

The Role of the EndoCannabinoid System
&
Cannabinoids Linked to Gut Health

Rob Streisfeld, NMD

DISCLAIMER

KEY OBJECTIVES

- 1) Present the history of Cannabis and Cannabinoids as medicine.
- 2) Introduce the Endocannabinoid system (ECS) and its role in homeostasis and stress modulation
- 3) Improved understanding of the Endocannabinoid system and its role in regulation of inflammation, neuronal signaling, aging and gut health
- 4) Gain insights into naturally occurring fatty acids which act as substrates for the ECS enzyme pathways
- 5) Understand the link between diet, microbiota and the ECS regulation of adipose and the consequences for obesity, diabetes, and other GI related disorders

SELF ASSESSMENT QUESTIONS:

1) All forms of Cannabis are psychoactive

TRUE or **FALSE**

2) The earliest reference to Cannabis is closest to:

a) 1860 b) 2900BC c) 1000 BC d) 1969

3) Cannabidiol (CBD) has been found to be:

a) *Anti-anxiety* b) *Anti-Inflammatory* c) *Anti-epileptic*
d) *Neuro-protectant* e) *All of the Above*

Various types of ***Cannabis*** have been described, and variously classified as **species**, **subspecies**, or **varieties**:

- plants cultivated for fiber and seed production, described as low-intoxicant, non-drug, or fiber types.
- plants cultivated for drug production, described as high-intoxicant or drug types.
- escaped, hybridized, or wild forms of either of the above types.

CANNABIS

C. sativa, the most widely cultivated in the Western World, was originally grown on an industrial scale for fiber, oil, and animal feedstuffs. It is characterised by tall growth with few, widely spaced, branches.

C. indica, originating in south Asia, is also known historically as Indian hemp, and is characterized by shorter bushy plants giving a much greater yield per unit height.

C. ruderalis, is a hardier variety grown in the northern Himalayas and southern states of the former Soviet Union, characterised by a more sparse, "weedy" growth. It is rarely cultivated for its **THC** content.

Cannabis ruderalis strains are high in the cannabinoid **cannabidiol**, so they are grown by some medical marijuana users.

*Autoflowers and resistant to many diseases which makes it attractive to new growers

How is hemp different from marijuana?

Hemp and marijuana are different varieties of *Cannabis Sativa*, a dioecious, flowering herb indigenous to many parts of the world.

“**Marijuana**” has been cultivated for high levels of THC, which is concentrated mostly in the flowers and trichomes of the plant.

Industrial hemp is cultivated for its fiber, and has almost undetectable levels of **THC** & comparatively higher levels of **CBD**.

Hemp has been grown and cultivated worldwide for thousands of years for industrial and medical purposes, making useful items like rope, clothing, sails, paper, and thousands of other products.

Hemp will not make you “high” and, in fact, hemp contains almost every dietary essential we can’t make ourselves.

Hemp can refer to any industrial or foodstuff product that is not intended for use as a drug.

Cannabis Sativa L.

- ◆ Over 500 Compounds identified (545)
- ◆ About 104 different Cannabinoids
- ◆ Terpenes, Flavonoids, Fatty Acids, Steroids, and other non cannabinoid constituents

Traditionally, non-drug plants produce relatively low levels of THC and high levels of CBD, while drug plants produce high levels of THC and low levels of CBD.

The THC/CBD ratio is genetically determined and remains fixed throughout the life of a plant.

SATIVA **INDICA**
Rudderless

History of Cannabis

(At least some it)

2900 BC - Chinese Emperor Fu Hsi **References Marijuana as a Popular Medicine**

"The Chinese Emperor Fu Hsi (ca. 2900 BC), whom the Chinese credit with bringing civilization to China, seems to have made reference to Ma, the Chinese word for Cannabis, noting that Cannabis was very popular medicine that possessed both yin and yang."

Robert Deitch *Hemp: American History Revisited: The Plant with a Divided History*,
2003

1500 BC - Earliest Written Reference to Medical Marijuana in Chinese Pharmacopeia

"The use of cannabis for purposes of healing predates recorded history. The earliest written reference is found in the 15th century BC Chinese Pharmacopeia, the Rh-Ya."

[National Institute on Drug Abuse \(NIDA\)](#) *Marijuana Research Findings: 1976, 1977*

1000 BC - Bhang, a Drink of Cannabis and Milk, Is Used in India as an Anesthetic

Bhang, a cannabis drink generally mixed with milk, is used as an anesthetic and anti-phlegmatic in India. Cannabis begins to be used in India to treat a wide variety of human maladies.

[US National Commission on Marihuana and Drug Abuse](#) "Marihuana, A Signal of Misunderstanding," [druglibrary.org](#), 1972



1000 BC to 1900 BC - Hemp extracts are the #1, #2 and #3 most important and most frequently used medicines for two-thirds of the world's population.



700 BC - Medical Use of Marijuana in the Middle East Recorded in the Venidad

"The *Venidad*, one of the volumes of the Zend-Avesta, the ancient Persian religious text written around the seventh century BC purportedly by Zoroaster (or Zarathustra), the founder of Zoroastrianism, and heavily influenced by the Vedas, mentions *bhang* and lists cannabis as the most important of 10,000 medicinal plants."

Martin Booth *Cannabis: A History*, 2005

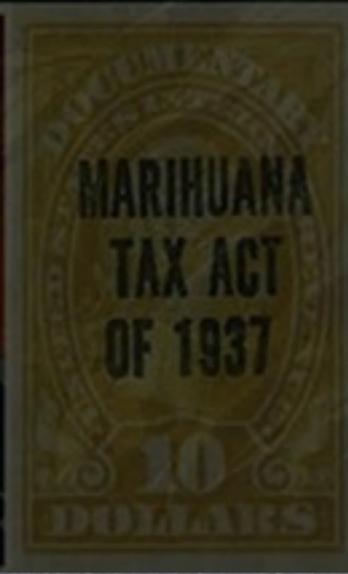
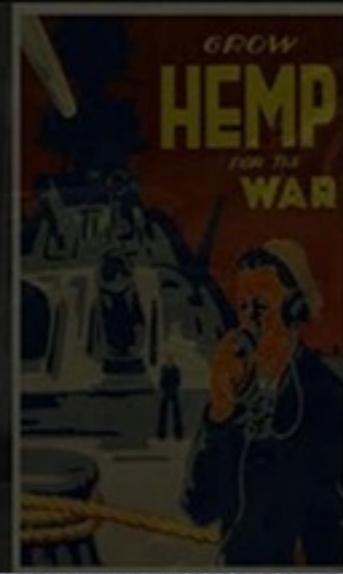
200 BC - Medical Cannabis Used in Ancient Greece

In ancient Greece, cannabis is used as a remedy for earache, edema, and inflammation.

US National Commission on Marihuana and Drug Abuse "Marihuana, A Signal of Misunderstanding," druglibrary.org, 1972

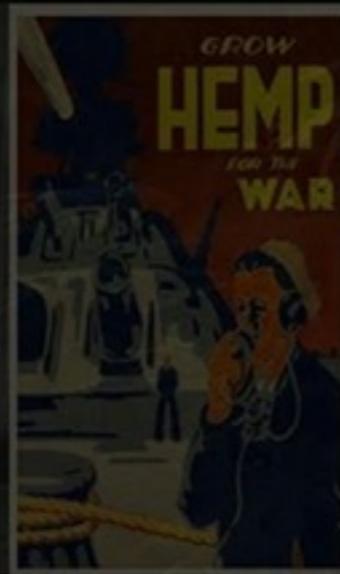


1611 AD - The King James Bible is printed on hemp paper.



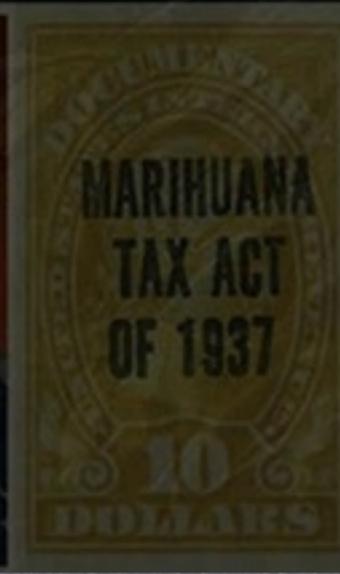


1776 AD - The first and second drafts of the Declaration of Independence are written on hemp paper.

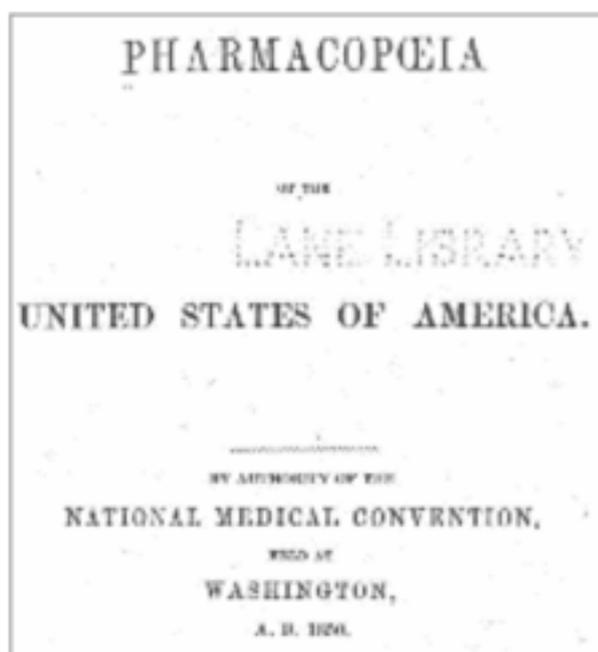




1812 AD - America goes to war with Great Britain over free-trade access to Russian hemp.



1850 - Marijuana Added to US Pharmacopeia



Cover of the 1851 United States Pharmacopeia
Source: antiquecannabisbook.com
(accessed Dec. 12, 2011)

"By 1850, marijuana had made its way into the United States Pharmacopeia [an official public standards-setting authority for all prescription and over-the counter medicines], which listed marijuana as treatment for numerous afflictions, including: neuralgia, tetanus, typhus, cholera, rabies, dysentery, alcoholism, opiate addiction, anthrax, leprosy, incontinence, gout, convulsive disorders, tonsillitis, insanity, excessive menstrual bleeding, and uterine bleeding, among others. Patented marijuana tinctures were sold..."

Richard Glen Boire, JD ★★ and Kevin Feeney, JD ★★ *Medical Marijuana Law*, 2007

EXTRACTUM CANNABIS. *Extract of Hemp.*
An alcoholic extract of the dried tops of
Cannabis sativa—variety *Indica*.

Page 50 of the 1851 United States Pharmacopeia
Source: antiquecannabisbook.com (accessed Nov. 18, 2013)

1918 - US Pharmaceutical Farms Grow 60,000 Pounds of Cannabis Annually

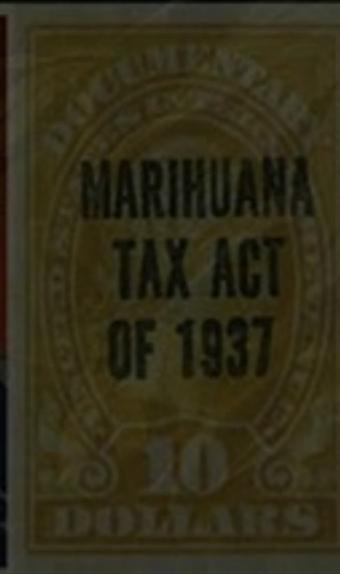
"Up to World War I, pharmaceutical supplies of cannabis indica were entirely imported from India (and occasionally Madagascar), in accordance with the U.S. Pharmacopoeia, which specified that it come from flowering tops of the Indian variety..."

Finally, in 1913, the U.S. Department of Agriculture Bureau of Plant Industry announced it had succeeded in growing domestic cannabis of equal quality to the Indian. When foreign supplies were interrupted by World War I, the United States became self-sufficient in cannabis. By 1918, some 60,000 pounds were being produced annually, all from pharmaceutical farms east of the Mississippi."

Dale Gieringer, PhD ★★ "The Forgotten Origins of Cannabis Prohibition in California," *Contemporary Drug Problems*, Summer 1999



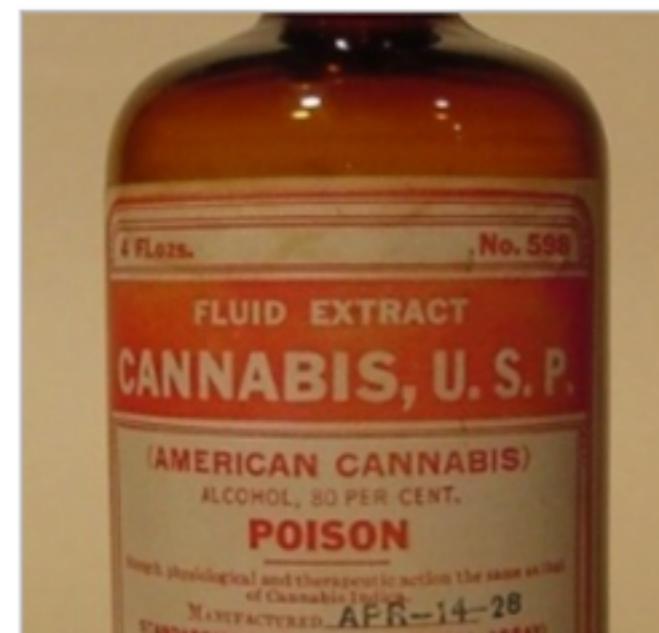
1901AD - The US Department of Agriculture predicts that the harvesting of hemp fiber will be America's #1 crop.



1930s - American Pharmaceutical Firms Sell Extracts of Marijuana as Medicines

"As demand for marijuana-based medications accelerated, pharmaceutical firms attempted to produce consistently potent and reliable drugs from hemp. By the 1930s at least two American companies – Parke-Davis and Eli Lilly – were selling standardized extracts of marijuana for use as an analgesic, an antispasmodic and sedative. Another manufacturer, Grimault & Company, marketed marijuana cigarettes as a remedy for asthma."

Janet Joy, PhD ★★☆☆ Alison Mack ★ *Marijuana as Medicine: Beyond the Controversy*, 2001



Parke-Davis cannabis tincture bottle
Source: antiquecannabisbook.com (accessed Dec. 22, 2011)

1933 - William Randolph Hearst Plays Role in Denouncing Marijuana

"[I]n 1933, marijuana became the target of government control. Sensationalistic stories linked violent acts to cannabis consumption... Many of the most outlandish stories appeared in newspapers published by William Randolph Hearst. Hearst reportedly had financial interests in the lumber and paper industries. He may have sought to eliminate competition from hemp."

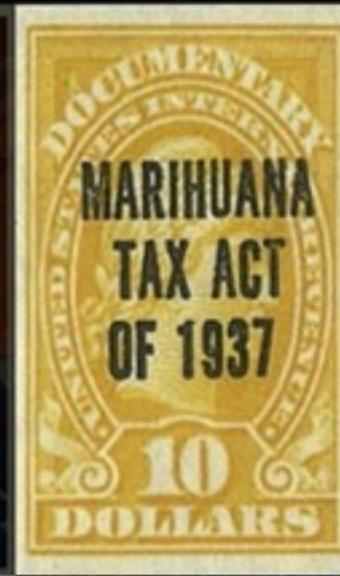
Mitchell Earleywine, PhD ★★☆☆ *Understanding Marijuana: A New Look at the Scientific Evidence*, 2005

"The first laws against cannabis in the United States were passed in border towns with Mexico... William Randolph Hearst was an up-and-coming newspaper tycoon, owning twenty-eight newspapers by the mid-1920s... Hearst then dropped the words cannabis and hemp from his newspapers and began a propaganda campaign against 'marijuana,' (following in Anslinger's footsteps)..."

Julie Holland, MD ★★☆☆ *The Pot Book: A Complete Guide to Cannabis: Its Role in Medicine, Politics, Science, and Culture*, 2010



1937AD - US Congress passes the Marijuana Tax Act of 1937, which levied a tax on anyone who dealt commercially in cannabis, hemp or marijuana.



May 4, 1937 - American Medical Association Opposes the Proposed Marihuana Tax Act and Supports Research on Medical Cannabis

"Hearings on the proposed taxation of marihuana were held before the Committee on Ways and Means between 27 April and 4 May 1937.

The last witness to be heard was Dr. William C. Woodward, legislative counsel of the American Medical Association (AMA). He announced his opposition to the bill... [and] sought to dispel any impression that either the AMA or enlightened medical opinion sponsored this legislation. Marihuana, he argued, was largely an unknown quantity, but might have important uses in medicine and psychology."

[Michael Schaller, PhD](#) ★★☆☆ "The Federal Prohibition of Marihuana," *Journal of Social History*, Autumn 1970

"There is nothing in the medicinal use of Cannabis that has any relation to Cannabis addiction. I use the word 'Cannabis' in preference to the word 'marihuana', because Cannabis is the correct term for describing the plant and its products. The term 'marihuana' is a mongrel word that has crept into this country over the Mexican border and has no general meaning, except as it relates to the use of Cannabis preparations for smoking..."

To say, however, as has been proposed here, that the use of the drug should be prevented by a prohibitive tax, loses sight of the fact that future investigation may show that there are substantial medical uses for Cannabis."

[William C. Woodward, MD](#) ★★☆☆★ [Statement to the US House of Representatives Committee on Ways and Means](#) (260 KB), May 4, 1937



NEW

AMERICAN farmers are promised a new cash crop with an annual value of several hundred million dollars, all because a machine has been invented which solves a problem more than 6,000 years old. It is hemp, a crop that will not compete with other American products. Instead, it will displace imports of raw material and manufactured products produced by underpaid coolie and peasant labor and it will provide thousands of jobs for American workers throughout the land.

The machine which makes this possible is designed for removing the fiber-bearing cortex from the rest of the stalk, making hemp fiber available for use without a prohibitive amount of human labor.

Hemp is the standard fiber of the world. It has great tensile strength and durability. It is used to produce more than 5,000 textile products, ranging from rope to fine laces, and the woody "hurds" remaining

after the fiber has been removed contain more than seventy-seven per cent cellulose, and can be used to produce more than 25,000 products, ranging from dynamite to Cellophane.

Machines now in service in Texas, Illinois, Minnesota and other states are producing fiber at a manufacturing cost of half a cent a pound, and are finding a profitable market for the rest of the stalk. Machine operators are making a good profit in com-



Top, sailing the seas with sails and rope made of hemp. Bottom, hemp fiber being delivered from machine ready for baling. Pile of pulverized hurds beside machine is seventy-seven per cent cellulose.

BILLION-DOLLAR CROP

petition with coolie-produced foreign fiber while paying farmers fifteen dollars a ton for hemp as it comes from the field.

From the farmers' point of view, hemp is an easy crop to grow and will yield from three to six tons per acre on any land that will grow corn, wheat, or oats. It has a short growing season, so that it can be planted after other crops are in. It can be grown in any state of the union. The long roots penetrate and break the soil to leave it in perfect condition for the next year's crop. The dense shock of leaves, eight to twelve feet above the ground, chokes out weeds. Two successive crops are enough to reclaim land that has been abandoned because of Canadian thistles or quack grass.

Under old methods, hemp
(Continued to page 144A)



Top, modern version of linen duster made from hemp. Bottom, harvesting hemp with a grain binder. Hemp grows luxuriously in Texas.

239

1937AD - US
a tax on an

which levied
marijuana.

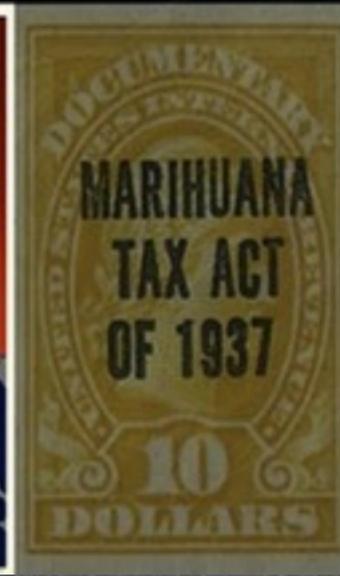
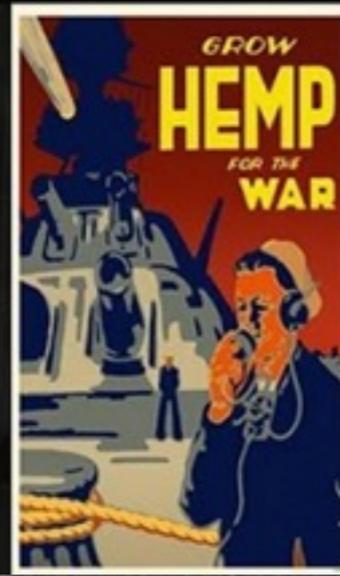
Popular Mechanics Magazine
Just a few short months later.



THE MEDICAL MARIJUANA DEBATE
KILLED 42 PEOPLE IN QUEBEC LAST MONTH FILES HI



1942AD - HEMP FOR VICTORY, a US government film encourages farmers to grow as much hemp as possible for rope, cloth and cordage to support WWII.



1942 - Marijuana Removed from US Pharmacopeia

"Marijuana was removed from the US Pharmacopeia in 1942, thus losing its remaining mantle of therapeutic legitimacy."

[American Medical Association \(AMA\)](#) ★ "Report 10 of the Council on Scientific Affairs," 1997

1938-1944 - LaGuardia Report Concludes Marijuana Less Dangerous Than Commonly Thought

In 1938, New York City Mayor Fiorello LaGuardia requests that the New York Academy of Medicine conduct an investigation of marijuana. The 1944 report, titled "The Marihuana Problem in the City of New York," but commonly referred to as the "LaGuardia Report," concludes that many claims about the dangers of marijuana are exaggerated or untrue.

[Roger A. Roffman, DSW](#) ★★☆☆ [Robert S. Stephens, PhD](#) ★★☆☆ *Cannabis Dependence: Its Nature, Consequences, and Treatment*, 2006

"The practice of smoking marihuana does not lead to addiction in the medical sense of the word... The use of marihuana does not lead to morphine or heroin or cocaine addiction and no effort is made to create a market for these narcotics by stimulating the practice of marihuana smoking... Marihuana is not the determining factor in the commission of major crimes... The publicity concerning the catastrophic effects of marihuana smoking in New York City is unfounded."

[LaGuardia Committee Report on Marihuana](#) ★★★★★ "The Marihuana Problem in the City of New York"  (15 KB), 1944

[Editor's Note: Read more about the LaGuardia Report on our page on [US Government Reports](#)]



New York Academy of Medicine Headquarters in New York City
Source: [nyc-architecture.com](#) (accessed Aug. 31, 2011)

1964 - THC, Main Psychoactive Component of Cannabis, First Identified and Synthesized

In 1964 Dr. Raphael Mechoulam, Professor of Medicinal Chemistry at the Hebrew University of Jerusalem, is the first to identify delta-9-tetrahydrocannabinol (THC), as the main psychoactive component of cannabis. He is also the first to synthesize THC.

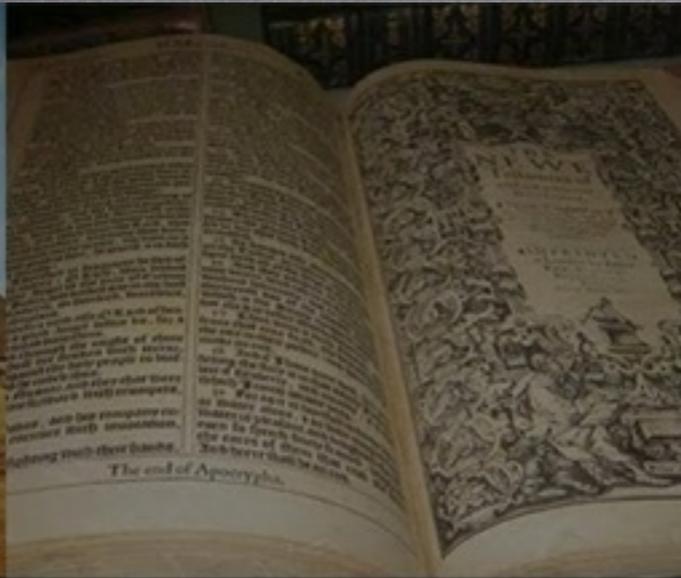
[GW Pharmaceuticals](#) ★ "GW to Develop New Cannabinoid Opportunities with Professor Raphael Mechoulam," GW Pharmaceuticals website, Jan. 21, 2003

Nov. 1, 1968 - UK Wootton Report Finds Cannabis Is Less Dangerous Than Alcohol, Other Drugs

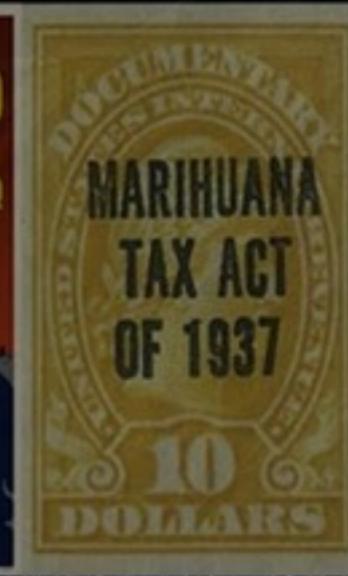
The Nov. 1, 1968 Wootton Report, written by the UK government's Advisory Committee on Drug Dependence, finds that "the long term consumption of cannabis in moderate doses has no harmful effects... Cannabis is less dangerous than the opiates, amphetamines and barbiturates, and also less dangerous than alcohol..."

The report's influence is seen in future British drug policies that reduce penalties for possession of marijuana by 50%.

[Stephen Abrams, PhD](#) ★★☆☆ "Soma, the Wootton Report and Cannabis Law Reform in Britain During the 1960s and 1970s," *A Cannabis Reader: Global Issues and Local Experiences*, www.emcdda.europa.eu, 2008



1972AD - President Richard Nixon declares all forms of cannabis illegal by signing into law the Controlled Substances Act.

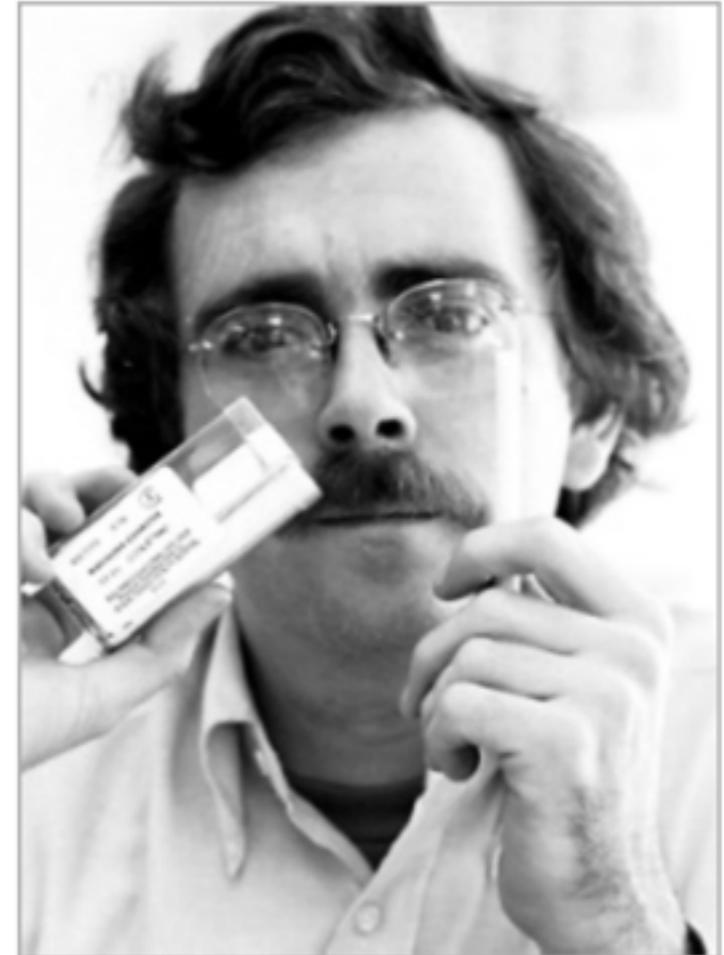


Nov. 24, 1976 - Federal Court Rules Robert Randall's Use of Marijuana a "Medical Necessity"

"In November, 1976, a Washington, DC man [Robert Randall] afflicted by glaucoma employed the little-used Common Law Doctrine of Necessity to defend himself against criminal charges of marijuana cultivation (US v. Randall). On November 24, 1976, federal Judge James Washington ruled Randall's use of marijuana constituted a 'medical necessity...'

Judge Washington dismissed criminal charges against Randall. Concurrent with this judicial determination, federal agencies responding to a May, 1976 petition filed by Randall, began providing this patient with licit, FDA-approved access to government supplies of medical marijuana. Randall was the first American to receive marijuana for the treatment of a medical disorder."

[Schaffer Online Library of Drug Policy](#) ★ "Significant Legal Cases," www.druglibrary.org (accessed July 15, 2010)



Robert Randall

Source: denverpost.com (accessed Aug. 31, 2011)

1978 - Federal Government IND Compassionate Use Program Supplies Patients with Marijuana

"NIDA also supplies cannabis to [seven patients](#) under single patient so-called 'compassionate use' [Investigational New Drug Applications \(IND\)](#). In 1978, as part of a lawsuit settlement by the Department of Health and Human Services, NIDA began supplying cannabis to patients whose physicians applied for and received such an USID from the FDA."

[National Institute on Drug Abuse \(NIDA\)](#) ★ "Provision of Marijuana and Other Compounds For Scientific Research - Recommendations of the National Institute on Drug Abuse National Advisory Council," NIDA website, Jan. 1998

1978 - New Mexico Passes First State Law Recognizing Medical Value of Marijuana

"In 1978, New Mexico passed the first state law recognizing the medical value of marijuana [Controlled Substances Therapeutic Research Act]. Over the next few years, more than 30 states passed similar legislation."

[Elsa Scott](#) ★ "Marinol: The Little Synthetic That Couldn't," *High Times Magazine*, July 1994

[Editor's Note: See full text of the [Mar. 1983 official progress report](#) (700 KB) on New Mexico's medical marijuana program.]

1980 - Marinol, a Synthetic Version of THC, and Smoked Marijuana Tested on Cancer Patients

"In 1980, the National Cancer Institute (NCI) began experimental distribution of a new drug called Marinol, an oral form of THC (the primary active ingredient in marijuana), to cancer patients in San Francisco. Simultaneously, six states conducted studies comparing smoked marijuana to oral THC in cancer patients who had not responded to traditional antiemetic medication. These state-sponsored studies revealed that thousands of patients found marijuana safer and more effective than synthetic THC. Meanwhile, the NCI experiments showed that some patients responded well to Marinol... Confronted with two different medical recommendations, the government chose to dismiss the state studies and give Marinol the green light."

[Kambiz Akhavan](#) ★ "Marinol vs. Marijuana: Politics, Science, and Popular Culture," [drugtext.org](#), 1997

1990 - Scientists Discover Cannabinoid Receptors

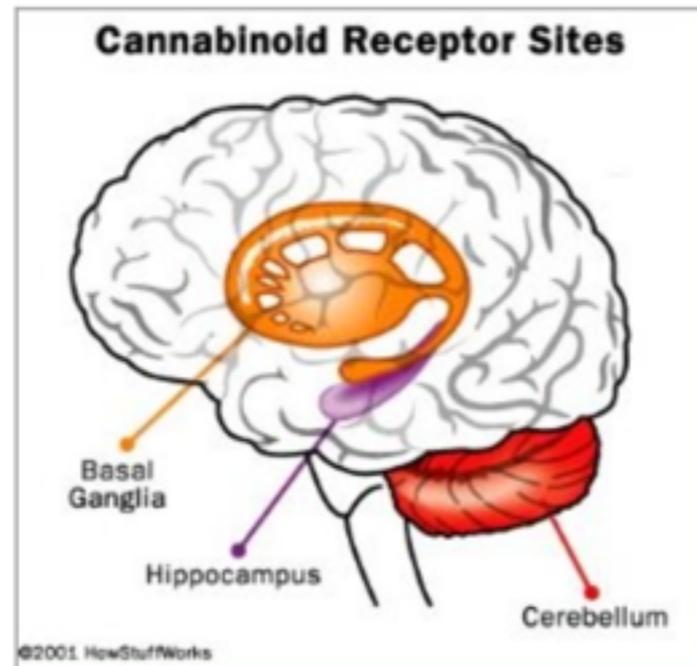


Diagram of cannabinoid receptor sites in the human brain.

Source: *HowStuffWorks.com*, 2001

Miles Herkenham, Senior Investigator at the National Institute of Mental Health, and his research team discover the cannabinoid receptor system in 1990. The discovery helps scientists understand the pharmacological effects of cannabinoids, which occur when the THC in marijuana binds with the cannabinoid receptors in the brain.

Jon Gettman, PhD ★★ ★ "The 1995 Marijuana Rescheduling Petition," *DrugScience.org* (accessed July 17, 2010)

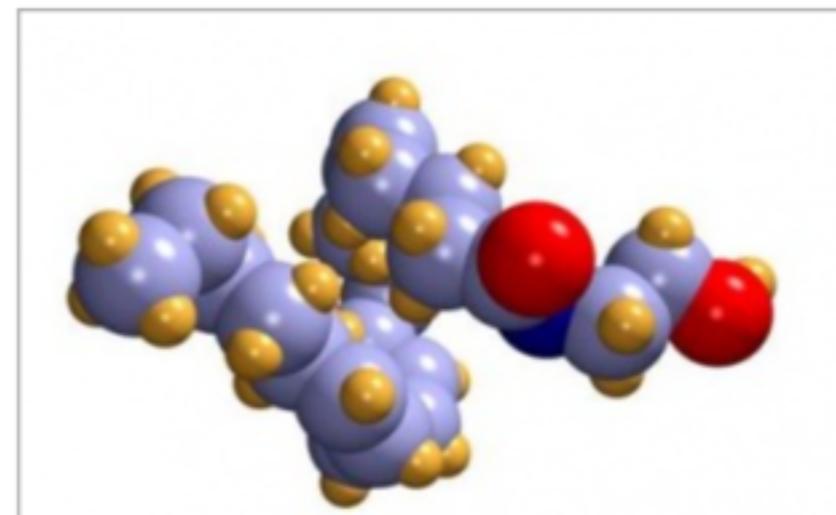
[**Editor's Note:** Read more in our question "What is THC (Delta-9-Tetrahydrocannabinol)?"]

1992 - Scientists Discover First Endocannabinoid

"Twenty-eight years after discovering THC, in 1992, Dr. Mechoulam, along with Dr. William Devane and Dr. Lumir Hanus, identified the brain's first endogenous cannabinoid (or endocannabinoid) - the brain's natural version of THC - which they called 'anandamide,' from the Sanskrit word 'ananda,' which means 'eternal bliss' or 'supreme joy.'

Vigorous exercise stimulates the release of anandamide, and the sense of euphoric well-being that comes with a healthy workout - what jogging enthusiasts refer to as a 'runner's high' - is due to elevated levels of endocannabinoids. The endocannabinoid system in the brain is also believed to help mediate emotions, consolidate memory, and coordinate movement."

David J. Brown, MS ★ "The New Science of Cannabinoid-Based Medicine: An Interview with Dr. Raphael Mechoulam," *Mavericks of Medicine*, 2006



Anandamide neurotransmitter molecule. The atoms are color-coded as carbon (light blue), hydrogen (yellow), nitrogen (dark blue) and oxygen (red).

Source: *SciencePhoto.com* (accessed Dec. 15, 2011)

Nov. 5, 1996 - California Becomes First State to Legalize Medical Marijuana

"Voters in California [pass] a state medical marijuana initiative in 1996. Known as [Proposition 215](#) (45 KB), it permits patients and their primary caregivers, with a physician's recommendation, to possess and cultivate marijuana for the treatment of AIDS, cancer, muscular spasticity, migraines, and several other disorders; it also protects them from punishment if they recommend marijuana to their patients."

Janet Joy, PhD ★★☆☆ Alison Mack ☆ *Marijuana as Medicine: Beyond the Controversy*, 2001

[Editor's Note: Ballot Proposition 215 was approved on Nov. 5, 1996 by 56% of voters and became effective on Nov. 6, 1996. Read more about [California's medical marijuana laws](#).]



Medical marijuana activist Chris Conrad and his wife Mikki Norris advocated for the passage of Prop. 215
Source: chrisconrad.com (accessed Dec. 28, 2011)

Jan. 30, 1997 - New England Journal of Medicine Publishes Editorial Calling for Marijuana to Be Rescheduled



Logo for the *New England Journal of Medicine*, founded in 1812.
Source: *NEJM.org* (accessed Dec. 14, 2011)

The *New England Journal of Medicine* publishes an editorial written by Jerome P. Kassirer, MD, titled "Federal Foolishness and Marijuana." The article states: "Federal authorities should rescind their prohibition of the medicinal use of marijuana for seriously ill patients and allow physicians to decide which patients to treat. The government should change marijuana's status from that of a Schedule 1 drug (considered to be potentially addictive and with no current medical use) to that of a Schedule 2 drug (potentially addictive but with some accepted medical use) and regulate it accordingly."

Jerome P. Kassirer, MD ★★★★★ "Federal Foolishness and Marijuana," *New England Journal of Medicine*, Jan. 30, 1997

Feb. 19 and 20, 1997 - NIH Says More Study Needed to Assess Potential of Medical Marijuana

On Feb. 19 and 20, 1997, the National Institutes of Health (NIH) "convened an Ad Hoc Group of Experts, which concluded that scientific evidence was insufficient to definitively assess marijuana's therapeutic potential and advised that the traditional scientific process should be allowed to evaluate the drug's use for certain disorders."

Tatiana Shohov ★ *Medical Use of Marijuana: Policy, Regulatory, and Legal Issues*, 2003

Oct. 7, 2003 - US Government Receives Cannabinoids Patent

The US Department of Health and Human Services receives a [patent \(US 6,630,507 B1\)](#) for the therapeutic use of "cannabinoids as antioxidants and neuroprotectants."

The abstract says in part: "Cannabinoids have been found to have antioxidant properties... The cannabinoids are found to have particular application as neuroprotectants... in the treatment of neurodegenerative diseases such as Alzheimer's disease..."

[US patent 6,630,507 B1](#) , Oct. 3, 2007

Sep. 2008 - Two Pounds of Cannabis Found Buried in 2,700-year-old Chinese Tomb

"The Yanghai Tombs near Turpan, Xinjiang-Uighur Autonomous Region, China have recently been excavated to reveal the 2700-year-old grave of a Caucasoid shaman whose accoutrements included a large cache [789 grams, or about two pounds] of cannabis..."

The cannabis was presumably employed by this culture as a medicinal or psychoactive agent, or an aid to divination. To our knowledge, these investigations provide the oldest documentation of cannabis as a pharmacologically active agent, and contribute to the medical and archaeological record of this pre-Silk Road culture."

Ethan Russo, MD ★★★★★ "Phytochemical and Genetic Analyses of Ancient Cannabis from Central Asia," *Journal of Experimental Botany*, Sep. 2008



Tomb M90 of the Yanghai Tombs, in which cannabis from 2,700 years ago was found.
Source: ScienceBlogs.com, Mar. 28, 2009

Nov. 10, 2009 - AMA Softens Position on Scheduling of Marijuana

The American Medical Association softens its position on medical marijuana in a policy statement released Nov. 10, 2009. The statement read in part: "Our AMA urges that marijuana's status as a federal Schedule I controlled substance be reviewed with the goal of facilitating the conduct of clinical research and development of cannabinoid-based medicines, and alternate delivery methods. This should not be viewed as an endorsement of state-based medical cannabis programs, the legalization of marijuana, or that scientific evidence on the therapeutic use of cannabis meets the current standards for a prescription drug product."

Prior to the Nov. 10, 2009 position quoted above, the AMA had recommended that marijuana be retained in Schedule I of the Controlled Substances Act pending the outcome of further studies.

[American Medical Association \(AMA\)](#) ★ "AMA Policy: Medical Marijuana," (10 KB)  Nov. 10, 2009

[Editor's Note: Lisa Lecas from the AMA Media Relations department sent a Nov. 12, 2009 email to ProCon.org with the following statement explaining the policy change:

"To help facilitate scientific research and the development of cannabinoid-based medicines, the AMA adopted new policy urging the federal government to review marijuana's status as a Schedule I substance. Despite more than 30 years of clinical research, only a small number of randomized, controlled trials have been conducted on smoked cannabis.

Federal drug approval is achieved after appropriate scientific and regulatory review to establish safety and efficacy. The limited nature of rigorous scientific studies on the therapeutic use of cannabis is insufficient to satisfy the current standards for a prescription drug product."]

Mar. 1, 2011 - DEA Places Five Synthetic Cannabinoids into Schedule I, Citing "Imminent Hazard"



Package of Spice, a synthetic cannabinoid.
Source: themudflats.net, Feb. 26, 2011

"The Administrator of the Drug Enforcement Administration (DEA) is issuing this [Mar. 1, 2011] final order to temporarily place five synthetic cannabinoids into the Controlled Substances Act (CSA) pursuant to the temporary scheduling provisions... This action is based on a finding by the Administrator that the placement of these synthetic cannabinoids into Schedule I of the CSA is necessary to avoid an imminent hazard to the public safety..."

The popularity of these THC-like synthetic cannabinoids has significantly increased throughout the United States, and they are being abused for their psychoactive properties as reported by law enforcement, the medical community, and through scientific literature. Some of the product names include, but are not limited to, 'Spice,' 'K2,' and many more."

US Drug Enforcement Administration (DEA) ★ "Schedules of Controlled Substances: Temporary Placement of Five Synthetic Cannabinoids Into Schedule I" (250 KB), DEA.gov, Mar. 1, 2011

Aug. 8, 2013 - Dr. Sanjay Gupta Comes out in Favor of Medical Marijuana

"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...

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

[Sanjay Gupta, MD](#) ★★★★★ "Why I Changed My Mind on Weed," CNN.com, Aug. 8, 2013



Dr. Sanjay Gupta

Source: Hamilton Nolan, "New Surgeon General: Dr. Sanjay Gupta," *gawker.com*, Jan. 6, 2009



February 7th, 2014 - President Barack Obama signs the Farm Bill, making it federally legal to grow hemp in America.

Feb. 14, 2014 - New Federal Guidelines Allow Banks to Provide Financial Services to Legal Marijuana Sellers

"The Obama administration on Friday [Feb. 14, 2014] gave banks a road map for conducting transactions with legal marijuana sellers so these new businesses can stash away savings, make payroll and pay taxes like any other enterprise..."

Marijuana businesses that can't use banks may have too much cash they can't safely put away, leaving them vulnerable to criminals. And governments that allow marijuana sales want a channel to receive taxes...

Currently, processing money from marijuana sales puts federally insured banks at risk of drug racketeering charges, so they've refused to open accounts for marijuana-related businesses.

Friday's move was designed to let financial institutions serve such businesses while ensuring that they know their customers' legitimacy and remain obligated to report possible criminal activity, said the Treasury Department's Financial Crimes Enforcement Network, or FinCEN.

But in response, the American Bankers Association said 'guidance or regulation doesn't alter the underlying challenge for banks. As it stands, possession or distribution of marijuana violates federal law, and banks that provide support for those activities face the risk of prosecution and assorted sanctions.'...

The guidance provided the banks with more than 20 'red flags' that may indicate a violation of federal law. Among them: if a business receives substantially more revenue than its local competitors, deposits more cash than is in line with the amount of marijuana-related revenue it is reporting for federal and state tax purposes, or experiences a surge in activity by third parties offering goods or services such as equipment suppliers or shipping services."

[Pete Yost](#) ★ "Feds Let Banks and Marijuana Sellers Do Business," [bigstory.ap.org](#), Feb. 14, 2014

["BSA Expectations Regarding Marijuana-Related Businesses"](#)  (100 KB), Department of the Treasury, Feb. 14, 2014

Oct. 28, 2014 - US Justice Department Will Not Enforce Federal Marijuana Laws on Native American Reservations

"Opening the door for what could be a lucrative and controversial new industry on some Native American reservations, the Justice Department... will tell U.S. attorneys to not prevent tribes from growing or selling marijuana on the sovereign lands, even in states that ban the practice.

The new guidance, released in a memorandum, will be implemented on a case-by-case basis and tribes must still follow federal guidelines, said Timothy Purdon, the U.S. attorney for North Dakota and the chairman of the Attorney General's Subcommittee on Native American Issues...

Purdon said in an interview that the majority of Native American tribes, mindful of the painful legacy of alcohol abuse in their communities, appear to be against allowing marijuana use on their territory.

The federal government will continue to legally support those tribes that wish to ban marijuana, even in states that now permit its sale, Purdon said."

[Los Angeles Times](#) ★★ Timothy M. Phelps, "U.S. Won't Stop Native Americans from Growing, Selling Pot on Their Lands," [latimes.com](#), Dec. 11, 2014
US Department of Justice, "[Policy Statement Regarding Issues in Indian Country](#)," 140 KB, Oct. 28, 2014

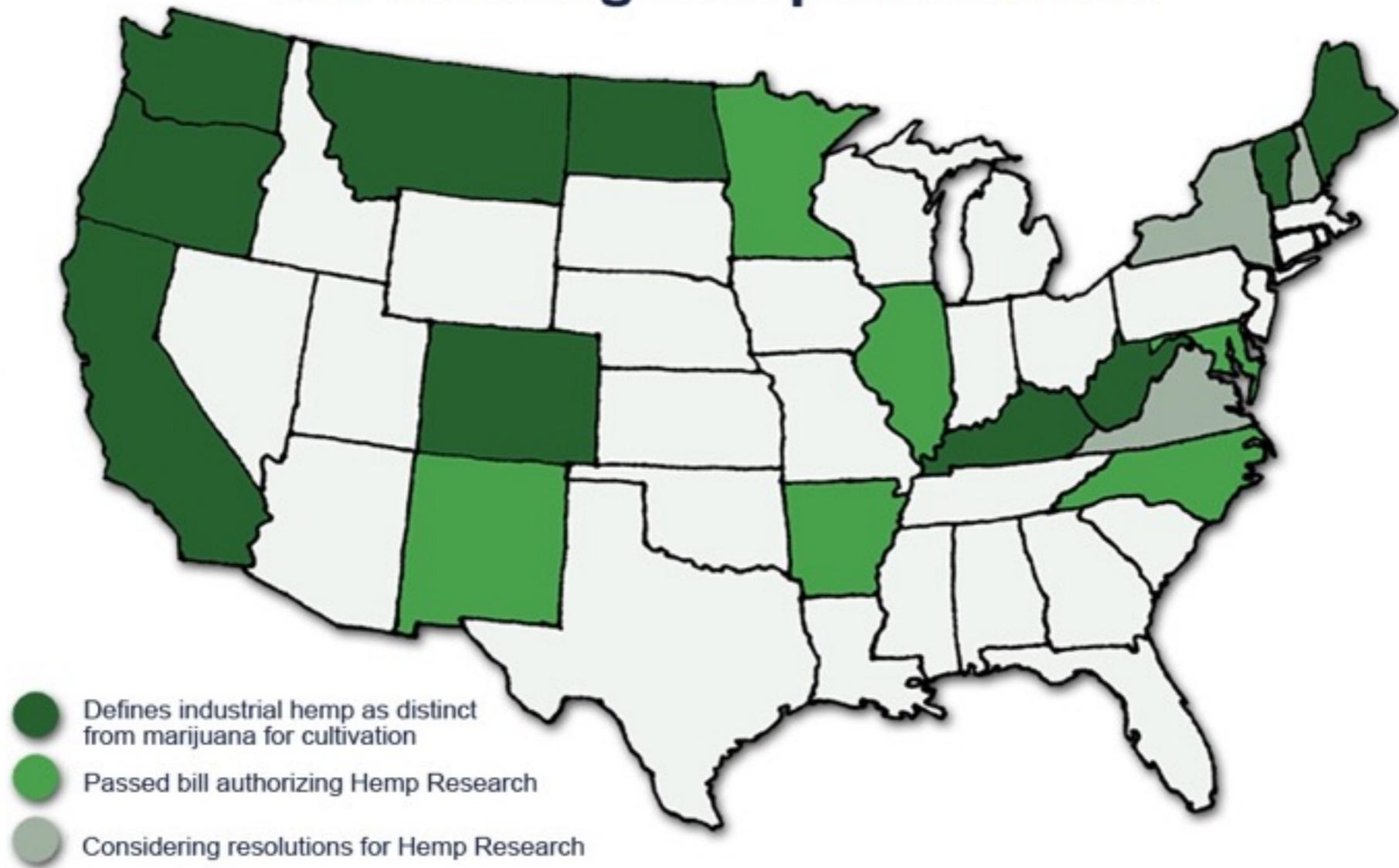
Dec. 17, 2014 - New Law Bans Justice Department from Using Funds Against Medical Marijuana in States Where It Is Legal

"The \$1 trillion spending bill that passed last week [and was signed into law by President Obama on Dec. 17, 2014] included a provision that blocks the Justice Department from spending any money to enforce a federal ban on growing or selling marijuana in the 23 states that have moved to legalize it for medical use. It marks a huge shift for Congress, which for years had sided with federal prosecutors in their battle with states over the liberalization of drug laws...

Representative Dana Rohrabacher, a Republican from California, was one of the authors of the medical-use provision, and he made the case to his colleagues on grounds that many conservatives can understand: states' rights. In a statement, he said his amendment would force the federal government to 'respect state sovereignty' on the question of medical marijuana."

[Russell Berman](#) ★ "Why Congress Gave in to Medical Marijuana," [The Atlantic](#), Dec. 17, 2014

The Growing Hemp Movement



Schedule I ?

Schedule I drugs, substances, or chemicals are defined as drugs with no currently accepted medical use and a high potential for abuse. Schedule I drugs are the most dangerous drugs of all the drug schedules with potentially severe psychological or physical dependence. Some examples of Schedule I drugs are:

heroin, lysergic acid diethylamide (LSD), **marijuana (cannabis)**, 3,4-methylenedioxymethamphetamine (ecstasy), methaqualone, and peyote

www.DEA.Gov

Schedule II

Schedule II drugs, substances, or chemicals are defined as drugs with a high potential for abuse, less abuse potential than Schedule I drugs, with use potentially leading to severe psychological or physical dependence. These drugs are also considered dangerous.

Some examples of Schedule II drugs are: cocaine, methamphetamine, methadone, hydromorphone (Dilaudid), meperidine (Demerol), oxycodone (OxyContin), fentanyl, Dexedrine, Adderall, and Ritalin

www.DEA.Gov

Schedule III

Schedule III drugs, substances, or chemicals are defined as drugs with a moderate to low potential for physical and psychological dependence. Schedule III drugs abuse potential is less than Schedule I and Schedule II drugs but more than Schedule IV. Some examples of Schedule III drugs are:

www.DEA.Gov

Schedule IV

Schedule IV drugs, substances, or chemicals are defined as drugs with a low potential for abuse and low risk of dependence. Some examples of Schedule IV drugs are:

Xanax, Soma, Darvon, Darvocet, Valium, Ativan, Talwin, Ambien

www.DEA.Gov

The EndoCannabinoid System

Everyone has an endocannabinoid system (ECS).

In fact, the ECS evolved long before humans; it is over 600 million years old. It regulates variety of biological processes, like pain, sleep, mood, and appetite.

However, experts believe that the overall function of the ECS is the regulation of **homeostasis**.

Balance within the ECS is critical to homeostasis and to prevent disease.



The Endocannabinoid System: Mechanisms Behind Metabolic Homeostasis and Imbalance

Stephen C. Woods, PhD

ABSTRACT

Scientific interest in the endocannabinoid (EC) system developed as a result of the known effects of tetrahydrocannabinol, including an increased desire to consume food. Further investigation has led to the belief that the EC system plays a role in accumulation of intra-abdominal fat and worsening of cardiovascular disease (CVD) risk factors. The EC system has been identified as a neuromodulatory system that is normally inactive but can be overstimulated to cause and exacerbate numerous metabolic pathologies. EC agonists and receptors have been identified in the brain, liver, and peripheral adipose tissue, and the EC system is known to affect metabolism in these areas and others through neuromodulatory signals. Meal size, body weight, and numerous metabolic factors such as triglyceride and cholesterol levels, insulin resistance, and glucose intolerance can be affected via the EC system. Further research into the EC system is warranted to elucidate its role in metabolic homeostasis. © 2007 Elsevier Inc. All rights reserved.

More than two decades of research have changed our early view of the ECS. It is obvious that the 'prototypical' ECS is deeply intertwined with other important lipid-based signalling systems. The formation of the mediators involved is time and tissue-specific and modulated by various endogenous (e.g. energy status, inflammation) and environmental factors, including diet. The complexity and dynamics of the 'endocannabinoidome' present technical challenges and require a systems biology approach. It has also become clear that initial strategies to modulate the ECS have probably been too narrow and expectations too high for drugs that specifically targeted CB₁ receptors [89] or FAAH enzymes [49]. The endocannabinoidome still holds many promises for both 'food' and 'pharma' applications. However, its complexity demands for more subtle multiple-target strategies instead of a classical one disease-one target-one drug approach.

ENDOCANNABINOID SYSTEM (ECS) = the receptors (CB1 and CB2) and the ligands (fatty acids of a particular type) which bind to them. It also includes the enzymes to make and degrade these ligand compounds.

- **CB1** = the receptor responsible for psychotropic effects of cannabis and the pro-inflammatory signaling of the immune system.
- **CB2** = the non-psychoactive receptor of the immune system including Mast cells, microglia and macrophages.
- (TRPV1) Transient receptor potential vanilloid type 1 ion channel.
- **Ligands** = The endogenous arachidonate-based lipids, anandamide (N- arachidonylethanolamide, AEA) and 2-arachidonoylglycerol (2-AG); these are known as "endocannabinoids" and are physiological ligands for the cannabinoid receptors. Endocannabinoids are all eicosanoids.

- **FAAH** = Fatty acid amide hydrolase degrades anandamide (AEA)

- [Pertwee RG (April 2006). "The pharmacology of cannabinoid receptors and their ligands: an overview". Int J Obes (Lond) 30 (Suppl 1): S13-8.]

EndoCannabinoids

- ◆ “Endo” - Produced by the body
 - ◆ Anandamide (AEA) (bliss)
 - ◆ 2-Arachidonoylglycerol (2-AG)

PhytoCannabinoids

Phytocannabinoid = plant derived fatty acid capable of attaching as a ligand to the CB receptors.



THC CBD CBG CBN CBC THCV CBGA CGCA CBCA THCA CBDA

Over 100 Have been identified

THC

The principal psychoactive constituent, responsible for the “high” associated with Cannabis/ Marijuana.

THCA, the Cannabidiolic Acid form, is not [scheduled](#) at the [federal level](#) in the [United States](#) and is therefore legal to possess, buy, and sell. It is possible that THCA could legally be considered an [analog](#) (of [THC](#)) although that is somewhat unlikely since it does not provide a [high](#) and THC does. If it were legally considered an analog, sales or [possession](#) with intent for human consumption could be prosecuted under the [Federal Analogue Act](#).

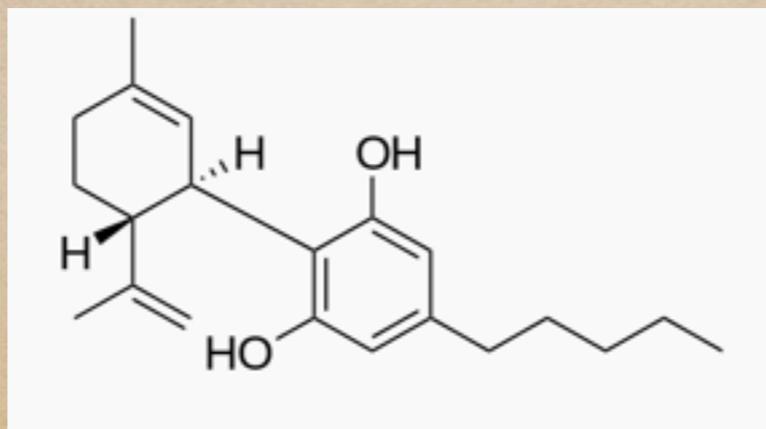
When swallowing marijuana (in teas, brownies, etc.), the main active ingredient, [Delta-9-THC](#), is [transformed by the liver](#) into the more psychoactively powerful Delta-11-THC.

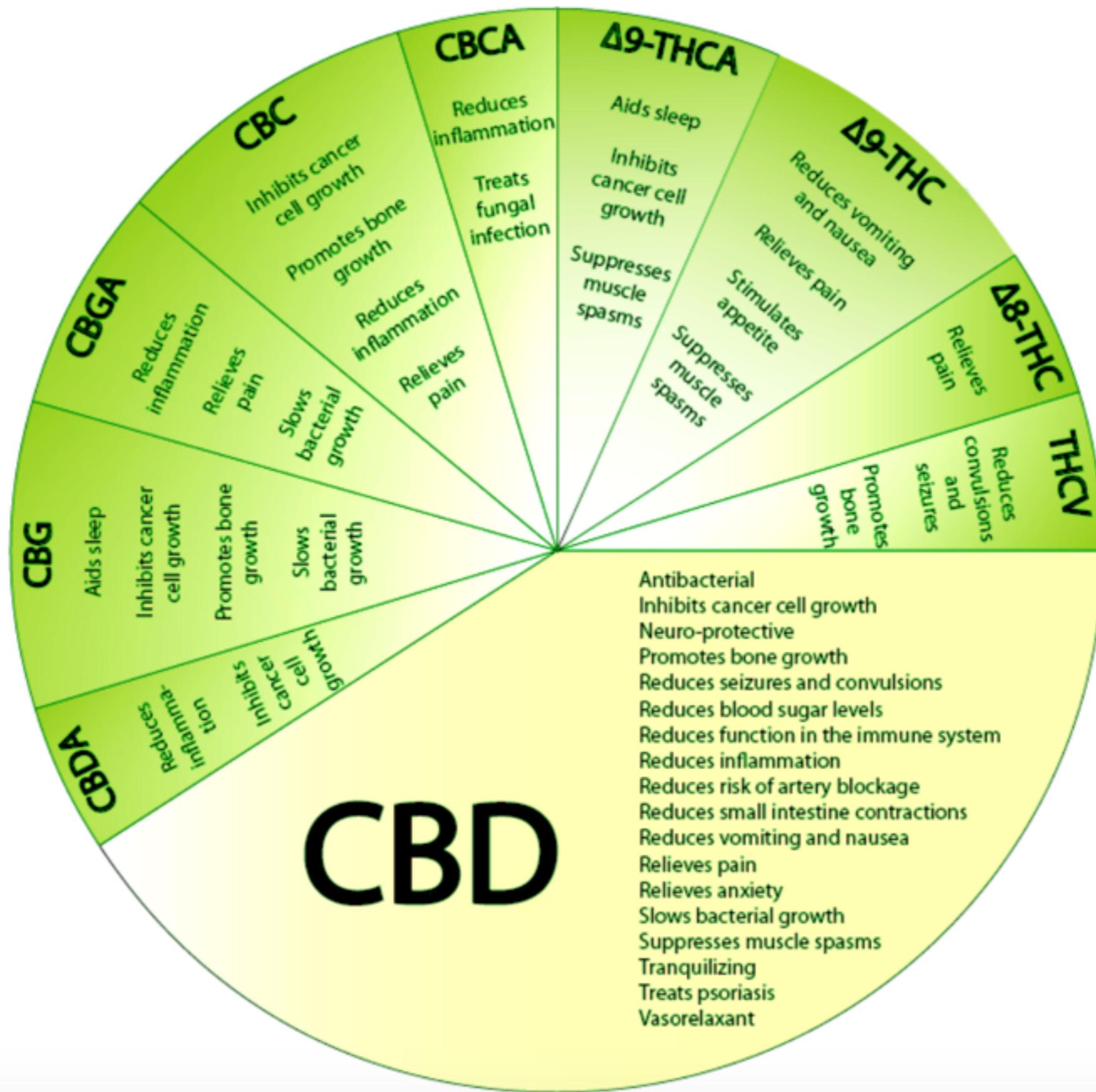
THCA > Delta -9-THC > Delta-11-THC

Cannabidiol (CBD)

A nonCB1, nonCB2 phyto-cannabinoid active primarily at the peroxisome proliferator-activated receptors (PPARs) which are a group of nuclear receptor proteins that function as transcriptional factors regulating the expression of genes.

A major [phytocannabinoid](#), accounting for up to 40% of the plant's extract.^[5] CBD is considered to have a wider scope of medical applications than [tetrahydrocannabinol](#) (THC).^[5] An orally-administered liquid containing CBD has received [orphan drug](#) status in the US, for use as a treatment for [Dravet syndrome](#), under the brand name **Epidiolex**.^[6]





CBD helps modulate stress response

- Biphasic response
- LOW-Moderate dose
- Decreases stress
- Decreases anxiety
- Decreases moodiness
- Decreases repetitive worrisome thoughts



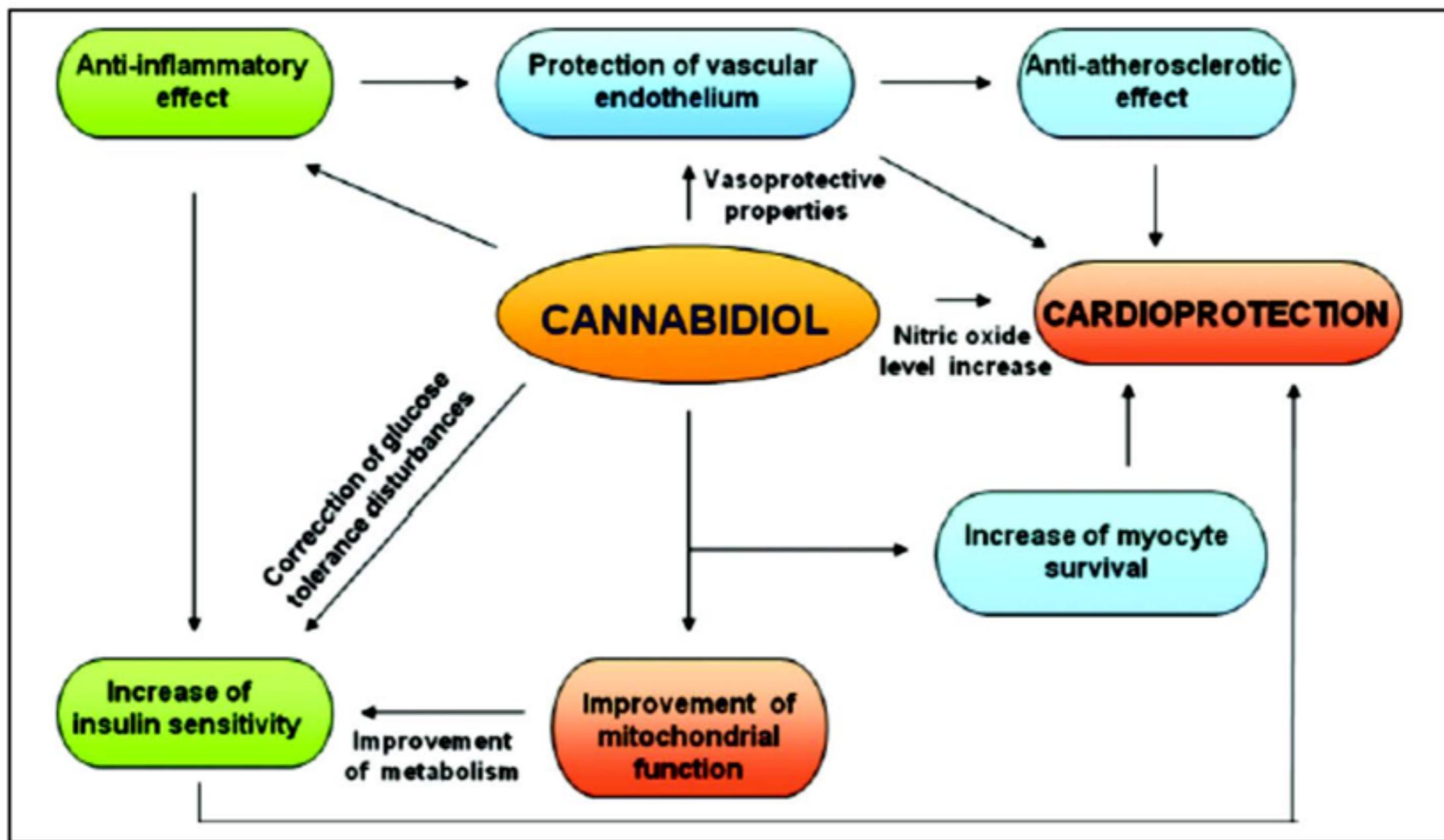


Fig. 3. Therapeutic potential targets of cannabidiol (CBD) in diabetes. CBD may exert beneficial effects against various diabetic complications by attenuating high glucose (inducing endothelial cell activation and inflammatory response), cardioprotection, increasing sensitivity to insulin, protection of vascular endothelium, improvement of metabolism, anti-inflammatory and anti-atherosclerotic effects.

FAAH, fatty acid amide hydrolase, is a membrane-bound enzyme which hydrolyzes and therefore terminates the actions of endocannabinoids, mostly **anandamide (AEA)**.

FAAH is expressed throughout the GI tract myenteric neurons

MAGL, monoacylglycerol lipase, is an enzyme mostly responsible for **2-AG** degradation

Palmitoylethanolamide (PEA) a novel endogenous fatty acid amide, belonging to the class of nuclear factor agonists.

Has no binding to CB1 or 2, but attaches to peroxisome proliferator- activated receptor alpha (PPAR- α) and cannabinoid-like G-coupled receptors GPR55 and GPR119.

Review Article

**Palmitoylethanolamide: A Natural Body-Owned
Anti-Inflammatory Agent, Effective and Safe against
Influenza and Common Cold**

J. M. Keppel Hesselink,¹ Tineke de Boer,² and Renger F. Witkamp³

¹ Faculty of Medicine, University Witten/Herdecke, Alfred-Herrhausen-Straße 50, 58448 Witten, Germany

² Department of Research and Development, Institute for Neuropathic Pain, Spoorlaan 2a, 3735 MV Bosch en Duin, The Netherlands

³ Division of Human Nutrition (Bode 62), Wageningen University, P.O. Box 8129, 6700 EV Wageningen, The Netherlands

Correspondence should be addressed to J. M. Keppel Hesselink; info@iocob.nl

Received 3 April 2013; Revised 9 June 2013; Accepted 10 June 2013

Academic Editor: Juan Carlos Kaski

Copyright © 2013 J. M. Keppel Hesselink et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Palmitoylethanolamide (PEA) is a food component known since 1957. PEA is synthesized and metabolized in animal cells via a number of enzymes and exerts a multitude of physiological functions related to metabolic homeostasis. Research on PEA has been conducted for more than 50 years, and over 350 papers are referenced in PubMed describing the physiological properties of this endogenous modulator and its pharmacological and therapeutical profile. The major focus of PEA research, since the work of the Nobel laureate Levi-Montalcini in 1993, has been neuropathic pain states and mast cell related disorders. However, it is less known that 6 clinical trials in a total of nearly 4000 people were performed and published last century, specifically studying PEA as a therapy for influenza and the common cold. This was done before Levi-Montalcini's clarification of PEA's mechanism of action, analyzing the role of PEA as an anti-inflammatory agent. We will review in depth these studies, as the results support the effectiveness and safety of PEA in flu and respiratory infections.

Dietary Cannabinoids

Dietary Cannabinoids = common food sources of ligands capable of binding to the CB receptors.

Example:

β -caryophyllene, a CB2 anti-inflammatory compound

Beta-Caryophyllene: The Dietary Cannabinoid That Could Make Synthetics Irrelevant

IN HEALTH · TECH — 12 NOV, 2013

Caryophyllene is approximately 30% of many hemp oil concentrates



Big Pharma



The cannabinoid that could erase decades of work is beta-caryophyllene (BCP). BCP is found in the essential oils of a variety of plants, including rosemary, hops, cloves and, of course, cannabis. It's also highly present in black pepper.

Beta Caryophyllene

A sesquiterpene found in the essential oil of **black pepper**, **oregano**, and other edible herbs, as well as in various cannabis strains and in many green, leafy vegetables.

It is **gastro-protective**, good for treating certain **ulcers**, and offers great promise as a therapeutic compound for inflammatory conditions and auto-immune disorders because it **binds directly** to the peripheral cannabinoid receptor known as “**CB2.**”

A September 2011 report by Dr. Ethan Russo in the British Journal of Pharmacology

Beta Caryophyllene is a powerful anti-inflammatory.

In 2008, the Swiss scientist Jürg Gertsch documented beta-caryophyllene's binding affinity for the CB2 receptor and described it as “a dietary cannabinoid.” It is the **only terpenoid known to directly activate a cannabinoid receptor.** And it's one of the reasons why **green, leafy vegetables** are so healthy for people to eat.

- **β -caryophyllene**, is a natural bicyclic sesquiterpene that is a **constituent of many essential oils**, especially **clove oil**, the oil from the stems and flowers of *Syzygium aromaticum* (cloves), the essential oil of **hemp *Cannabis sativa***, **rosemary *Rosmarinus officinalis***, and **hops**.

Caryophyllene is notable for having a **cyclobutane ring**, a *rarity* in nature, which provides it with its unique chemistry.

- **It is the ingredient drug dogs are trained to detect.**

- **Piperine (aka – bioperine)** is a powerful and complex agent of pepper and other plants. It may have EC complimentary activity.

Terpenes

Terpenes and terpenoids are the primary constituents of the **essential oils** of many types of plants and flowers.

Essential oils are used widely as natural flavor additives for food, as fragrances in perfumery, and in **medicine** and **alternative medicines** such as **aromatherapy**.

Synthetic variations and derivatives of natural terpenes and terpenoids also greatly expand the variety of aromas used in perfumery and flavors used in food additives.

Vitamin A is a terpene

- ◆ Around **200 terpenes** have been found **in cannabis**, but only a few of these odiferous oily substances appear in amounts substantial enough to be noteworthy, or nose worthy, as it were.
- ◆ The terpenoid profile can vary considerably from strain to strain.

Cannabinoids and the GI System

Cannabis has been used to treat conditions such as: emesis, gastric ulcer, abdominal pain, gastroenteritis, diarrhea, and various forms of intestinal inflammation

CB1 receptors are located predominantly in the excitatory motor neurons of the myenteric plexus, which regulate gut motility.

CB1 Receptors are also present in peripheral nerve fibers within the brain-gut axis, potentially influencing motility and secretion and modulate food intake and emesis (Duncan et al. 2005)

CB2 receptors are also expressed in GI epithelia, and can be unregulated by probiotic treatment or IBS (Izzo and Sharkey 2010; Wright et al. 2005)

CB1 receptor activation induces gut permeability .

IBD and Cannabis

A study of 30 Crohn's disease patients (26 males) and need for surgery before and after use of cannabis. (smoking marijuana)

Of the 30 patients, 21 improved significantly after tx with cannabis. The need for other medications was significantly reduced and the number of patients requiring surgery decreased during cannabis use (Naftali et al. 2011)

Gut microbiota composition is associated with intestinal ECS content and CB1 receptor mRNA expression.

CBD has shown to exert anti-proliferative effects in colorectal carcinoma cells. (Aviello et al. 2012)

THC relaxes the colon and reduces postprandial colonic motility and tone in humans (Esfandyari et al. 2007)

GERD: CB1 receptor antagonist, **rimonabant**, inhibited the meal-induced increase in transient LES relaxation, increased postprandial LES pressure leading to a lower number of acid reflux events, and increased the duration of distal esophageal peristaltic waves (Scarpellini et al., 2011)

Dietary fat including PEA and EFAs directly contribute to ECS tone.

PEA and CBD are natural occurring cannabinoids that act apart from CB1 and CB2 to reduce inflammation and reduce chronic pain.

The microbiome further regulates the net effect of dietary intake and regulation of ECS in ways which can either contribute to health or cause obesity, diabetes, and chronic systemic inflammation.

Administration of inulin-type prebiotics reduces endocannabinoid system tone through a endoxotin-dependent mechanism, thereby favoring improvements in fat and liver cell lipid load.

(Cani et al)

The EndoCannabinoid system plays a central role in regulation of glucose homeostasis and insulin sensitivity in several peripheral organs.

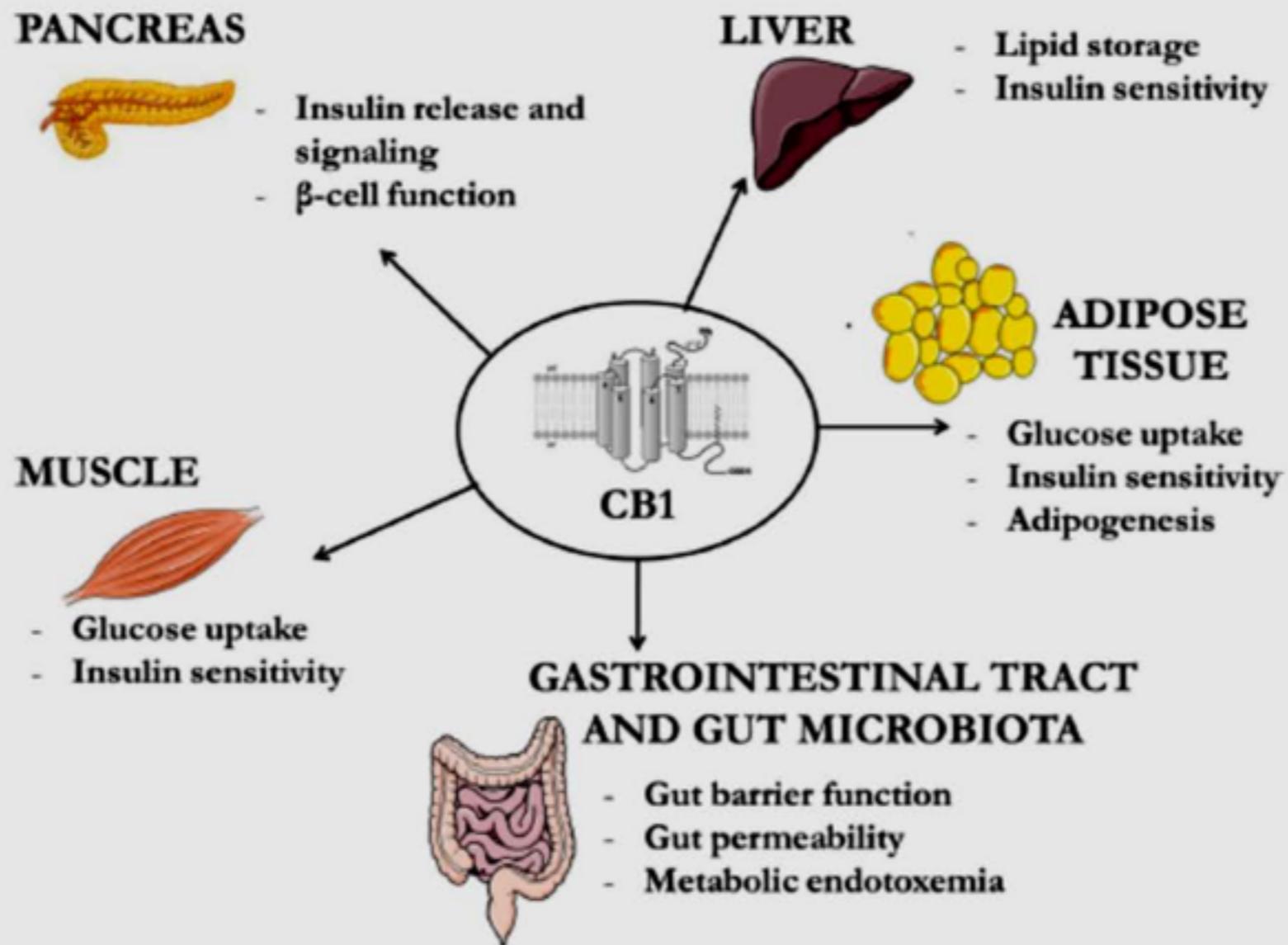


Fig. 3. The endocannabinoid (eCB) system and metabolism. This system plays a central role in the regulation of glucose homeostasis and insulin sensitivity in several peripheral organs. CB₁ receptor activation induces gut permeability. Gut microbiota composition is associated with intestinal eCB content and CB₁ receptor mRNA expression.

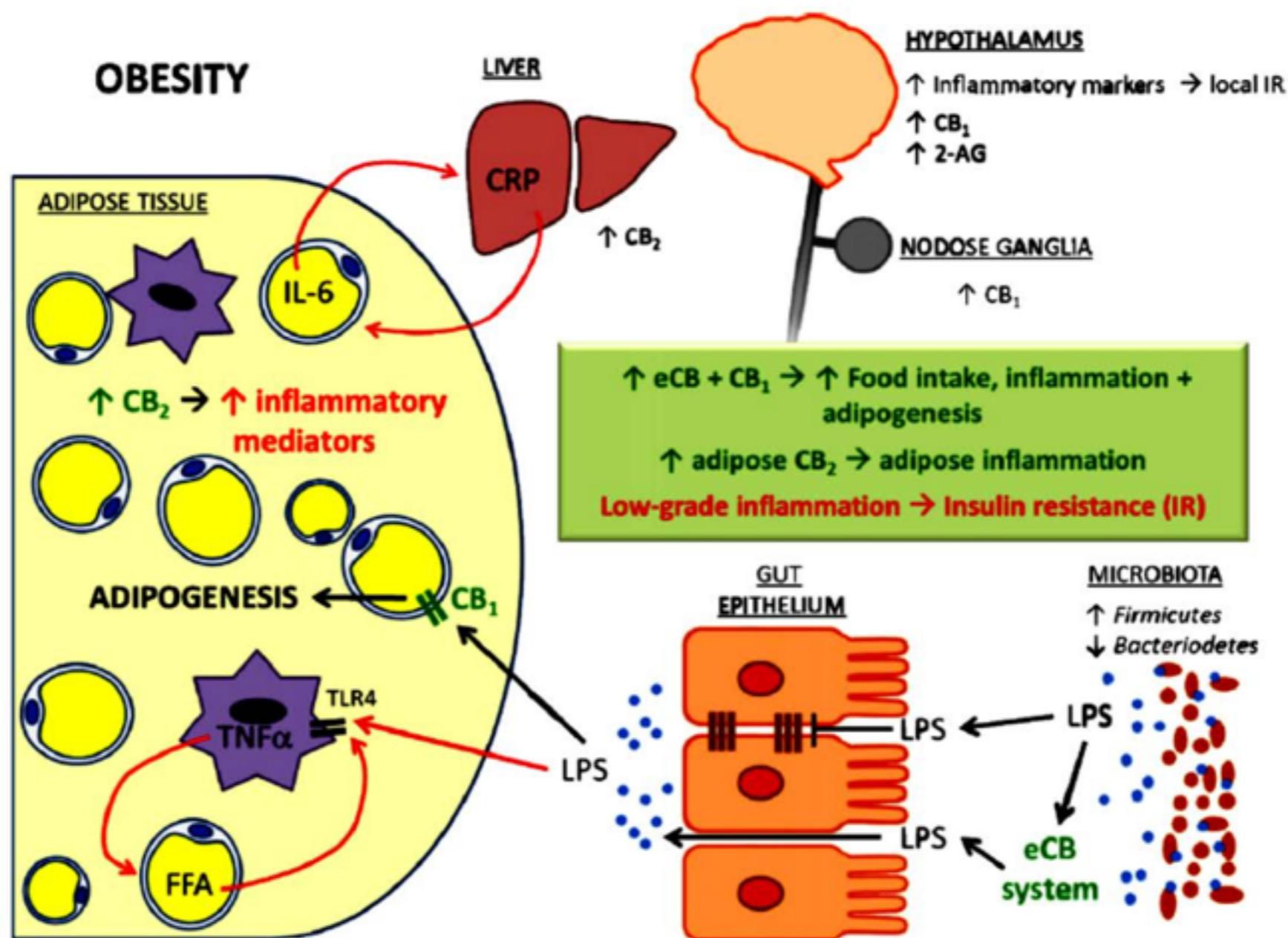


Fig. 1. Interactions between the endocannabinoid system and inflammatory mediators in obesity. Gut-microbiota alter intestinal permeability (directly or indirectly) and leakage of bacterial lipopolysaccharide (LPS) initiates inflammatory changes in adipose tissue and elsewhere. Enhanced expression of endocannabinoid tone in the liver, brain and adipose tissue exacerbates systemic inflammation and the development of obesity and its complications such as insulin resistance (IR). Intestinal barrier function is in part regulated by CB_1 receptors. Thus the endocannabinoid system through direct and indirect actions throughout the body controls the development of obesity and its systemic inflammatory complications.

Lifestyle Change to Enhance the ECS

“Many randomized controlled trials identified in this systematic review have been conducted on lifestyle modifications (e.g., exercise, maintenance of ideal body weight) and CAM interventions (e.g., dietary supplements, stress modification, acupuncture, massage and manipulation). **In our opinion these are sensible methods of enhancing the eCB system.** Preclinical studies identified useful prescription drugs, such as SSRIs, anxiolytics, antipsychotics, and anticonvulsants. However, these drugs are generally administered in a chronic fashion, and this comes with a caveat: generating chronic elevations in AEA and 2-AG may be counterproductive. **Faced with constant activation by agonists, CB1 and CB2 desensitize and downregulate.”**

Citation: McPartland JM, Guy GW, Di Marzo V (2014) Care and Feeding of the Endocannabinoid System: A Systematic Review of Potential Clinical Interventions that Upregulate the Endocannabinoid System. PLoS ONE 9(3): e89566. doi:10.1371/journal.pone.0089566

LEGAL CANNABIS?

DELIVERY SYSTEMS

EXTRACTION TECHNIQUES

NATURAL vs SYNTHETIC

NEW YORK MEDICAL CANNABIS LAW

QUALIFYING CONDITIONS

- Amyotrophic Lateral Sclerosis (ALS)
- Cancer
- Epilepsy
- HIV/AIDS
- Huntington's Disease
- Inflammatory bowel disease
- Parkinson's Disease
- Multiple Sclerosis
- Neuropathies
- Spinal cord damage

PATIENT POSSESSION LIMITS

30 day supply but only non-smokable preparations allowed

STATE-LICENSED DISPENSARIES

Yes, five producers of cannabis-based preparations and up to 20 dispensing centers to be licensed by the state.

Did You Know?

The first cannabis-based prescription medicine, **Sativex**, was launched in the **United Kingdom** on **June 21, 2010**.

Sativex is a mouth spray approved to treat spasticity in patients with Multiple Sclerosis. **Marinol**, a synthetic version of delta-9-THC, a chemical which appears naturally in the marijuana plant, was approved in the United States in **1985**.

DRUG - HERB INTERACTIONS

CBD is a potent inhibitor of the Cytochrome P450 enzymes, more so than Bergapten (Grapefruit)

This could have implication with blood thinners, chemotherapy, and epileptic medications

More research needed

10 Pharmaceuticals Based on Cannabis

Conditions ranging from inflammation, obesity, cancer, neuropathic pain, appetite stimulant, muscle spasticity, and more

Sativex

**Cannabinor
(formerly PRS-211,375)**

Dronabinol/Marinol

HU 308

Nabilone / Cesamet

HU 331

Dexanabinol

Rimonabant / Acomplia

CT-3 (ajulemic acid)

Taranabant / MK-0364

Everyone should
have a philosophy
for living
better.

Compay Segundo

THANK YOU

RobStreisfeld@gmail.com