Pressure BioSciences, Inc. (PBIO) Just Might Have the Ideal Drug Delivery Technology for Cannabinoids

- **The Tide of Cannabis Legalization Continues to Rise**
- **Medical Cannabis Market to Hit $56 Billion in 7 Years**
- **Technology that Improves the Bioavailability of Cannabinoids**

With the passage of laws permitting medicinal use of cannabis in at least 32 U.S. jurisdictions and Canada, producers of cannabinoids for medical purposes are racing to improve delivery methods for their formulations. Cannabinoids, such as cannabidiol (CBD), are hydrophobic (literally, afraid of water). In practice, this means they do not dissolve or emulsify readily in water, which may seem to pose a problem, since by composition the human body is more than half water. Yet, paradoxically, for a drug to be readily absorbed, it must be largely hydrophobic, yet not completely so. It must, to some extent, dissolve in water. As a result, new, patented technology from Pressure BioSciences, Inc. (OTCQB: PBIO) may provide the ideal transport for CBD and other cannabinoids. PBIO's Ultra Shear Technology (UST) has the capacity to develop water-soluble nanoemulsions that can be employed to improve the bioavailability of cannabinoids.

Emulsions are mixtures of two or more liquids (e.g., oils in water) that cannot be blended into each other without the addition of chemicals called emulsifiers (e.g., surfactants). Emulsions are used in multiple everyday products, including food, medical products, pharmaceuticals, nutraceuticals, cosmetics, industrial lubricants, and even cannabis oil extracts (e.g., CBD). Nanoemulsions have been shown to have improved absorption, higher bioavailability, greater stability, and other advantages, when compared to the standard, much larger macro- and micro-emulsions.

Nanoemulsions offer an advanced mode of drug delivery expected to improve the bioavailability of a wide range of active agents. These nano-sized emulsions, in which two immiscible liquids are usually combined to form a single phase by means of an emulsifying agent that combines surfactant and co-surfactant, typically have droplet sizes that fall in the 20–200 nm range. It would take 10 million nanometers to cover a length of one centimeter (about 0.4 inches).

Interestingly, PBIO believes their patented Ultra Shear Technology (UST) may be able to make commercial-scale nanoemulsions that would require far less emulsifying agents than current methods, perhaps even none. Emulsifying agents are chemicals, some are natural, some are not. With consumer demands for non-additive natural products, the availability of nanoemulsions that require little or no chemical emulsifiers should be well received by consumers and manufactures alike, and rewarded by shareholders.

Late last year, PBIO announced a partnership with Phasex Corporation. The aim of the collaboration is to combine PBIO's patented UST and Phasex's SCF-based processing methods to enable the development of stable, water-soluble nanoemulsions of nutraceuticals, including CBD-enriched plant oil. Phasex is a pioneer in the development of supercritical fluid (SCF)-based toll processors, which are used for extracting, purifying, recrystallizing and fractionating a wide range of polymers, natural extracts and other chemicals.

Complementing Phasex' SCF extraction technology with PBIO's UST makes a great deal of commercial sense. Currently, there is a market for new methods to turn hydrophobic extracts into stable, water-soluble formulations. UST offers the potential to solve that problem by producing stable nanoemulsions of oil-like products in water. The range of commercial applications is extensive and includes inks, industrial lubricants, cosmetics, pharmaceuticals and nutraceuticals, as well as medically important plant oil extracts such as CBD. UST utilizes ultra-high pressure-driven fluid dynamic shear forces, combined with controlled temperatures, to engender homogenization.

Data from scientific studies indicate that nanoemulsions of nutraceuticals and pharmaceuticals may exhibit improved absorption, higher bioavailability, greater stability, and lower levels of stabilizing additives (surfactants) compared to the larger droplet sizes resulting from current emulsion processes. Because of these significant advantages, nanoemulsions are currently the focus of many research efforts worldwide. In this field, the PBIO-Phasex joint venture is poised to break new ground. Combining Phasex' SCF extraction methodology with PBIO's disruptive drug delivery technology may signal the genesis of an entirely new paradigm in therapeutic treatments.

The global medical marijuana market is set to reach a value of USD 55.8 billion by 2025, according to a new report by Grand View Research, Inc. As it expands, the demand for enabling medical technologies, such as UST, are set to rise. PBIO, it seems, is about to thrive in the brave new world of cannabis liberalization.

For more information, please visit www.pressurebiosciences.com.