

The Facts
about
Cannabis

Summer, 2014

A Brief History of Cannabis

The plant *Cannabis Sativa* has been cultivated throughout recorded history for its versatile fiber (known as hemp), nutritious seeds and oil, and its psychoactive and medicinal properties.

The industrial uses of hemp include paper, textiles, biodegradable plastics, construction products, health food and fuel. George Washington and Thomas Jefferson both grew hemp. Jefferson drafted the Declaration of Independence on hemp paper. Because of marijuana prohibition, it has been illegal to grow hemp in America, but both the U.S. Congress and the Tennessee General Assembly this year passed legislation opening the door to domestic hemp production.

Cannabis use for social, religious or spiritual, and medicinal purposes goes back as far as the 3rd millennium BC. The cannabinoids in marijuana supplement our body's own endocannabinoid system (discussed below) to mitigate a wide variety of conditions including migraine headaches, chronic pain, glaucoma, nausea, AIDS wasting syndrome, ALS, MS, Parkinson's, Crohn's Disease, addiction to alcohol and opiates, epilepsy, fibromyalgia, hypertension, Hepatitis C, cancer, rheumatoid arthritis, PTSD and Tourette's Syndrome.

Marijuana is also a mild intoxicant that generally improves one's mood and heightens awareness of our thoughts and surroundings. It can enhance intellectual and sensual experiences as well as creativity. There is typically an increased appreciation of music, art and food.

Unlike alcohol and tobacco, marijuana is not physically addictive, nor is it associated with life threatening diseases or increased mortality. Marijuana is incapable of causing death by overdose and does not cause violent behavior or reckless driving.

If you are told otherwise, remember the warning of Wm. F. Buckley, Jr.: **“Narcotics police are an enormous, corrupt international bureaucracy ... and now fund a coterie of researchers who provide them with ‘scientific support’ ... fanatics who distort the legitimate research of others. ... The anti-marijuana campaign is a cancerous tissue of lies, undermining law enforcement, aggravating the drug problem, depriving the sick of needed help, and suckering well-intentioned conservatives and countless frightened parents.”**

Why Was Marijuana Prohibited?

The origin of national marijuana prohibition is tied closely to the end of alcohol prohibition. When the Volstead Act was repealed in 1933, agents from Treasury Department charged with enforcing the Act were transferred to the newly-formed Federal Bureau of Narcotics. Anxious to justify their continued employment, they needed a new prohibition and they needed it fast.

Marijuana was the ideal target because it was unfamiliar to the general public. Thus the government could demonize pot as a highly dangerous and foreign substance. Calling cannabis “marijuana” made it seem even more foreign. Physicians who had prescribed cannabis for decades

did not realize this new prohibition was aimed at a widely used medicine until it was too late. The government's unscientific and racist claims about marijuana included these:

"There are 100,000 total marijuana smokers in the US, and most are Negroes, Hispanics, Filipinos, and entertainers. Their Satanic music, jazz, and swing, result from marijuana use. This marijuana causes white women to seek sexual relations with Negroes, entertainers, and any others."

"Marijuana is an addictive drug which produces in its users insanity, criminality, and death."

"Reefer makes darkies think they're as good as white men."

"Marihuana leads to pacifism and communist brainwashing"

"Marijuana is the most violence-causing drug in the history of mankind."

Testimony before the Senate Interstate Commission on Crime (1937): Senator DAVIS: How many (marijuana) cigarettes would you have to smoke before you got this vicious mental attitude toward your neighbor? Mr. ANSLINGER (head of the Federal Bureau of Narcotics): I believe in some cases one cigarette might develop a homicidal mania, probably to kill his brother...some people could smoke five before it would take effect, but all the experts agree that the continued use leads to insanity.

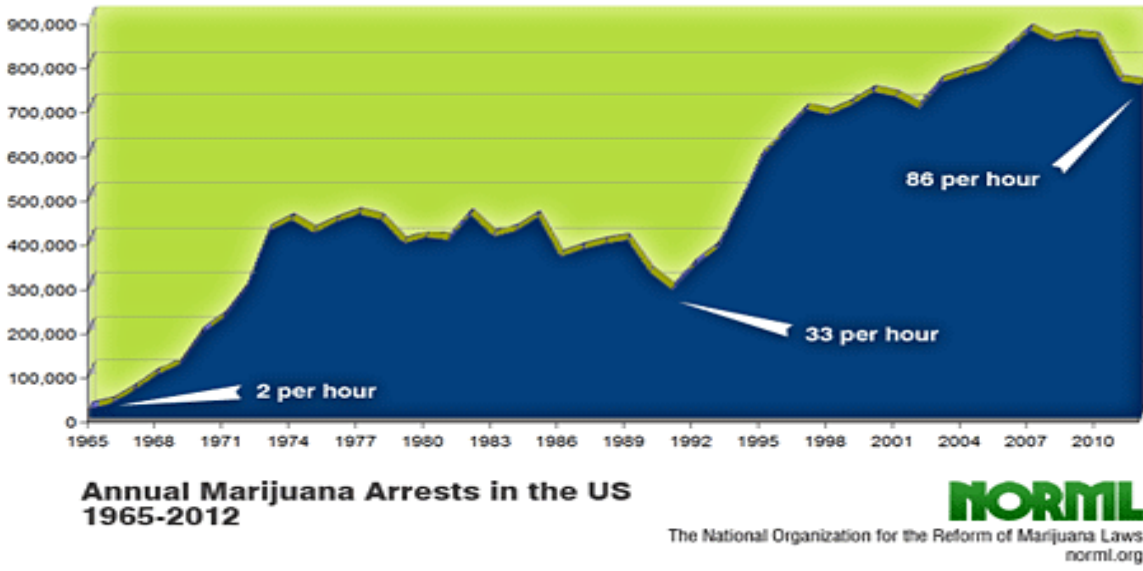
Based on these lies, pot prohibition sailed through Congress despite the opposition of the American Medical Society which predicted (accurately) that passage of the Marihuana Tax Act would lead to marijuana becoming unavailable as medicine.

From our history books: The bill to ban the cannabis plant from American soil passed easily in the committee and moved on to the House of Representatives. It landed on the Speaker's Platform before a limited number of Congressional Representatives. The debate that followed consisted of a single man, a Republican from New York State, who stood and asked what the bill was about. Speaker Rayburn replied, "I don't know. It has something to do with something called marihuana. I think it's a narcotic of some kind."

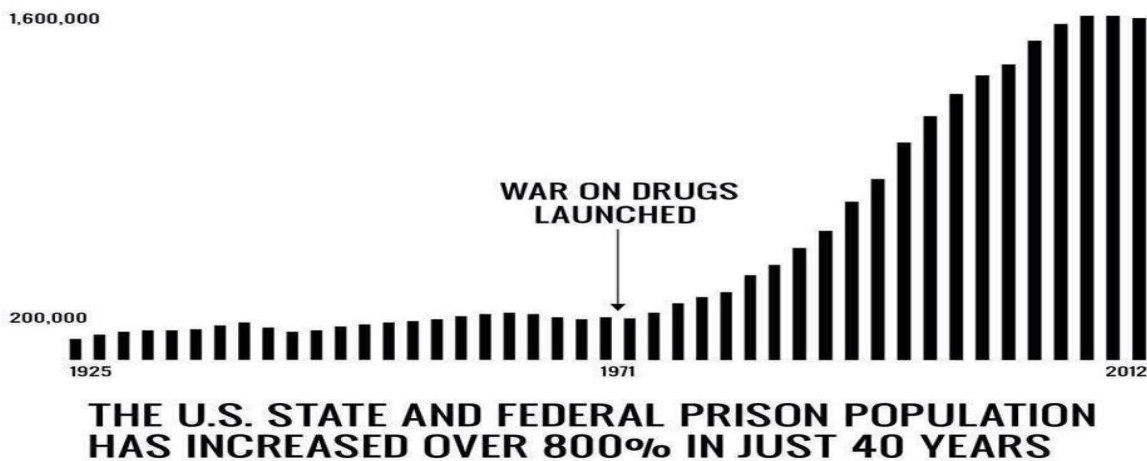
The same man asked if the AMA supported the bill. In response to the question, a member of the committee that had criticized the AMA's Dr. Woodward and sent the bill to Congress leaped to his feet and shouted, "Their Doctor Wentworth came down here. They supported this bill 100 percent!" This spurious statement ended further questions, and the vote began. There was no recorded vote on the bill; instead, legislators walked past this point or that point on the floor to indicate a yes or no vote. The bill was on the floor for a remarkable 92 seconds before it became Federal Law. This new prohibition happened in 1937, just four years after Congress repealed alcohol prohibition.

The arrests began, slowly at first. But...

Especially in Recent Years, Arrests Have Soared...



...Creating a Prison-Industrial Complex in Which 90% of Federal Prisoners are Non-Violent Offenders:



More than 22 million Americans have been arrested on marijuana charges. Arrests continue at near-record levels. Why? Because marijuana arrests are easy and profitable for law enforcement.

If it's late on your shift and you'd like a few hours of overtime, why arrest a drunk who may be belligerent and throw up in your vehicle? Arrest a citizen for marijuana, boost your arrest statistics (which are directly tied to increased funding) and use the forfeiture laws to acquire cash, homes, autos and other personal possessions for your district--or your next bonus.

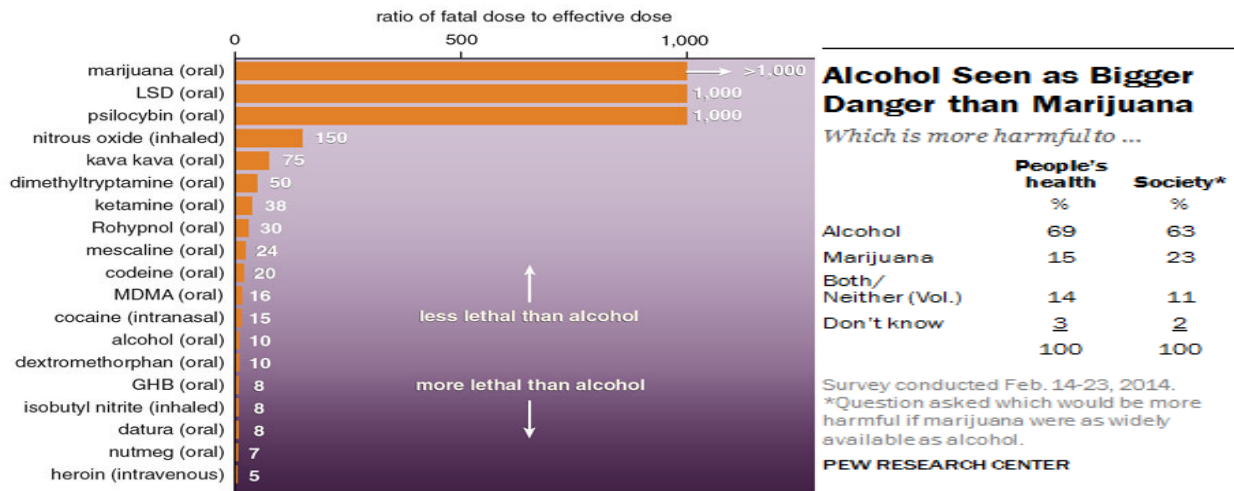
In other words, arresting someone for pedophilia or spousal abuse is a drain on law enforcement resources. Arresting someone for marijuana can be profitable. This creates a terrible and corrupting conflict of interest for police that only legalization can remove.

For those who are arrested, the experience can be a life-changing event. It may result in loss of employment, loss of financial aid for college or having your children placed in foster care. An arrest can haunt you for life. And marijuana arrests are aimed disproportionately at minorities. This is why the NAACP now supports legalization, regulation and control of marijuana.

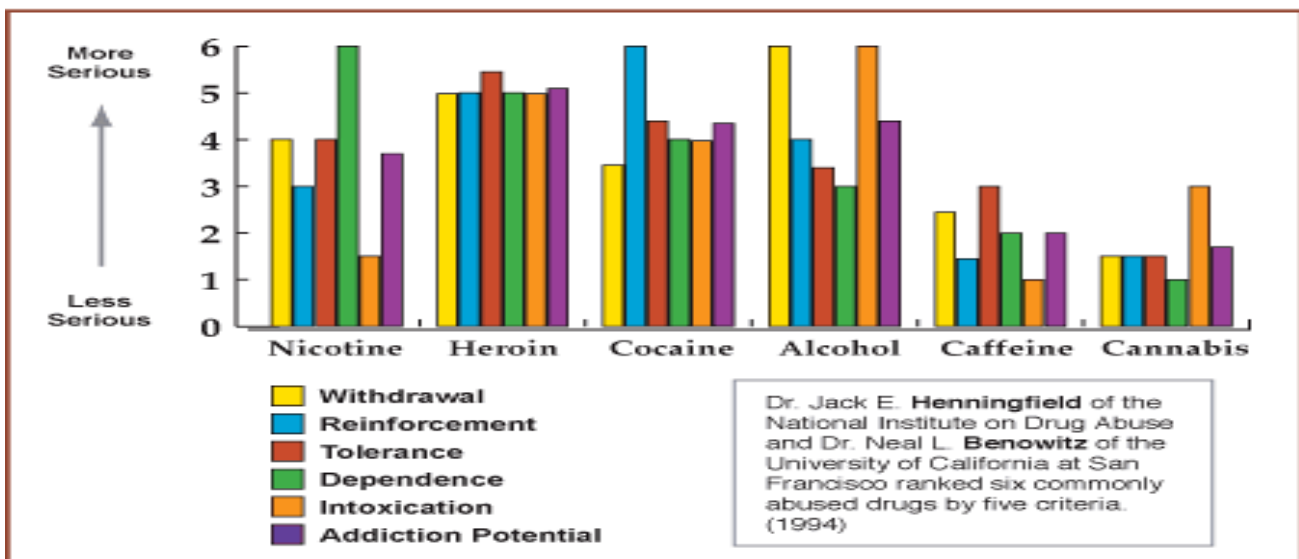
Is Marijuana Safer than Alcohol?

“...it is now demonstrable—*by any measure* (italics in original)—that marijuana is substantially less harmful than alcohol and, indeed, marijuana is probably **the least harmful psychoactive substance now in widespread use in the world.**”

Bonnie, Richard J. *Marijuana Use and Criminal Sanction*. Charlottesville, Virginia. The Michie Company. 1980. (Professor Bonnie was the Legal Director of the National Commission on Marijuana and Drug Abuse appointed by President Richard Nixon.



How does cannabis compare to other drugs?



Total scores: Nicotine 20. Heroin 26. Cocaine 20. Alcohol 23. Caffeine 8. Cannabis 8.

Marijuana and Driving

“What’s wrong with a drug that makes teenage boys drive more slowly?” P.
J. O’Rourke

Because we are familiar with alcohol, it’s natural to assume the well-recognized risks of alcohol apply to marijuana. These dangers include violent behavior, physical addiction so severe that merely stopping use can cause death, death by overdose, heart disease, liver damage, brain damage and cancer. But none of these perils are present with pot, including reckless driving.

This is not to say marijuana has no impact on driving. It does. But as noted in the first section, marijuana heightens our awareness. Alcohol deadens our awareness. We have all seen drunks who insist they are sober and demand keys to the car.

In contrast, someone under the influence of marijuana is aware of their condition and will typically decline to drive until the effect of marijuana has passed. If required to drive, they will drive more cautiously. So, yes, there is an effect but it is the opposite of the blind drunk driving that alcohol intoxication causes. Have you ever read about a driver who careened the wrong way down an highway, causing a head-on collision, who was not drunk?

But what about headlines shouting, “Marijuana is associated with 15% of traffic fatalities?” The data may be correct but they are (often intentionally) misleading. Here is why. The inactive metabolites of marijuana are detectable in blood for up to a month or longer. If approximately 15% of drivers have smoked marijuana over the past month, approximately 15% of drivers will test positive for marijuana. And if marijuana use increases over time, so will the percent of drivers who test positive, leading no doubt to headlines of, “Marijuana causing more deaths on the highway!”

Perhaps the most thorough analysis of the effects of marijuana and other substances on driving, “Drugs and Alcohol: Their Relative Crash Risk,” appeared in January, 2014, in the Journal of Studies on Alcohol and Drugs. The researchers concluded that alcohol is by far the most dangerous substance, even at blood levels below 0.8%.

As for the crash risk associated with the presence of marijuana, the authors determined—much to their surprise—there is little association at all. “Although drugs other than alcohol do contribute to crash risk, we found that such a contribution depends on the type of drug under consideration. Somewhat unexpected was the finding that although marijuana’s crude OR (odds ratios) indicated a significant contribution to fatal crash risk, once it was adjusted by the presence of alcohol and drivers’ demographics, **marijuana’s OR was no longer significant among either sober or drinking drivers.**”

Similarly, a comprehensive 2013 meta-analysis of 66 separate studies assessing the risk of road accident associated with the presence of various licit and illicit drugs estimated that marijuana was associated with only a nominally increased risk of fatal accident (estimated odds ratio = 1.26) or injury (1.10). In that study, only anti-histamines (1.12), penicillin (1.12), and analgesics (1.02) were associated with comparable odds ratios to that of cannabis.

Of course, highlighting these scientific findings does not imply that driving under the acute influence of cannabis is not without risk or nor does it mean that such behavior should not be

discouraged, both socially and legally. But there is no scientific basis for the “Carnage on the Highways” scare propaganda of pot prohibitionists.

So Is Marijuana Harmless? Of Course Not.

No substance is harmless to all people under all circumstances. Individuals using marijuana for the first time may experience discomfort, sometimes extreme discomfort that can lead to a temporary panic reaction. This is more likely to happen when a novice user ingests marijuana orally instead of smoking or vaporizing.

Smoking or vaporizing provides almost immediate feedback, so users can quickly gauge their reaction. Ingesting marijuana edibles delays any effect for an hour or so. Thus the dose cannot be adjusted until the full impact is already apparent. This is why the powerful synthetic form of marijuana, Marinol, is not widely prescribed: it is ingested orally and thus it is difficult to determine the effective dose for a first-time patient. Marinol may also cause confusion and paranoia and it is expensive.

Physically, there is no serious harm associated with marijuana. If there were, we should treat marijuana like tobacco and alcohol, discouraging its use through honest warnings. Concerns over the health consequences of a substance do not justify treating those who use the substance as criminals. Moreover, criminalization is not necessary.

Tobacco is highly addictive, widely available and comparatively inexpensive, but we slashed tobacco use more than in half without jailing a single smoker. Honest education works. Prohibition does not.

The Public Believes Its Eyes, Not Its Government.

Our government continues to label marijuana as a dangerous drug with no medical value. It spends billions of dollars arresting otherwise law-abiding citizens and funding poorly controlled “studies” to scare the public.

Voters know better. In 2012, strong majorities in Colorado and Washington State passed initiatives to legalize marijuana. Earlier this year, Uruguay became the first country to legalize marijuana. Ten years ago, Portugal decriminalized all drugs; drug use in the country dropped.

Medical marijuana is now legal in 21 states and the District of Columbia. It will be on the ballot in Florida this fall. Full legalization will be on the ballot in Alaska and possibly other states. The Middle Tennessee State University Poll earlier this year found that 75% of Tennesseans, including 56% of Republicans, support medical marijuana. This year Tennessee legalized hemp and passed legislation to allow research on cannabis oils, if the Federal government approves.

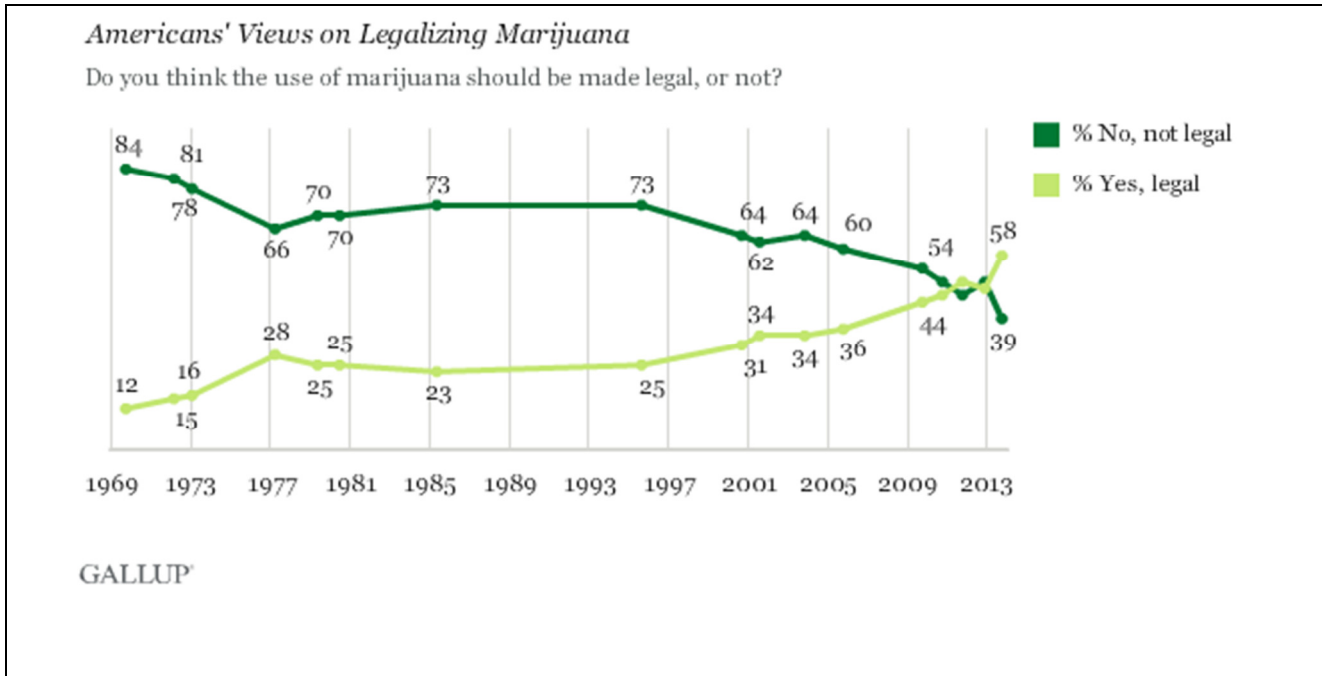
In national polls, as many as 90% of Americans support medical marijuana. And medical marijuana is now endorsed by a majority of physicians including 82% of oncologists. As far as support for full legalization:

For the First Time, Americans Favor Legalizing Marijuana.

Support surged 10 percentage points in past year, to 58%

by Art Swift

WASHINGTON, D.C. -- For marijuana advocates, the last 12 months have been a period of unprecedented success as Washington and Colorado became the first states to legalize recreational use of marijuana. And now for the first time, a clear majority of Americans (58%) say the drug should be legalized. This is in sharp contrast to the time Gallup first asked the question in 1969, when only 12% favored legalization.



On November 5, 2013, a flurry of state and municipal marijuana initiatives passed, most by overwhelming majorities. Almost 70% of voters in Portland, Maine, endorsed legalizing adult possession of up to 2.5 ounces of marijuana, a prelude to a state-wide ballot in 2014. Three cities in Michigan voted for legalization by huge margins.

In Colorado, voters approved a 15% excise tax on the wholesale price of recreational marijuana, and an additional 10% sales tax on its retail price. Lawmakers from both parties, as well as Gov. John Hickenlooper, a Democrat, and the state's attorney general, a Republican, backed the tax measure, which passed with 65 % of the vote. (At the same time, voters soundly rejected an increase in the state income tax.)

But If We Legalize Marijuana and Use Increases, What Will Happen to Our Country?

We already know. In the eight-year period between 1969 and 1977, marijuana use by those under age 30 did not double, or triple, or quadruple. It soared seven-fold, from 8% to 56%! This is far

more than any conceivable increase in marijuana use that might result from legalization. And what was the result?

Did doctors report an increase in birth defects? No. Brain damage? No. Heart attacks? No. Traffic fatalities? No. Violent crime; spousal abuse; sexual assault? Of course not. This is also the case in states where medical marijuana is legal and we now have reliable statistics. The data demonstrate either no adverse impact or actual positive impacts including a decline in traffic fatalities and in suicide rates among males under 30. Contrary to the fears of prohibitionists, there is no increase in marijuana use by teens.

Marijuana Is Medicine. Our Government Tries to Hide the Facts.

Mayo Clinic Proceedings: "Bureaucratic Hurdles ... Interfere With Legitimate Cannabis Research"

Thursday, 01 March 2012

Rochester, MN: Federal officials should reclassify cannabis under federal law and permit "long-stifled research into a potential trove of (the plant's) therapeutic applications," according to review published in the February issue of the journal *Mayo Clinic Proceedings*, a peer-reviewed journal sponsored by Mayo Clinic in Rochester, Minnesota.

The review, entitled "Blurred Boundaries: The Therapeutics and Politics of Medical Marijuana," states: **"Bureaucratic hurdles not erected for other potential pharmaceuticals continue to interfere with legitimate cannabis research. The federal government instituted its 1970 ban in the absence of scientific evidence supporting its position. It maintains the ban, despite scientific evidence suggesting that cannabis could have positive effects on the many organ systems endocannabinoid activity modulates."**

It concludes: "Because of this modern-day prohibition, opportunities to further study marijuana's risks and benefits and develop new pharmacotherapies are squandered. It is high time for the federal government to ... reclassify marijuana so that it has the same status as certain opiates and stimulants. ... By forcing marijuana to languish as a Schedule I drug with a 'high potential for abuse, no accepted medical use, and no accepted safety for use in medically supervised treatment,' **the federal government thumbs an illogical nose at contemporary public sentiment, recent scientific discoveries, and potentially head-to-toe therapeutic breakthroughs. This reclassification would be a first step toward reconciling federal and state law and permitting long-stifled research into a potential trove of therapeutic applications to commence."**

Dr. Sanjay Gupta, CNN Medical Correspondent and assistant professor of neurosurgery at Emory University School of Medicine:

August 8, 2013: "...I mistakenly believed the Drug Enforcement Agency listed marijuana as a schedule 1 substance because of sound scientific proof. Surely, they must have quality reasoning as to why marijuana is in the category of the most dangerous drugs that have "no accepted medicinal use and a high potential for abuse." **They didn't have the science to support that claim, and I**

now know that when it comes to marijuana neither of those things are true. It doesn't have a high potential for abuse, and there are very legitimate medical applications. In fact, sometimes marijuana is the only thing that works.

We have been terribly and systematically misled for nearly 70 years in the United States, and I apologize for my own role in that.”

Cancer and Cannabis

The fact that cannabis is the safest and most effective treatment for chemotherapy-induced nausea is well-established. Less well known is that in 1974, a research team at the Virginia Commonwealth University (acting at the behest of the federal government) discovered that cannabis inhibited malignant tumor cell growth in culture and in mice.

As reported in the *Washington Post* on August 14th, 1974, administration of marijuana's primary cannabinoid THC, "slowed the growth of lung cancers, breast cancers and a virus-induced leukemia in laboratory mice, and prolonged their lives by as much as 36 percent."

U.S. government officials dismissed the study (which was eventually published in the *Journal of the National Cancer Institute* in 1975) and refused to fund follow-up research until conducting a similar—though secret—clinical trial in the mid-1990s. That study, conducted by the U.S. National Toxicology Program to the tune of \$2 million concluded that mice and rats administered high doses of THC over long periods experienced greater protection against malignant tumors than untreated controls.

Government researchers once again shelved the results, which only came to light after a draft copy of its findings were leaked in 1997 to a medical journal, which in turn forwarded the story to the national media. Nevertheless, in the decade since the completion of the National Toxicology trial, the U.S. government has yet to encourage or fund additional follow-up studies examining the cannabinoids' potential to protect against the spread cancerous tumors.

Fortunately, scientists overseas have generously picked up where U.S. researchers so abruptly left off. In 1998, a research team at Madrid's Complutense University discovered that THC can selectively induce apoptosis (program cell death) in brain tumor cells without negatively impacting the surrounding healthy cells. Then in 2000, they reported in the journal *Nature Medicine* that injections of synthetic THC eradicated malignant gliomas (brain tumors) in one-third of treated rats, and prolonged life in another third by six weeks.

In 2003, researchers at the University of Milan in Naples, Italy, reported that non-psychoactive compounds in marijuana inhibited the growth of glioma cells in a dose dependent manner and selectively targeted and killed malignant cancer cells.

The following year, researchers reported in the journal of the American Association for Cancer Research that marijuana's constituents inhibited the spread of brain cancer in human tumor biopsies. In a related development, a research team from the University of South Florida further noted that THC can also selectively inhibit the activation and replication of gamma herpes viruses. The viruses, which can lie dormant for years within white blood cells before becoming active and spreading to other cells, are thought to increase one's chances of developing cancers such as Kaposi's Sarcoma, Burkitt's lymphoma, and Hodgkins disease.

More recently, investigators published pre-clinical findings demonstrating that cannabinoids may play a role in inhibiting cell growth of colorectal cancer, skin carcinoma, breast cancer, and prostate cancer, among other conditions. When investigators compared the efficacy of natural cannabinoids to that of a synthetic agonist, THC proved far more beneficial – selectively decreasing the proliferation of malignant cells and inducing apoptosis more rapidly than its synthetic alternative while simultaneously leaving healthy cells unscathed.

The government did fund a major study intended to show marijuana causes lung cancer. To its embarrassment, the study showed the opposite:

June 18, 2009 - Los Angeles, CA, USA

In 2006, Dr. Donald Tashkin led the largest population case-control study ever to assess the use of marijuana and lung cancer risk. The study, which included more than 2,200 subjects (1,212 cases and 1,040 controls), reported that marijuana smoking was not positively associated with cancers of the lung or upper aerodigestive tract – even among individuals who reported smoking more than 22,000 joints during their lifetime.

"What we found instead was no association and even a suggestion of some protective effect," Tashkin told the newspaper chain, noting that cannabinoids cause "cells [to] die ... before they age enough to develop mutations that might lead to cancer."

In an interview, Donald Tashkin of the UCLA David Geffen School of Medicine, Division of Pulmonary and Critical Care Medicine, said: "[A]t this point, I'd be in favor of (marijuana) legalization. I wouldn't encourage anybody to smoke any substances. But I don't think it should be stigmatized as an illegal substance. Tobacco smoking causes far more harm. And in terms of an intoxicant, alcohol causes far more harm (than marijuana)."

Tashkin said that when he began his work thirty years ago, he "opposed ... legalization because [he] thought it would lead to increased use and that would lead to increased health effects." However, he now admits that his decades' worth of scientific research revealed an opposite conclusion.

Cancer and Cannabis: Which U.S. Government Agency Is Telling the Truth?

Website of the Drug Enforcement Administration: **"Marijuana has no accepted medical use."**

Website of the National Institute of Cancer: **"Cannabinoids may cause antitumor effects by various mechanisms, including induction of cell death, inhibition of cell growth, and inhibition of tumor angiogenesis and metastasis. Cannabinoids appear to kill tumor cells but do not affect their nontransformed counterparts and may even protect them from cell death."**

...The potential benefits of medicinal cannabis for people living with cancer include antiemetic effects, appetite stimulation, pain relief, and improved sleep. In the practice of integrative oncology, the health care provider may recommend medicinal cannabis not only for symptom management but also for its possible direct antitumor effect."

But Marijuana Is Not FDA-Approved

That's correct because the FDA approves only chemical compounds submitted for testing by private companies seeking patent protection. These studies typically involve a small homogenous group, sometimes fewer than 200 patients, mostly white males with no preexisting conditions other than the condition the untested drug is expected to treat.

Too often, the compound is approved but when used by a wider audience such as women, minorities, and patients with preexisting conditions, the "safe and effective" FDA-approved drug (fen-phen, Vioxx) causes serious health problems, including fatalities. This is impossible in the case of marijuana which has been used for centuries and was widely prescribed by physicians for decades before the Marijuana Tax Act effectively prohibited use. Moreover, marijuana has, in fact, been the subject of FDA-approved, double-blind, placebo-controlled studies:

Thursday, 18 February 2010, Sacramento, CA: The results of a series of randomized, placebo-controlled clinical trials assessing the efficacy of inhaled marijuana consistently show that cannabis holds therapeutic value comparable to conventional medications, according to the findings of a 24-page report issued Wednesday to the California state legislature by the California Center for Medicinal Cannabis Research (CMCR).

Four of the five placebo-controlled trials demonstrated that marijuana significantly alleviated neuropathy, a difficult to treat type of pain resulting from nerve damage. There is good evidence now that cannabinoids (the active compounds in the marijuana plant) may be either an adjunct or a first-line treatment for ... neuropathy," said Dr. Igor Grant, Director of the CMCR, at a news conference at the state Capitol. He added that the efficacy of smoked marijuana was "very consistent," and that its pain-relieving effects were "comparable to the better existing treatments" presently available by prescription.

A fifth study showed that smoked cannabis reduced the spasticity associated with multiple sclerosis. A separate study conducted by the CMCR established that the vaporization of cannabis – a process that heats the substance to a temperature where active cannabinoid vapors form, but below the point of combustion – is a "safe and effective" delivery mode for patients who desire the rapid onset of action associated with inhalation while avoiding the respiratory risks of smoking.

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Marijuana as Medicine Would Save Patients and Taxpayers Millions of Dollars

A recent example: When BB in Nashville was undergoing chemotherapy, she found the best anti-emetic did not work so she tried marijuana. The result as she posted on Facebook:

"I woke up the other night with the worst nausea I've ever had. I was afraid. But 3 or 4 minutes after cannabis, all the nausea was gone. I went from wanting to just die to wanting to eat something in just a few minutes!"

The drug that failed was Emend and as BB further noted: “*Emend, which you take for 3 days during each chemo treatment, is \$1,500 a week and I needed it for 6 weeks.*”

In other words, \$9,000 for a drug that was ineffective and has serious side effects (including liver damage and potentially fatal interaction with other drugs) compared \$100 at most for a drug that is effective and has no serious side effects. Multiply this by hundreds of times a day to understand the financial costs of medical marijuana prohibition.

Another example: In January, 2014, Nicole and Penn Mattison moved from Nashville to Colorado for access to medical marijuana that may save their daughter Millie’s life. The cost of one debilitating but ineffective drug she was taking: \$60,000 a month. The monthly cost of the marijuana (which is working): \$150!

Introduction to the Endocannabinoid System

**Dustin Sulak, DO
Maine Integrative Healthcare**

As you read this review of the scientific literature regarding the therapeutic effects of cannabis and cannabinoids, one thing will become quickly evident: **cannabis has a profound influence on the human body. This one herb and its variety of therapeutic compounds seem to affect every aspect of our bodies and minds. How is this possible?**

In my integrative medicine clinic in central Maine, we treat over a thousand patients with a huge diversity of diseases and symptoms. In one day I might see cancer, Crohn's disease, epilepsy, chronic pain, multiple sclerosis, insomnia, Tourette's syndrome and eczema, just to name a few. All of these conditions have different causes, different physiologic states, and vastly different symptoms. The patients are old and young. Some are undergoing conventional therapy. Others are on a decidedly alternative path. Yet despite their differences, almost all of my patients would agree on one point: cannabis helps their condition.

As a physician, I am naturally wary of any medicine that purports to cure-all. Panaceas, snake-oil remedies, and expensive fads often come and go, with big claims but little scientific or clinical evidence to support their efficacy. As I explore the therapeutic potential of cannabis, however, I find no lack of evidence. In fact, I find an explosion of scientific research on the therapeutic potential of cannabis, more evidence than one can find on some of the most widely used therapies of conventional medicine.

At the time of writing, a PubMed search for scientific journal articles published in the last 20 years containing the word "cannabis" revealed 7,704 results. Add the word "cannabinoid," and the results increase to 15,899 articles. That's an average of more than two scientific publications per day over the last 20 years! These numbers not only illustrate the present scientific interest and financial investment in understanding more about cannabis and its components, but they also emphasize the need for high quality reviews and summaries such as the document you are about to read.

How can one herb help so many different conditions? How can it provide both palliative and curative actions? How can it be so safe while offering such powerful effects? The search to answer

these questions has led scientists to the discovery of a previously unknown physiologic system, a central component of the health and healing of every human and almost every animal: the endocannabinoid system.

What Is The Endocannabinoid System?

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. Endocannabinoids and their receptors are found throughout the body: in the brain, organs, connective tissues, glands, and immune cells. 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.

Cannabinoids promote homeostasis at every level of biological life, from the sub-cellular, to the organism, and perhaps to the community and beyond. Here's one example: autophagy, a process in which a cell sequesters part of its contents to be self-digested and recycled, is mediated by the cannabinoid system. While this process keeps normal cells alive, allowing them to maintain a balance between the synthesis, degradation, and subsequent recycling of cellular products, it has a deadly effect on malignant tumor cells, causing them to consume themselves in a programmed cellular suicide. The death of cancer cells, of course, promotes homeostasis and survival at the level of the entire organism.

Endocannabinoids and cannabinoids are also found at the intersection of the body's various systems, allowing communication and coordination between different cell types. At the site of an injury, for example, cannabinoids can be found decreasing the release of activators and sensitizers from the injured tissue, stabilizing the nerve cell to prevent excessive firing, and calming nearby immune cells to prevent release of pro-inflammatory substances. Three different mechanisms of action on three different cell types for a single purpose: minimize the pain and damage caused by the injury.

The endocannabinoid system, with its complex actions in our immune system, nervous system, and all of the body's organs, is literally a bridge between body and mind. By understanding this system we begin to see a mechanism that explains how states of consciousness can promote health or disease.

In addition to regulating our internal and cellular homeostasis, cannabinoids influence a person's relationship with the external environment. Socially, the administration of cannabinoids clearly alters human behavior, often promoting sharing, humor, and creativity. By mediating neurogenesis, neuronal plasticity, and learning, cannabinoids may directly influence a person's open-mindedness and ability to move beyond limiting patterns of thought and behavior from past situations. Reformatting these old patterns is an essential part of health in our quickly changing environment.

What Are Cannabinoid Receptors?

Sea squirts, tiny nematodes, and all vertebrate species share the endocannabinoid system as an essential part of life and adaptation to environmental changes. By comparing the genetics of cannabinoid receptors in different species, **scientists estimate that the endocannabinoid system evolved in primitive animals over 600 million years ago.**

While it may seem we know a lot about cannabinoids, the estimated twenty thousand scientific articles have just begun to shed light on the subject. Large gaps likely exist in our current

understanding, and the complexity of interactions between various cannabinoids, cell types, systems and individual organisms challenges scientists to think about physiology and health in new ways. The following brief overview summarizes what we do know.

Cannabinoid receptors are present throughout the body, embedded in cell membranes, and are believed to be more numerous than any other receptor system. When cannabinoid receptors are stimulated, a variety of physiologic processes ensue. Researchers have identified two cannabinoid receptors: CB1, predominantly present in the nervous system, connective tissues, gonads, glands, and organs; and CB2, predominantly found in the immune system and its associated structures. Many tissues contain both CB1 and CB2 receptors, each linked to a different action. Researchers speculate there may be a third cannabinoid receptor waiting to be discovered.

Endocannabinoids are the substances our bodies naturally make to stimulate these receptors. The two most well understood of these molecules are called anandamide and 2-arachidonoylglycerol (2-AG). They are synthesized on-demand from cell membrane arachidonic acid derivatives, have a local effect and short half-life before being degraded by the enzymes fatty acid amide hydrolase (FAAH) and monoacylglycerol lipase (MAGL).

Phytocannabinoids are plant substances that stimulate cannabinoid receptors. Delta-9-tetrahydrocannabinol, or THC, is the most psychoactive and certainly the most famous of these substances, but other cannabinoids such as cannabidiol (CBD) and cannabitol (CBN) are gaining the interest of researchers due to a variety of healing properties. Most phytocannabinoids have been isolated from *cannabis sativa*, but other medical herbs, such as *echinacea purpura*, have been found to contain non-psychoactive cannabinoids as well.

Interestingly, the marijuana plant also uses THC and other cannabinoids to promote its own health and prevent disease. Cannabinoids have antioxidant properties that protect the leaves and flowering structures from ultraviolet radiation - cannabinoids neutralize the harmful free radicals generated by UV rays, protecting the cells. In humans, free radicals cause aging, cancer, and impaired healing. Antioxidants found in plants have long been promoted as natural supplements to prevent free radical harm.

Laboratories can also produce cannabinoids. Synthetic THC, marketed as dronabinol (Marinol), and nabilone (Cesamet), a THC analog, are both FDA approved drugs for the treatment of severe nausea and wasting syndrome. Some clinicians have found them helpful in the off-label treatment of chronic pain, migraine, and other serious conditions. Many other synthetic cannabinoids are used in animal research, and some have potency up to 600 times that of THC.

Cannabis, The Endocannabinoid System, And Good Health

As we continue to sort through the emerging science of cannabis and cannabinoids, one thing remains clear: a functional cannabinoid system is essential for health. From embryonic implantation on the wall of our mother's uterus, to nursing and growth, to responding to injuries, endocannabinoids help us survive in a quickly changing and increasingly hostile environment. As I realized this, I began to wonder: can an individual enhance his/her cannabinoid system by taking supplemental cannabis? Beyond treating symptoms, beyond even curing disease, can cannabis help us prevent disease and promote health by stimulating an ancient system that is hard-wired into all of us?

