gastrointestinal tract.

DehydraTECH™ introduces CBD into your system faster and cleaner!

DehydraTECH™ does not simply make things smaller – we make things simply effective.

The Food and Drug Administration has not evaluated CBD products, nor the technologies described, for safety or efficacy.