

James Coppa

# Introducing Medical Marijuana



**The Complete Science Behind  
The Effect Of The Plant In Treating  
Diseases, Medical Protocols And  
Its Influences In The Longer Run**

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# **Introducing Medical Marijuana 2 In 1**

The Complete Science Behind The Effect Of The  
Plant In Treating Diseases, Medical Protocols And  
Its Influences In The Longer Run

By

James Coppa

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# **Marijuana Secrets**

5 Life-Altering Medical Benefits Of Medical  
Marijuana No Doctor Will Ever Tell You  
About

By

James Coppa

# Introduction

Human beings are plagued by numerous health issues, usually as a result of their genetics and their interactions with the environment. Fortunately, medicine has evolved enough to help treat and even cure various diseases. Even so, certain conditions –such as cancer, Crohn’s disease, Alzheimer’s disorder, multiple sclerosis, glaucoma– still defy conventional medical intervention. As studies progress in the search for a cure, several medications have been developed to help treat the symptoms of incurable diseases, although they still have major limitations and adverse effects. This has led many to seek alternatives to improve the quality of life of patients.

In the past decades, several pieces of research have been conducted that points to the potentials of cannabis as one such alternative. The active chemicals present in marijuana are cannabinoids that are very similar to those naturally produced in our body to regulate appetite, movement, memory, among other functions. It has been discovered that the interaction between cannabis chemicals with various body systems makes them quite effective in the treatment of a long list of conditions.

Bonn Miller (2018), a renowned medical researcher, said, “The highest amount of proven fact for the therapeutic effects of cannabis relates to its ability to reduce chronic pains, nausea, and vomiting due to chemotherapy and spasticity (tight or stiff muscles).”<sup>[63]</sup> These are symptoms debilitating to patients, but for which the medications available have proven to be ineffective. The ultimate advantage that medical cannabis offers is that it can deal with all these symptoms at the same time.

Most people regard marijuana as a harmful substance that worsens conditions. Usually, it is because they have been told more about its adverse effects than its capacity to help in coping with a wide range of health challenges. The facts presented in this book attempt to correct this perception. The book is not meant to take the place of the sound medical advice that your physician should provide. Instead, it focuses on changing the narrative about marijuana. By providing solid scientific information gathered from renowned experts and studies, it explains how cannabis can

provide relief for the health conditions mentioned above as well as many others.

Before delving further into the book, I recommend taking a minute to set it aside everything you've heard about marijuana for the time being. Reading through these pages, you will learn some novel, interesting things about medical marijuana that might change your perception of it. As it happens with many controversial subjects, we make the most of their benefits when we approach them unbiased.

So why wait any longer? Real, effective solutions that will mitigate your suffering, or that of your loved ones, can be found within these pages. Understand how it is exactly that marijuana works with your body to help it heal and alleviate pain. Learn which strains work better for which symptoms, and what are the recommended means of administration. Start reading right away to discover effective means to improve your or your loved one's quality of life.

# Chapter 1: What Is Cannabis

Cannabis or marijuana is a greenish-gray mixture of the dried flowers of the cannabis Sativa plant. The cannabis plant has leaves that are bright green. They have a distinctive shape with 5 or 7 leaflets. The upper leaves and flowering tops of the cannabis plant have a covering of sticky resin. Cannabis sativa plant grows in the wild in the warm & tropical climates of the world. It is also commonly cultivated in commercial quantity.

Marijuana is one of the most common psychoactive substances in the world. It is known by several names such as weed, herb, pot, grass, bud, ganja, Mary Jane, and a vast number of other slang terms. CBD and THC are two of the most popular components of marijuana. However, it contains hundreds of other active compounds with a wide range of effects.

Marijuana can be taken in different ways, depending on the preferences of the users and their current state of health. This can be done by chewing, applying as a balm, brewing as a tea, chewing in edibles like chocolate bars, cookies, and candies and inhaling through a vape pen or hand-rolled cigars among other methods <sup>[40]</sup><sup>[31]</sup> .

Cannabis is consumed mainly for its calming and relaxing effects. It is also prescribed for a wide range of medical conditions. Generally, the use cases of marijuana are broadly categorized as either recreational or medicinal.

## Recreational Marijuana

Marijuana has both physiological and psychoactive effects when consumed. The immediate effects of the consumption of marijuana are euphoria and relaxation. This feeling is commonly described as being “high” or “stoned”.

The recreational use of marijuana involves taking cannabis to attain this feeling for the purpose of stress relief, enjoyment, and creative stimulation. The effects of such states include alteration of the user’s conscious

perception of himself and his environment, heightened sensations, distortion in the perception of space and time, among other effects.

## **Medical Marijuana**

Medical marijuana refers to the use of cannabis and its constituents in the treatment or improvement of disease symptoms. As you will later find out in this book, Cannabis has served a medicinal purpose for several centuries. However, the fact that it is currently classified as an illegal drug by many governments and the limitations placed on its production has limited research into the efficacy of cannabis in disease treatment. Still, there are some pieces of evidence to support the use of cannabis in reducing nausea or vomiting, improving appetite, treatment of chronic pain, control muscle spasm, and its use during chemotherapy.

Currently, marijuana and its cannabinoids are listed as Schedule 1 controlled substances by the United States Drug Enforcement Administration (DEA). This means that according to federal law, no one is allowed to prescribe, possess, or sell marijuana, whether for recreational or medical purposes. The United States Food and Drug Administration also does not approve the use of crude or whole marijuana for medical use.

However, the use of marijuana in the treatment of some medical conditions has been declared legal by several states in the United States. 33 states, 4 out of 5 permanently inhabited territories and the U.S. District of Columbia already permit the use of marijuana on doctor's recommendations. Similarly, 11 states permit the recreational use of marijuana. They include Alaska, Maine, Illinois, Massachusetts, Washington, Michigan, California, Colorado, Oregon, Vermont, and Nevada. Some countries such as Canada, South Africa, Uruguay, and Georgia also permit the use of cannabis for both recreational and medical purposes.

## **What Are Cannabis Strains?**

The cannabis plant is believed to be originally native to Central Asia. However, after several centuries, the plant can now be found in almost every continent of the world. It is commonly cultivated in commercial quantity, which means cultivators take their time to selectively grow the plant, based on the specific needs of their communities. Over time, cultivators have developed variations of the plant, affecting its qualities and features. These variations are referred to as the landrace strains of cannabis.

However, since their introduction to the west from their native habitats, the landrace strains have been crossbred by horticulturists to explore and improve the plant's potentials. This crossbreeding has led to the development of three main varieties or strains of the cannabis plant. The three major cannabis strains are cannabis Indica, cannabis Sativa, and hybrid. Not only do these plants have specific shapes, structures, and features that distinguish them, they also have varying effects on users as well. The characteristics of each strain vary significantly from grower to grower in terms of aroma, appearance, possible effects, and other contents.

In this light, a strain is often marketed based on its unique characteristics. Also, these popular cannabis strain groups are distinctive and help provide a structure to understand marijuana and its entire effect better. Here is an overview of the most popular cannabis strains and how they work from a medical standpoint.

## **Sativas**

Sativas are typically tall plants with thin leaves. They produce an invigorating feeling and are known to uplift a user's mood. Thus, they are mostly recommended for use for social gatherings, creative projects, and other daytime activities that require energy and alertness.

## **Indica**

Indica is a compact plant with broad leaves. Ideal for relaxation, and

usually associated with more bodily sensations. As a result, they are mostly recommended for individuals who need a nighttime relaxation drug.

## **Hybrid**

A hybrid strain is a balanced crossbreed between Sativa and Indica. Thus, it displays the effect of both. It's recommended for individuals who want a balance between euphoria and relaxation.

Bear in mind that this classification is based mainly on widespread user perception of each strain and marketing purposes. There is still limited research to support this effect-based classification of marijuana strains.

Furthermore, it is important to note that there may be differences in how each individual respond to cannabis. This has been shown by several clinical experiments, such as a recent study published in the Scientific Reports Journal. The research led by Steven Laviolette (Ph.D.) of the Schulich School of Medicine and Dentistry gave insights into how cannabis can produce diverse psychological effects in different people. Hence, the kind of cannabis strain you choose mainly depends on the kind of effect you desire.

Today, instead of using the popular strains for the classification of cannabis, experts now classify various strains of marijuana based on the THC and CBD composition. For example, cannabis with a high THC but low CBD content is believed to produce a euphoric effect while one with a high CBD but low THC content. Similarly, marijuana with a balanced or equal CBD and THC composition is believed to only be mildly euphoric <sup>[5]</sup>. Understanding the various marijuana strain and Chemotypes this way is important whether you intend to use cannabis for recreational or medicinal purposes since each strain has unique effect profiles and medical benefits.

## **How Is Cannabis Consumed?**

Although smoking remains the most common way in which people consume cannabis, it is obviously not the only one. There are various delivery methods for both recreational and medical use of marijuana. This is mainly because cannabis comes in different forms. However, the method of consumption depends largely on individual preferences <sup>[48]</sup> .

### **Smoking**

The most common way people take marijuana is to roll it into a cigarette (also called a “joint”) and smoke it. Ancient Asians, Africans, and middle-easterners used Hookah’s to smoke marijuana as early as the 16<sup>th</sup> century. While modernized versions of these ancient devices are still in use, they are less common today.

Today, people typically smoke through a pipe or a bong, a device that filters marijuana smoke through a liquid before it is inhaled by the user. Another common method of smoking cannabis is through a blunt. This is a regular cigar that has been hollowed out, and the tobacco has been partially or completely replaced with marijuana. It is also possible to smoke marijuana using mini-bongs (also known as bubblers that are about the same size as a pipe).

### **Vaping**

Vaping involves heating marijuana to a temperature just below its point of combustion. This way, the active ingredients are released but without burning the plant material up. Although vaping is a relatively new way of consuming marijuana, it has become quite popular for various reasons. Users who prefer vaping claim that it produces greater euphoric effects than regular smoking and that it is devoid of the typical marijuana smell. However, the scientific verdict is still out on e-cigarette and vaping products as there are some concerns about their effect on the health of users.

## **Dabbing**

Similar to vaping, dabbing involves inhaling vapor as well. However, in this case, the vapor is from oil, resins, or concentrates extracted from the marijuana plant rather than the leaves. A bong or glass pipe heated with a blowtorch is used to create the vapor. Dabbing is believed to produce more smoke than when marijuana is smoked directly. Also, because a butane lighter is used, there are concerns about exposure to potentially toxic substances like benzene and methacrolein in the process of dabbing.

## **Oral Ingestion**

Oil extracted from the cannabis plant can be used in baking or cooking various types of food. Oral ingestion of cannabis is common among both medical and recreational users of marijuana as vendors now incorporate marijuana into edibles like cookies, ice cream, granola bars, gummy bears, and so on. Marijuana oils can also be added to teas, beer, and sodas. The general perception is that ingesting marijuana through edibles is less harmful than other methods. However, research seems to suggest the opposite, since cannabis overdose is more frequently connected to consumption in treats <sup>[43]</sup> .

Another modernized method for consuming marijuana is topical oils, which are applied directly to the skin. Here, infusions of THC and CBD are put in sprays, where marijuana tinctures are mixed with water, alcohol, or other solutions. The main reason to use this method is to avoid the potentially harmful effects of smoking, especially when used for medical purposes.

## **Chapter 2: Why Marijuana Became A Friend Of Medical Science**

In recent times, the debate to allow the use of marijuana for medical purposes has grown louder. Thankfully many U.S. states have now legalized both the medical application and recreational use of cannabis. But several centuries ago, long before the struggle for its legality began, marijuana has been used mainly in the treatment of pain and other medicinal purposes.

As far back as 5000 years ago, Shen Nung, a Chinese emperor, used to prescribe cannabis for the treatment of symptoms of malaria, beriberi, rheumatism, menstrual cramps, and constipation. Marijuana is believed to have been widely in use in ancient India for relieving dysentery and lowering fevers. The miracle drug was considered a gift from the gods.

More recently (in 70 A.D.) Pedacius Dioscorides, a Roman physician, recommended cannabis for the treatment of earache and for elevating libido. A report from 1854 issued by the United States Dispensary described the extract of the cannabis plant as a potent aphrodisiac. It also appraised its potentials in boosting appetite, improving sleep, treating spasm, and relieving pain.

However, while it seems marijuana fared well in the ancient past, the present hasn't been so kind. In the 1930s, marijuana was made illegal by U.S. congress despite the objection of the American Medical Association. Congress declared marijuana illegal at the time based on the grounds that "there is positively no evidence to indicate the abuse of cannabis as a medical agent or to show that its medicinal use is leading to the development of cannabis addiction.

In the 1970s, marijuana was classified under schedule I, for drugs with a high potential for abuse and no medical use. However, in the same decade, marijuana became recognized for helping treat glaucoma and nausea and vomiting in patients undergoing chemotherapy. It was mainly due to this antiemetic property of cannabis that it was adopted in the treatment of

AIDS patients as well <sup>[34]</sup> <sup>[52]</sup> .

In recent years there has been a growing call to make the use of cannabis for medical purposes legal. The term medical cannabis is today used to describe physician recommended usage of marijuana and its components (notably cannabinoids) in the treatment of diseases and the improvement of symptoms.

The most commonly cited use case for medical cannabis is chronic pain, although research has shown its possible application for other purposes as well. Cannabis, at present, is already being used for medicinal purposes in 33 U.S. states, and more and more states are working towards legalizing medical marijuana.

## **How It Works**

When you inhale cannabis smoke or ingest it through any other method, chemicals are released into the body. Two of the major active ingredients in cannabis are THC and CBD. THC is so potent that it reaches the brain in mere seconds after it gets into the body, and its effects can be felt almost immediately.

The effects of marijuana on users vary from one person to the other. However, most people report an initially mellow and relaxing feeling commonly accompanied by light-headedness and haziness. As mentioned earlier, the effects may vary based on the cannabis strain as well. In addition to these physiological effects, users may also experience some cognitive effects as well. All of the effects of marijuana use are caused by the interaction of its component chemicals with the brain.

To fully understand how marijuana affects the brain, it is important to understand how the brain works. Information received by the brain is processed by specialized cells known as neurons. Neurons communicate with each other through chemicals called neurotransmitters.

Neurotransmitters bind to protein receptors on the neurons in order to control various brain and body functions.

Neurons in the brain have groups of cannabinoid receptors that control various functions such as short-term memory, learning, coordination, and problem-solving. These cannabinoid receptors respond to neurotransmitters produced naturally by the body. These natural neurotransmitters are weed-like chemicals produced by the endocannabinoid system that has long been identified by scientists <sup>[21]</sup> .

Medical marijuana is believed to be able to interact with the body's endocannabinoids by either mimicking, enhancing, or blocking them. It is this interference of chemicals in marijuana with the brain's neurons that causes the effects of cannabis on the body and mind.

In 2018, Dr. Laura M. Borgelt, a professor at the University of Colorado and a medical marijuana expert, presented a medical research update on the effects of marijuana and its component. Her research gives some insights into how marijuana affects the body and why it is so effective for various medical uses.

The study conclusively reveals that cannabis is effective in the treatment of chronic pain in adults. Medical marijuana was also found to be useful in Patient-reported multiple sclerosis and as antiemetics in the treatment of chemotherapy-induced nausea. There is also moderate evidence to suggest that cannabinoids (mainly Nabiximols), are effective in improving short-term sleep in patients with “sleep disturbance associated with obstructive sleep apnea, fibromyalgia, chronic pain, and MS.”

However, there is limited evidence for the effectiveness of oral cannabinoids or cannabis in increasing appetite and decreasing weight loss associated with HIV/AIDS or in improving symptoms of Tourette syndrome. The study was also unable to fully prove that cannabis can help with effectively treating anxiety symptoms in individuals with social anxiety and symptoms of PTSD. Other findings from the 2018 research include:

- Limited evidence to support better outcomes (i.e., mortality, disability) after a traumatic brain injury or intracranial hemorrhage. There's also limited evidence that cannabis is ineffective in improving symptoms of dementia (cannabinoids), intraocular pressure associated with glaucoma (cannabinoids), reducing depressive symptoms in individuals with chronic pain or MS.”
- No or insufficient evidence to “support or refute that cannabinoids is effective for cancer-associated anorexia-cachexia syndrome and anorexia nervosa, cancers, including glioma, irritable bowel syndrome, epilepsy, spasticity in patients with paralysis due to spinal cord injury, chorea and certain neuropsychiatric symptoms associated with Huntington’s disease, symptoms associated with amyotrophic lateral sclerosis (ALS), Parkinson’s disease or levodopa-induced dyskinesia, dystonia, treatment for mental health outcomes in individuals with schizophrenia or schizophreniform psychosis or achieving abstinence in the use of addictive substances.”

Furthermore, her research revealed the potential effects of short-term marijuana use to include: Impaired short-term memory, motor coordination, altered judgment, paranoia, and psychosis (for high doses).

Similarly, the possible effects of long-term use of cannabis included 9% overall addiction. Moreover, if used from adolescence, it can lead to altered brain development, cognitive impairment, poor educational outcome symptoms, diminished life satisfaction and achievement, chronic bronchitis, and increased risk of chronic psychosis disorders

In conclusion, marijuana does affect the human body with both beneficial effects and some risks, depending on the frequency, the dose, and the manner in which it is used. Medical researchers are focusing on the beneficial effects of the plant in combating a wide range of diseases and symptoms.

## **Chapter 3: The Most Known Healing Properties Of Cannabis**

Cannabis can be found in different forms, and its healing properties are renowned <sup>[54]</sup> . Some of the most notable healing properties of cannabis include:

### **Pain Reliever**

Perhaps the most notable reason for the widespread advocacy for the legalization of marijuana is because of its ability to treat various forms of pain. This is also the major reason why it has been legalized in certain states and countries of the world. THC and CBD are the two most active compounds in marijuana, and they are responsible for its analgesic/healing effect <sup>[23]</sup> <sup>[31]</sup> . Marijuana, when taken in the right dosage, has proven to be quite effective in relieving pain, particularly chronic pain.

Pain is a foreboding of disease, the symptom that tells all is not well with our body. There is no actual medicine for certain types of pain. Thus, the search for a new and effective pain reliever. Pain may be chronic or recurring, or it can happen in a single occurrence - either when you're ill, giving birth, or are injured <sup>[6]</sup> . Pain signals arise and travel to the brain by one of three main pathways, each of which produces different sensations.

### **Somatic Pain**

This is the feeling that most people imagine when they think about pain. Somatic pain arises in response to messages sent by receptors to the brain whenever an injury occurs in any part of the body. These signals are sent to the brain through the peripheral nerves and are typically described as a constant dull pain in the injured part of the body.

## **Visceral Pain**

Visceral pain is a sensation or pain signal that is sent from a specific class of receptors present only in the gut. It is experienced when organs or tissues within the abdominal cavity are disturbed or stretched as a result of injury or disease. Visceral pain is experienced in forms of feelings of pressure within the abdomen. In most cases, it may seem to be coming from a different part of the body than its actual source. Hence it is sometimes known as referred pain.

## **Neuropathic Pain**

This is the pain felt when there is an injury or direct damage to a nerve. Often, neuropathic pain is experienced in the form of a burning sensation and can occur in response to even a gentle touch. Neuropathic pain is difficult to treat compared to other types of pains since it commonly doesn't respond to narcotic pain killers. Cases of neuropathy are best handled with anticonvulsant drugs and certain surgical procedures.

For example, there was a case of a young mother who was diagnosed with endometriosis and suffered from debilitating pain regularly. In conjunction with her doctor-prescribed medicine, she resorted to medical marijuana, using CBD oil after the legalization of cannabis in the state where she lived. She claimed to have been able to manage the condition of her kid better afterward.

Other specific causes of pain were found to have been positively addressed by cannabis. For example, a study compiled and reviewed in 2018 in the UK by *Frontiers in Pharmacology* found CBD to be effective in the treatment of pain such as cancer pains, fibromyalgia, and neuropathic pain with no side effect recorded <sup>[9]</sup> .

Also, while conclusive human studies are yet to be carried out, a 2016 study that looked at the effectiveness of CBD in treating rats suffering from arthritis noted an overall reduction in pain in the affected joints of the rats under the study. This suggests that CBD gel may potentially help

people with arthritis relieve their pain.

Similarly, a 2017 study presented at the Congress of European Academy of Neurology suggests that cannabinoids may be just as suitable and effective for the treatment of migraine attacks as drugs that are currently in use for it. The study also noted that cannabis was surprisingly effective in patients who had suffered migraines as children.

## **Anti-Inflammatory**

Inflammation happens to everyone, whether you are aware of it or not. Inflammation is a broad term, but mostly it is a significant part of the immune system's response to injury and infection. It is the body's way of passing a signal for the immune system to heal and repair damaged tissue.

Inflammation is also a defense mechanism to protect the body from damage, infection, and external invaders such as viruses and bacteria. Infections, skin wounds, and other damage to tissue will not be able to heal without inflammatory interaction and responses. When injuries or infections occur, the damaged cells release chemicals that cause the blood vessels to leak fluid. This causes swelling in the tissues. The aim of this is to isolate the foreign substance that has entered into the body or the defective cells from further contact with unaffected body tissues.

The chemicals will also attract phagocytes (white blood cells that feed on damaged cells and germs) to the site of the injury or infection. Common examples of inflammation include arthritis, ulcerative colitis, asthma, skin conditions, and general joint pain or soreness. In some cases, inflammation may occur when the immune system wrongly identifies harmless substances or cells as defective.

Although the evidence for this is still developing, marijuana has been shown to help alleviate inflammation. Cannabis serves as an anti-inflammatory chemical because it has active ingredients that can help

target inflammation <sup>[9]</sup> <sup>[57]</sup> . Marijuana is known to contain up to 450 different chemical components that affect the body by activating the CB1 and CB2 cannabinoid receptors. The CB1 receptors are found in the central nervous system and control perception. The CB2 receptors, on the other hand, are found in the tissues and play a major role in how inflammation occurs. It is the activation of the CB2 receptor that controls the release of pro-inflammatory cytokines.

Scientists have now discovered that a substance known as beta-caryophyllene, which is one of the main components of cannabis (making up 12 to 35% of cannabis oil), can selectively activate CB2 receptors to inhibit inflammation. This substance also offers a unique advantage. Unlike other psychoactive compounds, beta-caryophyllene does not activate the CB1 receptors. This makes it possible to use this compound in treating inflammation without the intoxicating effects associated with cannabis use.

So far, cannabis has shown tremendous promise as a healing agent for various inflammatory diseases. Also, it is worth noting that cannabinoid receptors 1 and 2 are widely distributed in the digestive tract and other body parts—the anti-inflammatory properties of cannabis work by acting on these receptors. Furthermore, a review published in the journal *pharmacological Research* indicated that both CBD and THC are well known medical cannabinoids that could act on immune functioning to trigger an anti-inflammatory response.

## **Stimulant**

Cannabis has a wide range of effects on various users. However, one of the most reported effects of hemp usage, either for medical or recreational purposes, is its ability to act as a stimulant. A stimulant is a substance that increases interest, level of activity, or enthusiasm of a person. This is done mainly by speeding up the transmission of signals from the brain to various parts of the body.

There are several legally available stimulant drugs in the market. Although they share common indices, each one has its unique properties and mechanism of action. Marijuana acts as a stimulant with the potential to make users feel energetic and alert. It may also improve a person's attention span. One of the well-known qualities of cannabis is that it helps to improve a person's mood moments after its intake. A major advantage of this plant over other forms of stimulants with the same effect is that it is less addictive, with minimal long-term effects on the brain and body functioning.

However, if there is an area where the ability of cannabis to stimulate shines, it is in its ability to increase appetite <sup>[24]</sup>. One of the side effects most commonly associated with the recreational use of cannabis is hunger (informally called "the munchies"). For years, medical researchers have sought to understand this effect and the connection between cannabis and appetite. Several studies have been carried out to establish how different doses of marijuana can lessen aversion for food. The reason for this is simple: THC, one of the active cannabinoids in cannabis, can help boost appetite.

Typically, hunger is regulated by certain processes that go on in the brain. After each meal, a chemical substance known as leptin is produced. This chemical produces a feeling of being filled and suppresses appetite. You will only feel hungry again as the level of leptin decreases in the body. Any health condition or medication that causes an increase in leptin level or a reduction in the rate at which this chemical drops will lead to loss of appetite. In addition to the leptin level, there are certain neurons in the brain that control hunger as well. They send signals to the brain when you are full or hungry. Some conditions, such as HIV-related anorexia, affect appetite by slowing down how neurons send hunger signals to the brain or block it entirely.

Cannabinoids stimulate hunger by counteracting these processes. By inhibiting the production of leptin, the desire to eat is heightened. THC can also slow down or block neurons from sending a message of "fullness" to the brain. This way, it tricks the brain into sending hunger signals.

For patients suffering from a lack of appetite due to various illnesses, the consumption of cannabis can help them maintain proper nutrition. Several cannabis users also claim that marijuana increases their appreciation of food by enhancing the sensory system and consequently heightening the taste. However, the mechanism behind this effect is yet to be researched.

## **Anti-Nausea**

Nausea is an unpleasant feeling that happens in the stomach that makes you feel like you're going to vomit. Although not a disease on its own, nausea is a frequent sign that may accompany several diseases and conditions. In many cases, it is unclear why vomiting occurs.

When you feel nauseated, you are not interested in food or drink or anything that has robust flavors. Nausea may also make it difficult to take prescribed medication when ill. The feeling may be caused by an unpleasant odor, virus, food that reacts adversely with your system, or pregnancy. Interestingly, studies have shown that nausea is a sign of a healthy pregnancy.

The occurrence of nausea and its possible causes vary from person to person. Some people's bodies are highly sensitive to sudden motion, specific food, or certain medications. All of these can result in nausea. Other common causes of nausea include bacterial or viral infections, gastritis, pains, and emotional stress. The timing of this unpleasant condition (nausea) or vomiting can indicate the cause. For example, if you feel like throwing up a few minutes after a meal, it may have been caused by food poisoning, gastritis, or an ulcer <sup>[27]</sup> .

Cannabis can be used for the prevention and treatment of nausea. Medical marijuana aids the relief of nausea using the same system that allows it to treat and relieve so many other ailments. Cannabis can be used as a stand-alone medication for treating nausea, no matter the underlying cause of the reaction.

Marijuana reduces the urge to vomit. This is due to the interaction between the cannabinoids and the endocannabinoid system <sup>[41]</sup> . This system is made up of receptor sites that exist on cells throughout the body. The moment cannabinoids like THC are ingested, they activate these receptor sites, which causes biological changes to take place. This change process is essential, for it regulates mood and manipulates the brain to reduce concerns about nausea and vomit.

The increased legality of cannabis has gradually given an opening for numerous scientific researches highlighting how powerful and compatible medicine marijuana is with our body. A scientific paper published in the British Journal of Pharmacology titled *Regulation of Nausea and Vomiting by Cannabinoids* by Parker in 2011 highlights that cannabinoids may be especially useful in treating the most difficult cases of nausea and controlling its symptoms. The author of this paper also stated that for centuries cannabis had been used as a therapeutic agent to fight against nausea <sup>[41]</sup> .

## **Neuro-Protector**

Neuro-protection refers to a mechanism aimed at protecting the nervous from injury and damage. This is especially vital for people who have sustained an injury or developed a degenerative health condition with neurological effects. Simply put, neuro-protection is the process or guarding nerve cells from further damage by preventing the spread of injury or disease from one neuron to neighboring neurons.

Medical scientists have always sought ways to protect the body from damage after acute occurrences, like nervous system injury. Neuroprotection is also important in preventing further brain damage due to degenerative conditions, such as Alzheimer's and Parkinson's disease, that tend to get worse over time. A few of the factors that may cause progressive degeneration in the brain include inflammation of nerves in the brain, overstimulation of nerves, and oxidative stress.

In addition to keeping the brain from getting worse in case of injury, neuroprotection may also result in the recovery or regeneration of the nervous system, its cells, structure, and function <sup>[51]</sup> . Today, a wide range of treatments for neuro-damage are being investigated by scientists. While several conventional medicines and even natural products have been proposed as neuroprotectants, they all have a wide array of possible effects.

However, it has been discovered that cannabinoids can be applied as neuroprotectants for limiting and preventing neurological damage. Not only does a cannabinoid treatment alleviate specific symptoms, but it also attempts to delay disease progression and even show prospects of repairing damaged structures.

In a study published in the NCBI Journal, the effects of cannabidiol and other cannabinoids as neuroprotectants were examined in rats exposed to toxic levels of the neurotransmitter glutamate. From the study, it was discovered that cannabidiol (a non-psychoactive component of cannabis) and delta 9-tetrahydrocannabinol (THC) both reduced AMPA, NMDA, and kainate receptor-mediated neurotoxicities. Also, Glutamate toxicity can be reduced by antioxidants. The study showed that CBD, THC, and other cannabinoids are potent antioxidants with the potential to reduce Glutamate toxicity <sup>[20]</sup> .

Also, from a review of research work from the late 1970s to 2011, it was discovered that “cannabinoids have particular application as neuroprotectants for mental and motor dysfunction in neurodegenerative diseases”. The study reviewed 117 articles, and its results on the neuroprotective ability of cannabis are supported by anatomical, biochemical, electrophysical, and pharmacological data <sup>[35]</sup> .

A strong link between neurodegenerative disease and cannabinoids has been established from these studies. Further research into the medical use of cannabis for the modulation of the endocannabinoid system can potentially lead to novel discoveries that will help in halting the progression and even the initiation of degenerative conditions.

## Antispasmodic

Most times, we complain of internal pains, tightness, and spasm around the muscles, but the specific factor responsible for this pain usually goes unidentified. A muscle spasm is a prompt and involuntary contraction that happens between one or more muscles. This muscle contraction typically occurs around the arms, foot arches, hands, thighs, abdomen, and sometimes around the ribcage.

Smooth muscles found within hollow internal organs like the colon can also go into spasm, causing significant pain. In most cases, this pain is colicky: it comes and goes. Examples of spasm in internal smooth muscles include menstrual cramps, diarrhea, and the pain associated with passing a kidney stone <sup>[31]</sup> <sup>[54]</sup> . There are numerous possible underlying causes of spasms in the muscles. Each reason depends largely on predisposing factors such as the environment and the part of the body involved.

It is critical to understand the frequency, timing, pattern, duration, and general situations in which muscle spasms occur. A spasm can affect many types of muscle in the body, resulting in different symptoms. When the body engages in unfamiliar exercise activities, the abnormal supply of calcium, water, glucose, magnesium, and potassium to the muscles can lead to spasm. Spasms may also occur when a muscle has been overstretched, tired, previously injured, or held on a spot for too long. Also, diseases of the nervous system, such as spinal cord injury, sclerosis can be associated with muscle spasm. It is usually abrupt, painful, short-lived, and may be relieved by gently stretching the muscle.

The potential causes of muscle spasm and the muscles affected vary. However, chemicals in cannabis show potentials to help ease the condition by targeting the specific source of spasm. This is commonly and inflamed or overworked tissue or muscle. For example, a 1982 survey of people with various spinal cord injuries revealed that 21 out of the 43 respondents experienced reduced muscle spasticity following marijuana use <sup>[12]</sup> .

Similarly, nearly all the participants in a 1997 survey that covered 112

regular marijuana users with multiple sclerosis reported a reduction of both the pain and spasticity associated with the condition <sup>[12]</sup> . However, this does not mean that all people with multiple sclerosis will find relief with marijuana. The study only shows that marijuana users among the people covered in the survey saw improvement in their condition. The study also reported a reduction in muscle spasms among patients after smoking marijuana. The patients also claimed that cannabis helped them to sleep better and relived nausea.

## **Chapter 4: What Serious Diseases And Conditions Are Treated By Cannabis**

Historically, Marijuana has been favored as a wonder drug for a variety of conditions. Despite not fully understanding the mechanism behind how cannabis works for these conditions, ancient physicians recommended marijuana for treating many serious ailments.

Today, there is still a lot of gray areas as far as cannabis use for some diseases or injuries is concerned. Still, available evidence suggests that cannabis indeed works in treating some very serious medical conditions. In most cases, cannabis is not a cure for the condition. However, smoking cannabis or ingesting it through any other methods can help manage their symptoms better. In many cases, cannabis is also recommended as palliative medication for coping with the side effects of conventional medications (such as the side effects of chemotherapy in cancer patients). In some cases, cannabis is also recommended to slow down the progression of some degenerative conditions and prevent them from getting worse over time. In this chapter, we will discuss in detail how marijuana works in the treatment of various severe conditions with concrete evidence from available research.

### **Chronic pain**

As humans, it is normal to experience pain at some point in our lives. Pain is the body's alarm system and a necessary mechanism for protection. Usually, pain is transient or moderate, but it can be quite severe, too, depending on the underlying cause. In fact, pain is considered to be the most common reason why people seek medical attention.

Each person perceives a painful stimulus in their unique way. The intensity of the pain is typically subjective, and only the person that is feeling it can most accurately define how they are feeling. However, even this can vary from one time to the other even when the stimulus is the same.

Pain is commonly classified as either chronic or acute. Acute pain occurs suddenly and is usually in response to a clearly defined stimulus such as injury. Acute pain will subside and eventually disappear as the cause of pain heals. Chronic pain, on the other hand, is less transient. It can persist for days or months, and is typically associated with an underlying condition; a common example is arthritis. Chronic pain may also vary in severity from mild to moderate, or even severe.

Pain relief remains one of the major reasons for the medical use of Marijuana, even from ancient times. Today, medical marijuana is becoming an increasingly popular alternative to traditional medications for relieving pain, such as opioids. Cannabis has the potentials to help ease various types of chronic pain, including those caused by inflammation and nerve damage.

The United States Food and Drug Administration (FDA) is yet to approve the use of most marijuana-based products in treating chronic pain. There is a need for more evidence to confirm their effectiveness and safety for that purpose. However, anecdotal evidence suggests that cannabis and its compounds may potentially help relieve pain in some ways.

Cannabis is a chemically complicated substance. So far, up to 568 different constituent molecules have been identified, of which over 60 are cannabinoids. These are compounds, similar to the natural chemicals produced by the body's endocannabinoid system, that interact with the body's receptors. The receptors and the interacting endocannabinoid system play a major role in the endogenous control of the pain sensation in the body. The two chief cannabinoids in cannabis that are believed to exhibit effects that may help alleviate pain are  $\Delta$ 9-tetrahydrocannabinol (commonly called THC) and cannabidiol (CBD). However, research has also identified other compounds such as flavonoids, terpenes, and other phytocannabinoids that can impact or alter the body's neurochemical system in order to regulate how pain is felt.

THC is the psychoactive component of cannabis that primarily causes the euphoric feeling for which marijuana is well known. However, in addition to this, THC has shown a lot of potential in relieving pain, reducing

nausea, and stimulating appetite. CBD, on the other hand, does not produce any euphoric effects, but it is also commonly credited for the pain relief and anti-inflammatory properties of cannabis.

Experts also believe that the pain-relieving effects of cannabis may also depend on the means of administration, although research on this is currently sparse. A study carried out in 2013 that compared the pain-relief effects of dronabinol (an oral cannabis product) and smoked marijuana <sup>[11]</sup>. The results of this study indicated that although dronabinol and smoked marijuana have the potentials to decrease pain, dronabinol had longer-lasting effects in decreasing sensitivity to pain. Other studies also suggest that smoking marijuana produces faster pain-relieving effects, yet it is oral administration that shows the potentials of lasting longer.

## **How Does Marijuana Work For Pain?**

Most studies carried out on the analgesic effects of cannabis have focused on CBD and THC, although some other components of marijuana show potential as well. THC is similar to the body's natural cannabinoids, so it directly interacts with cannabinoid receptors in the brain to stimulate the reward system to reduce pain sensations. CBD interacts with pain receptors for its anti-inflammatory and pain-relieving effects.

Receptor bearing cells in various parts of the body send pain signals to the brain when they are activated by temperature, pressure, chemical changes, or movement. These pain signals are sent to the brain through various pathways depending on the type of sensation involved. The peripheral nerves that detect and transmit pain sensations are known to contain several cannabinoid receptors. These receptors mainly respond to the body's natural cannabinoids. But the similarity between these endocannabinoids and the chemical constituents of cannabis means they can also act to block the peripheral nerves from feeling pain as well.

In the past few years, there has been an increasing body of research aimed at unraveling how marijuana works for the alleviation of chronic pain. Some of the studies focused on specific parts of the cannabis plant, such as

CBD oil alone to discover the specific way this compound works. Other studies focused on the entire plant to discover the entourage effects of the various parts of the plant.

According to a 2015 study that reviewed various researches on the use of marijuana for chronic pain, several positive results were reported. The review suggested that cannabinoids in marijuana may be effective in the treatment of neuropathy (nerve pain) and other types of chronic pain <sup>[22]</sup> . Another study published in 2016 revealed that marijuana, when used for the treatment of pain associated with cancer, helped to improve the quality of life of the patients. Similar studies of the use of marijuana in treating chronic migraines showed an improvement in pain with marijuana use <sup>[6]</sup> .

One obvious advantage of cannabis for pain-relief over traditional medication is the reduced possibility of addiction and drug dependency associated with drugs like opioids. Cannabis also showed lower side effects compared to these medications.

Still, additional research is needed to conclusively determine how marijuana can help with the treatment of chronic pain. There is so far limited research to demonstrate the pain-relieving effects of various cannabis strains, the most effective methods of delivery, and the right dosage.

Generally, to use cannabis effectively for the medical treatment of pain, a personalized approach is recommended. The treatment should be tailored for each person in order to determine the correct dose to relieve pain with limited side effects. Generally, experts recommend that treatment begins with a low dose of CBD and THC. If you intend to use CBD for treating pain, you should speak to your physician about the correct dosage and route of administration.

## **Cancer**

According to statistics reported in an NCBI journal, about 30% of people living in America are at risk of developing cancer during their lifetime. Up to two-thirds of this number will eventually die from various forms of cancer, while many will live with the condition for several years <sup>[31]</sup> . Because of the severity of this condition, researches are continually seeking ways to cure it. However, in addition to seeking a cure, efforts are also being made to discover ways to improve the quality of life of cancer patients.

Although cannabis does not treat cancer itself, one of the main reasons why it has become popular is that it helps to relieve the symptoms commonly associated with cancer treatment, such as nausea, headache, and loss of appetite. While research is sparse, several cancer patients and their relatives have reported how helpful marijuana has been in relieving the adverse effects of chemotherapy.

The beneficial effects of cannabis in cancer treatment are diverse. Patients report that it helps in suppressing the urge to vomit and quells nausea. Consuming cannabis has also proven to increase appetite and soothe anxiety. Some clinical studies show that marijuana doesn't alleviate these symptoms any better than the medications currently available. However, the fact that cannabis can tackle several of the symptoms simultaneously is an important advantage.

Drugs made from certain chemical components of marijuana can also be used as a complementary treatment for traditional medication for any of these symptoms. For example, THC in the form of dronabinol (also known as Marinol) has been used in treating vomiting, nausea, and appetite loss. There are also indications that medications made from a combination of cannabinoids will prove even more effective than using those with THC alone.

## **Treatment Of Vomiting And Nausea**

Generally, nausea occurs when one of the sensory centers of the brain and digestive tract are stimulated. A feeling of nausea may be accompanied by

vomiting, although this is not necessarily the case. The emesis pathway describes the physiological mechanisms behind vomiting, which involves a combination of signals to the brains and complex action of the digestive and respiratory muscles. Anti-vomiting medication can be designed to impact any of the sites on the emesis pathway.

Experts don't fully understand how and why chemotherapy tends to cause vomiting. However, there are speculations that the drugs may contain digestive byproducts that can stimulate receptors in certain sensory cells. Some of the common chemotherapy agents that may cause patients to vomit include cisplatin, mustine, and methotrexate (with cisplatin being the most common culprit causing vomiting in most patients). The severity of nausea and vomiting varies depending on the medication used.

On the other hand, experts can say very little about the actual mechanism that triggers nausea. However, it is clear that it occurs solely as a result of brain activity. Since the emesis pathway is easier to study, most research focuses mainly on alleviating vomiting rather than nausea.

The antiemetic property of cannabinoids to prevent or suppress vomiting has been widely studied. Two forms of THC (namely, delta-9 and delta-8 THC) are the most studied for this purpose. Experts are also looking at two synthetic medications (lavonatradol and nabilone) whose mechanism of operation and target receptors are similar to that of THC as potential antiemetic medication. There is also limited evidence that smoking marijuana directly helps suppress the urge to vomit in patients undergoing chemotherapy.

## **Cannabis For Wasting And Appetite Loss**

Loss of appetite and wasting are two of the most common side effects of chemotherapy treatment in cancer patients. These side effects not only affect the quality of life of the patient, but they may also hasten death. Up to 50 to 80 % of cancer patients are at the risk of developing cachexia. This is a condition that causes a disproportionate loss of lean body tissues. The severity of cachexia varies depending on the type of cancer. However,

it is a condition most commonly associated with the advanced stages of prostate, pancreatic, and lung cancer. The wasting process in this condition is stimulated by cytokines, which are proteins produced by the immune system in response to the cancerous tumor.

Currently, the standard medication for cachexia treatment includes intravenous feeding. Patients may also be treated with appetite stimulants such as Megace. The problem with traditional stimulants is that patients only gain weight in the form of fat rather than lean tissue. Marijuana, on the other hand, is well known for its ability to stimulate the appetite. Research has shown that THC is responsible for this hunger-stimulating property of marijuana. By blocking the production of Leptin, the hormone that suppresses appetite, THC helps increase appetite.

In treating appetite loss, cannabis targets the CB1 receptors located in different parts of the body. These receptors are associated with appetite regulation and hunger suppression. The action of CB1 receptors includes helping you to know when you need to eat and making food seem more attractive.

The results of the studies on the effects of cannabis use in the treatment of cancer mirror studies on the effects of cannabis use for pain, nausea, and appetite management. THC, CBD, and other components of cannabis may not be the much sought after cure for cancer, but they help patients deal with the symptoms much better. They also help to counteract the side effects of chemotherapy in order to increase the overall quality of life of individuals undergoing cancer treatment.

## **Epilepsy**

Epilepsy is a non-communicable neurological disorder. This condition affects the central nervous system causing abnormal brain activities leading to seizures and other forms of unusual sensations, behavior, or loss of awareness for some periods. Epilepsy is not gender-restrictive, and it affects people of all ages, ethnic, and racial backgrounds. In fact, it is

considered one of the most common non-communicable neurological disorders, especially in countries with low to middle income.

Epilepsy patients experience varying symptoms when the condition hits. In some mild cases, patients could be confused or simply stare blankly for some seconds or minutes. Other more serious cases may be accompanied by uncontrollable twitching of the legs and arms and even unconsciousness. Some patients may also experience psychic symptoms like anxiety and fear. A single incidence of seizure does not conclusively mean a person is epileptic. However, an epilepsy diagnosis will most likely be made after two unprovoked cases.

For many patients of seizures, medications and surgery is sufficient treatment for them. In some cases, lifelong medication may be required to keep seizures in check, but some patients become completely cured. Children who suffer epilepsy at a young age may be able to outgrow the condition. Yet medication doesn't always work. Up to one-third of epileptic patients suffer symptoms that are completely resistant to traditional medications <sup>[16]</sup> .

Epilepsy (especially drug-resistant cases) can reduce the quality of life of patients and cause serious cognitive and psychosocial problems. Epilepsy can also put patients at risk of drowning, falling, and other accidents. Because of the severity of the problem, several studies are being carried out to find an alternative treatment, especially for drug-resistant cases of epilepsy. Another reason why the search for alternative medication has become popular is due to the side effects of conventional antiepileptic medications such as anemia and osteomalacia. Experts are, therefore, looking at more effective treatment with lesser side effects.

So far, clinical trials have been focused on new drugs for keeping the condition in check. The use of cannabis in the treatment of epilepsy is currently off-label. However, cannabis has been used since ancient times as an anticonvulsant. CBD is considered a safe and effective compound for treating epileptic seizures, although THC is used as well. Most recent trials now focus on a Propyl analog of CBD known as Cannabidivarin (CBDV) <sup>[42]</sup> . Yet, despite widespread studies, the mechanism of how it works in the

treatment of epilepsy is still unclear, mainly due to limited human trials. Hence, doctors and patients still have concerns about their long-term safety.

Even so, it is believed that endocannabinoids block or reduce the release of excitatory neurotransmitters in the central nervous system in order to prevent seizures. Experts suggest this because cannabinoids also act on the body's CB1 and CB2 receptors like the body's natural cannabinoids. A recent study on rats revealed that the loss of both types of receptors results in more severe cases of seizures. Hence, medications that can stimulate the activities of these receptors have therapeutic potentials for the treatment of epileptic seizures. In addition to its effects on CB1 and CB2 receptors, CBD also has the potentials to decrease the presynaptic release of glutamate.

According to a study carried out in 1977 that investigated the anticonvulsant effects of CBD in rats, it was discovered that the efficacy of CBD is comparable to that of phenytoin. CBD was also revealed to have protective effects similar to that of phenobarbital with the potentials to decrease relapse after treatment. While more evidence is still needed to confirm long-term safety, CBD has been proven safe for use in the short term with limited or no psychotropic activities. The fact that CBD has a long-lasting effect (up to 30 hours when delivered intravenously and 23 hours orally) also makes cannabis more effective for patient-compliance [53] .

One high powdered research covered a total of 171 patients in a controlled, randomized, and double-blinded study. The research was intended to discover the potential effects of CBD in the treatment of drop seizures in cases of Lennox-Gastaut syndrome. The patients were split into placebo and drug groups. At the end of the study, drop seizures were discovered to have reduced by up to 43.9% in patients in the CBD group and only 21.8% in patients in the placebo group. CBD also showed potentials in mitigating other types of seizures. The side effects recorded were mild to moderate in their severity. The study also discovered an increase in liver enzymes in some of the patients at the onset of treatment, although this eventually resolved on its own as treatment progressed [51] .

A nationwide survey was carried out in Australia in 2017 on the medical use of marijuana in epilepsy treatment. There were 976 respondents to the survey, which included epilepsy patients, their parents, or guardians. The survey revealed that up to 15% of patients in the survey were using cannabis to control drug-resistant seizures as well as to get rid of some of the side effects of conventional drugs. Most of the respondents in the survey reported an improvement in their condition <sup>[47]</sup> .

Despite all the positive results, there is a need for further studies into cannabis use in treating epileptic seizures. Most of the studies available today were carried out on patients that were also using other anti-epileptic medication, and this could have confounded results. However, cannabis-based drugs have been shown to have potentials in the treatment of drug-resistant cases of epilepsy with fewer side effects and greater efficacy. Hence, it is worth trying and may very well help in decreasing the mortality and morbidity associated with drug-resistant epilepsy.

## **Parkinson ' s Disease**

Parkinson's disease (Parkinson's for short) is a neurodegenerative disorder. It is one of the most common neurological disorders in the world and the second most common in the United States. The condition is characterized by selective degeneration of nigrostriatal dopamine receptors, a unique population of brain cells.

The treatment commonly administered for patients today is symptomatic. It is mainly aimed at replacing dopamine deficiency to alter its effects. Hence, only the motor symptoms of the disease are treated. Most of the medications currently in use for Parkinson's are aimed at enhancing the brain's ability to synthesize dopamine. This is commonly done by the administration of a dopamine precursor such as levodopa. Some medications also stimulate dopamine receptors directly or stimulate presynaptic sites to inhibit dopamine reuptake.

Despite showing some level of efficacy, most forms of therapies currently

in use come with several adverse effects such as dyskinesia (a movement disorder commonly characterized by involuntary muscle twitches). The long-term use of Parkinson's medications can also cause motor fluctuations. In addition to being limited in their effects on the motor symptoms of Parkinson's and the possible adverse effects, most of these drugs also do little or nothing to delay the progression of the disorder. Hence, patients will still get worse over time, despite medication. For these reasons, there is an ongoing search for better and safer alternatives for treating both the motor and non-motor symptoms of Parkinson's disease while slowing the progression of the condition.

In recent times, there has been growing interest and some research into the potentials of cannabis and its compounds in treating Parkinson's disease and other neurodegenerative disorders. Medical marijuana shows potential in treating both the motor and the non-motor symptoms of Parkinson's. Marijuana and its compounds also show anti-degenerative properties, which means they may help slow down the progression of the condition, thus enhancing the quality of life of patients.

THC and CBD, along with some other cannabinoids, can cross the blood-brain barrier to exert neurotrophic effects. This makes them suitable as analgesic, antiemetic, sedatives, stimulants. It also makes them ideal for the treatment of degenerative conditions like Parkinson's. The compounds contained in marijuana act by targeting the endocannabinoid system (in particular, cannabinoid receptors) in order to modulate these as well as other physiological and cognitive functions. Since the cannabinoid receptors are distributed in various parts of the body, cannabis compounds can impact the peripheral and central nervous system, cardiovascular system, gastrointestinal tract, immune system, and even the reproductive system.

Experts are yet to fully map out the mechanism that explains the anti-degenerative properties of medical marijuana in humans. However, some animal research points to the antioxidant properties of CBD and THC as a possible explanation. This provides protection for neurons and prevents the degeneration of brain cells like the nigrostriatal dopaminergic neurons, which are the main cause of Parkinson's disease. They also stimulate CB1 receptors in order to mitigate further inflammatory damage and further

reduce bradykinesia and tremor.

In addition to animal studies, a survey of patients with Parkinson's symptoms also reveals an alleviation of non-motor symptoms such as memory impairment, sleep disorder, fatigue, and depression when cannabis is used. There are also accounts of the efficacy of marijuana in decreasing motor symptoms like tremor, bradykinesia, and rigidity.

One survey carried out on patients suffering from Parkinson's Disease in Colorado, USA, revealed some beneficial effects of medical marijuana in treating the non-motor symptoms of the condition. From the study, it was discovered that CBD is quite effective in treating psychosis and sleep disorders, which are common non-motor symptoms experienced by Parkinson's patients <sup>[17]</sup> .

Animal studies also revealed that phytocannabinoid compounds like THCV and  $\Delta 9$ -THCV show potential as neuroprotectors as well. These compounds can also assist by relieving some of the symptoms of Parkinson's. The studies suggest that marijuana may be used either as a standalone alternative or a combined therapy for Parkinson's disease <sup>[18]</sup> .

Researchers are yet to establish the optimum dosage of cannabis required for its efficacy. This is largely due to limited human testing, so the information currently available cannot be generalized for every patient. However, experts recommend a gradual introduction of cannabis, especially for individuals who have never used marijuana before.

Dosage can then be increased gradually with time if needed. This helps to minimize the risks of possible adverse effects such as fatigue, nausea, dizziness, anxiety, headaches, impaired cognition, and palpitations. These side effects vary from patient to patient and also depend on the formulation of THC and CBD used. Further extensive research is still being done to take into account also the stage of the disease, age, and other factors that might affect the efficacy of cannabis, enough to make conclusive recommendations.

# **Alzheimer's Disease**

Alzheimer's disease is a progressive neurodegenerative condition that causes a gradual loss of memory and affects the ability to think as well as other mental functions. Alzheimer's is the most common cause of dementia in the aged. The disease is characterized by an abnormal buildup of plaque and protein clumps in the brain known as amyloid. This causes biological changes that affect the connections between brain cells, thus causing the cells to degenerate over time and eventually die. These biological changes occur about 10 years before patients begin to experience symptoms.

Presently, researchers are yet to establish a single cause of Alzheimer's. However, some studies indicate that the disease may be caused by various factors such as genetics, environment and lifestyle choices, or a combination of three.

Alzheimer's disease is generally divided into two categories: familial inherited Alzheimer's disease and sporadic Alzheimer's disease. Although the onset of both categories of Alzheimer's is indistinguishable, both forms of the disease are characterized by the extracellular build-up of amyloid peptide and plaques. The condition may also be associated with excitotoxicity, neuroinflammation, and oxidative stress. The death of neuron cells associated with the progression of the disease is commonly caused by the continuous aggregation of peptides, which lead to neurofibrillary tangle formation.

Alzheimer's disease currently has no cure. Today the most common treatment is the use of cholinesterase inhibitors. This drug prevents the breakdown of chemicals used by neurons in the brain for communication by blocking the enzymes responsible for the breakdown of these chemicals. However, despite their widespread use, cholinesterase inhibitors are unpredictable and carry some major side effects, such as insomnia and nausea. Hence, reducing the quality of life of the patients.

Alzheimer's disease causes an enormous burden to caregivers and the health care system in general. It also costs patients economically, as well.

It is estimated that by 2050 11 -16 million Americans will be living with Alzheimer's disease. Still, no effective treatment has been developed to cure the condition or slow down its progression.

Although no clinical trials have been carried out on the effects of cannabis on people living with Alzheimer's disease or dementia, some studies have revealed that the components of cannabis, such as THC and CBD, may be able to remove the formation of the amyloid peptide in lab-grown nerve cells. A study carried out by researchers in the University of California on the potential therapeutic effects of THC on Alzheimer's Disease revealed that THC could inhibit the buildup of amyloid peptide plaques that cause the disease <sup>[49]</sup> .

In another study published in the journal of Neuroscience in 2018, CBD oil and THC were administered to mice with some symptoms of Alzheimer's disease. At the end of the study, the mice showed an improvement in cognition and learning with a reduction in amyloid clumps in their brains in comparison to a control group <sup>[56]</sup> . An earlier study carried out in 2016 by Salk Professor, David Schubert had confirmed that THC helps in the removal of harmful protein that contribute to Alzheimer's disease in the brain cells <sup>[45]</sup>

Further research is still being carried out to understand how cannabis and its components affect the brain. Available evidence already suggests that CBD oil has the potential to reduce inflammation of brain cells. However, this has not been proven yet in human tests. Cannabis compounds can also help in the treatment of both insomnia and nausea. Hence it can be used to counteract the side effects of conventional medications for Alzheimer's. Furthermore, anecdotal evidence also points to even better potentials for marijuana use in the treatment of Alzheimer's. There are indications that cannabis will not only help patients cope with symptoms of the condition but may also delay the progression of the disease.

You should bear in mind that many of the studies on the use of cannabis for treating Alzheimer's did not use human subjects. However, the few clinical studies that do have shown some very promising results. The anti-inflammatory effects of CBD have been confirmed by several studies, a

property that can be quite beneficial in the prevention of the onset of Alzheimer's.

Another possible reason that accounts for the popularity of cannabis among Alzheimer's patients compared to conventional medication for dementia is its cost. A one-month supply of Namzaric (a cholinesterase inhibitor) may cost as much as \$500. When you compare this to the cost of low-dosage edibles or any other oral cannabis products, it is easy to see the advantages of marijuana as an alternative. Patients will be able to live without the side effects of cholinesterase inhibitors and still spend a lot less on their treatment.

Given these reasons, even if cannabis is not proven to be a wonder-drug for Alzheimer's disease, it would still be a viable alternative for patients all over the world. This explains the renewed medical interests. As more territories declare medical use of cannabis legal, new studies are being carried out to see how marijuana and its compounds can help with Alzheimer's and other conditions.

For instance, in 2019, King's College London began clinical studies to investigate how THC and CBD can help dementia patients. The study focused on reducing aggression and agitation in patients suffering from dementia. The researchers hope to prove from the study that oral cannabis will be effective as an alternative to antipsychotic medication administered to dementia patients to ensure compliance during treatment.

The Spier Family Foundation, in conjunction with the Marijuana Investigations for Neuroscientific Discovery program at the McLean University, is also planning to fund research targeted specifically for finding alternative treatment for Alzheimer's Disorder. This study is aimed at discovering the therapeutic importance of THC and establishing which other cannabis compounds will be most effective for treating the condition.

Hopefully, these and other future clinical studies will reveal the effects of cannabis compounds in treating Alzheimer's and other forms of dementia. These studies may also lead to the development of more effective products

designed specifically for dealing with the challenges that Alzheimer's patients currently face.

## **Multiple Sclerosis**

Multiple sclerosis is a neurodegenerative condition that affects nerves in the brain and other parts of the central nervous system. Multiple sclerosis is a condition that occurs in people with a strong immune system that eats away the protective covering of nerves in the brain, optic nerves, and spinal cord. It is a serious and lifelong condition that currently has no known cure. The medication currently available can only slow the progression.

Multiple sclerosis is serious and becomes even more debilitating over time. Symptoms include pains in the eyes and in the back, tremor in the limbs and hands, muscle cramping, fatigue, dizziness, tingling, or burning sensations. Patients may also experience speech deficiency, cognitive issues, mood changes, and depression. It is believed that medical marijuana contains compounds that may be effective for the treatment of some of the symptoms of multiple sclerosis. Hence it is recommended for patients living with this disease under lawful conditions.

Although cannabis contains several components, it is THC and CBD that have been investigated the most for the treatment of multiple sclerosis. Marijuana compounds are currently being used for treating the specific symptoms of multiple sclerosis. For instance, THC is a well-known stimulant that helps to increase appetite and prevent or reduce nausea. THC is also used for multiple sclerosis patients to help in mitigating issues of muscle control. CBD, on the other hand, is desired for its effects in treating mental health conditions and managing epileptic seizures, which are possible symptoms of multiple sclerosis. Both compounds also show a lot of potentials in preventing inflammation and in managing pain. Epidiolex is a cannabis-derived drug approved by the FDA for the treatment of multiple sclerosis. However, this drug is made entirely from CBD and contains no THC at all.

The use of cannabis for improving muscle control in multiple sclerosis has been under intense study in recent years. In a study published in the *Journal of Neurology, Neurosurgery & Psychiatry*, multiple sclerosis patients were placed into two groups. Patients in one group were administered an oral marijuana extract while those in the second group were given a placebo. At the end of 12 weeks, it was the patients in the marijuana group had experienced greater relief from muscle stiffness than those in the placebo group <sup>[59]</sup> .

Another study carried out in 2011 involved 572 patients with multiple sclerosis. The patients were given marijuana extracts and placebo as well. Again, the patients that were treated with marijuana extract were relieved of spasticity, which is another common symptom of multiple sclerosis <sup>[60]</sup> .

There is also a chance that cannabis helps with treating bladder problems, yet another common symptom of multiple sclerosis. Scientists have carried out a number of researches to that effect. A study that placed participants on oral marijuana treatment for a 10-week period revealed that marijuana is helpful in improving bladder problems in patients suffering from multiple sclerosis. According to a systematic review of various studies published in 2014, there is enough evidence to suggest that marijuana can help with such issues <sup>[28]</sup> .

Still, medical marijuana is not recommended for everyone and does not work for every symptom of multiple sclerosis. For example, there is no evidence that shows that marijuana can assist with the cognitive symptoms of multiple sclerosis, such as difficulty thinking or memory problems. In fact, according to one study published in the *Journal of Neurology*, multiple sclerosis patients who smoked cannabis had poor results on cognitive tests compared to others who did not smoke marijuana.

There is also no evidence to show that marijuana can help reduce tremors, according to a systematic review of studies carried out to examine the potentials of cannabis to help alleviate this symptom <sup>[28]</sup> . However, experts believe that marijuana can help in treating tremors caused by medical conditions other than multiple sclerosis.

Another important question that is yet to be answered about cannabis use for multiple sclerosis is the guidelines for use. According to the American Academy of Neurology, patients can use oral marijuana extracts and sprays as well as synthetic THC. However, the verdict is still out on whether smoking cannabis will be beneficial to multiple sclerosis patients. Furthermore, additional research is still needed, especially regarding the long-term safety of cannabis in treating multiple sclerosis. This is a common concern with drugs with psychoactive effects like THC, although it is less of an issue with CBD.

## **Crohn ' s Disease**

Crohn's disease is an inflammatory bowel disease that causes the inflammation of some parts of the digestive tract. The exact cause of this condition is currently unclear. However, doctors believe that it may be a result of problems with the immune system. The symptoms of Crohn's symptoms and its severity vary considerably from person to person. It often includes diarrhea, fatigue, nausea, weight loss, fatigue, abdominal pain, and weight loss. The symptoms of Crohn's disease are usually debilitating and may sometime be life-threatening.

Chron's Disease is a relapsing-remitting disorder. This means that patients typically experience both relapse and remission periods. During the remission phase, there are few or no symptoms. This is commonly followed by periods when the symptoms flare up, and the condition gets worse. Crohn's disease currently has no cure. Available treatment is only aimed at helping to relieve the symptoms and prevent relapse when the patient is in remission.

There is evidence that suggests that cannabis may help ease inflammation, which is the cause of most of the symptoms of Crohn's disease. The cannabinoids contained in marijuana interact with the body's endocannabinoid system, the CB1 and CB2 receptors in particular, both of which are present in the gastrointestinal tract and immune cells. The interaction of cannabinoids with the receptors in these key areas has effects on patients' gastrointestinal systems. According to a study carried

out in 2009 using a mouse model of colitis (another related inflammatory bowel disease), it was discovered that the activation of CB1 and CB2 receptors caused a decrease in inflammation. The result of this study serves to prove the role of cannabis in the management of the symptoms of Crohn's disease and other IBDs.

According to a survey of inflammatory bowel disease patients in the U.S. and Canada, it was discovered that up to 15 to 20 % of patients currently make use of cannabis. Also, about 40 % of patients were reported to have used cannabis specifically to relieve symptoms of IBD. This study also shows that patients make use of cannabis both through smoking and oral routes to deal with pain, diarrhea, and boost appetite.

A few studies have been carried out to investigate the potential effects of medical cannabis on Crohn's disease, ulcerative colitis, and other inflammatory bowel diseases. One of the earliest observational studies on Crohn's disease was conducted in Israel in 2011 by Dr. Naftali. The study found that the use of medical cannabis in the treatment of Crohn's resulted in a subjective decrease in the disease's activity scores. There was also a reduced need for corticosteroid medication. However, in this study, most of the patients discontinued traditional therapy while still using medical cannabis <sup>[46]</sup> .

In 2013, Naftali carried out further randomized and controlled trials that involved the use of medical cannabis in patients with Crohn's. From the study, it was discovered that smoking 2 sticks of cannabis cigarettes daily for 8 weeks caused a significant improvement in the activity index scores of the disease in comparison to that of patients placed on placebo. However, cannabis use did not cause an improvement in disease markers like hemoglobin and CRP. Still, the results of the study reflect that patients using cannabis for Chron's disease experienced an overall improvement in their quality of life, appetite, and pain scores <sup>[39]</sup> .

More recently, a systematic review of 3 different studies published in 2018 showed mixed results <sup>[25]</sup> . The review analyzed results derived from different studies aimed at discovering the effectiveness and safety of using marijuana and its oil in treating Crohn's disease. The first study reviewed

involved 21 patients who smoked a marijuana cigarette for 8 weeks. The study compared the condition of the patients to that of a placebo group for the same period. The results showed that the group of patients that smoked marijuana was more likely to go into remission. However, they were also prone to some side mild effects such as nausea, sleepiness, nausea, and so on.

Another study under the review compared the use of marijuana oil with a placebo for a group of 22 patients. At the end of the day, there was no difference in the remission rates of both groups. The third study involved 50 patients with Crohn's disease treated with marijuana oil or a placebo. After 8 weeks, it was found that patients that used marijuana experienced better quality of life, and the severity of their symptoms dropped significantly. However, it is important to note that the quality of evidence from the reviewed trials may be quite low, and more extensive research is required.

A few other studies on marijuana use in people suffering from Crohn's disease have been carried out in recent years. Each of these studies has examined how different chemicals from the plant can help with managing Crohn's. Some studies also looked at how Crohn's disease affects people who already use or do not use cannabis. One of the studies, published in the Journal of Digestive Diseases and Sciences in 2019, found that cannabis users were less likely to develop an intra-abdominal abscess and active fistulizing disease <sup>[33]</sup> .

Still, it is important to note that most of the studies carried out so far on Crohn's disease involve a small number of patients. The studies were also carried out over brief periods. Little is known about the possible effects of long-term use of cannabis for this purpose. Some experts believe that the symptom-relieving effects of marijuana may be a problem, especially considering the remitting-relapsing nature of Crohn's disease. Marijuana could simply mask ongoing inflammation, thus tricking patients into thinking that they are in remission when they aren't.

These and other potential limitations of marijuana as a medication for Chron's are yet to be fully explored by researchers. Still, experts suggest

that cannabis can be used in dealing with the pain and other symptoms of the condition, especially in patients that are not responding well to conventional treatment.

## **Glaucoma**

Glaucoma is one of the leading causes of blindness in the world, currently affecting over 60 million people worldwide. Glaucoma occurs in various forms, including open-angle, closed-angle, and secondary glaucoma. Of these three, the most common form of glaucoma is open-angle glaucoma (POAG). Glaucoma is a progressively degenerative disorder that causes the degradation and destruction of cells in the retina and the optic nerves. This leads to a constriction of a person's normal visual field until it eventually disappears, leading to total blindness.

Researchers are yet to discover the specific factors that trigger POAG and other forms of glaucoma. However, three possible risk factors have been identified. It is believed that age, race, and increased intraocular pressure can make a person develop glaucoma. Statistics show that 1% of people over the age of 60 currently live with POAG, with the numbers rising as high as 9% for those over 80. Also, up to 10% of African Americans aged 80 and above are affected by the disease. And about 25% of the Caribbean population with African ascent are affected.

Intraocular pressure may increase as a result of blockage of the flow of the aqueous humor, the fluid which helps the eye to maintain its rigid shape. This clear fluid normally circulates from the back of the cornea to the front of the lense. An elevated intraocular pressure will result in the restriction of the flow of this liquid. This will cause the fluid to back up like water in a dam. Scientists also suspect increased pressure affects the circulation of nutrients to the optic nerves, further contributing to the disease. Since elevated intraocular pressure is the only risk factor of glaucoma that can be altered or controlled, most glaucoma treatments are designed to reduce this condition.

Traditional medication designed to lower intraocular pressure achieve this by targeting various parts of the circulation routes of the fluid. One common target for these medications is the trabecular meshwork, a connection of cells and tissues through which the aqueous humor flows. Glaucoma medications, such as dipivefrin or epinephrine, act by altering the shape of some of these cells to improve the flow of aqueous humor from the eye. Other drugs like brimonidine simply reduce the quantity of fluid produced, while others stimulate the production of agents that help to ease the passage of the fluid through the eyes. However, despite their effectiveness, conventional medication can do nothing to slow down the progression of the disease itself.

Another possible treatment option available to glaucoma patients to reduce intraocular pressure is surgery. Laser eye surgery can be carried out to cut the trabecular meshwork to ease the flow of fluid through it. A piece of the eyewall can also be removed through surgery to allow the fluid to flow and drain out beneath the conjunctiva (the tissue which lines the interior of the eyelids and covers the front surface of the eye). Some surgeries also involve the insertion of drainage tubes inside the eye. However, none of these have proven to effectively cure glaucoma or reverse vision loss. The search for alternative treatment for this condition has led patients to turn to medical marijuana as a possible solution. Today, glaucoma is one of the most cited reasons for the prescription of medical marijuana.

Interestingly, the use of cannabis in the treatment of glaucoma is not a new development. The earliest research to examine how marijuana can reduce intraocular pressure as a means of slowing down the progression of glaucoma was first carried out in the early 1970s. Back then, the report generated a lot of interest among researchers because the popular medications of the period had several adverse effects. Today, the case is different as the ban of cannabis has slowed down research into its potentials, and conventional drugs now perform better than they used to.

However, the search is still on for a glaucoma medication that can cure the disease or even reverse the damage it causes. For this purpose, clinical studies are now being carried out to examine the potentials of marijuana and its cannabinoids, alongside research on other conventional medications. So far, we have learned from some of these studies that

cannabinoids may indeed help reduce intraocular pressure significantly in both glaucoma patients and healthy individuals as well. In most of the trails carried out, cannabis was able to maintain these effects for as long as three to four hours on a single dose <sup>[1]</sup> .

However, researchers are yet to fully understand the exact mechanism behind the effect of cannabinoids in reducing intraocular pressure (IOP). Additionally, there are some major drawbacks that discourage the widespread use of cannabis. One major factor is the psychological effects it has on some individuals. The elderly, the target population of glaucoma, are likely to find the effects of cannabis intolerable. For example, patients may report heart palpitations, symptoms of low blood pressure, anxiety, and other effects of cannabis use. These may counteract the positive effects of reduced IOP that patients may feel.

Another possible problem facing the use of cannabis for glaucoma is the short duration of its effects. Since cannabinoids only reduce intraocular pressure for about 3 to 4 hours, patients will have to take the drug for as much as 6 to 8 times a day. This is a major limitation to the use of cannabis in treating this condition.

Future research will likely focus on ways to isolate the therapeutic effects of cannabinoids. This way, the side effects of THC and other cannabinoids could be avoided. Similarly, the development of a cannabis-based drug with longer-lasting effects would be quite desirable. However, cannabis is promising in the treatment of glaucoma as medication that can fully protect the optic nerves from progressive damage. There is already firm evidence that some cannabinoid compounds have nerve-protecting properties. So, it is most likely that future researches focus on exploring this particular effect of cannabis.

## **Eating Disorder**

Eating disorders are complex mental illnesses characterized by severe disturbances in a person's eating habits as well as in thoughts and

emotions related to their eating behaviors. Typically, people with eating disorders are abnormally concerned about food and how it affects their body weight or self-image.

Millions of people all over the world are affected by various forms of eating disorders. However, women between the ages of 13 to 35 are the most commonly affected. Eating disorders are divided into three broad categories. These are anorexia nervosa, bulimia nervosa, and binge eating disorder. These types of eating disorders are quite similar and only differ slightly.

Anorexia nervosa is characterized by a limited intake of food, usually driven by the fear of being fat. Patients with this condition have problems with their body image and live in denial of their excessively low body weight. Hence, they continue to eat less, and they exercise obsessively. They may also use laxatives or force themselves to vomit in a bid to lose more weight. People diagnosed with anorexia nervosa typically weigh at least 15% less than their expected healthy weight.

Bulimia nervosa is also founded on a negative self-image. Although patients will eat, they follow eating with periods of self-purging. Binge eating and rigorous exercises are also common symptoms of bulimia. People with this condition may be slightly underweight as well, but not as much as those with anorexia nervosa. In fact, people of all weights—overweight, obese, or regular—are diagnosed with bulimia.

Patients with binge eating disorder consume enormous quantities of food uncontrollably within a short period of time. However, unlike the other two types of eating disorders, they do not try to self-purge to get rid of the excess food they consume. Binge eating is a chronic problem that can lead to a number of serious health issues like obesity, diabetes, hypertension, and other forms of cardiovascular disorders.

In most cases of eating disorders, patients are extremely critical of their own bodies and suffer from very low self-esteem. They typically feel overweight and will intentionally starve themselves or try to attain weight

loss by several other unhealthy methods, in spite of signs of malnutrition and starvation. This negative self-image and the fact that most patients have a hard time recognizing they have a problem usually worsens their condition.

Patients of eating disorders may also suffer from panic attacks, anxiety issues, obsessive-compulsive disorder, and substance abuse. Hence, treatment for eating disorders must address both the physical and emotional symptoms of the condition. With proper medical care, patients should be able to resume normal and healthy eating habits.

## **How The Endocannabinoid System Affects Eating Disorders**

Extensive research has been carried out to understand what is the role of the brain's endocannabinoid system in eating disorders. Several of these studies point to important clues that indicate how the psychological process of patients with these conditions work. Understanding the role of the endocannabinoid system will help us understand how and why cannabis can be a possible solution.

It is believed that patients with anorexia typically have a higher concentration of endocannabinoid receptors in some parts of their brains. For example, the dorsal striatum (which is the part of the brain responsible for forming habits) typically has a higher concentration of these receptors. This makes the section of the brain more active in such patients, thus playing a part in making it difficult to break negative eating habits. Another section of the brain that is commonly affected is the insula (the region of the brain where the emotions and thoughts related to food intersect with the pleasure one feels from eating). This part of the brain regulates a person's body perception, sense of reward, and tasting senses. All of these functions have been found to be altered in people with an eating disorder, leading to unhealthy rituals common to patients of anorexia and bulimia.

From this relationship between eating disorders and the endocannabinoid system, it is induced that cannabis could be used as a possible medication.

This is particularly important since disordered eating habits may prove very difficult to treat with regular medications and therapy. This is mainly because the unhealthy habits that characterize these disorders are deeply ingrained in a way quite similar to drug addiction. Since the cannabinoids can bind with the body's endocannabinoid system, there is a chance that cannabis will serve as a more effective treatment.

The stimulant property of cannabis also comes to play in helping patients with eating disorders to gain weight, which is one of the major markers of a successful treatment. The property of cannabis that increases a user's appetite while making food taste better could, for instance, help with cases of anorexia. Cannabis may also help with the anxiety and stress that patients experience. All of these qualities make the prospect of medical marijuana for treating eating disorders quite interesting.

In addition, some studies show that marijuana use may help deal with other unhealthy feeding behaviors associated with eating disorders. For example, there was a study carried out by the Center for Eating Disorders in Denmark that evaluated the effects of dronabinol (a synthetic form of THC) in treating 24 women with severe cases of anorexia nervosa. The results indicated that the participants experienced significant weight gain. Also, a drastic reduction in unhealthy eating patterns was discovered from their food and eating habits inventory. What is more, the study revealed that the women experienced a better mental health compared to when they started taking THC or when they were taking a placebo. They were less driven to be thin, better at regulating impulses, and more forgiving in self-disciplinary actions.

In another study, Alzheimer's patients suffering from anorexia were treated with dronabinol as well. The patients experienced some weight gain despite no increase in their caloric intake. Researchers believe that their weight gain may be attributed to the fact that they spent less energy on "disturbed behaviors," such as anxiety and nervousness about food, paranoia, and confusion. This allowed their bodies to channel more calories to nourishing their bodies.

All of these effects of cannabis in treating patients with eating disorders

are highly desirable. Cannabis would complement psychological therapies, as well. The calming effects of cannabis can potentially help patients process trauma (which is a common underlying cause of eating disorders). This would help them to understand their triggers and be more cooperative in their therapy sessions with a counselor.

## **Post-Traumatic Stress Disorder**

Posttraumatic stress disorder (PTSD) is a condition that occurs in people who have witnessed or experienced a terrifying or traumatic event, such as a serious accident, war, natural disaster, rape, or any other form of violent assault. It is essentially characterized by failure to recover from a past terrifying experience. The condition may last for months or even years, with the patient experiencing triggers that bring back memories of the traumatic experience along with some emotional and often physical reaction. Symptoms of PTSD may include nightmares, flashbacks, avoidance of triggers, negative reaction to noise or touch, anxiety, and depression. In serious cases, PTSD can lead to detachment, self-harming, and even suicide.

PTSD is commonly observed in combat veterans. Hence, it was earlier referred to as “being shell-shocked” or having “combat fatigues” in the years that followed World Wars 1 and 2. However, indirect exposure to trauma can also trigger PTSD. For instance, when a person learns about the violent death of a loved one or people who are repeatedly exposed to details of horrible trauma. Police officers and first responders are continually exposed to gory and disturbing details of various tragedies.

PTSD occurs in people of all ages, ethnicity, and cultural background. However, women are generally more likely to have PTSD than men. It is estimated that about 3.5% of American adults are currently living with PTSD with varying severity. What is more, an estimated 1 in 11 people in the world will be diagnosed with PTSD in their lifetime. The fact that indirect exposure to trauma can also trigger PTSD helps explain these figures.

Currently, the most commonly recommended medication for PTSD are antidepressants or anti-psychotic medicines. Many patients also undergo psychological therapy, such as cognitive-behavioral therapy and other forms of trauma-focused treatments. Still, most patients still struggle to find relief from conventional PTSD medication. Due to the very low remission rates of traditional treatments, most patients now consider alternative medications—such as medical marijuana—to cope with the symptoms of PTSD.

In a study published in the *Journal of Psychopharmacology*, PTSD was found to have increased the risk of major depressive episodes up to 7 times in patients that did not use cannabis. The risk of suicidal ideation was also increased by as much as 5 times. Even so, medical research into the viability of using cannabis in treating PTSD symptoms is quite limited. In the past, the fact that cannabis use was linked to poor mental health discouraged several people from trying it, even though there is no evidence to prove that cannabis can exacerbate symptoms of PTSD or any mental disorder. In fact, the relationship between cannabis use and PTSD is more complex than it seems to appear on the surface.

The effects of cannabis in helping trauma survivors goes beyond providing temporary relief from negative emotions. The human body produces endocannabinoids that interact with special receptors spread out in the brain and various parts of the body. This interaction within the endocannabinoid system regulates several body and mental functions, including how the body is affected by traumatic experiences as well as memories, sleep, feelings of fear and anxiety, all of which are symptoms of PTSD. It is a known fact that THC and CBD, two of the most popular molecules in cannabis, are structurally similar to endocannabinoids, which makes them interact easily with the biological and mental processes of the body.

CBD and THC can interact directly with receptors that play major roles in the symptoms of PTSD. For example, alteration of the CB1 receptors in the prefrontal cortex of the brain has been observed in PTSD patients. The interaction of Cannabinoids with these receptors in the hippocampus, amygdala, and the prefrontal cortex can alleviate feelings of anxiety as well as mitigate suicidal thoughts in patients.

The interaction of cannabinoids with the amygdala may also decrease negative memories, alleviate anxiety and fears. Similarly, stimulating the receptors in the prefrontal cortex increases the production of serotonin, a hormone with antidepressant properties. Cannabinoids can also help with other symptoms of PTSD by boosting mood, decrease hypervigilance and hyperarousal, and reduce intrusive memories.

Several benefits have been reported in the treatment of PTSD symptoms with marijuana. Researchers at the British Columbia Centre on Substance Use (BCCSU) and University of British Columbia carried out a health survey on 24,000 Canadians. From the study, it was concluded that PTSD patients who did not use cannabis were more likely to suffer suicidal thoughts and depression than those who did. The authors of the study point to this as preliminary evidence to support cannabis in reducing depression and suicidal behavior two of the most notable symptoms of PTSD.

Of course, the risks of substance abuse in PTSD patients is quite high. Hence the concerns of patients and health care providers, especially considering the lack of evidence to its clinical effectiveness and recommendations on correct usage. Still, evidence indicates that low-risk cannabis users are unlikely to develop suicidal or depressive episodes, among other symptoms of PTSD. On this note, the controlled use of medical marijuana for treating patients with PTSD is highly recommended.

## **HIV Infection**

The human immunodeficiency virus (HIV) is a viral infection that attacks the human immune system. When left untreated, an HIV infection will lead to acquired immunodeficiency syndrome (AIDS). Unlike most other viruses, the body cannot completely get rid of HIV. Thus, the virus is able to continue living in an infected person's body indefinitely, attacking the CD4 cells (also called T-cells). These are the ones that help the body fight off infections. If left untreated, HIV will destroy so many CD4 cells that it will leave the body open to several opportunistic infections and diseases. It is as if it made a hole in the body's shield against attackers.

Currently, no cure has been discovered for HIV. However, the infection can be effectively controlled using antiretroviral therapy (ART). Patients who diligently follow their ART prescription can live a normal and healthy life. The viral load (which is the measure of HIV in their blood cells) will also be kept at an undetectable level. This low viral load means the patients can live a long and healthy life with no risk of transmitting the virus to an uninfected person.

HIV was a major cause of illnesses and deaths between the early 1980s to 1990s. The earliest drugs formulated for treating the virus were prone to failure and had several debilitating side effects. Even from the early days of the HIV epidemic, cannabis has been used in the treatment of many of the complications associated with the infection, such as Kaposi's Sarcoma (a form of skin cancer), AIDS dementia, wasting syndrome, and other serious conditions.

The use of cannabis for patients with HIV was spurred mainly as a way of helping patients cope with the wasting syndrome. At the time, there were little options for treating wasting. Hence, doctors turned to the appetite-stimulating property of marijuana as a way of counteracting the profound weight loss that HIV patients experienced. Since legislation at the time prevented the use of marijuana even for medical purposes, doctors were only prescribing Marinol (or dronabinol), a synthetic form of THC.

Today, despite the availability of medication for keeping the HIV infection under control, cannabis is still commonly used as a medication for treating symptoms like nausea, pain, depression, and weight loss that may be experienced either as symptoms of the virus itself or as side effects of the ART medications. In addition to these effects, there have even been some suggestions that marijuana may have positive effects in slowing down or preventing the progression of the virus, although this has not been proven with scientific research yet <sup>[37]</sup> .

The research into cannabis use in the treatment of HIV patients is still very limited due to legislation banning marijuana use in clinical settings. However, there is still widespread support for cannabis use in treating HIV wasting syndrome. Similarly, evidence from studies carried out with

Marinol has shown positive prospects. According to the result of one research published in 2016 in the February issue of the HIV/AIDS Journal, Marinol use was found to be effective for stimulating appetite and stabilizing the weight of patients, even in advanced cases of wasting. In the study, patients gained an average of 1% of lean muscles within the period of the test.

In this sense, Marinol displays an advantage over conventional medication for HIV wasting syndrome. Although conventional medication, such as Megace, seems to be more effective for stimulating weight gain, the weight increase experienced is usually an increase in body fat. But in the case of Marinol, what increases is the muscle mass, a much more promising indicator of health.

By comparison, very few tests have been carried out to investigate the effects of smoked marijuana in HIV patients. The little research available concludes that orally administered cannabis-based drugs (like Marinol) seem to be more effective. Still, most people seem to prefer smoking marijuana to oral medication due to the immediacy of its effects. Smoking marijuana also promises additional benefits, such as pain and stress relief, which are also usual symptoms in HIV patients.

In addition to its stimulant properties, cannabis was also frequently prescribed to help patients alleviate peripheral neuropathy. This is a painful condition that occurs when damaged nerve cells interrupt the correct communication between the brain and the body, mainly skin, muscles, and internal organs. Peripheral neuropathy is a common side effect of early generation HIV drugs. It causes an uncomfortable pain sensation that is similar to needles and pins stuck in different parts of the body. The condition is progressively debilitating. However, marijuana can help provide pain relief for patients. It also has the potential to slow down the progression of the disease and other forms of pain associated with HIV infection treatment.

HIV patients may also have trouble sleeping or experience other anxiety-related symptoms. Marijuana use can help them cope better with these complications, thus improving their quality of life. Coupled with regular

ART drugs, cannabis can help HIV patients live a better life, whether it is consumed in the form of oral medications or smoked.

## **Insomnia**

Sleep is a basic human function that is essential for maintaining sound physical and mental health. However, it is a function that eludes so many adults. According to statistics from the National Sleep Foundation, 50 to 70 million American adults experience some form of sleeping disorder. It is estimated that about 30 to 40% of the population will be diagnosed with insomnia at one point or the other in their life, with up to 15% being very chronic cases.

Insomnia is a sleep disorder commonly characterized by an inability to fall asleep. Typically, insomnia is believed to be a psychiatric or mental condition, although it can also be caused by physical conditions as well. Insomnia can also be caused by unhealthy sleeping habits, use of some substances, or even biological factors. More recently, experts have begun to consider insomnia as an inability of the brain to stop itself from being awake. It is a disruption in the brain's normal sleep-wake cycles in which the brain spends too much time in the wake cycle and a short period in the sleep cycle.

Since so many people are affected by sleeping disorders, there is a continuous search for a cure that is both effective and safe for use. There are several medications that are recommended for patients with a sleep disorder, all of which have varying levels of effectiveness. Before undertaking treatment, it is important to understand the factors that might be causing the sleeping difficulties. Some possible underlying causes of insomnia include arthritis, chronic pain, asthma, lower back pain, and endocrine problems. Insomnia can also be attributed to psychological issues, such as anxiety and PTSD, among other causes. In most cases, treating the underlying cause of insomnia is a much more effective treatment approach than merely taking medication that aids sleep.

Although Marijuana remains a controversial medication, it could be an effective treatment for insomnia, with little or no side effects. Using marijuana as a sleep aid can help to restore a person's natural sleep cycle by treating many of the possible underlying causes of sleep disorder. Whether you are experiencing sleeping difficulty after a stressful day, or due to a chronic pain, marijuana can provide relief and help you fall asleep better. Apart from its analgesic properties, Marijuana's function as an anti-anxiety medication can help de-stress the mind and body, making falling asleep easier.

The sedative and relaxing effects of cannabis are well known, and this is a property that helps people fall asleep easier. A recent study has validated these beliefs as it has discovered that cannabis can indeed shorten the time it takes for users to fall asleep. According to this study, cannabis use resulted in a 30 minutes reduction in the time it took for the patients to fall asleep. Moreover, people with no prior history of insomnia slept an average of 15 minutes after using marijuana. Apart from helping people fall asleep faster, marijuana also increases the amount of time a person spends in a deep sleep <sup>[61]</sup>.

## **How Cannabis Affects Sleep**

Cannabis contains several natural chemicals, many of which can influence sleep cycles in one way or the other. Cannabidiol (CBD) and Tetrahydrocannabinol (THC) both affect sleep in their own way., but there are other components of cannabis that affect sleep as well. Three of the common cannabinoids that may have an effect on a person's sleep cycle include:

### **Cannabidiol (CBD)**

This is a component of cannabis that has no euphoric or mind-altering effects. CBD affects sleep cycles by promoting relaxation. The fact that it has no psychoactive effects has made CBD one of the most popular components of cannabis for treating insomnia. CBD acts by reducing anxiety, relieving pain, and promoting mental focus and clarity. It also promotes alertness and reduces sleepiness during the day, thus promoting a

balance in sleep cycles that makes it easier to fall asleep at night.

### **Cannabinol (CBN)**

Cannabinol is a less-popular cannabinoid. It is believed to have very strong sedative effects, which are further enhanced when combined with THC. Additionally, it has pain-relieving effects and acts as an anti-inflammatory. THC is converted naturally to CBN in aged cannabis.

### **Tetrahydrocannabinol (THC)**

THC is the most popular psychoactive cannabinoid found in marijuana. It is what causes the euphoric effects that cannabis is well known for. But THC also has several beneficial properties as well. It has been proven as a potent pain reliever and sedative. There is also some evidence to suggest that THC can help improve a person's sleep. This makes THC a potential medication for treating obstructive sleep apnea.

Another way THC affects sleep is by altering how much time the brain spends in each stage of sleep. It has been discovered that THC can reduce the time the brain spends in Rapid eye movement sleep (REM) <sup>[61]</sup>. This stage of sleep is characterized by light sleep with a propensity to dream. REM is particularly important for people whose sleep is frequently disrupted by disturbing dreams and nightmares, such as PTSD patients. While all stages of sleep are important for maintaining health, reduction in REM sleep increases the time the brain spends in slow-wave sleep, which is a much deeper sleep state. This alteration of sleep architecture can help to restore the therapeutic effects of sleep.

### **Terpenes**

These are tiny aromatic compounds present in cannabis. They give marijuana its typical taste and smell. With more than 150 different types identified, the most common types include myrcene, caryophyllene, terpineol, and limonene. Terpenes play a significant role in the effects of cannabis on sleep. Scientists believe that this compound works by enhancing the effects of various cannabinoids. It is also believed that terpenes can influence mood, alertness, and energy. Some terpenes even have anti-inflammatory properties.

If you are considering using cannabis for treating your insomnia, it is important that you speak to your doctor first, especially if you are currently on a medication routine. Knowing what to do and where to start can be a little intimidating without adequate information. Hence, talking to a knowledgeable expert about using marijuana is important in order to identify the strain of cannabis that is best for you and assert the recommended dose.

## **Chapter 5: Places Where Medical Marijuana Is Legal**

In recent years, the legal landscape regarding the use of marijuana has seen a lot of changes. Today in the United States, several states allow the use of medical marijuana with the establishment of comprehensive cannabis programs. By federal laws, cannabis remains a schedule 1 drug. This means it is classified as a drug with no acceptable medical use and with a high potential of causing dependency. Recent research has shown that these assertions are less than accurate. In light of this, there has been growing momentum for the legalization of cannabis, both for recreational and medical use.

So far, medical marijuana legalization has witnessed a lot of progress. Currently, medical cannabis is legal in 33 U.S. states as well as in the District of Columbia. In 11 of these states, the recreational use of marijuana is allowed as well. Although the law governing cannabis use in each of these states varies, they generally allow certified patients or their caregivers to possess and use marijuana for medical purposes <sup>[30]</sup>. In some states, home cultivation is also permitted. The table below gives a state by state break down of cannabis use legislation in the 33 states where medical use is legal.

<b>State</b>	<b>Date enacted</b>	<b>Major features</b>	<b>Recreation use allowed</b>
Alaska	3/4/1999	Possession allowed up to 1 oz. Cultivation allowed up to 6 plants.	Yes
Arizona	11/2/2010	Possession allowed up to 2.5 oz. Cultivation allowed up to 12 plants.	No
Arkansas	11/9/2016	Possession allowed up to 2.5 oz. per 14 days period. Cultivation not permitted.	No
California	11/6/1996	Possession allowed up to 8 oz. of dry plant or 12 immature plants (6 mature plants)	Yes

<b>State</b>	<b>Date enacted</b>	<b>Major features</b>	<b>Recreation use allowed</b>
Colorado	6/1/2001	Possession allowed up to 1 oz. of dry plant or 6 mature plants. Public smoking not allowed.	Yes
Connecticut	10/1/2012	Possession allowed up to 2.5 oz. per month. Carrying more than physician's recommended dose is illegal. Cultivation not permitted.	No
Delaware	7/1/2011	Possession allowed up to 6 oz. Physician can only dispense 3 oz. Patient can only register at one center.	No
Florida	1/3/2017	Conditions determined in the process of certification.	No
Hawaii	12/28/2000	Conditions determined in the process of certification.	No
Illinois	1/1/2014	Possession allowed up to 2.5 oz. per 14 days period. Cultivation permitted.	Yes
Louisiana	5/19/2016	Quantity determined during approval. Possession allowed for 1 month worth of supply. Inhalation, smoking or vaping not allowed.	No
Maine	12/22/1999	Possession allowed up to 2.5 oz. per 14 days period. Cultivation permitted	No

<b>State</b>	<b>Date enacted</b>	<b>Major features</b>	<b>Recreation use allowed</b>
Maryland	6/1/2014	Possession allowed determined during certification process.	Yes
Massachusetts	1/1/2013	Possession allowed up to 10 oz. per 30 days period.	Yes
Michigan	12/4/2008	Possession allowed up to 2.5 oz. or 12 plants in enclosed facility.	Yes
Minnesota	5/30/2014	Quantity determined during approval. Possession allowed for 30 days worth of supply.	No
Missouri	12/6/2018	Possession allowed up to 4 oz. or 6 plants of unprocessed marijuana for a 30 days period.	No
Montana	11/2/2004	Possession allowed up to 1 oz., 12 young plants or 4 mature plants.	No
Nevada	10/1/2001	Possession allowed up to 2.5 oz. or 12 young plants for a 14 days period.	Yes
New Hampshire	7/23/2013	Possession allowed up to 2.5 oz. or 12 young plants for a 10 days period.	No
New Jersey	1/18/2010	Quantity determined during approval.	No

<b>State</b>	<b>Date enacted</b>	<b>Major features</b>	<b>Recreation use allowed</b>
New Mexico	7/1/2007	Possession allowed up to 8 oz. or 230 units for a 3 months period. Cultivation permitted pp to 12 seedlings or 4 mature plants.	No
New York	7/5/2014	Possession allowed for 30 days worth of supply.	No
North Dakota	11/8/2016	Possession allowed up to 3 oz. per 14 days period.	No
Ohio	9/8/2016	Quantity determined during approval. Possession allowed for 90 days worth of supply. Smoking not permitted.	No
Oklahoma	6/26/2018	Possession allowed up to 3 oz. or 6 plants.	No
Oregon	12/3/1998	Possession allowed up to 24 oz. or 6 mature plants.	Yes
Pennsylvania	4/17/2016	Quantity determined during approval. Possession allowed for 30 days worth of supply.	No
Rhode Islands	1/3/2006	Possession allowed up to 2.5 oz. or 12 plants.	No
Utah	12/1/2018	Possession allowed up to 113 gr. of cannabis or a cannabis product with up to 20 gr. of total THC. Smoking not permitted.	No

<b>State</b>	<b>Date enacted</b>	<b>Major features</b>	<b>Recreation use allowed</b>
Vermont	7/1/2004	Possession allowed up to 2 oz., 7 immature plants or 2 mature plants.	Yes
Washington	11/3/1998	Possession allowed up to 3 oz. of cannabis, 48 oz. of solid infused products, 216 oz. in liquid form or 21 grams as concentrate.	Yes
West Virginia	4/19/2017	Possession allowed for 30 days worth of supply. Smoking not permitted.	No

Apart from the United States, the use of marijuana for medical and recreational purposes is legal in different countries. Each of these countries has specific conditions for possession, cultivation, and use. Although cannabis remains banned in most countries of the world, the ones that have legalized its use include Argentina, Canada, Colombia, Chile, Australia, Germany, Greece, Cyprus, Greece, Italy, Israel, Lithuania, Jamaica, North Macedonia, South Africa, Luxembourg, Portugal, Netherlands, Switzerland, Uruguay, Thailand, and Zimbabwe.

Other countries have very restrictive laws governing possession or use of marijuana, and it is outrightly banned in several countries. Despite the ongoing legislative changes, the fact that cannabis is still classified as a schedule 1 drug is a limitation. One major implication is that medical marijuana is not covered by health insurance. Additionally, the federal ban places a major limitation on research and clinical trials to test the potential of marijuana as a medicine.

## **Chapter 6: How To Get Your Medical Marijuana Card**

Your medical marijuana card (or MMJ card) allows you to purchase cannabis to treat a health condition. Holding this card enables you as a registered user to obtain marijuana in a state-approved dispensary, health clinic, or wellness center. It will also help avoid criminal penalties in states where the medical use of marijuana is permitted, especially if recreational use is banned. Here's what you should expect from the process of getting an MMJ card.

### **Finding A Dispensary**

The first step is to visit a dispensary where you will register and begin the process of obtaining your card. Once you have found a certified cannabis clinic, you can fill the application form online. Your application will be analyzed, and you will be linked to a doctor. Once the doctor approves your MMJ card, it will be sent to you.

Depending on your state, you may only have a handful of dispensaries to choose from or thousands of them. These days, you can access your card online on the telemedicine platform <sup>[62]</sup>, where you can find a directory of clinics offering certified cannabis cards along with reviews and ratings of their services.

### **Applying For A Card**

Getting a medical cannabis card requires a bit of paperwork. You will need to fill out a form and then coordinate an appointment with a certified marijuana doctor. You will have to present your medical records, with details of any illnesses or disabilities you have, for analysis. If the doctor approves, he will provide a signed medical statement that recommends medical cannabis to treat your condition. Lastly, you will be asked to

provide proof of residency in the state where you are applying for the card, such as your driver's license or passport.

## **Getting A Physician**

Before your MMJ card is issued, a registered physician will have to ascertain that medical cannabis can help alleviate the pain or discomfort caused by your health condition. This can sometimes be difficult since some doctors are not convinced of the potential benefits of marijuana. However, the people at the dispensary will be able to help you with this.

## **Application Fee**

The application fee for a medical marijuana card varies from place to place. In Washington and West Virginia, for instance, you only need to pay \$1 to get your card, while in New Jersey, the application fee may rise up to \$200. However, in some other states, such as New Mexico, the application is free. You should check the fee in the state that you are applying to know what the exact price is. On average, the application costs between \$25 and \$50.

## **Regulations**

Each state that has legalized the medical use of marijuana has its own laws for the process of obtaining an MMJ card. Although the general procedure is similar, there are some differences between them. For instance, each state allows MMJ cards for different conditions. The state of Arizona, for example, considers patients with cancer, Chron's disease, and glaucoma as qualifying for issuance of MMJ cards. But Connecticut has an even longer list that includes conditions such as ulcerative colitis and sickle cell disease. New York does not include anxiety as a qualifying condition, but New Jersey does. Hence, you will have to check if your state covers the

condition you need the card for.

## Conclusion

In the course of this book, we have highlighted the various ways medical marijuana can help you or the people you care about in the treatment of various diseases and their symptoms. We have explored the various diseases that can be treated with medical cannabis and shown how and why it works as a viable option.

The cannabis plant is the most popular psychoactive compound in the world. The leaves, buds, flowers, oils, and extracts of the plant are well known all over the world for their recreational and medical benefits. Cannabis is most popular for its recreational use, mainly due to the euphoric effects that it produces. However, cannabis contains hundreds of helpful cannabinoids that are also quite popular for their medical effects. These chemicals bear close similarities to the natural cannabinoids produced by the body's endocannabinoid system. It is this semblance that makes it possible for cannabis molecules to interact with special receptors in the central nervous systems and other parts of the body to manage various body functions.

This mechanism mostly explains the medical use of cannabis compounds in the treatment of conditions like chronic pain, nausea, eating disorders, insomnia. It also explains the ability of marijuana to lower blood pressure and help the body relax. Legislation concerning cannabis use has seen a lot of changes in recent years. 33 U.S. states currently allow the medical use of cannabis in the treatment of chronic diseases, debilitating diseases, and serious injuries. The medical use is also authorized for the treatment of symptoms of various diseases, such as cancer, Crohn's disorder, Alzheimer's disease, HIV/AIDS, multiple sclerosis.

Medical marijuana can be used in the treatment of any of these conditions upon registration and approval by a certified physician. From all the evidence examined so far in this book, it is clear that cannabis offers several benefits, many of which are still currently unknown or untested. The use of cannabis remains a largely controversial subject, but the efficacy is practically undeniable. The fact that it is still illegal by federal laws means clinical trials and evidence from research are still sparse. But

if the available evidence is anything to go by, cannabis may very well hold the key to mitigating, managing, and possibly even curing several medical conditions that you or your loved ones might be facing. Hence, it is highly recommended and worth trying.

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# **The Marijuana Effect**

Revealing The Hidden Truths About  
Marijuana And How It Really Affects Your  
Mind And Body

By

James Coppa

# Introduction

Marijuana has been at the center of many debates lately, as different States around the world, and especially in the USA, have decided to move towards or to return to the legalization of this substance. A medicine for some, a drug for others, numerous are the myths and the legends related to Marijuana plants and their consumption. Which is why we are going to dive deep into their roots, discover what the real consequences of Marijuana intake are, and what are its effects when interacting with the human body.

We will discover Marijuana's origins, its history, and how this plant could survive and thrive for centuries. We will explore the science behind the substance and the components that allow Marijuana to operate over and with the body.

We will also study the different forms of Marijuana that exist today, to detail how each one of them can provoke its specific effect. While doing so, we will also explain how to use every single form of Marijuana.

Finally, after having to explore all the safe and sometimes fun ways of consuming Marijuana, we will also present the consequences of misusing it. As Marijuana can affect the body and the mind, we will see how Marijuana can turn from an ally to a problem. And after doing so, we will also expose the possible solutions and forms of treatment that one can seek once Marijuana becomes an issue.

The goal of this book is to offer a complete and general overview of Marijuana that can both accompany users through a safe journey of consumption, and guide abusers towards a healthier life balance.

# The Marijuana That Most Of Us Know

Sooner or later in life, even the most religious non-smoker has heard about Marijuana. But, when you are not a consumer, it may be hard to picture it precisely and to get a clear idea of what Marijuana is and what it is not. For example, I remember having a high school classmate who received a formal punishment after a teacher found a Cannabis leaf inside of his agenda. The professor believed that she was acting in the best way possible, as she had seen the pointed leaf appearing in many different artworks related to drug consumption, and most high schools forbid drug consumption. Nevertheless, as we are going to see, what she found was not, in fact, a drug sample.

So, what is Marijuana? Are we talking about a plant, a drug, a flower? And how does Marijuana look? To start our exploration of the substance, we should clarify a few points and maybe dissipate some misconceptions. In this section, we are going to understand better how consumers call Marijuana and how it looks once it is ready to be employed.

When we talk about Marijuana, most commonly known as weed, we consider the final product of what in the beginning was a plant: Cannabis sativa <sup>[1]</sup>. The plant itself, when in nature, does not carry any psychoactive effect. Also, not every part of the Cannabis plant can become Marijuana; in fact, it is mainly the flowers of the Cannabis sativa, once harvested and dried, that become the weed that most of us know.

So, to quickly get back at my high school teacher, what she found was probably a small evidence of an ongoing romance between my classmate and Marijuana, but not a real sample of consumable Marijuana. Similar to what illicit couples do when they decide to carry a photo of the beloved one in their wallet: finding such an object might mean that the person in the photo is important, but seeing the two while exchanging a kiss would be the only way to prove an existing love story.

This Marijuana, or weed, often presents itself as a greenish-grey dried ensemble of pointed buds with a strong and pungent smell. This form of

Marijuana has many different slang terms, such as grass, pot, weed, bud, Mary Jane, MJ, herb, and a vast number of other names <sup>[1]</sup> .

When consumed, the buds separate from one another and then crushed, usually with a tool called a grinder, whose function reminds of one of a pepper grinder. The goal of this procedure is to obtain a thin powder that one can mix (usually with tobacco) or decide to smoke directly to obtain a stronger effect. The most common way of smoking Marijuana for recreational purposes is in the form of a hand-rolled cigar <sup>[1]</sup> , with or without a filter. A very similar method involves the blunt, an emptied cigar with Marijuana replacing the contents. Another very popular way of smoking Marijuana is through a pipe <sup>[1]</sup> , that can look like a plain tobacco pipe, or also come in a bigger and more elaborate shape. And in this case, we are going to address it with the name of a bong. We should clarify that these ways of consuming Marijuana are amongst consumers who integrate the substance in their daily life for recreational purposes, often choosing it for its aroma and the euphoric feeling it brings.

But one can consume Marijuana in many other forms, especially medical Marijuana. In this scenario, we are going to find edibles, such as teas, cookies, brownies, or candies <sup>[1]</sup> , where Marijuana mixes with food, and its properties are activated thanks to the heat of the cooking process. We can also find Marijuana extracts, called resins <sup>[1]</sup> , which have stronger effects, and that are widely known both for their recreational and medical properties.

# Marijuana Science: What It Is

As we have seen, Marijuana can come in many different forms and shapes, just like people. And just like people, the goals of its consumption can be as numerous as human quirks. The mainstream stereotype might bring us to think that there are just one or two types of Marijuana smokers, usually pictured as lazy and careless about their future, and solely interested in the recreational aspect of smoking weed and “getting high.” Even I can remember from when I was a kid, many adults telling me things like: “If you ever smoke Marijuana, it will burn your brain cells, and you will never be able to concentrate again.” This hearsay is a quite scary and definitive threat that portrays Marijuana as a brain-eating monster with terrible consequences.

In reality, the phenomenon is much more complex and much more ancient than this. That is why scientists have decided to bring their expertise to the table and to study Marijuana, its origins, and its effects through the history of humankind.

If we try to trace the story of cannabis, historical reports like the one published by Barney Warf <sup>[3]</sup> send us a long way back in time, even before the origins of civilization. Using cannabis to better human life is a practice that started about 12,000 years ago, on the steps of central Asia. More precisely, in the regions that are now Mongolia and Southern Siberia <sup>[3]</sup> . We are talking about prehistorical cultivations, back when humans were hunters and gatherers.

In this ancestral reality, Cannabis and hemp (the non-psychoactive variant of the plant, usually employed for fabric and other domestic purposes), were widely used, and ancient Marijuana was, in most cases, a medicine, thanks to its relaxing and pain-reducing properties. Doctors used it as an anesthetic during painful procedures <sup>[3]</sup> , and Shen Nung, emperor of China from more than five thousand years ago, prescribed it to his subjects as a valid treatment for an extended number of health conditions, such as beriberi, malaria, rheumatism, constipation, absent-mindedness, and menstrual cramps <sup>[2]</sup> .

Marijuana did not stop its race to China, as farmers helped to spread it through South Asia and India, and primitive Europeans known as Aryans, after invading several regions of South Asia around 2000 B.C., carried the plant and its properties to the Middle East, Russia, and Ukraine <sup>[3]</sup>. And as the journey of this plant became more elaborate and vaster, its medicinal power received more and more acknowledgment. Still, in Asia and especially in India, historians noted that cannabis could treat fever and severe diarrhea, and poets described it as the plant that could free us from anxiety <sup>[3]</sup>. Hence, marijuana was a gift from the Gods. Even Viking tribes, known for their nomadic nature, helped to spread Marijuana across the world and the centuries. Cannabis seeds were found into the remains of Viking ships <sup>[3]</sup>, allowing us to understand how a simple plant from China managed to reach Europe, and later on, through migration flows around the 19<sup>th</sup> and 20<sup>th</sup> centuries, South America and the United States <sup>[3]</sup>.

And just as Marijuana managed to finalize its trip around the world, the historical context during which it was traveling, caused it to lose its medicinal status, and acquire a new and way more negative reputation. Mexicans fleeing to the United States to escape the revolution happening in their country would often carry the plant with them, perpetuating its medical use. And they were not the only ones since, during the 19th century, American Doctors would often use it to treat the same conditions that they would treat with opium. And they noted that, compared to opium, Marijuana did not cause the same negative secondary effects, such as constipation, diminished appetite, and checked secretions <sup>[2]</sup>.

But, as the 20<sup>th</sup> century started, the arrival of the first immigrants produced the first anti-immigration backlashes: reactionary newspapers would systematically blame Mexican immigrants for all sorts of criminal activities, like robbery, murders, promiscuous behaviors, and smoking Marijuana<sup>3</sup>. And the racist fears of its smokers, continuously described as dangerous criminals, leading to the formal banishment of the substance, that is still nowadays classified as a Schedule I controlled substance <sup>[3]</sup>.

## A Look At Phytocannabinoids

We have seen just how powerful Marijuana is, a plant whose properties were so miraculous that doctors all over the world have been using it for centuries, allowing it to reach our era and to obtain global fame. What we still have to explore is how all of this was possible on a chemical level, and what makes that Marijuana can interact on such a large scale with the human body. To better understand this aspect, we are now going to put the Cannabis plant under the microscope and closely analyze its molecular components: the phytocannabinoids.

Cannabis plants consist of more than 400 molecular components <sup>[4]</sup>, and 66 of those components classify as phytocannabinoids <sup>[4]</sup>. Phytocannabinoids are cannabinoids that the Cannabis plant produces naturally, and that can cause a specific plant to carry specific characteristics, such as the peculiar smell, healing properties, or the potential intensity of its psychoactive effects (or the absence of them).

While the majority of the phytocannabinoids is still under examination, two of these components are receiving more and more attention from the scientific community: we are talking about THC, or tetrahydrocannabinol, and CBD, or cannabidiol <sup>[5]</sup>. The two molecules are very similar, and they also share almost the same healing properties, but while CBD is mainly responsible for the pain relief effects, THC is the only molecule that can cause any psychoactive effects <sup>[5]</sup>.

So, what we are saying here is that two cannabis plants that are consumed in the same way and at the same dosage, but differ from one another in terms of the number of THC components and CBD components, will provoke different results on the body. In other words, only plants that present high doses of THC can get you high <sup>[6]</sup>, creating the well-known “light-head” effect that we usually associate with Marijuana consumption in general.

But how is it possible that some chemical molecules present in a plant can have these types of impacts on our nervous system? The reason is that, in

some way, we as humans are like Cannabis plants: the phytocannabinoids are not the only cannabinoids existing in nature. Our bodies already produce their cannabinoids, known as endocannabinoids.

All cannabinoids can interact with the human nervous system, both those produced by the body, and those that we can introduce into the body but that exist in external nature, and that happens thanks to cannabinoids brain receptors CB1 and CB2, who are naturally in charge of capturing and reacting to those substances across the body <sup>[7]</sup> .

## THC

Let's have an even closer look at the chemistry involved in the process. We will start analyzing THC, the molecule that we introduced before, as the only one capable of “getting you high” <sup>[6]</sup> . THC, or tetrahydrocannabinol, surely carries medicinal properties, the same that made Cannabis plants so popular through the centuries, but it is also responsible for the plant's psychological effects <sup>[6]</sup> .

Believe it or not, it is this small molecule the only one that can make the high happen, making you feel potentially better or worse, depending on the dosage and the individual tolerance. And the only way for THC to modify the psychological state of the consumer relies on the similarities between Cannabis plants and human bodies that we briefly introduced before.

THC molecules, once activated and introduced into the body, act in the same way as our internal cannabinoids (the endocannabinoids), attaching themselves to the brain's cannabinoids receptors <sup>[6]</sup> , CB1, and CB2. These receptors belong to the endocannabinoid system that operates over different neurological circuits.

Regularly, the body produces cannabinoids molecules automatically. And whenever we need to remember something, reflect upon a problem, walk, dance, drive, or eat, they attach themselves to their specific receptor, to

spread through the body the right chemicals and molecules that can make the action possible. The same process happens whenever a pleasant event occurs when we hurt ourselves, and we need instant relief, or when we need to know what part of the day we are in or even how much time we have left to complete a certain task. Well, THC molecules can attach themselves to those same receptors, CB1 and CB2, triggering, and even enhancing the same neurological response and substances release <sup>[6]</sup> .

One main effect of THC intake is the euphoric experience, due to the way the Cannabis molecules trigger our pleasure system, making our brain cells manufacturing and spreading dopamine <sup>[6]</sup> . THC results, therefore, in a feeling of happiness and the tendency to be giggly, even without an external cause of joy. And the manifestations are quite fast to appear, as THC molecules can take between 10 and 30 minutes to have an impact on our psychological state <sup>[6]</sup> .

Euphoria is not the only psychological modification induced by THC. We have seen just how vast is the number of functions that are regulated by the endocannabinoid system, meaning that once THC molecules trigger the brain's receptors, we might experience psychophysiological modifications of many sorts and on many levels.

In mild dosages, THC can reduce movement speed and create new pathways of reasoning <sup>[6]</sup> . One might suddenly feel relaxed, detached from daily problems, and capable of remembering facts otherwise completely unrelated to the current situation. A controlled and conscious intake of THC often results in new ideas, in the activation of otherwise dormant creative processes, and in the ability to solve problems faster.

But, even the sweetest of candies, when overeaten, can cause some troubles. When we consume it in overly high doses, THC can make us see the dark side of our brain systems. By triggering beyond the limit our brain receptors, THC can cause the same responses presented before, and take them to the extreme. The results can vary from one person to another, making us experience serious difficulty in producing coherent thoughts or speeches.

Another typical consequence is that our physical coordination might drop to the point where simple tasks like cooking or driving become difficult or even dangerous. Finally, the initial relaxing detachment from reality can turn into hallucinations and paranoia <sup>[6]</sup> .

These symptoms can occur when the consumer does not control or adjust the dosage of THC. For example, when someone starts consuming Marijuana too early in life, as the young brain is more susceptible and sensitive than the adult one. Also, this happens because young people usually integrate Marijuana into a not so well-structured life routine, which makes it harder for them to be in control of their consumption.

Another scenario where the negative symptoms tend to show up is when ingesting Marijuana through edible products. In this case, consumers who are new to the substance might confuse the usual amount of food that someone needs to eat to feel full, with the number of edibles required to feel “the high.” And there could not be the worst type of confusion since edible forms of Marijuana are amongst the strongest ones available, which means that the amount of product ingested to “get high” is considerably lower than normal food <sup>[6]</sup> .

## **CBD**

Another very important molecule from Cannabis plants is THC younger sibling: CBD or cannabidiol. They have the same age, as they have always existed within the plant, and they both shared Marijuana’s Intercontinental journey, but CBD molecules have been receiving scientific attention only recently.

This molecule looks and works almost like THC, as they both have a very similar chemical structure, and the two of them can attach themselves and interact with the same brain receptors, and therefore interact with the bodily functions regulated by the endocannabinoid system <sup>[7]</sup> . Thus, CBD and THC similarities extend to some of the same medicinal properties; in fact, both molecules have an active role in pain relief, anxiety reduction,

nausea treatment, and insomnia diminishment <sup>[8]</sup> .

What makes CBD unique, besides its chemical structure that is slightly different from THC, it's the fact that this molecule is not psychoactive in any way. CBD consumption cannot provoke the "high feeling" normally associated with Marijuana.

Hence, medical consumers are employing plants with high levels of CBD more and more, thanks to their milder effects on the body and their inability to modify a person's cognitive state. This use and distinction are especially present in States where THC products are legal for recreational purposes, and medical patients look for a product that will heal them without interfering with their cognitive processes <sup>[7]</sup> .

So, if you were thinking about trusting ancient Chinese doctors, and starting treating a few health issues with Marijuana, but then you felt scared while reading the potential side effects related to THC, CBD might be a good alternative.

As we briefly mentioned, employing CBD can reduce all types of physical pain. It can also reduce nauseous states that often accompany other health conditions. CBD's healing properties are quite vast, as this molecule is useful to ease headaches and chronic migraines, lower anxiety levels, helping with depression, psychosis, or seizures, and it can be a good ally in case of insomnia <sup>[8]</sup> .

For these reasons and these discoveries, CBD products are now legal even in the States, where THC is still illegal, both for medicinal and recreational purposes. In these products, THC is often present as well, but the dosage must respect strict regulations and does not have to surpass a fixed percentage <sup>[8]</sup> .

# Understanding The Endocannabinoid System (ECS)

In the previous sections, we talked about the Endocannabinoid System, or ECS, and how this human neurological structure enables Marijuana and its molecules to interact with our bodies and even modify the way we feel, act, and think. Without the presence of cannabinoid receptors already operating in our brains and bodies, none of the previously mentioned phenomena would be possible. For this reason, before we move further into our exploration of Marijuana and its effects, we will analyze the ECS, its discovery, and how it works.

First, we already know about the deep connection between Marijuana and the ECS, thanks to the similarities between Cannabis molecules and human molecules (the endocannabinoids) <sup>[6]</sup>. However, what we still do not know is that the two connected scientifically and historically as well.

The ECS ended under scientific scrutiny thanks to the studies conducted on Marijuana around the '90. Scientists were trying to understand, just as we are doing right now, how Marijuana works, and how the body treats it and perceives it. And while doing so, they almost accidentally stumbled upon a whole unknown system of internal signaling that connects the outside world, the brain, and our bodies: the ECS <sup>[10]</sup>.

The ECS is a complex ensemble of cells, receptors, and chemicals present all over the body, where molecules that work just like Cannabis molecules, the endocannabinoids, are produced, captured, and used to regulate and alter our internal state. ECS causing changes to our internal state happens all the time, thus, whether we want it or not, and whether we actively consume Cannabis or not, we all have cannabinoids molecules circulating into our bodies, and we all have specific receptors designated to receive them (CB1 and CB2) <sup>[10]</sup>.

These receptors' only function is to capture the chemicals akin to Marijuana produced by the body, the endocannabinoids, and enhance their

effect until an internal change occurs <sup>[9]</sup> .

The ECS regulates numerous functions, and its receptors are present in different regions of the brain and several areas of the body. This system operates over emotions, memory and learning processes, metabolism and eating habits, pain perception and inflammatory responses, motor control, sleeping habits, cardiovascular system functions, muscle formation, bone remodeling and growth, liver functions, sex habits, stress responses, and skin and nerves functions <sup>[9]</sup> , which is a lot.

We might say that the ECS acts as a good parent figure over the body, signaling whether we need to eat more, turn left to avoid some danger, sleep better, take a good breath to rebalance our anxiety or grow a little bit, to maintain a consistent internal balance, also known as homeostasis <sup>[9]</sup> .

## **ECS Components**

The complexity of the ECS relies on its shape: we are not talking about one single and well-delimited organ, but rather a several components that are constantly interconnected and working together. These components are the endocannabinoids, the brain receptors CB1 and CB2, and the enzymes that take care of the cannabinoids once their work completes. The three of them are located all over the body, as the ECS is present in several regions of the brain and the peripheral nervous system as well <sup>[10]</sup> .

Every component represents a stage of the work that the ECS does, and it is precisely through its components that we are going to analyze the ECS and its functioning.

The first components of the chain are the endocannabinoids, chemical molecules produced and synthesized inside of the body and for the body itself, and that has a very close structure to the cannabinoid molecules found in Marijuana plants. Their role is to help regulate and rebalance the body's internal functions. For doing so, the body releases them whenever

its homeostasis varies through life events <sup>[10]</sup> . For example, let's say that we slightly cut ourselves while cooking: we will produce endocannabinoids to inform the brain that the body will have to face a little amount of pain and that it will have to act accordingly. But endocannabinoids alone cannot do the job; they need to bind and “work together” with the specific receptors related to the function that requires some readjustment.

Successively, following the synthetization of the endocannabinoids, it is up to receptors CB1 and CB2, present in different brain areas and nervous system zones, to pursue the work and make the change happen. Cannabinoid receptors, CB1 and CB2, are the second components of the ECS, and their role is to receive and interpret the endocannabinoids that are circulating in a specific area at a specific time. Endocannabinoids molecules can bind to one receptor or the other; this means that every liberation of endocannabinoids will have different consequences. Also, the effects of their liberation depend on the location of the receptor they bind to, in parallel with which endocannabinoid binds to it <sup>[10]</sup> .

For instance, endocannabinoids might bind with CB1 receptors in a spinal nerve to relieve pain. Others might target a CB2 receptor in the immune cells to signal inflammation <sup>[10]</sup> . In general, we might say that endocannabinoids bind to specific receptors, located in (or in charge of) the area that needs some readjustment, to tell the cells responsible for the function (pain, hunger, memory, and so on), to work either faster or slower.

Finally, after the receptors receive the information brought by the endocannabinoids, the cells responsible for the function know what to do. They can now spread neurotransmitters and chemicals that will make us remember what we need to remember, ease a sensation of pain, or move our hand in the right direction <sup>[10]</sup> . At this stage, endocannabinoids have completed their function, and Enzymes will then finalize the process as the third component of the ECS.

Enzymes, in general, are biological molecules that speed up the rate of

virtually all of the chemical reactions that take place within our cells. They serve a wide range of vital functions in the body (like metabolism), and some of them help to break large molecules into smaller pieces that are more easily absorbed by the body. Other enzymes help bind two molecules together to produce a new molecule. In the ECS, enzymes break down cannabinoids molecules after they have finished transmitting their message. The cells have done their work in the physiological processes, and the endocannabinoids cannot continue circulating. Enzymes break them into smaller pieces so that the body can reabsorb them <sup>[9]</sup> .

## **Processes And Functions ECS Regulates**

To complete our exploration of the ECS, we will move our attention from its microscopic aspects, and focus on the bigger picture: the processes and functions that the ECS regulates. Having a healthy ECS means having a healthy life, and in the previous sections, we have seen a few of the life functions that the ECS regulates and balances. We are now going to detail those functions, and see how the ECS interacts with these systems to maintain them in the best state possible.

First, we must clarify that the ECS is still under scientific examination, as researchers are trying to understand better the exact amount of functions that are under the ECS influence <sup>[13]</sup> . Nevertheless, we can identify the principal ones. The memory function is certainly one of the most important, responsible for making us remember big and small things, things that happened far away in the past, or things that we need to know how to do. Emotions are another area regulated by the ECS. Located in one of the inner parts of the brain and felt all over the body, emotion's nature and intensity can vary greatly across the years, or even through the same day.

The ECS also monitors the functions related to appetite and nutrition habits, or in other words, those instincts, signals, and rituals that determine how what or when we eat. We can also cite metabolism and the different ways that our cells employ to extract and manage the energy that the body

needs from the outside.

Finally, the ECS is also in charge of reproduction, or how we behave around sexuality, and fertility, that function that determines whether and in what capacity we can procreate and keep on procreating <sup>[10, 11, 12]</sup> .

Every one of these life-sustaining functions belongs to one or more specific organs, and those organs operate following the rhythm imposed by the nerves, which in turn, connect to specific brain regions dedicated to one system or another. We might say that the brain is the chief of the orchestra, sending signals through the nervous system to the other organs to make them work at the right speed and intensity.

But these circuits sometimes overwork or underwork. For example, stressful events might occur, making us feel an excessive amount of negative emotions, or making us store too many details about a painful circumstance in our memory department, or even making us lose interest in feeding ourselves or in establishing healthy social connections. Potentially, any external event can modify how our life systems work, and even a simple heavy meal can alter our internal state, and interfere with the way we will work, learn, feel, and digest successive meals.

For this reason, the ECS intervention is not only important but even lifesaving. As we have already learned, the ECS's primary role consists of rebalancing our inner state, working to help maintain the body's homeostasis <sup>[13]</sup> . Maintaining the body's homeostasis means operating over its life systems, making sure that their level of activity is neither too high or too low, but right in the middle. For this reason, the ECS works retroactively <sup>[13]</sup> , after the body perceives a change.

When the internal environment detects an imbalance, the body synthesizes endocannabinoids that interact with the cannabinoid receptors. This imbalance triggers a chemical response that works to return the physiological process to homeostasis <sup>[11,13]</sup> . For example, whenever we hurt ourselves, our sensory circuit perceives pain, and the ECS role is to mitigate the sensation of pain by slowing the work of pain receptors.

# Types Of Marijuana And What They Do

Now back to Cannabis plants and their vast world. We have seen how, and what kind of molecules comprises Cannabis, we have seen how they affect the body and the mind once consumed, and we will now see how many different sorts of Marijuana exist. We will present how they look from the outside, and we will explore the details of how scientists, cultivators, and potential consumers treat and consider them.

We already know that Marijuana types can differ based on their percentage of relatively THC or CBD molecules, but this is not the only difference that distinguishes one Marijuana type from another. Nowadays, we can count about 800 different varieties, and the field of Marijuana science knows them with the name of “strains.”

With 800 different strains existing today and probably more to come in the future, it can be confusing to navigate amongst all this diversity. However, we can count on another way to classify Marijuana at its purest form that might help us make some clarity. This classification divides strains into three categories: Indica, Sativa, and Hybrid <sup>[14, 55]</sup> . The main difference amongst them is the shape of the plant itself when in nature, the dimension of it, and the type of leaves. Some experts attribute different and specific effects to each of these categories, but this vision is still being debated <sup>[14, 55, 56]</sup> .

In general, if we focus once again on the 800 varieties, we can safely affirm that every strain brings different and peculiar effects to the table, depending on the percentages of the chemicals inside of it. Every strain presents a unique dosage of cannabinoids and terpenes, determining how the specific type of Marijuana will interact with the specific consumer <sup>[14]</sup> .

This aspect is especially important for professional growers, since this allows them to experiment with “hybrid” combinations, and potentially discover more and more new combinations of Marijuana induced effects <sup>[55]</sup> . For this reason, professional growers constantly work on breeding Cannabis plants in new ways, and by doing so, they keep on discovering

new strains to experiment with within their cultivation and later the market.

When the growers discover more viable strains, another important advantage is a better genetic differentiation within the plant species. Various strains may be more resistant to droughts, or they might grow faster and stronger. And since every new variety develops differently, each one provides its unique feature and its palettes of characteristics. Whenever a grower develops a new strain, the chances are that its effects will target life functions or dysfunctions in a new way, guaranteeing the grower's success, and a new and efficient option for medicinal Marijuana consumers. Experimental cultivation continues, creating more effective treatment options for any given medical condition <sup>[14, 55]</sup> .

And while cultivators pursue their experimentations, widening the strains on the Cannabis family, we will explore deeper the most well-known strains: Sativa, Indica, and Hybrid. To start, we must clarify that Sativa and Indica are two distinct species or strains, and even if they both belong to the same cannabis family, they are deeply different.

They are receiving more and more recognition for having unique growing characteristics, psychoactive effects, and for the possibility to employ them for different medicinal purposes. Understanding the variations is important, especially for people who suffer from different health issues, and who need to inform themselves on which strain will be a better cure for their symptoms and a better fit for their lifestyle <sup>[56]</sup> .

## **Indica**

Following our three categories classification, the first strain that we are going to study is the one we usually identify as the strongest: Indica.

Cannabis Indica owns its name to its place of origin. The first discovery of Indica plants happened around 1700, and the explorers reviewed them as

plants growing essentially inside and around the geographical regions of India <sup>[56]</sup> . In it's a wilder and natural state, Indica as a plant initially only grew in Afghanistan, India, Nepal, and Northern Pakistan, and in particular, on the Hindu Kush mountain range.

With time, the medicinal properties of the plant started receiving more acknowledgment and appreciation, and it was only after that Indica strains began traveling the world. Thanks to this success, today, we no longer must look for them on mountaintops or Indian clearings, since it is now more common to cultivate it in greenhouses all over the world <sup>[56]</sup> .

So, how can one recognize this initially Asian plant? From the outside, Indica plants tend to grow shorter than other strains, assuming a bushy shape with large and broad leaves. Its buds follow this trend too, presenting themselves as wide, dense, and bulky <sup>[56]</sup> . These physical characteristics also have an impact on Indica's growing preferences, as these plants, when in nature, usually thrive in colder climates with a shorter season.

And when it comes to the effects and medicinal properties, Indica strains have their unicity as well. Even if every strain presents its unique combination of molecules, the general opinion indicates Indica strains as showing a prevalent percentage of CBD molecules and a lower percentage of THC molecules <sup>[15]</sup> . The outcome of this combination is that consuming Marijuana Indica in substantial doses often results in a very calming and relaxing effect. Amongst the experts of the Marijuana field, Indica has a strong reputation for causing relaxing or "chill" effects <sup>[15, 56]</sup> .

For this reason, we suggest this strain of Marijuana to treat conditions related to high levels of anxiety, chronic pain, nausea, and/or sleeping issues <sup>[56]</sup> . And the general advice is to consume it at night time, precisely for the deep relaxation that it can produce, making us feel nice and ready to go to bed for a good night of sleep <sup>[15]</sup> .

## Sativa

At the opposite end of our classification, we will find Sativa strains, often known as the “lighter” type of Marijuana.

The first trait of Sativa plants is their favorite geographical place of growth. Originally, these plants only grew naturally in Asia, Africa, Colombia, and Mexico, and only in regions where the climate is mostly warm, and the seasonal changes take longer and are slighter <sup>[15]</sup> .

Now, thanks to industrialized techniques of cultivations, and to the flourishing popularity of Cannabis consumption, Sativa strains can be grown in greenhouses all over the world, just like it happened for its previously studied counterpart, Cannabis Indica.

The easiest way to distinguish the two sorts of strains relies on their aesthetic. While we can recognize Indica strains for being usually short sized and bushy, Sativa strains grow taller and thinner, with long-limbed leaves, and long flower buds that can resemble little green sausages <sup>[56]</sup> .

On a chemical level, Sativa strains also differ from Indica strains. THC is the prevalent molecular component in this type of plant, while CBD molecules are also present but in minor percentages. This ratio explains the general consequences of Sativa intake, which commonly implicates a cerebral and uplifting effect on the person who chooses this strain <sup>[56]</sup> .

Instead of inducing an instant feeling of relaxation that makes us dive deep into ourselves, Sativa consumption can result in feelings of excitement, augmented speed of thoughts, increased creativity, and a full-body energy increase. Helping you feeling productive and free from anxiety, you can employ Sativa for numerous health conditions, but also as a great ally during stressful life periods. Its properties make Sativa the best choice possible for daytime use, especially if you have many creative tasks that require a lot of fast thinking and imagination, such as writing or completing an artistic work <sup>[15, 56]</sup> .

# Hybrid

We have seen the two extreme opposites that nature created, Indica and Sativa, and right in the middle, we will find the third most famous strain: Hybrid. Hybrid strains are fabricated creations that solely grow in greenhouses or farms. It is the result of the human need to combine and experiment with both Indica and Sativa properties <sup>[15]</sup> .

When you are a professional grower, your goal is to grow a good product that can be palatable and useful for as many people as possible. This goal is how Hybrid strains saw the light, and why growers keep on creating them, by combining more and more Indica and Sativa plants, or even hybrid plants with other hybrid plants, to obtain potentially the perfect Cannabis strain for the market.

The consequence of this constant experimentation and ramification is that hybrid strains cannot follow a specific set of characteristics. Visually speaking, hybrid plants can be tall or small, depending on the size of both its “parents” plants. And the same goes for the shape of the leaves and the size of the buds <sup>[15]</sup> .

This logic also applies to the chemical composition of hybrid strains, where the ration of CBD molecules and THC molecules can differ from one plant to another, always depending on the whether the starting plants were CBD dominants or THC dominants. As a general rule, we might say the growers often aim at enhancing the amount of THC within the plant, but asking for the list of the ingredients before buying one product or another is always the best way to know what you are about to consume <sup>[15]</sup> .

Concerning the effects, hybrid strains can make you feel differently depending on the predominant active ingredient of each hybrid. One hybrid strain can be CBD dominant, becoming ideal for anxiety and stress relief, while another might be THC dominant and acts, for example, as a way to reduce the after-effects of cancer treatments. Typically, hybrids have the balance of the Sativa and Indica effects, which are stimulating

and relaxing, respectively <sup>[15, 56]</sup> .

## A Closer Look At The Forms Of Marijuana

One point as been clarified already: If you want to be able to predict the effects of Marijuana, you will probably need to know the type of strain it comes from and the dominant ingredients of that strain, in terms of cannabinoids and terpenes.

But there is another big factor that plays a key role in determining whether Marijuana will be altering our psyche, relaxing our muscles, or make us feel paranoid and anxious: the type of preparation <sup>[17]</sup> . Cannabis plants, when in nature, do not hold any power over us, meaning that you can't get high just by looking at a Marijuana plant, or by standing near to it. Whether the goal is to smoke it, eat, or use it for fabric, all sorts of Marijuana require work and preparation to be used and consumed by humans.

And even if we stick to recreational and medicinal Marijuana, the kinds of preparations available for Marijuana are quite a few. The type of preparation will not modify the inherent properties of the plant, as all of these forms will contain the active components of Marijuana, the phytocannabinoids <sup>[17]</sup> . But two different preparations will determine two different amounts of product required to perceive its effects, two different time frames where the effects will be felt and later on reabsorbed, and two different ways to integrate the substance into our daily life.

Marijuana forms constitute, in this way, a separate field of exploration and the whole world that we need to discover and learn about to be able to navigate through it with ease and consciousness.

If we look back at the last few decades, we will only find three forms of Marijuana preparations. Traditionally, three categories exist to classify Marijuana: herbal, hashish, or hash oil. The first one, herbal Marijuana, refers to the dried flowers and leaves of the plant, which is also the most common sort of Marijuana that is still available to these days. The second one, known as hashish, comes from the resin of the plant. And the third one, the hash oil, is amongst the most potent forms of Marijuana available,

where the producers use a complex process to extract THC components from the plant <sup>[17]</sup> .

Nowadays, these three forms of Marijuana, or preparations, still exist, and they all keep thriving amongst both recreational Marijuana lovers and medicinal Marijuana consumers. Similar to hybrid Marijuana strains, their success not only contributed to their transmission through the years, but it was also the starting block for their multiplication. Today, as soon as we enter into the Marijuana market, we can find other and sometimes unexpected forms of Marijuana. We are talking about concentrates, which follow the same rule as Marijuana oils, by being a very strong form of Marijuana, with a quite complex and sometimes dangerous method of extraction. We will also find edibles, a very popular form of Marijuana, where the use of heat extracts the active components and then mixed with traditional food, such as cookies, teas, or even candies. Finally, we can complete the list with Marijuana topicals, and Marijuana creams and patches, which constitute a valid alternative for several types of external usages and bodily applications <sup>[17]</sup> .

As we have said before, these forms of Marijuana determine the intensity of the product, as different forms or preparation of one same plant can vary in strength and can be consumed in an array of ways. Smoking Marijuana will provoke one type of high while eating; it will affect our body and mind differently. And the same goes for ingesting a few drops of Marijuana oil, compared to the external application of a cream-based on Marijuana principles: both will work thanks to phytocannabinoids, but the intensity and the levels of their impact will differ greatly <sup>[17]</sup> .

For this reason, we are now going to separate and analyze every form of Marijuana: how to obtain them, and finally, how each one of them will interact with our body and life systems.

## **Dried Leaves**

If you remember what we said during the first chapter of this book, then

you probably already have an idea about the composition of this first form of Marijuana. Dried leaves and flowers of Marijuana are surely the most common form of weed that exists today, and that has been existing across decades. And it is to this form that we refer to whenever we talk about “smoking weed” or “smoking pot” <sup>[18]</sup> .

Its popularity is probably due to the simplicity of the process involved to obtain this specific form of Marijuana, and to how easy it is to consume it. The steps to the final product are quite simple; all it takes is a little bit of patience. When Cannabis plants are mature enough and ready to be harvested, the strains are chopped from the cultivation, trimmed into smaller sections, and placed in a different environment, away from any source of humidity that might interfere with the process. The goal of this stage is to dry the leaves and the flowers as much as possible, to be able to crush them into a thin powder once we are ready to consume them. And every grower has their technique and ritual, where some even use drying devices to speed up the operation.

Similarly, some only take about one week to dry their product. And later, seal their weed into bags or jars, waiting to consume it or sell it. Others, on the other hand, prefer to “cure” it, which could take 2 or 3 months of drying before considering their Marijuana ready to be utilized. Only one thing is the same for everybody, and that is that only female plants can undergo this procedure and become the weed that most of us know <sup>[18]</sup> .

After these stages, Marijuana is ready to be smoked, and the soft and green plant that it used to be when in nature, not only looks different once dried, assuming a darker shade of green and a rough texture, but it also gives off a very pungent and specific aroma, even before being smoked <sup>[18]</sup> . This same aroma persists during the consumption when Marijuana burns and the smoke it produces can be smelled even from long distances.

The ways of consuming this type of product can be a few, but the common denominator is that it usually happens through the smoke and aerial intake. To smoke this “weed,” the user has to crush the buds, either manually, or with a specific tool, called a “grinder.” Once you have crushed the buds, you can smoke the powder resulting from them directly or mix it with

tobacco. The easiest way to smoke it is through a cigar, and Marijuana based cigars are usually known as “spliff” or “joint.” It can be obtained by manually rolling the cigar, or by emptying an already industrial made cigar and subsequently replacing its content with Marijuana and tobacco <sup>[18]</sup> .

And if you would like to smoke Marijuana, but you are not a fan of cigarettes nor tobacco, there are other options available. You can also smoke-dried Marijuana through pipes and bongs <sup>[18]</sup> , two popular tools further discussed in the next chapters. Generally, this form of Marijuana is less potent than other forms of weed, but it can still produce quite strong effects if smoked in massive doses.

## Hashish

Hashish is another very popular form of Marijuana, especially in the Northern African States and Arab Cultures, granting it the alternative name of *Moroccan* <sup>[19]</sup> . Hashish, or Moroccan, and dried Marijuana are two profoundly different sorts of Marijuana. Even if it comes from the same Cannabis plants as dried Marijuana leaves, hashish shares only some of the characteristics of its most famous cousin. First of all, they do not come from the same parts of the plant. Hashish does not come from the flowers nor the leaves of Marijuana, but rather from the fine growths of Cannabis plants that produce the plant’s resin, the trichomes <sup>[19]</sup> .

Another big difference relies on the method required to make hashish. The process for dried leaves of Marijuana is not as elaborate as the process for hashish.

First, you collect trichomes from the plants, and later on, you compress the trichomes to extract the resin stored on their inside. After extracting the resin, you leave it to dry and subsequently compressed to create compact solid blocks whose color can vary from yellowish-brown to dark brown or licorice black. The substance that results from this process goes from the liquid of the resin to the solid and quite greasy consistency of hashish <sup>[18]</sup> .

Due to its appearance, soft on the inside and shiny from the outside, hashish gets often compared to chocolate, and just like chocolate, once it is ready for usage, hashish can come in the form of small squared bocks, little balls, and even tiny sheets <sup>[18]</sup> .

However, this type of product does share a similarity with dried leaves, since just like dried Marijuana, hashish is usually consumed as a smoking preparation, and generally using hand-rolled cigarettes. When smoked, hashish is split into smaller pieces, again, just like chocolate, and then warmed to turn it from solid to malleable. Before putting it into a cigarette, you will have to mix hashish with tobacco, but you can skip this step if the goal is to feel a stronger effect <sup>[18]</sup> .

Concerning the effects of hashish, we can keep in mind all the Marijuana induced alterations that we listed in the previous chapters, and then elevate them to a higher potency. Hashish's highs are usually stronger than the ones you will obtain by smoking Cannabis flowers, even if the active ingredients of hashish are the same as Marijuana, the phytocannabinoids, and especially THC molecules. But since hashish comes from the resin of the plant, where the THC concentrations are higher, THC levels in hashish are significantly higher as well, making hashish one of the strongest forms of Marijuana available <sup>[19]</sup> .

## **Concentrates**

Dried Marijuana and hashish are surely amongst the most well-known forms of Marijuana, and this isn't surprising at all, considering the ease in acquisition, and how equally easy it is to consume them. And even if the latter is usually stronger than the first, the two of them can still be considered as mild forms of Marijuana, especially for their ways of consumption, which makes them generally manageable for anybody.

But there is another form that not many may know, as it scores significantly higher on the scale of potency, and is for the most expert Marijuana consumers and lovers. We are talking about concentrates, a pure

and clean form of Marijuana, where the active ingredients are extracted and separated from the rest of the plant to obtain a product whose smaller doses can give you the highest effects <sup>[20]</sup> .

Marijuana concentrates can take many forms and shapes, and each one of them possesses its unique name. The first element that differentiates one concentrate from the others is the method of extraction. Professional extractors can usually count on specific machines, allowing them to experiment with chemical solvents that separate the active ingredients, phytocannabinoids, and terpenes, from everything else. Extraction can also be made through non- chemical processes, for example, using pressure, fine filtration, or extremely cold water <sup>[20]</sup> .

Another factor that plays an important role in defining what type of product will result from the extraction is the starting material. You can obtain using the dried leaves of Marijuana, hashish, or even other types of concentrates that can be further refined and cleared from whatever is not CBD, THC, and terpenes <sup>[20]</sup> .

To make some clarity, we will identify the main types of concentrates available to these days and see what sort of process they must undergo to reach their final form. We are talking about waxes, oils, and shatters.

The first concentrate that we mentioned, the wax, owns its name to its consistency, as this type of product generally assumes an opaque golden color, and a sticky and smooth feeling <sup>[20]</sup> , that might make us mistake it for honey, or, as the name says, wax. Waxes are usually obtained starting from another extract, and then whipping it until its consistency is modified <sup>[20]</sup> .

The second type of extract is nothing more than the Cannabis plant's oils at its purest form. Now, even if this might sound plain and simple, the truth behind this product is a little bit more complex. By working with the raw materials with patience and care, you can separate the pure ingredients from everything that is plant matter and not oils. Specific chemicals and

industrial machines are required to make oils, which make them on one side one of the purest and cleanest forms of Marijuana available, but also not a good option for lovers of DIY creations <sup>[20]</sup> .

And to close our triad, shatters are also a type of concentrates whose name describes their consistency. From the outside, shatters look like transparent candies or small pieces of glass, and when you touch them, they break and “shatter,” just like glass. You can use hydrocarbon to extract shatters from the plants or rawer concentrates, similar to waxes <sup>[20]</sup> .

All of these concentrates, or extracts, as we previously mentioned, have to undergo precise chemical procedures. They are made by extracting THC from the cannabis plant with butane, carbon dioxide, or other solvents. Hence, they are sometimes called THC oil, marijuana oil, or butane hash oil <sup>[20]</sup> . Marijuana concentrates are potent, said to be three to five times stronger than dried leaves. That’s the reason why they may cause hallucinations or mental issues when taken substantially <sup>[18, 20]</sup> .

## **Edibles**

One more form of Marijuana that is rapidly taking over the market in areas with weed legalization is one that combines the multiple advantages of several types of products. Edibles forms of Marijuana are any food or beverage infused with Marijuana <sup>[18, 21]</sup> , and they are gaining more and more success due to a vast number of reasons.

To start, we have seen that Marijuana intake, when done in a controlled and conscious way, can have many health benefits. But since smoking is often the most popular way to consume it, it can lead to the same unpleasant side effects related to smoking tobacco or any other substance, such as respiratory problems, frequent coughs, pulmonary irritation, and so on. And while many do not mind or even decide to integrate smoking Marijuana while being already smokers, others might find smoking weed too dangerous for their health <sup>[21]</sup> . And this is where edibles come in,

allowing anyone, from experienced Marijuana lovers to hesitant beginners, to profit from all the possible Marijuana induced effects, without compromising their airways.

And this is not the only reason that makes edibles so attractive; there are almost infinite ways to combine Marijuana with food and beverages, making it extremely easy to mix with everyone's specific food preferences, and even easier for DIY cooks to experiment in their kitchen. Edibles can also take the form of capsules, becoming easy to carry around as well, and a valid alternative for those who are too busy to follow elaborate recipes <sup>[21]</sup> .

There are several methods available to infuse Marijuana into your favorite snacks. If you decide to start from dried Marijuana, keep in mind that the goal is to extract its active ingredients, THC, CBD, and terpenes, to mix them later with food <sup>[21]</sup> . And one very simple and quite classical way to do so is to use heat to dissolve Marijuana into a fat matter, such as butter, milk, or kitchen oil, filtrate the mixture to remove any plant residuals, and later use the Marijuana enriched ingredient for cooking whatever comes to your mind <sup>[21]</sup> .

One of the most popular ingredients used to dissolve Marijuana is typically butter, making pastry and cookies the most well-known food items that you can combine with Marijuana <sup>[21]</sup> . Who has never seen at least once a movie where you can offer Marijuana in the form of sweet chocolate brownies? Exactly, probably no one. And cookies and brownies are just the tip of the iceberg, where the more you seek, the more recipes you will find out, such as pizzas, sauces, cakes, milkshakes, and so much more <sup>[21]</sup> .

One more way to add Marijuana to edible products is to use Marijuana oil to extract the active ingredients directly; all it takes is to add a few drops of your favorite phytocannabinoids combination to your equally favorite food. This method is especially useful when you decide to mix Marijuana with food items that do not have any fat in them, like, for example, fruit drinks or teas <sup>[21]</sup> .

When ingested, Marijuana takes a different road than when it is smoked or inhaled. Before being felt, you need to digest the Marijuana, and its effect takes longer before they manifest, usually from half an hour to one hour and a half, depending on the consumers' sensibility and whether other food has to be digested first <sup>[21]</sup> . And even if THC concentrations are usually lower than what we can find in other forms of extracted Marijuana, edibles induced effects can be significantly stronger than the ones provoked with a Cannabis cigar, and they can last for six or even 12 hours <sup>[18, 21]</sup> .

## Topicals

The final Marijuana form that we will see on this list is the topicals. Topicals are usually self-care products, like creams, lotions, and patches infused with Marijuana extracts. Once again, in this type of product, you will have to separate the Marijuana active ingredients from the plant material, and later on, infuse them into the cream or patch <sup>[21]</sup> . The goal of this procedure is to carry the healing Marijuana properties and make them available for other types of usage.

We have largely talked about how Marijuana can be used and have been widely used to treat pain and to induce relaxation. Well, the goal with topicals is to produce the same kind of results that one can obtain by smoking or eating Cannabis, but only on selected areas of the body, and only on a superficial level.

Topicals also contain THC, as the majority of other Marijuana-based products, but are not for getting high, particularly as they do not reach the bloodstream when applied <sup>[21]</sup> . For example, under this section, we might find creams and lotions for muscle relaxation, whose usage is only external, and that will not interfere in any way with the psychological state of the consumer.

The superficial and local use of topicals separates them from any other form of Marijuana, for being the only ones that one cannot use for

recreational purposes under any circumstance. On the other hand, this aspect is also very important, since their inability to alter the psychological state of the user makes them also a classic form of medicinal marijuana. By using the cannabinoid receptors placed on the external organs, they are used to treat arthritis, spasms, muscle aches, skin troubles, and other conditions <sup>[21]</sup> .

## How Is Marijuana Administered?

It has become quite clear now that the word Marijuana does not refer to one precise product, but rather to a whole world of different sorts of plants, with different combinations of molecules, and that such a plant shape into a vast number of forms. And while there are different forms of marijuana, there are also several ways of consumption and administration.

Every single way of consuming Marijuana has its ritual, its specific tools, and it can interact with the body differently than any other one. Depending on whether you decide to smoke it, eat it, take a few drops of it, or apply it on your skin, you will obtain different results. While the active molecules of Marijuana that make it effective remain the same from one form to another, the area of the body that they interact with can vary the way greatly, the specific individual will feel and perceive their consequences.

Some types of Marijuana intake will have a stronger impact and last longer, while others might go easier with the body, but then require a shorter period to reach the brain and alter its functions. It is hard to say and define which one is the best method to take Marijuana if one decides to do so. But it is certainly not impossible to operate an informed choice, based on how every single administration method will have a specific impact. Also, you should understand the types of negative and possible side effects of different Marijuana intake.

And we are sure glad to help you do so. In the next table [Table 1], you will find a concentrate of all this information, followed by detailed instructions and descriptions for each administration method currently available. This way, even a potential novice consumer will be able to sort things out, while understanding what kind of method integrates into their specific life routine, and which negative side effects could maybe be too strong to handle at their stage of consumption <sup>[22, 23]</sup> .

<u>Method</u>	<u>Effects</u>	<u>Negative side</u>
<i>Smoking</i>	Fast effects, easy to control. Also easy to practice as it requires little to no tools.	Respiratory problems related to smoke.
<i>Vaping</i>	Vapour is less violent than smoke, and cannabis oils can cause a stronger "high".	Still unregulated. Most of the cartridges used to refill the e-cigarette come from the black market, containing dangerous chemicals that can make the consumer sick.
<i>Tinctures</i>	Same effects as smoking or eating Marijuana, but milder.	Contains alcohol. In addition, dosage has to be handled carefully.
<i>Edibles</i>	Stronger, longer lasting effects.	Require time before the high can be perceived. Possible misuse by excessive intake, causing anxiety and heavy fatigue.
<i>Topicals</i>	Non-psychoactive, therefore non-invasive. External use only.	Lack of research and regulation on the subject. Possible allergic reactions due to non-controlled ingredients.
<i>Patches</i>	Non-psychoactive. Longer lasting medicinal effects than topicals.	Non-psychoactive, therefore not ideal for those using Marijuana for its recreational aspects.
<i>Suppositories</i>	Medicinal use only. Non-psychoactive.	Only operates locally.

[Table 1]

## **Smoking Cigars / Pipes / Bonges / Blunts / Hookah**

The easiest and most common way of using Marijuana is by smoking it. The great popularity of this method is quite understandable since it

requires little to no modifications to the raw product to enjoy its benefits. In fact, to smoke Marijuana, all it takes is to dispose of even a small amount of dried leaves, and maybe some tobacco, but this is only necessary if you wish to mitigate Marijuana's flavor, smell, and impacts.

Dried Cannabis leaves and buds are crushed and reduced into a powder, and then rolled into cigarettes or placed in pipes or bongs, then smoked aka inhaled and exhaled <sup>[23]</sup> . The heat of the flame that burns Marijuana powder activates its phytocannabinoids, so that once the Marijuana charged smoke enters the lungs, our pulmonary alveoli absorb THC and CBD molecules, allowing them to reach our bloodstream right away. And once in our blood, the route to our brain is quite short, making that smoked Marijuana felt within 5 or 10 minutes after its intake. This rapidity is a big strong plus for medicinal Marijuana users whose conditions require fast action, like people who deal with chronic pain or those who have to face unpredictable panic attacks <sup>[23]</sup> .

Pipes and bongs work with the same principles. The main difference is that, usually, when you smoke Marijuana through a pipe or bong, it does not get mixed with tobacco, and the power of its smoke is in that way a little bit more intense. The advantages of these tools also rely on the cleanliness of the smoke that results from them. Pipes allow the consumers to enjoy a good smoke, without also inhaling paper and other materials contained into cigarettes filters, while bongs, thanks to their section dedicated to storing water, filter the smoke before inhaling. Another great side of pipes that usually appears once the consumer has gained some experience and starts to become creative is that you can make pipes from almost everything. Marijuana smokers that run out of rolling options and do not possess a pipe of their own are known to use old bottles, buckets, or even fruits to enjoy their smoke <sup>[23]</sup> .

You can consume dried Marijuana in a blunt, which is a hollowed-out cigar with marijuana or a mixture of tobacco and marijuana <sup>[23]</sup> . And some smoke them through mini-bongs and hookah <sup>[23]</sup> , which you might also know by the name of shisha, from some parts of the world where the shisha is usually associated with using smoke to gather and share a moment.

Smoking Marijuana is, as we previously said, one if not the easiest way to consume it, but it does not come without a price. And if on one side cigarettes and bongs allow the consumer to have more control over the amount of weed that enters their body, on the other hand, smoking can cause the same side effects that one can develop by smoking tobacco cigarettes. Even if researchers agree on saying that smoking Marijuana has no direct link to a greater chance of developing a lung cancer, frequent smokers can often develop issues such as teeth problems, irritations of airways, chronic bronchitis, and persistent and strong coughs <sup>[23]</sup> .

## Vaping

The term Vaping is short for vaporizing, the act of inhaling the vapor of cannabis or other products to feel their effect. This method of consuming Marijuana is relatively new, as its birth happened in parallel with the advent of “vape “as a substitute for cigarettes. These vaporizers, or e-cigarettes, allow consumers to pursue their smoking habits while diminishing the usual intensity of common smoke. And after nicotine-based e-cigarettes took off, it didn’t take long before the vaping market integrated THC vaporizers as well <sup>[23]</sup> .

In this method, the user inhales the vapor of cannabis, as the vaporizer heat the Marijuana derivate placed inside of it almost until it reaches the point of combustion, without ever getting to it. To vape Marijuana, it is possible to heat the dried form of it, but most vaporizers use Marijuana oils, where THC concentrations are usually significantly higher than THC percentages found in the raw product. We are talking about 20% of THC contained into dried herbs, compared to a 70% to 90% of THC contained into Cannabis oils <sup>[24]</sup> .

It might be for this reason that vaping is gaining more and more popularity, even amongst old school consumers. This preparation even tends to be favored by some because it reportedly gives access to a stronger high feeling. Consumers also turn towards vaping for practical reasons, since this consumption method leaves a lesser unpleasant smell

than smoking, and it is certainly easier to carry around <sup>[23]</sup> , which allows frequent smokers to access their favorite products even in areas and contexts where burning the classical cigarettes wouldn't be a viable option.

The latest research about vaping indicates that this inhalation method has become the third most popular way of using marijuana <sup>[24]</sup> . And even if this explosion has opened new doors for consumers, its recent nature also comes with potentially serious health risks.

In the US, only some of the States have legalized the use of recreational and medicinal Marijuana, while in others, you still consume the substance, but its usage is neither controlled nor regulated. And while we can leave aside the political aspects for a while, it is still important to see how this uneven movement can impact consumers. When we talk about illegal consumption, we talk about the black market, where prices do not always guarantee the quality, and where there is no authority making sure that safety protocols are respected <sup>[24]</sup> .

When it comes to vaping products, uncontrolled merchandise present across the black market means potentially contaminated pre-filled cartridges that enter the lungs bringing THC molecules and everything else that was present during the production. And this is more than a theoretical conjecture, as research confirms an alarming incidence of reported respiratory problems brought on by vaping pot.

One especially critical report is the one published by the Center for Disease Control and Prevention: the 2019 Mortality and Morbidity Report. In this study conducted over hospitalized patients after contracting serious respiratory issues, it reported that 92% of interviewed patients admitted vaping THC, and the majority of them would use pre-filled cartridges from unknown sources before becoming sick <sup>[24]</sup> .

## **Tinctures**

Cannabis tinctures are alcohol-based products infused with Marijuana, and therefore carry Marijuana properties <sup>[23]</sup> . It is possible to purchase them, but you can also easily fabricate them at home since several previously tested recipes exist to satisfy the needs of those who love a good old-fashioned homemade product <sup>[25]</sup> .

Generally, to make Marijuana tinctures, all it takes is to reduce the dried flowers into a powder, subsequently mix it with alcohol in a jar, and finally let the two blend. Some recipes suggest to leave the mixture to sit for a few weeks, others to heat it in a water bath to speed up the process, and finally, some indicate that shaking the jar is enough to let alcohol absorb Marijuana molecules <sup>[25]</sup> .

Whatever method one decides to utilize, the final step remains the same: it is important to filtrate the alcohol-based mixture and separate all the residual plant material from the infused liquid. And once the extraction is completed, depending on the method used, the final product will look like a dense and transparent liquid whose color can vary from golden yellow to intense green. For this reason, Marijuana tinctures also possess some eccentric alternative names, such as the golden dragon or green dragon <sup>[25]</sup> .

With such names, it can be easy to think that tinctures are extremely strong and hard to handle. On the contrary, they offer a great alternative to those who would like to consume Marijuana without incurring the potential side effects of a smoking habit. Also, they do not require any fat product to dissolve the active ingredients of Marijuana, becoming very useful to those who are on a diet or do not want to have to eat a cookie any time they need to absorb phytocannabinoids <sup>[25]</sup> .

The simplest way to use tinctures is to place a few drops of it under the tongue and let the arterial veins placed right underneath do the job. This way, Marijuana can directly reach the bloodstream and absorb very quickly, guaranteeing a fast effect that will be similar to those induced by smoke or edibles, but that will usually be milder and last for less time <sup>[25]</sup> .

Being a little less strong than other forms of Marijuana, tinctures can be a great starter for those who are just beginning to use medical or recreational Marijuana, allowing them to safely test the dosage that is the most adjusted to their system, adding or removing drops from one intake to another <sup>[23, 25]</sup> .

Another way to use tinctures is to mix them into food items and beverages. With this method, the intensity of the tincture will remain the same, but the route that Marijuana molecules will take will be the same they take when placed into Marijuana edibles. When mixed with food items, you will have to digest Marijuana tinctures with the rest of the meal felt, and this process can take between 30 to 90 minutes <sup>[25]</sup> .

Whatever the form, tinctures give the same effects of marijuana, though in a milder way.

## **Consuming Marijuana Edibles**

Marijuana edibles are food items that contain Cannabis. They require a little bit more preparation than the one needed to roll a joint, but they can be great for those who cannot stand the smell and the feeling of a cigarette <sup>[21, 23]</sup> .

The classical way to combine food and Marijuana is through Canna-butter, an ingredient whose funny name already describes its nature. Canna-butter is plain butter that has been heated and blended with Cannabis dried herbs, and later on, filtrated and let to rest, to obtain a new and quite greenish butter that one can use like any other butter, for example, to prepare cookies or cakes. The difference is that this type of butter is also enriched with Marijuana phytocannabinoids, and will, therefore, add them too to the recipe <sup>[21]</sup> .

And Canna-butter is not the only edible ingredient that one can blend with Marijuana to prepare delicious foods. Kitchen oils can furnish a valid

choice as well, offering a dairy-free option that can be used just like any other oil. Also, Marijuana dried herbs are not the only alternative available to mix Cannabis properties into edible items, because, since the proliferation of Cannabis oils and tinctures, almost any type of food or beverage can become the perfect host for a few drops of Marijuana. And because Marijuana oils and tinctures do not require any cooking or modification, they allow us to ingest Marijuana even in the form of capsules and lozenges <sup>[21]</sup> .

With so many choices available, it is not a surprise that edibles are so popular. And this is especially true amongst those who are just starting their journey through Marijuana products. Because whether you decide to opt for a soft brownie, a sweet candy, a crunchy peanuts bar, or a sip of refreshing tea, the intake process remains the same: all you have to do is swallow your food, and then wait.

However, the waiting part is quite crucial. First, the wait is necessary for the body to absorb THC and CBD molecules, and therefore let them reach the bloodstream. You must digest marijuana edibles to produce the usual euphoria, light head, and or the medicinal benefits of Marijuana, and this can take between 30 to 90 minutes. And secondly, such products generally have a significant amount of tetrahydrocannabinol (THC), which makes the “high “that they produce significantly stronger and longer-lasting than the one consumer can obtain by smoking weed <sup>[21]</sup> .

It is possible to estimate how long you will feel an edible, as users report perceiving their effects for four up to 12 hours. But if you are starting with your experimentation, the factors to keep in mind are your general metabolism rapidity, your body weight, how much THC the specific product that you will choose contained, and how many servings of the food you will eat.

In fact, with these products, waiting is not a simple matter of patience before reaching the pleasure, but also a safety measure. It is crucial only to take small amounts of Marijuana-infused foods so that the body and brain do not get overwhelmed with excessive amounts of THC <sup>[21]</sup> .

These edibles are for recreational and medical purposes, and they can trigger a wide range of effects like relaxation, euphoria, or increased appetite. And when the consumer exaggerates and consumes them in substantial doses, the negative effects can range between heavy fatigue and pervasive anxiety <sup>[21, 23]</sup> .

## Applying Topicals

Marijuana topicals are self-care and medicinal products, such as oils, balms, and creams infused with cannabis. Their goal is to use the healing Marijuana properties to treat external or superficial health issues, such as skin problems or muscles pain. These formulations are usually denser and more diluted than pure Cannabis oils, and users often employ them to treat localized inflammation and pain <sup>[23]</sup> .

To benefit from their effects, all it takes is to collect a small amount of the topical and then apply it to the area that requires treatment, just like any other beauty or medicinal cream. Once the cream is on, the cannabinoid receptors placed on the surface of the body will bind to the phytocannabinoids present in the cream, and induce relaxation or reduce inflammation, depending on the specific combination of ingredients in the specific topical <sup>[26]</sup> .

Since the phytocannabinoids concentration are quite low when it comes to topicals, and since they only interact with the external parts of the body, topicals are not psychoactive in any way. Even when a topical contains THC, its molecules will not reach the bloodstream, making it impossible for the consumer to “get high “after using a Cannabis cream or lotion <sup>[26]</sup> .

When presented this way, topicals seem like the safest and less invasive alternative available, but they also have a tricky side. Just like we said about vaping and non-controlled cartridges, topicals are quite recent as marketable products. And because of their newness, they lack substantial research on the subject. Therefore, they do not have standardized methods

to evaluate their quality.

For consumers, this often results in creams and products that worked perfectly for the producers, but whose efficacy cannot translate to the general public. Also, Cannabis is not the only ingredient present in today's topicals, as those who produce them usually mix them with other materials. And these materials, due to the home-made nature of the product, either do not figure on the packaging or, once again, their quality did not undergo any testing. It is advisable only to purchase Cannabis topicals that have been tested by third parties to avoid any unexpected allergic reactions <sup>[26]</sup> .

Nevertheless, some researches have decided to take the issue on their hands and to verify the claims about Cannabis topicals' efficacy. So, even if scarce, researches do exist on the subject, notably attesting that topical Cannabis can help treat a large number of conditions, particularly skin conditions, such as eczema, irritations, or inflammations.

One especially interesting report is the one published in the book of Dr. Henry Granger Piffard, MD, one of the pillars of American dermatology. In his book, he stated how cannabis taken at night had helped him feel relieved of his eczema itching <sup>[26]</sup> .

From there, several studies have shown how cannabis can treat skin conditions, particularly because of its known anti-inflammatory, antimicrobial, and anti-itch qualities <sup>[26]</sup> . Thanks to these results, Cannabis topicals are gaining more and more recognition as an efficient way to use Marijuana as a medicine.

## **Patches**

There is an additional way to use Marijuana as a medicinal tool without experiencing any of the psychological alterations associated with smoking a joint or eating a Cannabis cookie, and the efficacy is outstanding.

Marijuana patches are a very discreet but potent way to introduce THC into our bodies, without ever losing control over its dosage. They are transdermal patches that look like slightly bigger Band-Aids, and whose effect, as their name suggests, works through the skin.

These patches, called transdermal delivery system or TDDS, has a unique structure where it presents several layers with one of them containing THC. Once applied on the skin, the patch gradually delivers THC molecules through the skin, that later on will enter the bloodstream and will travel through the body. But these doses of THC will be very small and delayed across several hours, so that the consumer can get a dose of the THC in Marijuana, without having it affect the brain and its course of functioning <sup>[27]</sup> .

The adhesive Marijuana is a very useful tool for those dealing with serious medical issues, and especially those with chronic conditions, as patches only let circulate a specific amount of THC, and they do that across a prolonged period, giving an all-day or all-night-long relief to those with persistent pain and severe anxiety <sup>[27]</sup> .

If you were considering the use of a patch, the mode of usage is quite simple. You apply the patch to a venous area of the body where the skin is quite subtle, such as the inside of the wrist, the arm, or an ankle <sup>[27]</sup> . Once the patch is on the body heat naturally activates it, and causes it to release a small amount of THC through the skin and into the bloodstream. The process goes on and on until all the THC in the patch absorbs, which can take several hours, assuring that you feel its effects through the body for up to 4 or 6 hours <sup>[27]</sup> .

The gradual release of THC is also at the origin of the non-psychoactive side of patches. When one smokes or eats Marijuana, the phytocannabinoids enter the body rapidly, causing the cannabinoids receptors to overwork and therefore to produce the usual side effects of the “high,” like euphoria, modification of thoughts processing, sudden and intense hunger, and, when THC reaches high doses, even paranoia, and coordination losses. On the contrary, patches deliver THC gradually,

allowing it to reach the bloodstream but only at a speed and intensity that allows THC molecules to perform their medicinal role, and nothing more than that <sup>[27]</sup> .

The efficacy of patches is not only due to the powerful properties of Marijuana but also to the attested functioning of patches as a medicinal tool. While Marijuana patches are quite recent as a product, patches, though not that common, have been around since the 1970s. We can mention, for example, nicotine patches as the elder cousin of Marijuana patches <sup>[27]</sup> .

## Suppositories

To finalize our list, we are now going to mention one last medicinal form of Marijuana: Marijuana suppositories.

Marijuana suppositories only have few ingredients, making their manufacturing quite simple. Using them, on the contrary, requires a little bit more knowledge, particularly about how, where, and for what one can use these suppositories.

To obtain Marijuana suppositories, the main ingredient you will have to use is Cannabis oil, which later you will have to blend with a thicker oily substance, one that the body can tolerate easily, like coconut oil or shea butter. Once the two ingredients are well mixed, you only need to place the compound into a suppository mold, and voilà, you will have your own set of Cannabis suppositories <sup>[28]</sup> .

And even if you do not have time to dedicate to their creation, but you still would like to give them a try, Marijuana-infused suppositories are now in the market, where their commercialization aims mainly at reducing cramps <sup>[28]</sup> .

Cramps are not the only issue that one can treat with suppositories, but their area of action remains restricted, as you will only be able to use them medicinally and not recreationally. Suppositories do not produce any “high, “even if some users declare that the feeling they produce on the rectal and pelvic muscles is still worth a try <sup>[28]</sup> . But apart from the “butt high” that some evoke, scientific evidence on how exactly those suppositories can influence the totality of the body is still quite scarce. We are still going to report available data to offer a complete review of this last product.

There are conflicting claims about the use of and the impact of Marijuana suppositories, especially because, by consuming Marijuana through the rectal or vaginal way, most of the conditions that you can usually target with Marijuana are not treatable. Despite this aspect, the product has been gaining popularity, especially thanks to consumer reviews. Suppositories work within the rectal or pelvic region, which contains a network of nerves that travel to the limbs and up the spine. And the colon contains cannabinoid receptors, the same CB1 and CB2 that we can find all over the body, which mediate THC’s effects, but only on the areas and function strictly close to the pelvic region and its nerves <sup>[28]</sup> .

Once we are aware of that, it is possible to use suppositories to placate issues like lower stomach cramps, rectal pains due to illnesses or accidents and operations, digestive issues and Chron symptoms, lower back pain and restless leg syndrome. It is also possible to insert suppositories in the vagina, and this case, alleviating menstrual cramps and pelvic discomfort, or even issues related to intercourse. We are talking about issues such as sexual pains and dryness. Vaginal suppositories can, therefore, even to induce vaginal relaxation and sexual enhancement <sup>[28]</sup> .

## Recreational Vs. Medical Marijuana

Throughout this book, we have talked about Marijuana consumption and about how it can serve both medicinal and recreational purposes. What we still must clarify in detail is what are the differences that separate the recreational weed from the medical one. And if we start by separating the two sorts, it is because they are substantially different, and that happens to be in terms of effects, purposes, active ingredients, quality, and regulation.

Until not so long ago, this distinction did not exist, and as we have seen in firsts chapters, Marijuana was undeniably a medical tool. The Marijuana we have known for long has been utilized in medical science for some time now to help cure a wide range of illnesses, symptoms, and other conditions. We have seen how originally Marijuana was employed to treat digestive problems, chronic pains, sleeping troubles, and even psychological disorders, like anxiety, eating disorganization, or depression. The wide range of efficacy of Cannabis on the medical field allowed this substance to resist across the decades, and to become more and more accepted as a valid way of treatment.

For example, in the US, we can think about the evolutions of Marijuana-related legislations in California, who became the first state to legalize the use of medical Cannabis in 1996, while recreational cannabis had to wait until 2018 to become legal, and as such sold to the general population <sup>[30]</sup> .

California was not the only state that waited so long before allowing its citizens to have access to both medicinal and recreational Marijuana. Recreational Marijuana became legal for the first time in the US only in 2012, and only in two states, notably the State of Washington and the State of Colorado <sup>[29]</sup> . And just recently, the full legalization of Marijuana as a recreational tool could take place. In 2019, it is now possible to count over 30 States where Marijuana is legal, and this status is valid for medical or recreational use or both <sup>[29]</sup> .

But even if in some parts of the US and the world, nowadays it is possible to find and buy the two sorts of Cannabis, they remain quite distinct on

many levels. To start, the main difference between medical Cannabis and recreational Cannabis are the active ingredients in Marijuana. The concentration of phytocannabinoids is different in the two types of weed. If in medicinal Marijuana, the main active ingredient is the Cannabidiol (CBD), in recreational weed, we usually find higher concentrations of Tetrahydrocannabinol (THC) content <sup>[31]</sup> .

And while THC is medicinally beneficial and carries its beneficial properties, its psychoactive nature is not recommended for users who specifically want to use Marijuana exclusively for health benefits. This difference is at the root of other differentiations, like who can use one type of Marijuana or the other, and how to produce and commercialize. Medicinal Marijuana can suit a large number of people, including children and elderly citizens, while recreational Marijuana is only adequate for adults or young adults, whose lifestyle and habits do not risk being compromised by the intoxicating side effects of THC <sup>[31]</sup> .

Another very important point concerns the quality of the two. We have already seen that the CBD contained in a Marijuana plant has proved to be an excellent medical remedy for several conditions and that for this reason its legalization and commercialization has taken its way and has been actualized for several years now. Thus, medicinal Marijuana not only requires a different pathway to be purchased, usually demanding a medical prescription, but it also has to undergo a series of quality tests perfected through time, and that does not appear in the requirements for recreational Marijuana, both legal and illegal. Medicinal Marijuana today is, therefore, the safest type of weed, with also the best quality <sup>[31]</sup> .

# The Good, The Bad, And The Ugly

We have started from a tiny plant from rural Asia, and we have ended up discovering an entire world of variants, products, and effects. Marijuana is still quite hard to grasp fully due to the number of forms and shapes it can take, both aesthetically and once consumed, as the ways it can interact with its users can depend on a vast number of factors. What we can say, though, is that Marijuana, even when taken in the smallest of doses, always has an impact on the human body, even when it can only alter a specific area of it. Whether that effect will be good, bad, or even ugly is something that over compasses universal predictions, and that mainly relies on how the specific user will decide to pick one form of Marijuana intake over another.

Marijuana's molecules can potentially change the way we think, perceive pleasure and pain, move, eat, digest, and treat internal inflammations. And the more THC molecules one consumes, the more the effects will be intense and sometimes harder to control. The effects can either be positive or otherwise, depending on the dose and the frequency of the consumption. The more Marijuana you will decide to take, the more it will be important to rebalance your system accordingly.

Marijuana is a natural product, but this does not mean that it is automatically good for everything and anyone. And to enjoy and profit the benefits this plant can carry, the safest way to do it is the conscious way. Knowing who you are, what does your age requires, what kind of symptoms you need to keep track, and for what purpose you might decide to choose Marijuana is certainly the best baseline to have before picking one particular Cannabis form and one particular dosage. For this reason, it is important to present both the reported benefits and the drawbacks of using Cannabis products, whether they are for recreational or medical use

[31] .

Because Marijuana can be quite fun and enjoyable, and even lifesaving at times, but it is important to keep in mind that we are talking about a substance that can potentially alter the totality of our body's systems. As we mentioned in the firsts chapters, Marijuana and humans do not only

share the same Earth; they are also similar on a molecular level.

Remember the fact that we already have cannabinoids in our system, the endocannabinoids that are so similar to Marijuana's phytocannabinoids, which are normally interacting with the endocannabinoid system, or ECS, that ensemble of processes that are present all over the body and the brain, and whose role is to regulate the intensity of how our life-sustaining systems work. And remember that taking in Marijuana with its psychoactive component can further mimic our endocannabinoids, by stimulating our body's endocannabinoid receptors, causing the various physiological and mental effects that we mentioned before, and that we are now going to discuss further <sup>[32, 33]</sup> .

## **What's Good**

Marijuana and the ways people should use it, or not use it, is still under a passionate debate. On one side, we can find those who argue that Marijuana can interfere too severely with the human body, making its consumption dangerous. While on the other side, consumers, researchers, and even doctors insist on saying that Marijuana is not only beneficial but sometimes necessary. And it would not be the case if Marijuana did not cause any good or pleasurable effect.

Today's research on the subject is still quite incomplete, precisely because the legalization of Cannabis is not everywhere, and because, to conduct proper studies on the subject, Universities and laboratories require a special permit <sup>[34]</sup> . But even that being the case, it is impossible to ignore millennia of use, and millions of users' voices reporting just how much Marijuana has changed and improved their life. The reported benefits of medical Marijuana <sup>[34]</sup> , as well as the 'feel-good' effects of recreational Marijuana, are two undeniably important sources of information that allow us to understand why so many people are desperate to have access to this product and to be able to do it in a controlled and safe way.

First, medicinal Marijuana surely is the key to understand this issue.

Imagine being severely sick and then imagine having a magical elixir that, with only one sip, takes away all your symptoms, leaving you free to live and experience your life as a normal and happy human being. Now, imagine that after experiencing this, the said elixir gets taken away from you, then given back, then again prohibited, then returned to you but in the worst form, then placed on hold, then debated, then declared illegal, and so on. Well, millions of patients are facing this issue daily. We are talking about people with sclerosis, MS, cancer, Chron disease, chronic and paralyzing anxiety, persistent pain and inflammations, or people undergoing chemotherapy <sup>[35]</sup> .

And all these people have found through medicinal Marijuana a way that not only allows them to ease their symptoms, but that is also easy to understand, easy to use, adaptable to everyone's particular necessities, and that can they potentially consume without major side effects, especially when we compare Marijuana to other and way more invasive forms of treatments.

And the same goes for recreational Marijuana, whose use acts as a gateway to strongest and more detrimental substances like heroin, opium, or psychedelic drugs. Even if a constant and massive use of THC can have negative consequences, none of them can compare to the ones experienced with the substances listed before, or even with the disasters of alcohol consumption. Also, a controlled and conscious use of recreational Marijuana can have health benefits as well and even improve some aspects of its user's life.

As we mentioned in one of the first chapters, Marijuana that contains THC molecules can interfere and modify several processes, and it can do so in a more intense way compared to CBD based products. But interference does not necessarily disrupt, as many recreational consumers report of using it to achieve a deep state of relaxation and relief, as well as a euphoric feeling accompanied by new and often more creative thoughts. And as for its health benefits, it is important to note that several types of research have linked THC molecules with a significant interference with cancer cells growths and that many patients dealing with PTSD symptoms need the stronger effect of THC to contrast their intense feelings of fear and panic, and their sleep-depriving nightmares.

Testimonies of this sort are present all over the internet and beyond, often backed by the few but strong research results that we have today. And it was only thanks to this persistence and focus, that more than half of U.S. states and the District of Columbia have legalized medical marijuana in some form, and more and more states are considering bills to do the same.

So, even if the current situation is everything but ideal for consumers, as even the most problematic ones would deserve to have access to safe and tested products, this is still to be considered a huge progress in allowing the use of Marijuana to treat certain health conditions.

But even if you made such steps, Marijuana consumption remains tricky. Decisions about its legalization, or not, have been left so far to single States, who can opt whether or not Marijuana should be regulated and accessible, and what conditions consumers have to fulfill to grant regular access to it. While on a Federal level, institutions still decide to prohibit Marijuana, and the substance did not lose its status of dangerous drugs.

So, even if many people are using Marijuana daily, both with or without prescription, the FDA has so far only officially approved its use for the treatment of two rare and severe forms of epilepsy, Dravet syndrome, and Lennox-Gastaut syndrome <sup>[35]</sup>, and Cannabis classified as a Schedule 1 drug.

This decision is extremely reductive, and it does not consider the real effect that Marijuana can produce, which can affect and modify a much wider spectrum than the one considered by the FDA. We have said several times that one can use Marijuana to ease extreme conditions, but it is also true that you can employ it to tackle less severe issues, such as lack of appetite, temporary stress, mild numbness, or sadness due to life events.

Users have been long reporting about how Marijuana can help enhance feelings of happiness, calmness, relaxation, increase the appetite, keenness, and heighten our sensory awareness, even in the absence of a paralyzing or invalidating condition <sup>[35]</sup>.

## What's Bad

The message so far has been quite clear: there are conditions and situations where Marijuana is an adequate solution, becoming even necessary to support a balanced lifestyle. But the opposite is also true, and there are specific situations and life stages where Marijuana must be either avoided or kept under strict control.

Researchers have published few studies on the subject, once again, because of the only recent cultural switch that has been allowing Marijuana to become a research subject. And the results obtained are sometimes contradicting or unclear. On one side, we can find studies conducted on humans, where in some cases we miss detailed information about the subjects who participated in the studies, and in other cases, we have studies whose results contradict each other.

And on the other side, we also have studies conducted on animals, especially on rats. Now, rats have a long history of being experimental subjects for researchers, and especially for neuro-researches, because of the similarities between the human brain and the rats' ones. But we must keep in mind that humans and rats do not share the same lifestyle. Also, research in laboratories are not directly comparable to the outside world, and that the ways scientists have chosen to administer Marijuana to rats are often coercive, invasive, and operated within conditions that makes it hard to formulate claims about free choices.

But even if we decide to take some distance from said researches, some of the results do suggest treating Marijuana with some caution. We briefly mentioned before that Marijuana, even if able to defend itself with years of historical benefits, and even if it can boast of the status of a 100% natural product, does have some ill effects. And those possible negative outcomes, are associated mainly with frequent and long-term use, especially if the consumption starts early in life, and/or with overdose, that can occur when you consume Marijuana in doses that are not adequate to what one person can tolerate, even if it is their first time consuming it.

When we talk about prolonged consumption, we can find studies where

“substantial evidence from animal research and a growing number of studies in humans indicate that marijuana exposure during development can cause long-term or possibly permanent adverse changes in the brain. Rats exposed to THC before birth, soon after birth, or during adolescence show notable problems with specific learning and memory tasks later in life.”<sup>[36]</sup>

These results claim that persistent Marijuana consumption in early life is generally not a good idea, especially because some evidence links the ECS with the formation of neural pathways during youth, and interfering with its work using Cannabis can prevent the brain from fully forming, causing the person to perform poorly on some tasks<sup>[36]</sup>.

Also, as we said before, even when you only consume Marijuana once or twice, a lack of knowledge about its dosage can lead to overdose. And even if overdosing on Marijuana does not have the same fatal consequence that overdosing on other products, the side effects can be quite intense and hard to manage.

In the lists below, you will find a resume of the possible negative sides of Marijuana, where the first list exposes the consequences of a short-term overdose, or as frequent users call it, a “bad trip.” And the second list shows how and what areas of our life one can substantially impact by intaking Marijuana for long and without control when the consumer is not yet mature enough<sup>[36, 37]</sup>.

As we will see, most of the side effects are directly related to the psychoactive power of Cannabis that can only manifest when the origin plant contains THC. CBD and medicinal products do not follow the same logic, making them ideal even for those who could be potentially vulnerable and at risk. Anyhow, we will start summarizing short-term adverse effects, and later on, long-term adverse effects in two shortlist that will help you predict and recognize the possible negative outcomes of Marijuana abuse.

## **Short-Term Adverse Effects**

### **Severe Anxiety And Paranoia:**

Believing that everyone is after you, that everyone is an enemy.

### **Hallucinations:**

Feeling and perceiving things that are not there, like sounds, colors, smells, and so on.

### **Slow Reaction Time:**

Hardship in starting movement when you need to, or difficulty to verbally respond and formulate a coherent response.

### **Being Prone To A Heart Attack Or Stroke:**

THC makes your heart work faster, and frequent use can make your cardiac system weaker. This effect of THC is especially true for consumers who already have heart conditions.

### **Poor Motor Coordination:**

Actions easily accomplished in normal conditions can become hard to perform when under the THC influence.

### **Long-Term Adverse Effects:**

Structural brain modifications when Marijuana consumption starts too early in life. <sup>[36, 37]</sup>

## **Long-Term Adverse Effects**

### **The Decline In IQ:**

Especially in verbal and memory tasks. While other areas seem to remain protected.

### **Poor Academic Performance And A Higher Chance Of Dropping Out:**

Marijuana can interfere with motivation, making it harder for chronic users to keep on performing in highly competitive environments.

### **Impaired Thinking And Ability To Learn And Perform Complex Tasks:**

Especially when memory is involved, as memory is one of the functions that suffer the most negative effects when one consumes Marijuana too early.

### **Lower Life Satisfaction:**

When using Marijuana replaces all the other activities, the “feel good” caused by the high can only replace temporary real-life achievements and joys.

### **Potential Development Of Opiate Abuse:**

When people use Marijuana as an escaped drug and consumes it in unsafe environments, there is a greater chance that this consumption will also incite the intake of other drugs and risky behaviors.

### **Relationship Problems:**

Using Marijuana too early in life can also alter the formation of other brain areas, notably those involved in self-control and in the ability to create close relationships.

### **Antisocial Behavior:**

Marijuana makes us feel good, and when that feeling is the only type of reward that we obtain from our environments, one big risk is to isolate ourselves from reality, to rely solely on the product. <sup>[36, 37]</sup>

## **What's Ugly**

We have seen what the most superficial risks linked to a misuse of Marijuana are, and we must keep in mind that when we talk about superficial, we do not mean unimportant, but rather those effects that are more visible from the outside. But the downsides of Marijuana can also go deeper, as researches show <sup>[39]</sup>, affecting those hidden areas of the brain, and therefore more difficult to study and monitor.

But thanks to today's advancements in neurosciences and Marijuana related studies, even the deep dark secrets of the brain can be brought to light, and that is what scientists are starting to do to understand better how psychotropic Marijuana can impact and even modify our heads.

These researches had shown that there are specific brain regions that seem to suffer the strongest impact of frequent Marijuana use and that the researches whose results indicated a greater detrimental effect when Marijuana consumption at younger ages could be confirmed even at this deeper level. Also, studies have shown some mental conditions that can trick individuals into using Marijuana as a way of self-treatment, while also being the exact reason why the same individual will experience greater damages after usage. So, let's dive deeper into these elements.

Chronic Marijuana users show specific brain abnormalities, notably in those regions related to working memory. Working memory is a vital function, the one that allows us to remember and learn daily actions quickly, words, habits, and so on, that can later be transferred into the long-term memory, if necessary. Abnormalities in these regions are not strictly related to Cannabis abuse or dependence; the same brain pattern is present in people with schizophrenia <sup>[38]</sup>. Poor working memory will mean being unable to keep up with the day, with any day. Not knowing how to respond to situations, or how to complete a simple task, let alone perform complex assignments.

This inability to "keep up" with things is a usual sign of Marijuana overdose, even when over time, the consumption is not prolonged. When someone overdoses on Marijuana, the side effects are not fatal, but the detachment from reality will be so strong and violent, that the person can perceive it like a close to death experience. Well, dependence from

Marijuana can cause the same detachment from reality as overdosing on the substance, but with greater and deeper damage.

And the effects can sometimes be irreversible, especially for those who've started using it in their teens <sup>[38]</sup> . As we mentioned previously, researches have underlined just how crucial the stage of development is for the brain and how equally sensitive the ECS is during this process. By taking constantly high doses of Marijuana during youth, the substance will interfere with the normal formation of the brain, giving it a new and not so reassuring shape. And while in some cases, such modifications can be treated and even brought back to normal, the earlier the substance abuse starts, the harder it will be to intervene.

Another factor that plays a key role in this process is each one's psychological health. Because while we can agree on saying that any abuse, even Marijuana abuse, can be at the root of long-lasting problems, we also have to mention that for some people, this can be worse than for others. We said that the brain abnormalities that the researchers discovered were similar if not the same as the ones shown in cases of schizophrenia. And what researches found was that for people who already showed schizophrenia symptoms, the damage caused by dependence and abuse was even greater <sup>[38]</sup> .

Similar to how Marijuana can be a lifesaver for some health conditions, there are other ones where the use of this substance can become harmful and dangerous. And the danger is particularly hard to see when the person will seek Marijuana to obtain some relief from the anxiety that often comes with symptoms of schizophrenia. The initial relaxation that Marijuana always produces will strengthen the will to use the product while smoking psychoactive weed can further aggravate this kind of psychological state in the long run.

For instance, as reported by a recent Northwestern Medicine study, teenagers who were heavy Marijuana smokers during several years had abnormal changes in their brain structures, even after they ceased their regular consumption. Their memory became poor, and they performed poorly on memory tasks <sup>[39]</sup> .

In this study, the brain abnormalities and memory problems were observed for subjects in their early twenties, two years after they stopped smoking marijuana. But we should note that those same subjects were tested across many years, from childhood to adulthood, even including observations from the people who were closer to them. This type of longitudinal study not only permitted researchers to have a baseline to which compare Marijuana early smokers to non-smokers but also by testing their subjects long after they stopped using Marijuana to attest to the long-term effects of chronic use.

## Is Addiction Inevitable?

Yes, everything that we have just said is quite scary, especially because we are still talking about the side effect of a substance whose beneficial properties have been long reported, used, and proved by researches. But this is often the case when something makes us feel good: we want to feel that feeling again and again, and the less we know or care about the dangers, the longer it will take to see it as a problem. And frequently using Marijuana without control, in some cases, can become a serious issue, known in the medical field under the name of Marijuana use disorder <sup>[40]</sup> .

So, what are the odds of developing such disorder, and how does it present itself from the outside. We already know that on a neurological and performative level, persistently using Marijuana when it is not the right fit for us can lead to a decrease of specific functions. But it is also possible to recognize the signs of this type of disorder even without having access to a research laboratory.

First, Marijuana use disorder can take two forms. The mildest one is called Marijuana dependence, and it is directly related to the physical aspects of the relationship between weed and your own body. When someone is dependent on Marijuana, it means that, at some point, its body will need Marijuana to function properly. In other words, its body will be “dependent” on Marijuana to eat, sleep, walk outside, or to be with other people, and so on. Another aspect of physical dependency is that, not only the person will constantly have to look for the substance to function, but once you remove the substance, they will experience withdrawal symptoms, that can vary from loss of sleep, loss of appetite, uncontrollable mood swings, irritability, or inability to concentrate. And those symptoms can last for one to two weeks <sup>[40]</sup> .

Another form of experiencing Marijuana use disorder is addiction. Addiction is more severe than physical dependency, as it does not only affect the body and the sensations related to it, but it also shapes the behavior and the habits of the user. Addiction means that the need to consume Marijuana overrides every other need, from the need to advance in one’s career, to the need to eat or have social relationships. The person

is taken over by the substance, their whole life and schedule will rotate around being able to consume constantly, even in circumstances where they no longer enjoy the effect, or where it could be dangerous to consume it safely <sup>[40]</sup> .

If we refer to scientific data, we find out that 30% of Marijuana users have developed some form or degree of Marijuana use disorder, and that the chances are even higher when the person started their consumption before the age of 18. Young consumers appear to be four to seven times more likely to develop a Marijuana use disorder than adults <sup>[40]</sup> .

Furthermore, the study noted that “Marijuana dependence occurs when the brain adapts to large amounts of the drug by reducing the production of and sensitivity to its endocannabinoid neurotransmitter.” <sup>[40]</sup> This means that by constantly introducing an external substance, the brain gets used to it, and it gets used to replace its normal functioning with it. For this reason, physical dependence more often than not leads to addiction, especially because, once it is a habit, the withdrawal symptoms that one has to face to get rid of it, often lead to prolonging the usage, and therefore solidify said habit <sup>[40]</sup> .

## **Who Are At Risk?**

Everyone is different, and this is also valid when we talk about addiction in general and Marijuana addiction as well. For some people, consuming Marijuana is a fun, pleasurable, and quite safe way to manage their small life pains, especially because of the little side effects it has compared to other stronger and more invasive medications. But for others, consuming Marijuana can become detrimental to their psychosocial health and balance. We have briefly mentioned in the previous chapters how some factors, like living conditions or psychological vulnerabilities, can turn Marijuana into an enemy, and we are now going to analyze them better to define who is at risk of developing a dependency or an addiction.

According to the US Substance Abuse and Mental Health Services Administration, Marijuana is addictive. They report that 1-in-6 people who start using the drug before the age of 18 can develop an addiction, while 1-in-10 adults who use Marijuana can become addicted <sup>[41]</sup> . And this other side of the gold medal can depend on many factors.

One big cause of Marijuana becoming a drug is its psychoactive nature. So, if on one side we know that only Marijuana containing THC can have psychoactive effects, on the other hand, we have scientific reports stating that over the past few decades, the THC content in Marijuana has been steadily increasing, reaching three times the concentration of THC compared to the Marijuana people used in the 1990s. And higher concentrations of THC mean stronger and more violent effects on the brain. We do not know for sure that higher concentrations of THC also can be responsible for greater brain damages, but researches agree on saying that these THC degrees surely can be linked to higher rates of dependency and addiction <sup>[41]</sup> .

The greater the psychoactive impact, the stronger the psychoactive modifications, which then lead to the process that we described before, where the brain replaces its cannabinoids with THC molecules, making them more and more necessary for the whole body to function. And the more the body will need to receive Cannabis to function, the more the behavioral habit will become solid, slowly but steadily leading to addiction <sup>[41]</sup> .

Therefore, one big risk factor is the THC concentration in the type of Marijuana that one chooses to consume. But this is not the only one. Researches have underlined other factors of vulnerability, less related to the substance itself and that has more to do with how one person is or how and where they grow up.

For instance, according to the medical director of the New Leaf Treatment Center in California, Dr. Alex Stalcup, genetics is one way to predict whether one will be prone to developing an addiction. Studies of identical twins raised in different families support this theory, as the two have higher chances to develop an addiction problem when one of the two starts

developing one. And the higher the genetic resemblance, the higher the risk, since this co-occurrence of two addictions problems surging even at a physical distance is more present when we observe identical twins than fraternal twins <sup>[42]</sup> .

But genes are not the only factor of vulnerability when faced with substance abuse. Someone can be genetically strong and start their life with a solid mental health, but then see it degrade because of unfavorable living conditions. Studies show how weak family ties can often make a person more and more fragile over time, and therefore prone to turn towards substances and the way they can make us “feel good” to replace what they cannot receive from their environments <sup>[42]</sup> . In these cases, the substance replaces a strong and reassuring parental figure, offering some emotional support to the person in distress.

The same logic of replacement through substance abuse applies to people with fewer choices and even less economic freedom. A big portion of people who seek help for addiction report chasing after the substance to compensate for what they cannot obtain in their daily life, like satisfactions, support, or enriching social relationships. These individuals may find drugs like Marijuana more attractive and see it as an easy escape from a life that does not resemble them, and therefore be at greater risk for developing an addiction <sup>[42]</sup> .

## **What Are The Tell-Tale Signs?**

Someone you know and love might be addicted to Marijuana to the point of not being able to carry on with their life. Or even you might be in the process of developing an addiction, but you are not sure about it. The good news is that there are signals and cues that one can learn to recognize others or themselves that might indicate that an addiction is establishing. Recognizing such signals is the first step to be able to react and offer the support needed in these types of situations. These cues are the tell-tale signs of addiction, and they can vary from external or internal signs, emotional or behavioral, physical, and psychological.

When addiction is looming or already present, the best way to see it is, of course, having a look at how much Marijuana one is using. Is the usage controlled and restricted to certain times and dosages, or the person keeps on using more, and no matter what part of the day they are in or what task they are required to do? Is the sum spent on Marijuana part of a fixed budget, or the person started spending more and more on Cannabis regardless of their financial situation? Are they still able to attend social gatherings and professional situations, or would they rather stay alone and consume non-stop?

Experts say that one of the biggest signs of Marijuana addiction is an uncontrollable urge to use Marijuana regardless of its negative outcome or effect. This addiction may take the form of “getting high “at work or even skipping work to consume, or spending more on the drug than what the person can afford without caring about the consequences. Experts also indicate a tendency for isolating from others and feeling unable to cope with social situations <sup>[43]</sup> .

And when you have a well-established addiction, the behavior of the person might start to change drastically, prioritizing the consumption over everything. This addiction can even lead to stealing to afford more and more substance, or showing irrational behaviors or even emotional outbursts, like fleeing a place in a hurry to consume, or raging over somebody else when consuming is not immediately possible.

On a physical level, the person facing an addiction problem often presents red eyes and a sleepy allure. When confronted with a conversation, they are often slow at responding, and can sometimes be unable to find the proper words to express themselves. They usually oversleep and overeat, causing them to develop the also present symptoms of chronic and extreme fatigue <sup>[43]</sup> .

More often than not, most of the people addicted to Marijuana feel that something is not right or something is lacking unless they can get high, which is true on a physical level, as they have accustomed their body to replace its cannabinoids with the ones present in the substance. And also, psychologically, the repeated action of consuming establishes a routine

that is often hard to kick-off, as those addicted have conditioned their mind and body to take in larger amounts of Marijuana to get high and to prioritize Marijuana use over social or occupational responsibilities <sup>[43]</sup> .

The more easily observable common signs of addiction are bloodshot eyes, poor motor coordination, lethargy, irritability, mood swings, paranoia, increased appetite, and lack of focus <sup>[43]</sup> .

# Preventing And Treating Marijuana Addiction

We have said it several times already, medicinal Marijuana can and is a great ally against a vast number of health and psychological conditions. But we have also seen that this is not the only form of Marijuana that people can have access to, as there is also another type of Marijuana whose properties are usually as tempting as the medicinal ones, and that carries the power to modify and alter even strongly the psychological state of its consumer as well. Recreational Marijuana contains THC, this molecule so similar to the body's cannabinoids that can interfere with our vital functions, making us feel great in the beginning and not so great once we lose control over it <sup>[44]</sup> .

It is precisely because of the mind-altering substance in marijuana, the THC that passes through the bloodstream until it reaches the brain that this form of the substance can become addictive. THC binds with the brain's cannabinoid receptors, CB1 and CB2, replacing and interfering with the normal process of capture of the endocannabinoids. Once the body gets used to receiving cannabinoids from the outside, it will demand the user to intake more and more, altering sometimes forever the functioning of these vital receptive cells. A large percentage of these cannabinoids receptors exist to influence thinking, memory, coordination, and sensory perception, which is why, once the whole system learns to rely on Marijuana to function, this will affect almost the totality of our existence <sup>[45, 46]</sup> .

At this stage, when the body demands larger and larger amounts of weed to perform through life, we can talk about dependence or abuse, where the user not only will seek after the substance regularly but also will feel negative withdrawal symptoms whenever not able to consume. Abuse can happen in both occasional and chronic users of the drug, but the symptoms are often temporary, such as elevated heart rate, sleeping problems, heightened awareness, and sharp emotional sensations.

And if the dependence establishes itself as a major part of the person's life, it is appropriate to talk about addiction. Addiction is the next stage of abuse and dependence when the person not only needs the substance to function but can sometimes stop to function to replace life activities,

responsibilities, and relationships with consumption <sup>[45, 46]</sup> . In cases of addiction, the initial abuse can get to the extreme, and the person has difficulty coping with the situation and even stronger difficulty quitting.

Almost anyone who uses Marijuana can become addicted, but we also know that the severity of the effects can depend on some factors that can make one user more vulnerable than another. We have seen the role of genetics in this process, along with the potency of the substance consumed, as experts assert that increasing levels of THC plays a crucial role in a person's chances of becoming addicted. Also, the frequency of use is a strong predictor of whether Marijuana consumption might become a problem or not.

Addiction is both physical and mental, as the body craves for and develops a higher tolerance for the elevated quantities of marijuana, and since you will actively desire the drug's effects, and consequently build activities around its consumption <sup>[45, 46]</sup> .

It is not enough understanding Marijuana to avoid addiction but also managing it actively. Luckily enough, there are several treatment options available nowadays, such as support groups and rehab <sup>[44, 45, 46]</sup> . We will now detail each one of them, how they work, and for whom every type of treatment might be a good option.

## **Motivational Enhancement Therapy (MET)**

One first form of treatment existing today is the Motivational Enhancement Therapy, also known as MET. This method is usually a short-term intervention that will not take place over several years like other forms of therapy, but it will rather set a fixed number of sessions where the help seeker will meet primarily with a counselor.

The simplest version of this method involves an expert in the field of addiction that provides private counseling to the person dealing with a

Marijuana use problem. The main goal of these counseling sessions will be to wake up dormant resources of the person, to help them find the inner strength and motivation to take once again the control over their consumption, and therefore their life. The belief is that, once the change happens internally and the person can once again connect with their sense of responsibility and accountability, it will be easier to engage their motivation to stop or reduce their consumption <sup>[47]</sup> .

This method resolves a very common problem amongst patients seeking help for addiction: their ambivalence regarding how to solve a personal issue through external help <sup>[47]</sup> . This ambivalence means that people who begin to acknowledge their substance-related issues look for help without being ready to stop their consumption. In other words, they sometimes feel like receiving specific counseling is enough. This ambivalent attitude precludes progress, and the MET aims precisely at reconnecting those two ends. The goal is to bring the person to the point where they can help themselves and become independent of the substance and the counseling.

The individual counseling offered by MET is usually also accompanied by other forms of support for addicted people, like, for example, the 12-Step treatment program that was created by Alcoholics Anonymous. The 12-Step program uses the force of the group as a key tool for change, where the person is motivated and supported by the presence of others, and at the same time, reassured by the fact the group is constituted by people who share the same goal: stop their consumption. The name of the program comes from its guidelines of 12 precise instructions printed in an official book that is now shared and used by all the support groups using this method <sup>[48]</sup> .

Researches conducted on teenage consumers and published by the US National Library of Medicine confirms the belief around the efficacy of MET. The National Institutes of Health tried to determine the feasibility of MET among teenage Marijuana users by advertising the possibility to take part anonymously to this therapy program within their school structure. Not only many students voluntarily decided to seek help, but it revealed that subjects significantly reduced Marijuana use three months after taking part in the program <sup>[57]</sup> .

This therapy program shows that presenting people with good quality information, and offering them easy access to an efficient form of support can be a great method to help them reduce problematic levels of Marijuana use.

## **Cognitive Behavioral Therapy (CBT)**

Another very efficient way to treat addiction and Marijuana addiction as well is one that you probably already heard about: Cognitive Behavioral Therapy, or CBT, is a very popular form of treatment that has been used for several decades now. Originally, CBT was to treat depression, and later many other psychological issues, such as anxiety, eating disorders, obsessive-compulsive troubles, or even PTSD. And because of its efficacy and safety, now it is widely used to tackle addiction as well <sup>[49]</sup> .

The length and nature of the CBT can vary from one patient to another, depending on the severity of the symptoms, the support that they can receive, and the type of issue that requires attention. In general, whether one must recur to CBT to get rid of a mild phobia or handle a deep-rooted addiction, the therapy is always verbal. The therapist uses a structured type of dialogue, where the objective is for the patient to become aware of his negative or inaccurate thinking so he can more clearly understand challenging situations and respond to them more effectively.

The relationship between this method and treating addiction usually relies on the causes behind the formation of said addiction. The addicted person is in some form of distress, and using the substance is the only response they know of that can help them cope with all sorts of life discomforts. Through CBT, the therapist not only helps the patient recognizing the suffering underneath their need for medication, but they also offer their patients new techniques and behaviors that they will be able to turn into life skills. And the simplicity of it all is that you can have a therapeutic talk facilitated by a psychotherapist or a therapist in a structured setting, normally for a specified number of sessions defined during the first encounters <sup>[49]</sup> .

CBT is often the preferred type of psychotherapy because it can quickly help the patient identify and cope with specific challenges, and it requires fewer sessions than other types of therapy. It has also proven its efficacy in addressing mental problems in various settings <sup>[49]</sup> .

Instead of suppressing the anxious thoughts with medication or self-medication, during CBT, the person focuses on studying their thought patterns on recognizing whether there are specific recurrences that systematically lead to the search for the substance. The therapist will help and support them bring to the surface their negative views about the world and the future to operate over them and potentially turn them into fuel for change <sup>[58]</sup> .

Being able to identify negativity is an important process that can help anyone, even those dealing with minor issues, but especially those carrying a substance use problem, since in these cases, there will likely be flawed perceptions of their life, called cognitive distortions. The cognitive distortions can bring the person to perceive themselves and the world as hopeless and without resources, transforming the substance they use into the only solution to face the day ahead. Cognitive distortions can vary, and one person can have a unique combination of them, but the main ones that specialists have identified so far are all-or-nothing thinking, mental filters, jumping to conclusions, and over-generalization of perceptions <sup>[58]</sup> .

## **Contingency Management (CM)**

To finalize our list, the last form of treatment that we know of for handling Marijuana addiction is Contingency Management or CM. Contingency Management is the underdog of this list, as it is the least known form of treatment amongst patients, and also amongst specialists of the field and therapist. The research on the subject is quite scarce, and the results are mainly empirical.

However, this sort of therapy is one that has shown the greatest statistical drops of consumption, even if the criticisms on its directions are still

numerous. Many claim that Contingency Management is way too expensive to apply it on a large scale, and also that this method only works on the most superficial levels of addiction, forgetting to address the deepest causes that often lead the person towards the use of substances <sup>[51]</sup> .

Nevertheless, CM, when applied, alone or in parallel with other forms of treatment, can bring great results; therefore, it is worth it to include it in our exploration.

CM consists of the use of rewards or incentives to help reinforced desired behaviors where the rewards can take the form of prizes or monetary rewards. The patient can obtain said reward once they show tangible proof of their abstinence. One example could be obtaining a small voucher every time the person can show a negative urine sample <sup>[50, 51]</sup> .

Another way of using CM is by withholding said rewards or by applying disciplinary measures every time the person is not able to provide the desired behavior. Like withholding cash whenever the person fails to present a clean drug test. But this version of CM is the object of even more severe criticism, where experts say that using punishments as a form of treatment breaks the trust and the feeling of support that the addicted person usually requires for their healing, often encouraging secrecy and cheating conducts <sup>[51]</sup> .

Even if not many psychiatrists are familiar or at ease with CM, this method always showed great results, and it might become a great ally when used in concomitance with other treatment methods, like CBT or other therapeutic methods. And for some patients, utilizing CM as a stand-alone method might also be more than enough to obtain change.

And despite the criticism, studies conducted on the subject confirm the belief about CM efficacy. On one research appearing on The Psychiatrist Journal published by the US National Library of Medicine, and conducted by the National Institutes of Health, found that CM treatments not only worked well for patients dealing with addiction but they sometimes even worked better than other forms of treatment <sup>[50, 51]</sup> .

# Psychotic Disorders And Marijuana

When we took the time to explore when and where Marijuana use could become problematic, we mentioned the link between schizophrenia and the abuse of this substance. We explained that the stronger the psychotic traits and symptoms, the higher are the potential negative influences of consuming psychoactive Marijuana. But the link between the two is still under investigation, and researchers affirm that even if Marijuana and Psychotic disorders correlate strongly, it is often hard to say whether one precedes or causes the other. In some cases, smoking Marijuana can lead to a greater chance of developing persisting psychotic disorders, while in others, the already existing psychotic disorders are the reason why the person turns towards Marijuana and ends up abusing it.

If we focus on Marijuana as a potential factor of fragility, we can find studies that link the persistent use of potent weed with an increased risk for psychiatric disorders. On a report by the National Institute on Drug Abuse, Marijuana abuse appeared to be the enhancing cause for developing severe psychological issues such as psychosis (schizophrenia), depression, anxiety, and substance use disorders. But even if Marijuana consumption was the common denominator between the subjects, the researches still noted that it was hard to precisely identify whether Marijuana alone was the sole responsible for their detrimental psychological health or if other factors were involved <sup>[52]</sup> .

Other more recent studies suggest that smoking strongly psychoactive Marijuana daily could raise the probability of developing a psychosis by nearly five times compared to non-consumers. Other factors that play important roles in creating a vulnerability to psychosis while consuming Cannabis are the age at which one starts consuming and genetics.

So today, the strongest evidence linking Marijuana use and psychiatric disorders suggest that Marijuana on its own does not cause psychological issues. Nevertheless, scientists agree on saying that the two relate strongly, as being genetically prone to a psychiatric issue, or growing up in an environment that is detrimental for one's mental health often leads to Marijuana abuse. And Marijuana abuse, especially when it starts at

younger ages, is particularly damaging for fragile people, often making their psychological and social conditions even worse <sup>[52]</sup> .

In the two sections below, we will resume the factors that appear in a publication by the National Drug & Alcohol Research Centre in Sydney, where their specialists asserted that the potential harms associated with using cannabis depend mainly on:

**The age at which the user began to use cannabis, especially if it was before 18 years old.** While still in development, the brain has to go through some key stages, and abusing Cannabis can interfere with these processes, known as synaptic pruning (when deleting old neural connections) and the development of white matter (responsible for transmitting signals in the brain) <sup>[53]</sup> .

**The patterns of use.** The pattern indicates the frequency, the dose, and the duration. The frequency is high when one consumes at least weekly. When we talk about dose, we usually refer to THC; the larger or stronger the dose, the more THC the person is ingesting, and THC is the primary psychoactive component of cannabis that can target areas of the brain involved in the regulation of emotional experiences. While the duration indicates how long in terms of years, the person regularly consumes <sup>[53]</sup> .

To explain even further how duration can have an impact on mental health, we can cite a related study led by Dr. John McGrath of the Queensland Brain Institute that operates for the University of Queensland. Dr. McGrath examined the data on 3,801 young adults born between 1981 and 1984 who underwent several psychological assessments once they were in their twenties. The subjects tested at different ages, and they all consumed Cannabis, but for different durations. The researchers found that the longer was the duration of Cannabis intake, the more they would develop multiple psychosis-related issues <sup>[54]</sup> . From such results, we can conclude that early, unsupervised, excessive, and prolonged use of Marijuana can result in mental disorders like psychosis and schizophrenia.

## Conclusion

Marijuana is truly a force of nature. It is gentle and efficient at the same time, and it so versatile that people can use it for whatever they need in whatever form they need it. It can be fun or healing, it can be discrete, or you can use it as a way to gather, and when people employ it correctly, it can become a real life-saver.

It is amazing how a simple plant can tackle and treat conditions and illnesses that would otherwise isolate the sufferer in a spiral of pain. But the goal of the one who seeks help is to become more autonomous and happier, and Marijuana alone cannot turn a whole life around. On the contrary, when Marijuana is the only support that the person uses to carry on, an imbalance is often around the corner.

We have seen how certain vulnerabilities can become even greater when Marijuana comes around. And how what in the beginning can be medicinal, in the long term, can become an illness.

Marijuana is not the perfect substance, and humans are not the perfect consumers. And even if Marijuana is safer than other substances, it remains something that can alter and even trick our minds and body. Whether one decides to use it to spend a fun night, or to have a good night of sleep finally, nothing comes free from consequences. And while there are some cases where starting to use Marijuana can open some new doors and pathways, there are others where the best option is to stop and look somewhere else to find the right kind of help.

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