

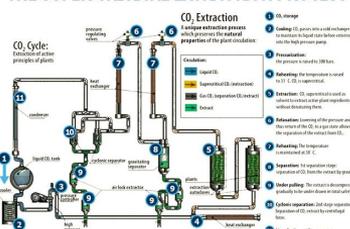


Charlotte, a dravet syndrome patient, pictured with high-CBD hemp plants that produce her medicine.

Background

Hemp (*Cannabis sativa*) has been used for fiber, food, feed and medicine for thousands of years. Hemp contains hundreds of phytocannabinoids and aromatic terpenoids. The primary phytocannabinoid is cannabidiol (CBD). CBD and other phytocannabinoids found in *C. Sativa* interact with the brain's endocannabinoid system (ECS), which consists of central nervous system receptors, CB₁, and peripheral nervous system receptors, CB₂. These interactions have been studied extensively in the scientific literature. Many results show that CBD is effective at treating a number of ailments and diseases. Until very recently, laws outlawing marijuana, another variety of *C. sativa* that is high in the psychoactive phytocannabinoid THC, also banned hemp. Section 7606 of the 2014 Agricultural act has authorized research universities to cultivate hemp for agricultural and marketing research. Scientific and medicinal research presented here will illustrate the important role CBD will have in a larger hemp industry.

THE SUPER CRITICAL EXTRACTION PROCESS



Documented medicinal and therapeutic effects of cannabidiol extracted from industrial hemp.

Tony de Veyra

Abstract:

Hemp (*Cannabis sativa*) has a long and extensive history of medical and therapeutic use. Despite this, modern science has only recently come to understand the active ingredient in hemp, cannabidiol, and its modes of action on various ailments. To explore the scientific literature, google scholar and the Cal Poly Pomona library database were explored with the keywords, "cannabidiol," "CBD," "terpenes," "phytocannabinoids," and "endocannabinoid system." Many literature reviews and published experiments were found, most of which indicated effectiveness of CBD in pre-clinical trials using animal models. There were a few clinical trials with very small sample sizes. In summary, more double-blind, clinical trials are needed to further evaluate the effectiveness of CBD and agricultural research is needed to help develop a domestic hemp-CBD production industry.



E-cigarette vaporizers and orally-administered tinctures are two of the most popular ways to ingest CBD-rich hemp extracts.



Epilepsy: CBD is an effective anticonvulsant in animal models of seizures¹. Experiments show beneficial reductions in seizure activity caused by CBD in vivo and in vitro models. A theoretical mode of action proposes that CBD displaces selective CB₁ agonists that otherwise cause seizures via excessive neurological signaling².

Psychosis: CBD has been demonstrated to counteract the psychotropic effects caused by Δ⁹-tetrahydrocannabinol (THC), another phytocannabinoid³. A double-blind clinical trial on schizophrenia patients showed CBD to be as effective as a leading treatment drug for psychosis while having a better side effect panel⁴. Researchers found higher levels of anandamide (ADA), an endogenous cannabinoid, in the cerebrospinal fluid of the treatment group, leading to a mode-of-action theory that CBD alleviates psychosis by reducing degradation of endogenous ADA⁵.

Neuropathy: CBD was found to be effective in alleviating neuropathic pain caused by diabetes⁶. CBD also alleviates neuropathic side effects of chemotherapy treatments⁷.

Cancer: endocannabinoid receptor activation has been shown to inhibit cancer cell proliferation by preventing the growth of new blood vessels in tumors⁸. In mice, CBD was found to upregulate COX-2 and PPAR-γ which cause lung cancer tumor cell death⁹. CBD also reduced breast cancer metastasis by down-regulating transcriptional regulator 1d1¹⁰.

Anxiety and PTSD: tests on mice revealed that CBD is as effective as diazepam (trade name: valium) at inhibiting behavioral and cardiovascular responses to conditioned fear¹¹. Normal CB₁ triggering by ANA is a part of normal fear extinction and CBD prevents the breakdown of ADA¹². A small clinical study has shown CBD to reduce anxiety levels among patients with Social Anxiety Disorder (SAD)¹³.

Conclusion: domestic cultivation for patient access

Peer-reviewed research has recorded the effects and modes-of-action of CBD in animal tests but are still in early phases. These pre-clinical trials, while demonstrative, only lay the groundwork for human trials, which have been very hard to conduct in clinical settings due to anti-drug laws that confuse hemp and marijuana. There is a huge need for more data and more experiments with double-blinds and large sample sizes. That said, the public has started using CBD and the large amount of anecdotal evidence generated by their experiences and testimonials support the compound's efficacy in humans. Patient and doctor groups have self-organized to publicize their results and demand improved access. Currently, CBD products are manufactured from extracts of plants grown in the EU and imported to the United States and this has made costs prohibitive for some patients. With Section 7606 of the 2014 Agricultural Act, universities have the opportunity to take the lead and demonstrate the agronomic performance and yields of high CBD hemp grown on US soils. This is absolutely necessary to pave the way for the farmers that will build up a domestic production industry.

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