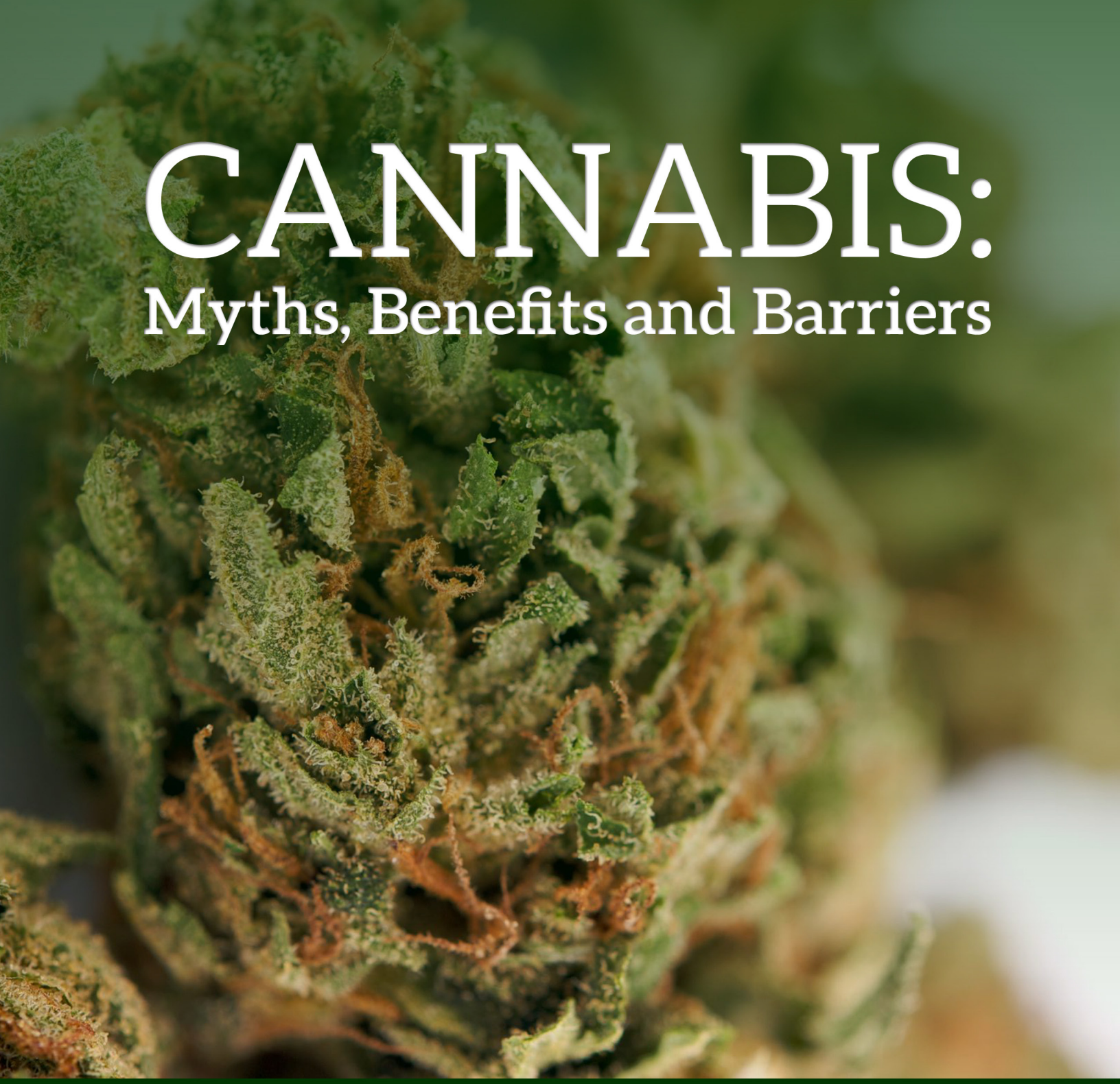

CANNABIS:
Myths, Benefits and Barriers

GreenMedinfo
Research Empowered

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You can probably count on one hand the number health topics as polarizing as cannabis. Whether it's a discussion of the pros and cons of legalization, recreational use, or the efficacy of medicinal applications, people either have strong opinions or uncomfortably try to "flee the scene." Cannabis is a complex and multifaceted subject, but one thing is clear—it's not going away anytime soon.

Legalization is expanding with every election. At present, 29 states and the District of Columbia have some form of legalized marijuana.[1] In North America, the marijuana market generated $6.7 billion in 2016, and if projections are true, it will exceed $20 billion in 2021. One acre of marijuana is worth 13,000 times more than an acre of corn and 43,000 times more than an acre of soybeans.

Due to regulatory barriers, lack of access, absence of funding, and overall "cannaphobia," scientific studies about cannabis lag well behind anecdotal accounts, although things are slowly moving in the desired direction. In the United States, scientists must get approval from the Drug Enforcement Agency (DEA) and Food and Drug Administration (FDA) to perform medical marijuana research, which is often an insurmountable hurdle. Even in states where medical marijuana has been decriminalized, federal regulations still prevent researchers from using that same product.

The crux of the problem is that cannabis is classified by the DEA as a Schedule I controlled substance, which is the same category that heroin, LSD, and ecstasy are classified in. This is the most tightly restricted schedule, reserved for drugs that supposedly have "no medical use." In 2009, the American Medical Association recommended rescheduling cannabis from a Schedule 1 to Schedule 2 drug, but so far this has not happened.

One thing is for certain: the notion that marijuana has no "medicinal benefits" is completely absurd.

Cannabis is a freely growing herb that has been coveted throughout human history for a multitude of uses - medical, industrial and otherwise. As far back as 2727 BC, cannabis was recorded in the Chinese pharmacopoeia as an effective medicine. Evidence for its use as a food, textile, and healing agent stretch back even further to 12,000 BC.[2]

Unfortunately, for every study coming out on the side of medical marijuana today, there are a dozen opposing forces attempting to suppress and discredit the data. The fact that the whole herb is non-patentable is the main reason it continues to struggle for approval from the powers that be. The pharmaceutical industry is what stands between you and your access to this powerful medicinal plant.

Sadly, any natural substance that supports our innate ability to heal faces adamant opposition because it offers no promise of profit for our government or medical industries. The US government is deplorable in its dishonesty about medical marijuana, clinging to its patents for medical use while at the same time claiming it has no medical value. For a government that loves denying weed's medicinal uses, it sure boasts an abundance of scientific studies about the health benefits on its prime research database, PubMed (more than 16,000 references come up under the term "cannabis").

We have thousands of years of anecdotal evidence about the health-supporting properties of cannabis, but we need to conduct rigorous scientific studies if medical legitimacy is to be established and barriers are to be removed. Before we get into the science, let's take a look at why cannabis works so seamlessly in the human body.

Like It or Not, Your Body Was Built for Cannabis

Cannabis has far-reaching effects in the human body - and now we know why. Like it or not, *we are hardwired for it*.

Like other mammals, we are born with a biological system designed to respond to about 60 different chemical compounds in cannabis: the endocannabinoid system (ES). Were it not for the fact that cannabinoids are part of our innate physiology, medicinal claims would not carry so much weight.

The endocannabinoid system consists of endocannabinoids (endogenous cannabinoid compounds that your body makes for itself), cannabinoid receptors, and enzymes that synthesize and degrade the endocannabinoids. A vast number of cannabinoid receptors occupy positions on cell membranes throughout your body, from head to toe.

The ES plays a role in many physiological functions - from heart and lungs to digestive, endocrine, immune, and reproductive physiology, to your mind and emotions. Although the mechanisms are not yet fully understood, we know cannabinoid receptors play a role in things like metabolism, mood, cravings, pain, immunity and more.[3] According to cannabis expert Dr. Dustin Sulak:[4]

> *"The endogenous cannabinoid system, named after the plant that led to its discovery, is perhaps the most important physiologic system involved in establishing and maintaining human health. In each tissue, the cannabinoid system performs different tasks... But the goal is always the same: homeostasis, the maintenance of a stable internal environment despite fluctuations in the external environment."*

The two main types of cannabinoid receptors are referred to as CB1 and CB2. CB1 are found mostly in the brain and mediate many of cannabis' psychoactive effects. CB2 are more prevalent in the rest of the body.[5] Many interactions occur in the limbic system (area of the brain involved with emotion, behavior, and long-term memory), the mesolimbic pathway (the reward center), and the brain structures responsible for pain perception. All the biological effects - both therapeutic and psychoactive - result from cannabinoids' activation of various receptors around the body, which explains why its effects are so diverse.

Very few physicians have been educated about the endocannabinoid system or the therapeutic potential of cannabis, and most are completely unfamiliar with the tens of thousands of preclinical studies already available today.

Cannabinoids and Flavonoids and Terpenes—Oh My!

If you look closely at a marijuana bud, you'll notice it is coated with a sticky sugar-like resin. This resin contains hundreds of therapeutic compounds including cannabinoids, terpenes, and flavonoids. Different strains have been created using traditional breeding techniques, each characterized by its own particular blend of compounds - a chemical "fingerprint" of sorts.

Cannabis contains more than 480 natural compounds of which 66 have been classified as "cannabinoids." Cannabidiol (CBD) is probably the most abundant, accounting for up to 40 percent of the resin. The strongest psychoactive compound, THC (delta-9-tetrahydrocannabinol, or Δ9-THC) is a member of the tetrahydrocannabinol subclass.[6]

Terpenes are the primary chemicals found in essential oils, naturally occurring in many plants, and more than 100 have been identified in cannabis. These are what give each strain its own distinctive flavor and aroma.

The cannabinoids and terpenes interact and modulate each other's effects.[7] This synergism is one of many examples of nature's divine wisdom - the compounds in cannabis combine to produce more powerful, and sometimes gentler, effects.[8] For example, CBD and THC work very well in combination because CBD helps temper the psychoactivity of THC. On the flipside, THC boosts the therapeutic action of CBD. Terpenes bind to the same receptor sites as the cannabinoids to modify the overall effects - for example, controlling how much THC passes through the blood-brain barrier.

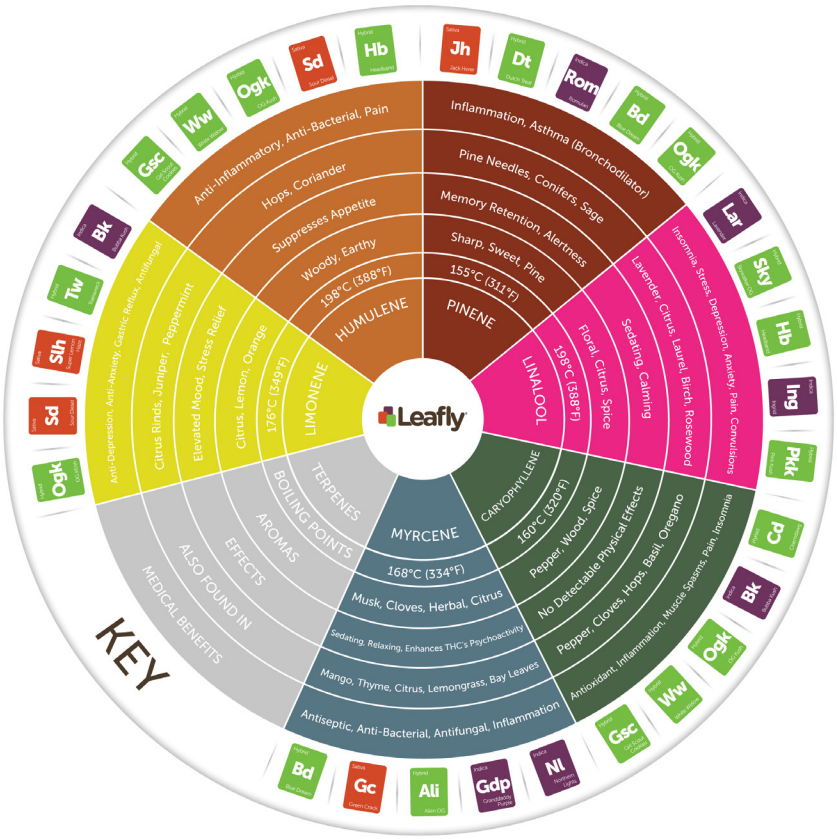
Adding to the plant's complexity, cannabis rivals broccoli, green tea, and cacao for its rich flavonoid content. The healing interplay of all these various compounds is sometimes referred to as "entourage effects." Whole plant medicine has the advantage of harnessing *the full spectrum* of a plant's therapeutic agents. This, unfortunately, is lost when compounds are used in isolation, which is what the pharmaceutical industry does with cannabis-based drugs like Sativex and Dronabinol.

It should be noted that simply breeding THC out of the cannabis plant is not helpful because, aside from its psychoactive properties, THC makes meaningful contributions of its own.[9]

Many people are not aware that raw cannabis does not contain THC. THC is produced only when cannabis is heated. When consumed raw, you get THCA (tetrahydrocannabinolic acid) which has much milder psychoactivity. THCA is known for relieving pain and muscle spasms. Raw cannabis also has many nutritional benefits, including omega-3 and omega-6 essential fatty acids, essential amino acids and antioxidants.

To customize your cannabis effects, strains are important—but temperature is equally important. Heat controls the effects produced by the cannabinoids. For example, high CBD

strains must be heated to the compound's boiling point of 356°F to produce benefits. To feel any benefits (relaxation, anti-seizure) from the terpene linalool, the temperature must hit 388°F. This type of customization is not possible through smoking, but vaporizers are fabulous tools for temperature control. For more information about this, read this article on Leafly:[10]



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QUICK GUIDE TO COMMON CANNABINOIDS, TERPENES AND CANNABIS STRAINS		
CANNABINOIDS	THC (delta-9-tetrahydrocannabinol)	Strongest psychoactive; most modern strains are bred for high THC; therapeutic value for pain, nausea, sleep, stress, and anorexia; can cause anxiety and paranoia
	THCV (tetrahydrocannabivarin)	Even more psychoactive than THC but duration is half as long; typically present only in trace amounts; energetic effects; therapeutic value for anxiety, stress and panic, tremors from neurological disorders; curbs appetite; stimulates bone growth
	CBD (Cannabidiol)	Non-psychoactive; counters psychoactivity of THC; calming effect; therapeutic for anxiety and insomnia; lowers blood sugar; therapeutic value for pain, inflammation, MS, stress, and seizures
	CBDV (Cannabidivarin)	Non-psychoactive; therapeutic value for seizures
	CBG (Cannabigerol)	Non-psychoactive; trace amounts; stimulates brain cell and bone growth; helpful for insomnia
	CBC (Cannabichromene)	Non-psychoactive; trace amounts; 10 times more effective than CBD for anxiety or stress; antiviral; anti-inflammatory; stimulates bone growth
	CBN (Cannabinol)	Mildly to non-psychoactive (non-euphoric); trace amounts; most sedating; therapeutic value for insomnia, glaucoma and pain
TERPENES	Linalool	Floral aroma; therapeutic value for anxiety, insomnia, seizures, and pain
	Limonene	Bitter citrus aroma; therapeutic value for heartburn and GERD, depression, and anxiety; antifungal; antibacterial; possible anti-cancer properties
	Caryophyllene	Spicy aroma; antiseptic, antibacterial, antifungal; anti-inflammatory; therapeutic value for nerve pain and depression
	Myrcene	Sedating effects; enhances psychoactive effects of other compounds; facilitates crossing of the blood-brain barrier; therapeutic value for spasms, pain, inflammation, insomnia, and hypertension
	Pinene	Pine aroma; counters cognitive effects of THC; bronchodilator; anti-inflammatory; antibacterial; enhances cognition
	Humulene	Hops-like aroma; antibacterial and anti-inflammatory; diminishes appetite
	Terpinolene	Woody or smokey aroma; antifungal, antibacterial; helps with insomnia
	Phytol	Minimal aroma; result of chlorophyll breakdown; helps with insomnia
	Eucalyptol	Eucalyptus aroma; antibacterial, anti-inflammatory
	Nerolidol	Woody scent; special ability to penetrate the skin; inhibitor of Leishmania protozoa
STRAIN: CANNABIS INDICA	Strain that grows less than 6 feet; fat deep green leaves; native to Afghanistan, Pakistan, India	**Relaxing and calming;** stronger varieties may induce sleep; promote social interaction; more likely to contain other terpenes such as guaiol (traditionally used for cough, arthritis and syphilis) and eudesmol
STRAIN: CANNABIS SATIVA	Strain that grows up to 12 to 25 feet tall; long and thin light green leaves	**Stimulating and energizing:** uplifting; helpful with pain relief; best for daytime use; can produce paranoia or edginess

Massive New Report Builds Clinical Legitimacy for the Health Benefits of Cannabis

GreenMedInfo has 476 abstracts on its cannabis page, including potential benefits for 252 diseases and 101 different pharmacological actions. New abstracts are being added all the time.

Contributing to this vast body of knowledge is a comprehensive new report by the National Academies of Sciences, Engineering, and Medicine: "The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research."[11] This report is based on the analysis of more than 10,000 cannabis studies, finding substantial benefits for many medical conditions, as well as busting several long-held marijuana myths. There remains a great deal we still don't know, but this report provides one of the most comprehensive looks at what we can glean thus far from rigorous scientific data. It is too extensive to cover in its entirely here, but some of the highlights are summarized below:

1. Conclusive or substantial evidence exists (the highest levels of confidence) that cannabis/cannabinoids are an effective treatment in three areas: chronic pain; muscle spasms from multiple sclerosis (MS) and amyotrophic lateral sclerosis (ALS); and nausea and vomiting related to chemotherapy.

2. Limited evidence suggests smoking marijuana provides some anti-inflammatory benefits.

3. Cannabis use is not associated with increased risk of lung, head or neck cancers, which are associated with tobacco smoking; however, limited evidence suggests frequent cannabis users have a higher risk for a certain type of testicular cancer.

4. There is insufficient evidence to support or refute a link between cannabis use and increased risk of heart attack.

5. Regular marijuana smokers experience more chronic bronchitis, although this resolves if they quit smoking.

6. Early onset of marijuana use is not associated with poor health outcomes as an adult. The idea that pot is a "gateway drug" to opioids or other drugs is fully disproven.

7. Driving under the influence of marijuana increases the risk of a motor vehicle accident.

8. Pregnant women should abstain from marijuana due to increased pregnancy complications and low birth weight babies.

9. Researchers found substantial evidence indicting cannabis may increase the risk for schizophrenia, although some postulate it may only exacerbate or trigger an illness that would have appeared regardless. Interestingly, among individuals with existing psychosis, cannabis actually *improves* performance on learning and memory tasks.

10. Cannabis may increase your risk for social anxiety disorder. However, other research finds positive effects for mood disorders, including anxiety and PTSD, so more research is needed.

As much as anything, this report shines the spotlight on the enormous chasm that represents what we don't know—or at least what we have insufficient science to "prove." Rigorous methodology aside, mountains of case studies along with centuries of anecdotal evidence underscore this herb's enormous healing power. As with many things, modern science simply lags behind. The following table shows the broad array of conditions for which cannabis research has shown health benefits. You can find studies related to each condition on the GreenMedInfo cannabis page. In the next few sections, we will discuss a few of these conditions specifically.

MEDICAL BENEFITS OF CANNABIS

- Pain, inflammation and neuropathy
- Irritable bowel syndrome (IBS) and Crohn's disease
- Alzheimer's and other forms of dementia and neurodegenerative disease
- Brain inflammation and brain cancer
- Cancer
- Traumatic brain injury (TBI)
- Addictions
- Sleep disorders
- Chemotherapy-induced nausea and vomiting
- Muscle spasticity, as related to Multiple Sclerosis (MS)12 and spinal cord injury
- Infections
- Diabetes and obesity
- Seizure disorders[13]
- Amyotrophic Lateral Sclerosis (ALS)
- Depression
- Schizophrenia and other psychosis
- Anorexia and weight loss (such as with HIV/AIDS)
- Parkinson's disease
- Glaucoma
- Fatigue
- Spinal cord injury spasticity
- Huntington's disease
- Anxiety disorders including PTSD and OCD
- Tourette's syndrome

Safe, Effective Pain Relief

Pain relief is probably the most widely known (and widely accepted) of marijuana's medicinal applications. Whether the pain is related to arthritis, fibromyalgia, cancer or another acute or chronic condition, cannabis has a long track record of providing relief. Cannabis has recently been shown to decrease the frequency of migraine headaches.[14]

In a 2014 survey, 56 percent of physicians favored nationwide legalization of cannabis, with support being highest among oncologists and hematologists.[15] These physicians recognize that cannabis is safer and often more effective than pharmaceutical pain killers. One enormous advantage held by marijuana is the absence of lethal overdoses - there have been no documented overdose deaths from cannabis. Why? Your body has a built-in feedback loop that prevents it. When your brain is stimulated with high doses of THC, it boosts the production of a hormone called pregnenolone by a whopping 3,000 percent. Pregnenolone counters the effects of THC.[16] Along with its endocannabinoid system, your body has a built-in safety valve.

If you "overdo it" on THC, you will probably be a little uncomfortable, but it's not going to shut down your heart or respiration, and it won't damage your liver or kidneys. THC can trigger anxiety and, in rare cases, psychosis, but those effects are temporary and self-limiting. Compared to alcohol and cigarettes, which cause tens of thousands of cardiac deaths each year, cannabis poses very little medical risk.

Death rates from opioid overdoses are soaring, both from heroin and prescription painkillers. In 2016, prescription opioids killed 17,536 people. In comparison, 37,757 died in car crashes and 36,252 perished in gun deaths (homicide and suicide) during the same period. Marijuana could be the key to fewer opioid-related deaths. One 2015 report by the National Bureau of Economic Research found that states with legal access to medical marijuana had lower rates of opioid addiction and fewer overdose deaths.[17] Similarly, a 2014 article in *JAMA Internal Medicine* found states with legalized medical marijuana to have a 25 percent lower mean annual opioid overdose mortality rate than states where medical cannabis was illegal.[18]

Many pain medications are damaging to the stomach and gut, but cannabis is found to be healing. Many individuals with nausea and other types of GI distress have found relief with cannabis.[19] The one exception is a rare and poorly understood condition called "cannabinoid hyperemesis syndrome" (CHS), characterized by intense nausea and vomiting after a long period of heavy cannabis use.

People need safer options for pain control, and cannabis has proven itself to be both safe and effective. You must be mindful of your source as marijuana can be laced with any number of dangerous agents such as heavy metals, molds, and pesticides.

Cannabis for Mental Illness, Mood and Cognition

In terms of mental illness, the research is mixed. Because cannabis contains a variety of active compounds that interact in a myriad of ways, different strains produce different effects, which

probably explains some of the variability in the research.

Consider anxiety disorders. Some studies suggest cannabis can trigger social anxiety disorder, but what type of cannabis exactly? Some of the herb's compounds, such as cannabis sativa, are known to provoke anxiety—even paranoia—but others are known for being calming to the mind, such as *Cannabis Indica*. Furthermore, in some people THC slows the mind down, while in others it has the opposite effect. For many, slowing down thought might be an undesirable effect, but if you happen to be plagued by obsessions and intrusive thoughts, taming the mind would be of great value by reducing the bombardment of disturbing thoughts.

Some of the cannabinoids are known for being potent anxiolytics (anxiety-reducers). Many individuals report improvements in symptoms of OCD (obsessive compulsive disorder), PTSD (post-traumatic stress disorder), and other anxiety disorders with certain strains, but it does involve some trial and error.[20] Cannabis may have some benefits for depression, although there is not much research in this area.[21] Those with a family history of schizophrenia or bipolar disorder should proceed with caution because marijuana may exacerbate psychotic symptoms.

If you have a mental illness and are considering trying cannabis, it would be best to consult someone with expertise in this area.

Cannabis may be addictive to some. According to integrative physician Dustin Sulak, DO, about 10 percent of marijuana smokers become addicted.[22] Of course, this must be weighed against potential health benefits on a case by case basis. For example, if you're suffering from cancer and you're near death, and cannabis offers the potential for tumor-shrinkage, addiction may not be your most immediate concern.

Cannabis may even have benefits to those with dementia. A remarkable 2006 study published in the journal *Molecular Pharmacology* discovered THC has not one, *but two therapeutic properties for* Alzheimer's disease. It benefits memory while at the same time reducing amyloid brain plaques that characterize this type of dementia.[23] How ironic, considering that the prevailing myth is that using marijuana "fries" the brain, resulting in debilitating memory issues! Other studies have also documented positive benefits for cognitive performance.[24]

Cannabis May Be Cancer's Worst Nightmare

The evidence is unequivocal that cannabis has anti-cancer effects, particularly cannabidiol (CBD). Medical marijuana is natural chemotherapy and has none of the devastating side effects of conventional chemotherapy. Human trials are prohibited in the US, but animal trials show tremendous promise.

Cannabis exerts its anti-cancer effects by triggering cancer cell death through autophagy and apoptosis, preventing those cells from dividing and spreading,

and preventing new tumors from growing a blood supply. CBD has been shown to inhibit a wide range of cancers including glioblastoma (a difficult-to-treat type of brain cancer), breast, lung, prostate, and colon cancer. Remarkably, cannabinoids selectively kill glioma cells while protecting healthy glial cells. One team of researchers wrote the following:[25]

> *"With its lack of systemic toxicity and psychoactivity, cannabidiol is an ideal candidate agent in this regard and may prove useful in combination with front-line agents for the treatment of patients with aggressive and high-grade glioblastoma tumors."*

Smoking marijuana might decrease your risk for bladder cancer, according to a large 2015 study.[26] Researchers at Kaiser Permanente in California found patients who used cannabis were 45 percent less likely to be diagnosed with bladder cancer than patients who did not smoke at all.

The clinical data about cannabis for pediatric cancers is limited to a few case reports, albeit impressive ones. Dr. Bonnie Goldstein details the case of a 14-year-old girl from Canada with an extremely aggressive form of leukemia who experienced positive effects from cannabis oil. She writes:[27]

> *"The patient's parents began treating her with untested concentrated cannabis oil. The patient started treatment with a blast cell count (leukemia cells) of 194,000 (there should be none). By Day 5 of the oil, her blast cell count grew to a dangerously high 374,000, however with continued administration of the oil, by Day 15 her blast cell count was down to 61,000. Additionally, the patient required fewer painkillers and had increased alertness. The lowest blast cell count noted was 300 on Day 39."*

Dr. Goldstein goes on to recount another case involving a teenager with aggressive osteosarcoma and lung metastasis for whom there was little remaining hope. She started him on a regimen of sublingual high-dose THC/CBD oil, and then had him resume his chemo. He immediately gained weight and stopped using opiates for pain. After three months of cannabis treatment, bone and PET scans revealed no evidence of disease. At the 18-month point in cannabis treatment (and one year off chemotherapy), he still showed no signs of disease and had resumed a normal life.

Dr. Goldstein shared yet another case of a toddler with leukemia who had such horrible side effects from chemo that he could not eat or sleep and was rapidly losing weight. Just a few drops of CBD/THC oil allowed him to eat, sleep, and regain his normal weight with far better tolerance of the chemotherapy.

Clearly, this plant holds great promise in our battle against cancer. While preclinical research and case reports have provided encouraging leads, human studies are sorely needed.

CANCERS FOR WHICH ANTITUMOR EFFECTS OF CANNABIS HAVE BEEN FOUND

- Breast, cervical and ovarian
- Lung cancer, including non-small cell (NCSLC)
- Colon
- Skin, including melanoma
- Leukemia, lymphoma and multiple myeloma (bone marrow cancer)
- Prostate
- Pancreatic
- Liver
- Mouth, head and neck
- Pheochromocytoma (adrenal gland cancer)
- Brain
- Stomach
- Bladder
- Thymus gland
- Bile duct cancer (cholangiocarcinoma)

What About Hemp?

Both hemp and cannabis (aka marijuana) come from the same plant—just from different parts. However, socio-political forces have muddied the water when it comes to definitions. A 1976 study published by the International Association of Plant Taxonomy concluded the following:[28]

> *"Both hemp varieties and marijuana varieties are of the same genus, Cannabis, and the same species, Cannabis Sativa. Further, there are countless varieties that fall into further classifications within the species Cannabis Sativa."*

When Cannabis Sativa is bred for high THC, it's referred to as cannabis or marijuana. However, when that same species is bred for industrial purposes (paper, clothing, oils, topical ointments, etc.), it's called hemp. Hemp contains CBD along with approximately 0.3 to 1.5 percent THC, but marijuana is typically five to 10 percent THC. Medical marijuana may contain upwards of 20 percent THC, with prize strains going up to 30 percent.

Confounding things further, different countries define hemp differently. Health Canada defines hemp as Cannabis Sativa products with less than 0.3 percent THC, whereas the US government defines hemp as all parts of any Cannabis Sativa plant containing no psychoactive properties, except for defined exceptions. In the US, the only products legal to sell, buy, consume or ship are made from industrial hemp—meaning less than 0.3 percent THC.

The bottom line is this: the "0.3 percent factor" is the most common distinction which, in reality, is just an arbitrary line.

To get around the legal restrictions, several American companies are now breeding hemp for high CBD and low THC content (well below 0.3 percent), then extracting it for CBD oil. The fact that the oil comes from hemp makes it possible for people who have no access to medical marijuana to access the health benefits of CBD. Although studies of hemp-derived CBD oil are even scarcer than those for marijuana oils, it makes sense they would produce similar benefits because they have the same active compounds.

If you decide to try a hemp-derived CBD oil (or any CBD product for that matter), make sure it's pristinely grown, organic, and free of contaminants. Most reputable companies are very transparent about their growing and sourcing practices and post chemical analyses of their products on their websites.

Changes Are Long Overdue

There is plenty of evidence to suggest cannabis is a safe and effective natural therapy with a wide range of clinical applications. Research consistently shows that its rich complement of compounds work synergistically within the body's own endocannabinoid system to help maintain homeostasis and restore health, including being a valuable weapon in today's anti-cancer arsenal. Even our pets are beginning to reap the powerful healing benefits of this ancient herb.[29]

More than 60 US and international health organizations support legalization of medical marijuana.[30] The US lags far behind in removing the barriers that prevent access to this powerful medicinal herb, which has already been decriminalized in many countries including Canada, the Netherlands, Spain, Israel, and Germany. It is likely that even more health benefits will be discovered as new studies emerge.

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