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# Your Complete Guide to CBD – The Hot New Cannabinoid

If you follow any trends in health and wellness, it seems as if *cannabidiol* (CBD) is absolutely everywhere these days. People can't get enough of it. It's showing up in lattes, gummy bears, dog treats, and even cheeseburgers, all the while being pitched as a kind of cure-all for every and any ailment.

But what is CBD exactly? What does it actually do? Is it all hype?

Turns out that there is quite a bit of hype and hyperbole, but there is also some pretty solid evidence that CBD can help with quite a few conditions. So without further ado, let's examine what CBD is and how it works, primarily via its interactions with the *endocannabinoid system* (ECS) and a state of being known as *homeostasis*.

## CBD & Cannabinoids

*Cannabidiol* (CBD) belongs to a group of chemical compounds known as *cannabinoids*. These cannabinoids can be broken down into the following categories:

1. **Endocannabinoids** - These are produced naturally in the mammalian body (sometimes referred to as *endogenous cannabinoids*).
2. **Phytocannabinoids** - These are extracted from the famous *cannabis* plant.
3. **Synthetic cannabinoids** - These are created in a laboratory.

For the purposes of this article, let's focus on the first two exclusively, starting with phytocannabinoids. Cannabis is a highly complex plant with [over 500 distinct chemical compounds, 104 of which are phytocannabinoids](#).

Furthermore, the two most notable phytocannabinoids are:

1. **Cannabidiol (CBD)** – Discovered in 1963 by influential cannabis researchers Raphael Mechoulam and Lumir Hanus. This phytocannabinoid does not cause intoxication but has a wide variety of health benefits.
2. **Delta-9-tetrahydrocannabinol (THC)** – Discovered in 1964 at Dr. Mechoulam's laboratory, this is the more famous phytocannabinoid and is the intoxicating component in marijuana.

CBD has a wide range of benefits while also having over 50 different mechanisms of action. As a result, it is sometimes referred to as a *multitarget therapy* and can act as a:

1. **Regulator** – CBD can regulate the levels of *endocannabinoids*.
2. **Adaptogen** - This term was coined in 1947 by toxicologist and pharmacologist Nikolai Lazarev to describe any compound that increases, “the state of nonspecific resistance [to] stress”. In other words, CBD helps your body respond healthily to stress while adapting to changing conditions.
3. **Modulator** – CBD controls your *endocannabinoid system* (ECS) so that endocannabinoid and hormone levels are kept at optimal amounts.

All of this is just a fancy way of saying that CBD helps the human body reach a state of balance and harmony, also known as *homeostasis*.

## We All Need Some Balance - What Is Homeostasis?

The great writer Margaret Atwood once stated, “I like a balanced universe.” Aren’t we all just searching for a little balance in our lives? This includes our bodies and the physiological processes that run them; these complex systems require balance and equilibrium in order to function properly.

In other words, our bodies work best when we are in *homeostasis*.

Homeostasis and CBD are intertwined. The concept of homeostasis originated in the 1800s when French scientist Claude Bernard stated that our bodies must have stable internal environments in order to support life.

However, the term “homeostasis” was coined in [1926 by American researcher Walter Cannon](#) in his highly influential book *Organization for Physiological Homeostasis*. In this landmark text, he concluded that the human body uses various processes to maintain an internal temperature that is consistent and independent of outside factors.

What does all this mean? Homeostasis is the human body maintaining stable internal *conditions* while *changes* are occurring internally and externally.

## CBD & the Endocannabinoid System

So how does our body oversee these different processes? How are all these systems efficiently integrated? This is where the *endocannabinoid system* (ECS) comes in! Now we’re really cooking with gas, because you can’t discuss CBD without first understanding the ECS. They go hand in hand.

The ECS is a regulatory and control system that oversees various processes in the body. One of its components was first [discovered in 1992 by a research team that included both Dr. Mechoulam and Dr. Hanus](#). At the time, they were researching the metabolic pathways of THC and they stumbled across endocannabinoids and the ECS by accident.

So what does this system do? What’s the big deal? Well, researcher [Vincenzo Di Marzo summarized its primary functions](#) as: “relax, eat, sleep, forget, and protect.” This is a useful shortcut for understanding the ECS and distilling its essence down to the most basic concepts.

However, to put it in fancier terms, the ECS is responsible for:

1. Pain and inflammation
2. Reward and motivation
3. Appetite, digestion, and metabolism
4. Proper functioning of the Immune system
5. Memory and learning
6. Pleasure and reward
7. Regulating body temperature
8. Emotional states and mood

Clearly, the ECS is an important system as those are all crucial functions in our bodies. If it were to break down or cease functioning, your entire body would go absolutely haywire. Imagine that your body is an advanced supercomputer, so the ECS is kind of like the *central processing unit* (CPU).

## The Basic Structure of the ECS

So we know that the ECS is important. But what is its structure? Well, it can be broken down to these three basic components:

1. **Receptors** - These are known as *G Protein-coupled Cannabinoid Receptors*, commonly shortened to *CB1* and *CB2 receptors*, and are spread throughout the human body. CB1 receptors are mostly in the brain and spinal cord while CB2 are mostly in the gut and immune system.
2. **Endocannabinoids** – As mentioned above, these are the *cannabinoids* that are produced naturally in the human body. The two most notable are *anandamide* and *2-arachidonoylglycerol* (2-AG for short). In fact, anandamide was that first component of the ECS that was discovered in 1992.
3. **Enzymes** – These produce or break down cannabinoids and endocannabinoids. For example, anandamide is produced by an enzyme known as *NAPE-PLD* and broken down by *fatty acid amide hydrolase (FAAH)* while 2-AG is broken down by *monoacylglycerol lipase (MAGL)*.

Take note of these endocannabinoids and their corresponding enzymes; the positive benefits of CBD has a lot to do with how it interacts and influences these components.

So what does the ECS have to do with homeostasis? Dr. Ethan Russo, a leading ECS researcher, stated that, “The ECS [...] can be thought of as a key mediator of physiological homeostasis [by] ensuring that various bodily systems function within tight parameters.” In other words, the ECS is a pro-homeostatic system. So how does CBD come into play?

## How Does CBD Influence Homeostasis & the ECS?

Do you remember *anandamide*, the endocannabinoid mentioned above? Well, its importance can not be overstated. It has plenty of important jobs in your body and is responsible for multiple homeostatic functions, including:

1. Appetite
2. Sleep cycles

3. Pain relief
4. Reproductive function and ovulation in females
5. Learning via the process of transferring *short-term memory* into *long-term memory*
6. Limiting the growth of breast cancer cells
7. Pleasure and reward

In fact, the term “anandamide” comes from the word *ananda*, the Sanskrit word for “bliss”. When we exercise, anandamide is what causes the famed “runner’s high” that everyone talks about. It works primarily by activating CB1 receptors, though it does have some activity with CB2 receptors as well.

Now, let’s not forget 2-AG! This endocannabinoid is very common and widespread; according to [a 2005 study](#), 2-AG is 170 times more prevalent than anandamide in our bodies. Furthermore, its mechanism of action is the inverse of anandamide: it mostly activates CB2 receptors while showing some activity with CB1 receptors.

But 2-AG is no slouch, either. It has a lot of important functions, including:

1. Regulating the immune system
2. Decreasing inflammation
3. Operating as a *neuroprotectant* for neurons
4. Producing *osteoblasts* for bone health
5. Regulating our energy balance

This is where CBD comes in. As a highly effective phytocannabinoid that is both a *regulator* and a *modulator*, it increases levels of both anandamide and 2-AG by:

1. [Inducing the production of NAPE-PLD](#) to raise anandamide levels.
2. [Blocking the production of FAAH](#) to keep anandamide levels high.
3. [Blocking the production of MAGL](#) to keep 2-AG levels high.

This is all just a fancy way of saying that CBD helps these precious endocannabinoids stay at higher levels in our bodies.

## What Are the Benefits of Taking CBD?

So now we know that CBD interacts positively with the ECS and helps maintain homeostasis. We understand that in theory, but what does it mean in practice? What are the specific effects of taking CBD?

Studies have shown that it may help with:

### Nausea and vomiting

Research indicates that CBD may help treat [nausea and vomiting](#) due to a number of medications conditions as well as [chemotherapy](#). This is due to its interactions with *serotonin 1A receptors* (or *5-HT1A receptors*) that are located in the *brainstem*, specifically in the *dorsal raphe nucleus*.

### Acute/chronic pain

Remember that CBD activates CB-2 receptors. This is significant as *central neuronal pain circuits* are comprised of CB-2 receptors. Pain relief may also be due to the fact that CBD stimulates the release of the neurotransmitter *dopamine* in the *midbrain*.

### **Acute/chronic inflammation**

[CBD may help to reduce inflammation](#) by reducing *cytokine* production as well as inducing *apoptosis* and the production of *T-regulatory cells* (also known as *T-regs*).

### **Regulating appetite**

CBD likely helps to maintain healthy appetite levels [via the ECS](#) and its control of the *hypothalamus*. This region of the brain governs the secretion of two appetite hormones: *ghrelin* and *leptin*.

### **Improving mood and emotional states**

Research has indicated that [CBD can help decrease anxiety and fear memory expression](#) and maybe even treat substance abuse in the future. This is likely due to its interaction with the ECS and the CB-1 receptors that govern anxiety, fear, stress, and mood. These receptors are located in the amygdala, hippocampus, prefrontal cortex, and periaqueductal gray (PAG), all areas of the brain that are linked to various emotional states.

### **Attacking/destroying cancer cells**

This one may come as a surprise, but CBD's interactions with [CB-1 and CB-2 receptors may help with certain forms of cancer](#). The immune system is boosted, allowing it to more effectively target and kill cancer cells, and the ECS inhibits *angiogenesis* (creation of new blood cells).

That's a whole laundry list of important benefits! Maybe CBD really does meet all the hype that's flying around right now.

However, it's important to remember that research is ongoing and some of these are fairly small studies. That being said, the results are still very promising and it certainly seems like CBD can life-changing, long-term beneficial changes for people with a variety of conditions and ailments – it really can help in more ways than one.

## **Is CBD Safe?**

So we've established that CBD is effective, but is it safe? Absolutely! In fact, it is an exceptionally safe compound. There has never been a recorded case of an overdose from CBD alone and [a 2011 study in Current Drug Safety indicated that](#):

1. Up to 1,500 mg a day showed no serious side effects in humans.
2. A toxic dose of CBD would have to be approximately 20,000 mg (20 grams) in a very short period of time.

That is an insane amount! No commercially-available CBD product would even come close to meeting those levels.

For example, the standard dose most people start with is  $\frac{1}{4}$  to  $\frac{1}{2}$  their body weight. That means that a person weighing 150 pounds would take between 37.5 and 75 milligrams. Obviously, this is far below the 1500 milligram a day threshold established in this study.

So you can definitely take CBD and not worry! It's incredibly safe and well tolerated in humans and other mammals, including dogs and cats.

## Is CBD Legal?

Carl Sagan, one of the great scientific minds of the 20th century, wrote that:

*"The illegality of cannabis is outrageous, an impediment to full utilization of a drug which helps produce the serenity and insight, sensitivity and fellowship so desperately needed in this increasingly mad and dangerous world."*

Let's all agree that Dr. Sagan has a point – cannabis is safe, helpful, and generally non-addictive. Until full legalization, however, the laws around cannabis have substantially loosened.

In December of 2018, US Congress passed the Farm Bill, a bipartisan piece of legislation that loosens the legal restrictions on the cultivation of hemp. Essentially, it allows farmers to cultivate hemp and commercially transfer products derived from hemp as long as they meet certain guidelines.

Namely, the bill explicitly defines hemp as any cannabis product with *less than 0.3% THC* and requires farmers to adhere to a licensing and permitting process. If the farmers follow these guidelines, then any hemp or hemp-derived products will be excluded from the *Controlled Substances Act* (CSA).

In other words, if CBD oil is derived from hemp plants, which have little to no THC content (less than 0.3%), then it is legal everywhere in the United States. The laws against cannabis are concerned with controlling THC as this is the active constituent in marijuana.

However, it appears as if widespread decriminalization or even outright legalization is imminent. Of course, once this occurs on the federal level, then any and all cannabis products, regardless of THC content, will be legal everywhere in the United States.

## Is CBD Psychoactive?

Technically, yes it is, but it *does not cause intoxication*. In other words, CBD does not get you high like other cannabinoids. Let's examine why that it is by comparing CBD and THC.

We all know that THC, the active constituent in marijuana, causes intoxication. CBD, on the other hand, does not. Anecdotal evidence suggests that it can cause a mild sense of relaxation, but it certainly does not bring about the foggy euphoria that THC does. When people talk about recreational cannabis use, they're really referring to THC. Plus, don't forget that THC is the banned substance, not CBD.

In the general conversation surrounding cannabinoids, the term *psychoactive* is used to describe this ability to induce intoxication. In other words, people frequently say that, "THC is psychoactive while CBD is not psychoactive." This is not entirely true as both cannabinoids affect the *psyche*, or psychological state. It's most accurate to just say that THC causes intoxication and CBD does not.

Interestingly, THC and CBD have the exact same formula, except that [THC has a cyclic ring while CBD has a hydroxyl group](#). Technically speaking, this means that [CBD is an isomer of THC](#) – they have the same formulas but different structures. This subtle distinction results in different effects. Both of these cannabinoids interact with the ECS, although they do so in slightly different ways.

Don't forget that the ECS has both CB1 and CB2 receptors. The compounds that activate these receptors can have two primary mechanisms of action:

1. **Agonists** – A compound that binds to a receptor and fully activates it.
2. **Antagonists** – A compound that binds to a receptor but does not fully activate it.

In the simplest terms, [THC is an agonist to CB1/CB2 while CBD is an antagonist to CB1/CB2](#).

Actually, if we are being 100% accurate and precise, then we would say that THC is a *partial agonist* while CBD can be an *antagonist* or an *inverse agonist* (it binds to CB1/CB2 but induces the exact opposite function).

But don't get overwhelmed: all of this is just a fancy way of saying that THC gets you high and CBD does not.

## CBD Is the New Kid on the Block

Let's get down to brass tacks: CBD is having a moment. Like, a *real* moment. In certain states, especially California or Washington, there's basically a cannabis Gold Rush that's sweeping through business and retail.

Although CBD has been known and studied in research circles for quite some time, it has absolutely exploded into the public consciousness. The interest around it is ballooning and shows little sign of stopping anytime soon.

That's why we have this breathless coverage touting it as a miracle drug that can cure anything and everything. While it is true that there has been a lot of hype and hyperbole surrounding CBD, it is actually a very promising cannabinoid. In fact, cannabinoids in general have been having a moment and are the subject of extensive research into their medicinal and health benefits.

A lot of this upcoming research is focused on CBD. Think of it this way: so far, the preliminary analysis has shown that CBD has several known benefits. These include treating pain, inflammation, anxiety, and gastrointestinal distress.

Additionally, it shows great promise in treating a wide range of other conditions. It has profoundly positive effects on the ECS and is exceptionally safe and well-tolerated in humans. By all accounts, CBD's moment is far from over and research will continue to reveal just how amazing this phytocannabinoid is!

Of course, as more and more research is published, it's likely that we'll find novel and effective uses of CBD. Either way, this explosion in popularity isn't going anywhere soon: CBD is here to stay!

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