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Cannabis: Its Benefits and Risks

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GH 401: Honors Thesis

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Abstract

Cannabis is a psychoactive drug that comes from the cannabis plant that has been used medicinally and recreationally for decades. With cannabis becoming legalized in more and more states, it is important to know its effects, whether they are good or bad. However, there are most benefits to using cannabis as its properties can help treat various diseases and conditions. Using cannabis can not only be beneficial to the individual who is using it but also to the state that legalized it. Various questions arise from cannabis use, including, how does it help manage pain or other conditions? What makes cannabis an anti-inflammatory agent? What does legalizing marijuana do for the economy? What are the health effects?

Keywords: Cannabis, Benefits, Health Effects, Legalized, Economy

Cannabis: Its Benefits and Risks

Introduction

Cannabis, marijuana, Mary jane, weed, pot, and grass, have many names and reputations to it. Nonetheless, Cannabis is a plant. Though it is just a plant it is very complex and has over 500 chemical entities. Out of those entities, between 80-100 of them are considered to be something called cannabinoids. The two main

cannabinoids in the

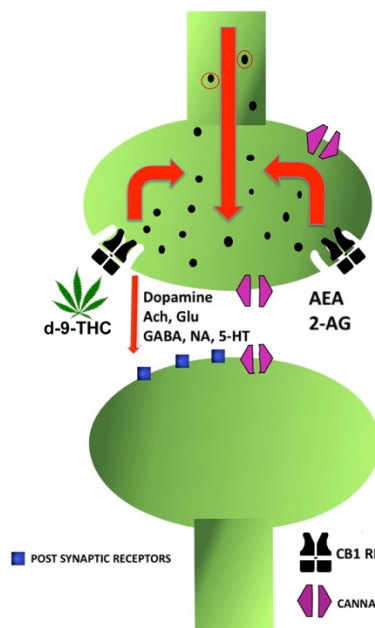
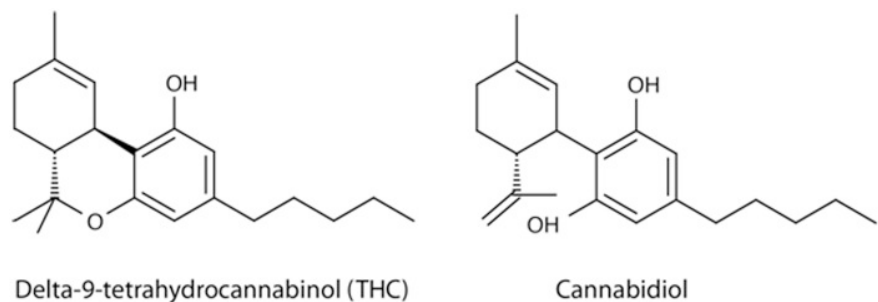
plant are delta-9-

tetrahydrocannabinol,

which is also known as

THC, and cannabidiol,

which is also known as CBD (Seppa, 2010). There are two cannabinoid receptors,



CB1Rs which are mainly in the brain, and CB2Rs

which are mainly in immune cells. When

cannabis is used, THC binds to CB1R and is not

picky in inhibiting neurotransmitters to release,

which is normally regulated by endocannabinoid

s like AEA and 2-AG. However, sometimes it is

not that simple because of the complex

interactions with other neurotransmitter

systems. CB1Rs and CB2Rs are members of a super family called G-protein-coupled

receptors or GPCRs. These receptors can sense an external molecule from outside of the nerve cell which leads to cellular responses. THC can activate these receptors, however, the mechanism of action for CBD is not clear since it does not bind to CB1Rs or CB2Rs (Okafor, et al., 2023).

The difference between CBD and THC is that CBD does not give you a euphoric or “high” feeling like THC does. CBD is also legal in all fifty states, unlike THC since it does not cause those euphoric effects. However, there are different restrictions depending on the state. The Farm Bill passed in 2018 made it impossible to keep CBD illegal since it made hemp legal in the United States (Grinspoon, 2021). Since it has become legal, CBD has become very popular, and people have come to realize all the benefits CBD has to offer.

The plant has two main subspecies named *Cannabis Sativa* and *Cannabis Indica*. *Sativa* and *Indica* can be differentiated by their physical characteristics, as well as their psychological effects. *Cannabis Sativa* has a much higher THC content and has taller thin leaves that are usually a pale green color. *Cannabis Indica*, on the other hand, has a higher CBD content and has short, broad, dark green leaves. Even though the major compounds of the two are similar, they have different pharmacological effects. *Sativa* has more of an uplifting, energizing effect, whereas *Indica* has a calming effect (Atakan, 2012).

Cannabis has been around for over 12,000 years, originating in Central Asia near the Altai Mountains, as well as Southeast Asia. *Cannabis* was mostly used for its

fibers to produce ropes and nets for food and seeds. After finding out the euphoric effects of cannabis when it is heated, humans shifted from gathering to cultivating cannabis. India also has strong ties to the history of cannabis. Some myths in India consider cannabis a divine ingredient, and is considered a medicine to reduce pain, anxiety, and nausea, as well as improve sleep and appetite, and relax muscles (Crocq, 2020).

As the years go on, cannabis is used and talked about more. However, there are still many stigmas around cannabis and those who use it. Many people assume that individuals who use cannabis are lazy and do nothing with their lives. There are many cannabis stereotypes including that it is a gateway drug, cannabis users are hippies, unproductive, and always high. However, cannabis can be very beneficial to many different people. Cannabis has anti-inflammatory effects, it can help with anxiety, pain, sleep issues, and a variety of other things.

With the frequent talk about legalizing marijuana, it is important to know its effects. Cannabis can have many effects on the body, most of which have a beneficial effect. Over the past decade, the stigma around smoking marijuana has gotten smaller and people started to realize the good that it does. However, a lot of people still do not realize its benefits and still have questions about what cannabis actually does, and its legalization. Major questions many individuals have about cannabis are, how does it help manage pain or other conditions? What makes cannabis an anti-inflammatory

agent? What does legalizing marijuana do for the economy? What are the health effects?

Cannabis: Pain and Disease Management

Cannabis has been used as a medicinal plant for more than two millennia. Cannabis was even available as a legal, licensed medicine in the United States for almost a century until the American Medical Association removed it when they published the twelfth edition of the *U.S. Pharmacopeia*. It was also fully legal until 1937 when the Marihuana Tax Act of 1937. However, as of 1985, when pharmaceutical companies got approval to start developing THC preparations, nabilone, and dronabinol for therapeutic use. As of today, research has been done to show how cannabis helps with many conditions. Conditions in which cannabis may help include, but are not limited to chronic pain, cancer, nausea and vomiting from chemotherapy, epilepsy, anorexia, irritable bowel syndrome, weight loss from HIV, Huntington's disease, Tourette syndrome, spasticity, amyotrophic lateral sclerosis, Parkinson's disease, dystonia, sleep disorders, traumatic brain injury, dementia, glaucoma, posttraumatic stress disorder, addiction, anxiety, depression, schizophrenia, and other psychoses. However, maintaining and treating chronic pain is the most common condition to treat with medical cannabis. Of the three studies that were researching marijuana's effects on pain, all three showed that cannabinoids have a modest effect on pain when smoked or vaporized (National Academies of Sciences, 2017). Other studies have also shown that cannabis use can effectively treat cytostatic-induced

nausea and vomiting, anorexia and cachexia in HIV/AIDs, bladder dysfunction in MS, tics, and levodopa-induced dyskinesia in Parkinson's disease (Grotenhermen, 2012). A lot of people with a disease such as AIDS/HIV or cancer can experience side effects like nausea, vomiting, pain, and anxiety. However, studies show that the use of cannabis can be a way to eliminate those side effects. Due to the active compounds within cannabis, cannabinoids influence a variety of physiological processes and biochemical pathways. This can be a potential site of action for new specific drugs (Noonan, 2015). Knowing this information, in states where cannabis is legal, doctors would be able to essentially prescribe cannabis for patients who are suffering from these side effects or conditions.

Cannabis is also known for its ability to reduce the feeling of anxiety. There have not been many studies done on humans, but there has been a lot done on mice. However, there was a study done by the Journal of Psychopharmacology suggests that cannabis does reduce anxiety in people who have been diagnosed with a generalized social anxiety disorder (SAD). SAD is a common disorder in which a person has an intense fear in most social settings, including something as simple as social interaction, to performing in front of others. People who have SAD fear that they are being judged or humiliated which gives them anxiety. In the study, there was a group that received 400mg of CBD, and another group that received a placebo. According to the study, the group that had the CBD showed "significantly decreased subjective anxiety, reduced ECD uptake in the left parahippocampal gyrus, hippocampus, and

inferior temporal gyrus, and increased ECD uptake in the right posterior cingulate gyrus” (Crippa, 2011) With these results, it suggests that due to the effects cannabis has on the paralimbic and limbic areas of the brain, it can reduce anxiety in SAD. With cannabis being able to reduce anxiety in those with generalized social anxiety disorder, it would also be able to help people with other types of anxiety as well.

Cannabis is also very helpful in helping people sleep. Sleep disorders such as insomnia make it difficult for a person to fall asleep and stay asleep. Insomnia is a very common sleep disorder that affects up to seventy million Americans each year. Many people who suffer from insomnia find it difficult to find something that helps them get a good night’s sleep. In spite of this, new studies over the past few years have linked cannabis use and having a better night's sleep. A study has shown that if someone takes a medium to high dose of cannabis before bed, then the time spent in REM sleep is increased (Gutierrez et al., 2022). However, if a person were to take a medium to low dose of cannabis before bed, then the time spent in REM sleep is decreased. REM stands for rapid eye movements and being in REM sleep means a person is in the stage of sleep in which their eyes are moving rapidly, their pulse increases, they start breathing faster, and this is also where people dream. If a person wanted to have a better night’s sleep, then they would want to be in the REM stage of sleep for as long as possible. Since taking medium to high doses of cannabis increases the amount of time spent in REM sleep, it would help people sleep better throughout the night.

There have also been studies done to see if cannabis is an effective alternative to using opioids. Due to the opioid epidemic, the medical field has been trying to find something other than opioids that help chronic pain. Cannabis has an active chemical, phytocannabinoids, that affects the body in many ways if it is combined with the receptor. THC attaches to cannabinoid receptor 1, while CBD attaches to multiple receptors (CB receptors, transient receptor potential vanilloid 1, serotonin 5-HT1A, and G protein-coupled receptor 55 (Villanueva, 2022)). Most cannabis-based products and medications get their effects through the activation of CB1 and CB2 cannabinoid receptors. Not only is cannabis an effective way to treat various diseases and conditions but there are also not any major side effects. The most common side effects, which more than 10% of patients have been, tiredness, dizziness, psychological effects, and dry mouth. Also, people are able to build a tolerance to these side effects fairly quickly, and withdrawal symptoms are rarely a problem in a therapeutic setting (Grotenhermen, 2012).

Cannabis: Muscle Inflammation

On top of treating a variety of diseases and conditions, it can also treat muscle soreness and inflammation. After exercising, it is common to get a sore sensation afterward which is called delayed onset muscle soreness or DOMS for short. DOMS is a mild injury; however, it can still make a person uncomfortable doing simple tasks throughout the day. If a person has DOMS, then they might experience inflammation,

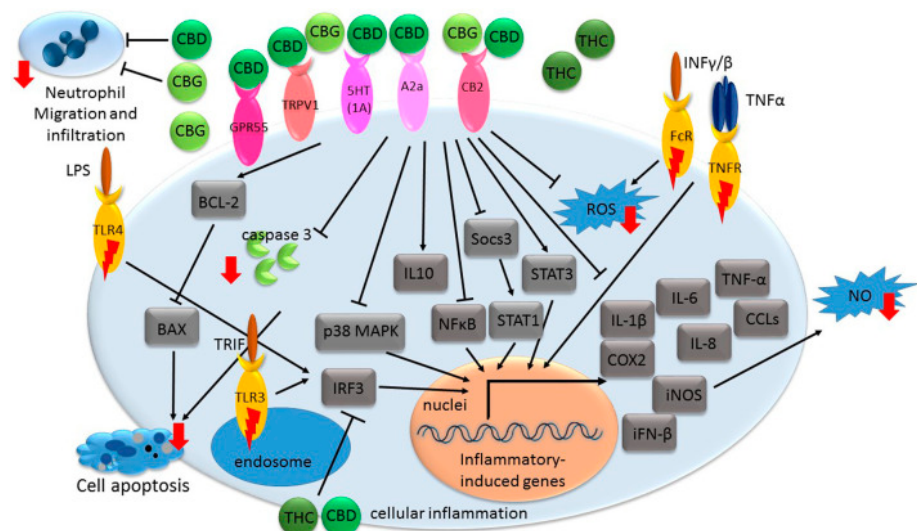
more pain while moving, dysfunction of nearby muscles, and decrease force capacities. There was a study done by the International Journal of Physical Education, Sports and Health that tested the effects that cannabis oil has on delayed onset muscle soreness. According to the results of that study, the group that consumed cannabis oil immediately after exercising showed a significant reduction in DOMS compared to the group that consumed a 1 mL dose of MCT oil or nothing. The two other groups also did not show a great difference between any other reported period and the previously reported score. However, the group who had the cannabis showed significantly different scores at the post-EIMD (exercise-induced muscle damage), twenty-four hours post-EIMD, forty-eight hours post-EIMD, and seventy-two hours post-EIMD (Hatchett, et al., 2020). These results prove that if a person were to use something like cannabis oil immediately after exercise, they tend to be less sore up to three days (seventy-two hours) after they exercise, as opposed to when one does not use cannabis oil.

If an individual uses cannabis, the cannabinoids downregulate cytokine and chemokine production. This then causes an upregulation of T-regulatory cells (also called Tregs), which acts as a mechanism to suppress inflammatory responses. In one study, both anti-inflammatory and pro-inflammation effects of THC were demonstrated. They proposed that different cell populations have different thresholds as a response to cannabis. The study revealed that during chronic inflammation, interleukin (IL-6) is suppressed which can cause a decrease in tissue injury. The study

also suggests that ajulemic acid (AjA), which like IL-6 is increased when smoking marijuana, can treat joint inflammation in individuals with systemic lupus erythematosus, osteoarthritis, and rheumatoid arthritis. Not only are there more anti-inflammatory properties, but there are also less pro-inflammatory properties (Nagarkatti, et al., 2009). This study shows what about cannabis makes it an anti-inflammatory agent.

The endocannabinoid system is a modulator of immune system activity and the dysregulation of it can be involved in many different chronic inflammations. Cannabis

makes a large number of phytocannabinoids and other biomolecules such as flavonoids and terpenes. Studies



show that phytocannabinoids, such as THC, CBD, and cannabigerol (CBG), display activity against inflammation. These various phytocannabinoids can bind to the endocannabinoid system and enhance many inflammatory-related diseases due to it being activated by several signaling pathways (Anil, et al.).

Economic Benefits of Legalizing Cannabis

Over recent years more and more states have started to legalize marijuana use, both medicinally, and recreationally. Due to the tax that is applied to cannabis products being sold at a dispensary, the state is able to benefit. The recreational cannabis tax in Illinois varies from ten percent on products with less than thirty-five percent THC, twenty percent on products that are infused with cannabis, and twenty-five percent on products with a THC concentration higher than thirty-five percent (*Cannabis Tax, n.d.*). Although not all states that have recreational marijuana have as high of a sales tax as Illinois, they still receive tax money on the cannabis products being sold.

As of 2021, thirty-six states, as well as four U.S. territories, have legalized medical cannabis use, and fifteen states, including the District of Columbia, have legalized recreational cannabis use (French, et al., 2022). When Colorado legalized recreational marijuana in 2014, the state made a significant amount of monetary tax revenue from the sales of cannabis. In 2015, Colorado was able to reach almost one billion dollars in sales at dispensaries across the state. From the one-billion-dollar sale, the state was able to make more than one hundred and thirty-five million dollars in taxation fees and revenue. The taxes earned from the sale of cannabis products are then used to fund things such as the state's public school capital construction fund, and various other public programs such as substance abuse programs (Hajizadeh, 2016). This shows that legalizing cannabis does not only benefits the individual using the product, but also the states that legalized it.

Not only does legalizing cannabis have benefits to the states via taxes, but it also opens up employment opportunities. When a state legalizes marijuana, marijuana farms, processing plants, and dispensaries start opening up around the state. With these facilities opening around the state, that opens up work opportunities for those who need it. Also, with the increase in dispensaries and access to legal cannabis, it decreases the amount of illegal, unregulated cannabis that is being sold on the streets (Hall, 2020).

Risks of Cannabis

Although there are many benefits to using cannabis, there also comes with some risks while using it. Due to the act of smoking, cannabis is similar to smoking a cigarette, which means it is not good for the lungs and can lead to lung cancer. Along with lung cancer, cannabis can also lead to a dependence, other respiratory conditions, and psychosis. The most prevalent risk in smoking cannabis is causing a dependency to form. Using cannabis frequently could cause you to have to lean to it in order to complete everyday tasks. Since cannabis use impairs cognition, it can also cause a risk of traffic accidents if driving after use, including fatal accidents (Karila, et al., 2014). Also, due to the benefits that cannabis can possess, there can be a sense of false beliefs about the therapeutic effects of cannabis. Due to seeing various benefits on social media or elsewhere on the internet, individuals are susceptible to believing misinformation about cannabis. Although there are known risks of consuming and

using cannabis, there have only been a few studies that actually compare the specific health risks of using cannabis. A majority of the research that has been done on the risks of cannabis have been surveys rather than studies (Goodman & Hammond, 2022). Since there has not been many scientific studies and mostly research done on studies, there is not much known about the definite risks of using cannabis.

Conclusion

Cannabis can be used for many purposes, especially for conditions such as chronic pain, inflammation, sleep disorders, anxiety, and various other diseases and conditions with few risks of using it. On top of being beneficial to the individuals using the plant, but the states in which legalized cannabis are also benefiting. According to the research done, cannabis is an effective alternative to opioid use due to its effectiveness of helping treat pain and inflammation. Also, due to the economic benefits, legalizing cannabis would be beneficial to the states as well as the population. Even though cannabis has many benefits, there are some risks that have been associated with using cannabis. Although not a lot of those risks have been proven by research, besides its effect on the lungs since all smoking is bad. However, if an individual does not smoke cannabis and ingests it instead, that takes away the negative effects on the lungs. In conclusion, the legalization and use of cannabis can be beneficial to everybody, from the individuals who use it, to the individuals who legalize it.

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