

The Rise of Cannabinomics

U.S. Medical Marijuana Empowers A Cannabis Laboratory Revolution



Photo courtesy of Paul Winkler,
Shimadzu Scientific Instruments

Summary/Introduction

Cannabis quality control testing, vital to ensuring the safety of consumers of cannabis products, is in its infancy. This testing, however, is shedding light on a long-suppressed field of cannabinomics. As more and more US states become medicinally and recreationally cannabis-legal, this testing will improve, mature and open the door to much more comprehensive cannabis research. The US is on the verge of a "green rush" and we believe humankind will benefit immensely from this cannabis revolution.

Sometimes the Light's All Shinin' on Me

Throng of eager entrepreneurs gather like rambunctious reptiles under the intense incandescence of metal halide and high pressure sodium lighting amidst row after row of extraction equipment, vaporizers and cannabis infused product booths. Cannabis conferences have sprouted up across the United States, and anyone attending such meetings will tell you that there is a buzz surrounding cannabis that is not attributed to tetrahydrocannabinol. At conferences like the Marijuana Business Conference and Expo, attendees weave through informative exhibition booths, short courses and oral presentations that cover a myriad of marijuana related topics, from cannabis cultivation tips and dispensary 'budtender' training to medical marijuana extracted oils and edibles. Financial experts, entrepreneurs, cannabis connoisseurs, laboratory chemists and a large contingency of novices intermingle to educate, share, learn and network. The energy level is exuberant, adrenalized with what seems to be unlimited opportunities.

At the time of writing this article, 37 states have pro- medical cannabis laws, including 23 states (and DC) that have medical laws and 4 states that have full legalization. There are over 2,000,000 legal medical marijuana patients in the U.S.A., and nearly half of Americans are now living in states with some form of medical marijuana or CBD legislation. As entrepreneurs position for highly coveted cultivation and dispensary licenses and state regulators work diligently to bring new medical cannabis programs online, another exciting business opportunity has emerged. Cannabis testing laboratories are needed to accurately determine cannabinoid potencies in cannabis products, and ensure that these products are free from contaminants.

New standards and best practices are being established by various associations in states where medical or recreational marijuana is legal. American Herbal Pharmacopoeia's monograph outlines the quality control criteria needed for ensuring the identity, purity, and quality of cannabis materials. The American Oil Chemists' Society (AOCS) has established a cannabis expert panel, which convenes to improve cannabis testing. New conferences devoted entirely to cannabis testing and research, like CannCon

(www.canncon.org), have emerged to bring cannabis laboratories together.

Other Times I Can Barely See

Despite the growth of both recreational and medical marijuana markets, there are numerous federal, financial, logistical and technical issues plaguing cannabis testing laboratories. Still federally illegal, marijuana is a Schedule I drug and US laboratories cannot receive standards at concentrations higher than 1 mg/mL. From a federal perspective, cannabis testing labs are neither protected nor legal.

Research branches of the federal government, such as the National Institutes of Health (NIH), publish manuscripts demonstrating several health benefits of cannabis and even state that, "The marijuana plant contains several chemicals that may prove useful for treating a range of illnesses or symptoms, leading many people to argue that it should be made legally available for medical purposes." [1]. Federal law enforcement agencies, seem to ignore reports in

peer-reviewed, scientific/medicinal journals and assert that cannabis has "no accepted medical use". They do this even though the US Department of Health and Human Services (HHS) was issued a US Patent entitled, "Cannabinoids as antioxidants and neuroprotectants" in 2003 [2]. The greatest impact of the federal government's failure to reclassify marijuana from a DEA Schedule I drug is that research labs cannot investigate cannabis health benefits because, marijuana simply cannot be legally obtained and researchers risk raids and imprisonment.

Standardization of testing and sample preparation is critical to ensuring safe products. For example, cannabinoid extraction from cannabis plant materials selectively separates cannabinoids, ultimately delivering them in a highly concentrated form. Concentrated oils and waxes are used to generate a wide variety of cannabis infused products, from gummi bears, brownies, and beverages to soaps and skin creams. Accurate testing of cannabis oils and products is necessary to ensure proper dosing and to minimize the risk of overdose. In addi-



Fig. 1. G.I. Grow's natural sunlight biomedical farm (www.GIGrow.us).



Fig. 2. Health disorders with reported cannabinoid impact. Learn more at the world's largest and most informative cannabis strain online database at www.leafly.com.

tion, safer extraction techniques need to be developed. The most popular technique, butane hash oil extraction, has had explosive consequences on the industry, as the number of butane hash oil extraction explosion victims has skyrocketed, leaving "chemists" charred with burns on up to 90% of their bodies.

In the meantime, medical cannabis patients are suffering. They simply cannot receive their prescribed medicine due to slow moving government programs. For example, although Massachusetts legalized medical marijuana in 2012, only one dispensary has opened out of the 15 that were awarded licenses. The federal government needs to act now.

Lately it Occurs to Me What a Long, Strange Trip It's Been

Cannabis analytical testing laboratories typically quantitate somewhere between 8-12 cannabinoids. These cannabinoids are separated and analyzed using conventional high performance liquid chromatographic systems. These labs also use GC and GCMS to profile terpenes, which give cannabis its fragrance and flavor. Another critical component of cannabis QC testing is screening for contaminants, such as pesticides, heavy metals and residual solvents (leftover from extraction procedures), mycotoxins/aflatoxins and microorganisms.

Tetrahydrocannabinol (THC) is the major psychoactive component in marijuana, with most plants containing around 15% THC. Modern marijuana growers are breeding plants with unheard of THC levels. Analysis of recent strains from California and Australia, however, reported THC levels as high as 40%. In general, as the THC levels increase, they do so at the expense of the other cannabinoids. While several health benefits have been reported for THC, many medical cannabis patients need cannaceuticals rich in non-psychoactive cannabinoids like cannabidiol (CBD), cannabidiolic acid (CBDA), cannabigerol (CBG), cannabigerolic acid (CBGA), cannabinal (CBN) and/or the non-psychoactive, carboxylated form of tetrahydrocannabinol (THC-A). These patients also seek non-smoking cannabis products, including oils and oil-infused edibles with easy to control, accurate dosages. G.I. Grow is a biomedical farm in Deer Island, Oregon that abides by Oregon Medical Marijuana Program rules and nurtures cannabis flowers with natural sunlight cultivation and water/ice extraction techniques to maximize their cannaceuticals therapeutic effect. They apply a holistic approach to cannaceutical development, focusing on quality rather than yield, to produce blends of oils in response to patient outcomes, tailoring personalized cannabinomics strategies for each individual patient.

The endocannabinoid system develops in early human embryonic stages and cannabinoid receptors play a critical role in brain development and foetal survival [3]. Researchers have become extremely interested in the endocannabinoid system as an emerging target of pharmacotherapeutics. Understanding and modulating the activity of the endocannabinoid system appears to hold great therapeutic potential in "a wide range of disparate diseases and pathological conditions, ranging from mood and anxiety disorders, movement disorders such as Parkinson's and Huntington's disease, neuropathic pain, multiple sclerosis and spinal cord injury, to cancer, atherosclerosis, myocardial infarction, stroke, hypertension, glaucoma, obesity/metabolic syndrome, and osteoporosis, to name just a few" [4].

It's research like this, specializing in human health rather than human high, that best illustrates the desperate need for standardization of procedures and cannabis test methods.

Cannabis contains more than 500 compounds that are unique to cannabis, including over 80 cannabinoids. We will only begin to appreciate the therapeutic potential of cannabinoids once cannabis research is allowed to take place in laboratories across the world. We will also begin to gain a better understanding of the interactions/synergies of the cannabinome with terpenes, flavonoids and other cannabis-containing compounds. In this regard, we are only beginning to unlock the healing potential of cannabis.

References

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- [2] US Patent #6630507, "Cannabinoids as antioxidants and neuroprotectants": www.google.ca/patents/US6630507.
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