

**Written Testimony of Martin A. Lee,
Director of Project CBD,
For the Senate Caucus on International Narcotics Control hearing on
“Cannabidiol: Barriers to Research and Potential Medical Benefits.”
9:30 a.m. Eastern, Wednesday, June 24, 2015**

Project CBD is a California-based educational nonprofit that focuses on cannabis science and therapeutics. Project CBD reports on new developments in the burgeoning field of cannabinoid research, which have significant implications for nearly every area of medical science. Project CBD does not engage in the sale of any products other than educational literature.

When we launched Project CBD in 2010, there was little public awareness of the therapeutic potential of cannabidiol, a nonpsychoactive component of the cannabis plant. CBD was virtually unknown even among cannabis clinicians and medical marijuana patients, despite preclinical scientific studies that underscored the ability of cannabidiol to [shrink malignant tumors](#),¹ [stop seizures](#),² [improve insulin sensitivity](#),³ and [ease chronic pain](#).⁴

A key turning point in the CBD saga occurred six years ago in Northern California with the serendipitous discovery of several strains of cannabis that we describe as “CBD-rich.” A strain or product qualifies as CBD-rich if analytical lab tests confirmed the presence of cannabidiol in amounts equal to or exceeding CBD’s controversial cousin, tetrahydrocannabinol or THC, aka “The High Causer.”

Not everyone enjoys the cannabis high. Cannabidiol can lessen or neutralize the psychotropic properties of THC, which make some people anxious and dysphoric rather than relaxed and euphoric. The reduced psychoactivity of CBD-rich cannabis may appeal to those seeking the medicinal benefits of cannabis without impairment or disconcerting side effects.

For the medical marijuana community, CBD would prove be a game-changer, enabling patients to avail themselves of additional treatment options that had never been scrutinized in a clinical setting. Today CBD-rich remedies are accessible in many forms -- as flower, edibles, capsules, ointments, tinctures, and concentrated

¹ *The non-psychoactive cannabidiol triggers caspase activation and oxidative stress in human glioma cells.* Massi P., et al. *Cell Mol Life Sci.* 2006 Sep;63(17):2057-66.

² *The cannabinoids as potential antiepileptics.* Karler R, Turkanis SA. *J Clin Pharmacol.* 1981 Aug-Sep;21(8-9 Suppl):437S-448S.

³ *Cannabidiol attenuates cardiac dysfunction, oxidative stress, fibrosis, and inflammatory and cell death signaling pathways in diabetic cardiomyopathy.* Rajesh M., et al. *J Am Coll Cardiol.* 2010 Dec 14;56(25):2115-25. doi: 10.1016/j.jacc.2010.07.033.

⁴ *The non-psychoactive cannabis constituent cannabidiol is an orally effective therapeutic agent in rat chronic inflammatory and neuropathic pain.* Costa B. et al. *Eur J Pharmacol.* 2007 Feb 5;556(1-3):75-83. Epub 2006 Nov 10.

extracts -- at medical marijuana dispensaries and via internet storefronts that market “hemp oil” preparations.

Anecdotal accounts of near-miraculous healing outcomes attributable to CBD-rich remedies are validated by extensive preclinical investigations that explain how and why CBD works on a molecular level. But clinical studies that actually demonstrate the efficacy of CBD are lacking because of anachronistic restrictions on cannabis-related research.

CBD-rich treatment regimens have reportedly extended the lives of advanced cancer patients and others suffering from a wide range of diseases. Most remarkable of all is the dramatic improvement in some cases of intractable pediatric epilepsy.

A surge of interest in cannabidiol was triggered by national television broadcasts featuring stories of severely ill children who became -- and remained -- seizure-free after they began ingesting CBD-infused oil extracts with little THC.

But a CBD-rich remedy with little THC doesn't work for everyone. Parents of epileptic children have found that adding some THC (or THCA, the raw unheated version of THC) to the CBD oil helps with seizure control in many instances. For some epileptics, THC-dominant strains are more effective than CBD-rich products.

The vast majority of patients need access to a broad spectrum of whole plant cannabis remedies, not just low THC medicine. One size doesn't fit all with respect to cannabis therapeutics, and neither does one compound or one product or one strain.

Along with a growing awareness of cannabidiol as a potential health aide there has been a proliferation of misconceptions about CBD and a misplaced emphasis on CBD as a single-molecule medicine.

Various scientific studies have established that CBD and THC interact synergistically to enhance each other's therapeutic effects. Scientists at the California Pacific Medical Center in San Francisco determined that a combination of CBD and THC has a more potent antitumoral effect than either compound alone when tested on [brain cancer](#) cell lines.⁵ British researchers have shown that [CBD potentiates THC's anti-inflammatory properties](#) in an animal model of colitis.⁶ And clinical studies

⁵ *Cannabidiol enhances the inhibitory effects of delta9-tetrahydrocannabinol on human glioblastoma cell proliferation and survival.* Marcu JP, et al. [Mol Cancer Ther.](#) 2010 Jan;9(1):180-9. doi: 10.1158/1535-7163.MCT-09-0407. Epub 2010 Jan 6.

⁶ *The effects of Delta-tetrahydrocannabinol and cannabidiol alone and in combination on damage, inflammation and in vitro motility disturbances in rat colitis.* Jamontt JM, et al. [Br J Pharmacol.](#) 2010 Jun;160(3):712-23. doi: 10.1111/j.1476-5381.2010.00791.x.

sponsored by GW Pharmaceuticals showed that CBD combined with THC is helpful for treating [neuropathic pain](#).⁷

CBD and THC both have well-documented neuroprotective effects, yet THC continues to be stigmatized as “recreational” and “dangerous.” Diehard marijuana prohibitionists are trying to exploit the good news about CBD to further demonize high-THC cannabis, casting tetrahydrocannabinol as the bad cannabinoid, whereas CBD is framed as the virtuous cannabinoid. Project CBD categorically rejects this moralistic, reefer madness dichotomy in favor of whole plant cannabis therapeutics.

Amid all the excitement about CBD, one should not ignore the importance of THC as a therapeutic substance. Investigators at the Scripps Research Institute in La Jolla, California, have shown that [THC inhibits an enzyme](#) responsible for the accumulation of amyloid plaque in the brain, the hallmark of Alzheimer’s-related dementia.⁸ Harvard University scientists found that [THC cuts tumor growth in common lung cancer](#) in half and “significantly reduces the ability of the cancer to spread” – which helps to explain why smoking marijuana doesn’t cause lung cancer.⁹ And a 2010 study in the *Journal of Clinical Psychopharmacology* reported that oral [THC improved symptoms of ADHD](#) and Tourette’s syndrome in a teenager.¹⁰

In addition to THC and CBD, cannabis contains several hundred compounds, including various flavonoids, aromatic terpenes, and many minor cannabinoids. Each of these compounds has specific healing attributes, but when combined they create what scientists refer to as an “entourage effect” so that the therapeutic impact of the whole plant exceeds the sum of its single-molecule parts.

A [recent study](#) in Israel documented the superior therapeutic properties of a whole plant CBD-rich cannabis oil extract as compared to synthetic, single-molecule cannabidiol.¹¹ The Israeli researchers found that a small amount of CBD-rich oil was needed for significant pain relief, whereas a much larger amount of pure CBD was required to achieve the same analgesic effect.

⁷ *Sativex successfully treats neuropathic pain characterised by allodynia: a randomised, double-blind, placebo-controlled clinical trial.* Nurmikko TJ, et al. [Pain](#). 2007 Dec 15;133(1-3):210-20. Epub 2007 Nov 7.

⁸ *A Molecular Link Between the Active Component of Marijuana and Alzheimer’s Disease Pathology.* Lisa M. Eubanks. [Mol Pharm](#). Author manuscript; available in PMC 2008 Oct 6. Published in final edited form as: *Mol Pharm*. 2006; 3(6): 773–777.

⁹ *Marijuana Stops Growth of Lung Cancer Tumors in Mice (Update1)*, Angela Zimm, [Bloomberg](#), April 17, 2007

¹⁰ *Oral delta 9-tetrahydrocannabinol improved refractory Gilles de la Tourette syndrome in an adolescent by increasing intracortical inhibition: a case report.* Hasan A. [J Clin Psychopharmacol](#). 2010 Apr;30(2):190-2. doi: 10.1097/JCP.0b013e3181d236ec.

¹¹ *Overcoming the Bell - Shaped Dose - Response of Cannabidiol by Using Cannabis Extract Enriched in Cannabidiol.* Ruth Gallily, et al. [Pharmacology & Pharmacy](#), 2015, 6, 75 - 85 Published Online February 2015 in SciRes.

Moreover, the administration of pure, single-molecule CBD in an animal model resulted in a bell-shaped dose-response curve, meaning that when the amount of CBD exceeded a certain point its therapeutic impact declined dramatically. “Healing was only observed when CBD was given within a very limited dose range, whereas no beneficial effect was achieved at either lower or higher doses,” the scientists observed. This characteristic of single-molecule CBD—manifested as a bell-shaped dose-response—imposes serious obstacles that limit its usefulness in a clinical context.

The dose-response improved significantly when CBD was combined with other cannabis components. “A lot of research has been made to isolate and characterize isolated single constituents of traditional herbal medicine to find their rationale for therapeutic uses,” the Israeli team concluded. “However, our data together with those of others provide legitimation to introduce a new generation of phytopharmaceuticals to treat diseases that have hitherto been treated using synthetic drugs alone. The therapeutic synergy observed with plant extracts results in the requirement for a lower amount of active components, with consequent reduced adverse effects.”

Raphael Mechoulam, the Israeli scientist who discovered the chemical structure of CBD and THC, likened cannabis to “a medicinal treasure trove.” He wasn’t referring to just one component of the plant. Cannabis, the still forbidden botanical, should be removed from Schedule I and regulated as a medicinal herb, not as a signal molecule pharmaceutical or a street drug.