

Your Endocannabinoid System Explained

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Summary

The endocannabinoid system, or ECS, is an important regulatory pathway in your body. It is responsible for controlling many physical and mental states including your energy levels, sleep, pain responses, anxiety, and mood. The ECS is controlled by molecules produced by your own body and can also be influenced by molecules from cannabis and other plants. Scientists are still trying to determine how these molecules can influence the ECS.



The endocannabinoid system helps to maintain health and internal balance

The ECS is a complex network of signalling pathways throughout the body.¹ The purpose of the ECS is to maintain your state of internal balance by responding to changes to your external environment including movement, temperature, light, and stress.² The ECS controls many different functions that are important for human health. Imbalances or malfunctions of the ECS can result in pain, anxiety, insomnia, low energy, depression, and other illness or disease.^{3,4}

Because of its important role in maintaining health, ECS is a key system to target for drug discovery. A common drug on the market that is thought to beneficially affect the ECS is acetaminophen (Tylenol®).⁵

The ECS includes two naturally occurring endocannabinoids, **anandamide** and **2-AG**, which send messages by interacting with their target molecules, the **CB1** and **CB2** receptors. The ECS also includes many other molecules that are similar to the endocannabinoids or that can raise or lower

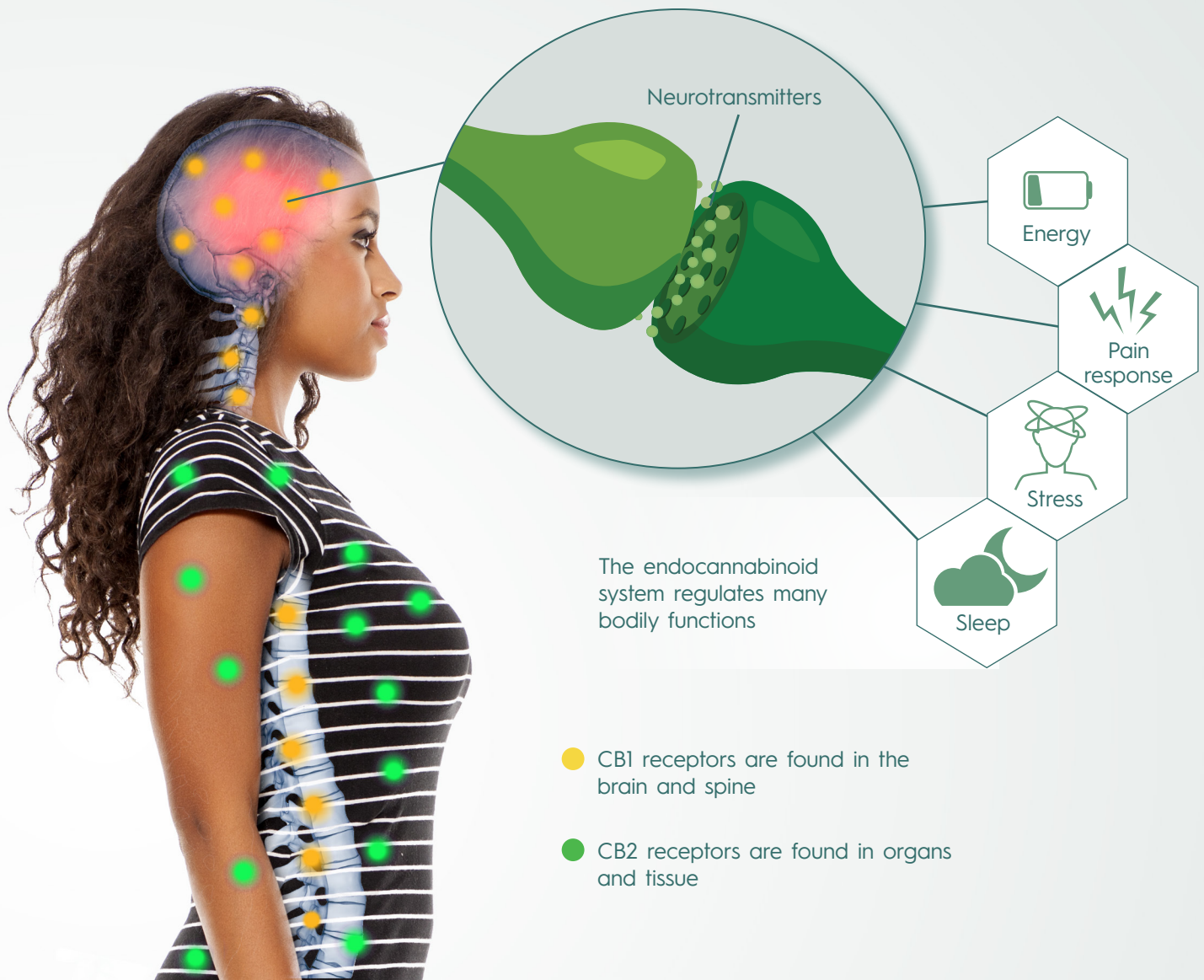
the levels of endocannabinoid in the body.⁵⁻⁷ The ECS was first discovered in 1988 when scientists identified the CB1 receptor as the main target of cannabis in humans.

The locations of CB1 and CB2 are linked to their functions. High levels of CB1 receptors are present in your brain and spinal cord, lower levels are found in the nerves that run throughout your body, and CB1 receptors are also present in many other organs and tissues.^{3,4,6} The CB2 receptor is present in organs and cells involved in immune function, but its presence in healthy brain and nerve tissue is uncertain.^{1,3,4,6}

Phytocannabinoid: from the plant

Endocannabinoids are produced by our body. *Phytocannabinoids* are plant cannabinoids that are produced by cannabis plants, as well as by a number of other plants.





The endocannabinoid system helps to maintain health and internal balance by controlling functions important for human health including energy, sleep, pain, and mood.

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The ECS is influenced by many different molecules including cannabis

The ECS is primarily influenced by the endocannabinoids, **anandamide** and **2-AG**. The ECS can also be targeted by many plant cannabinoids.⁷ The best-known plant cannabinoids are tetrahydrocannabinol (THC) and cannabidiol (CBD) from the cannabis plant. THC, the psychoactive compound of cannabis, mimics your endocannabinoids and interacts with CB1 and CB2 receptors.¹ CBD also targets CB1 and CB2, in addition to other targets in the body.^{1,3} It is believed that when THC and CBD are consumed together, CBD acts to modulate the effects of THC.⁴

Cannabis also contains over 100 other active compounds besides THC and CBD including terpenes, fatty acids, and phytophenols.

The exact function that each of these molecules has on the human body is still being determined. Some scientists believe that these different molecules work together to simultaneously activate several points in the ECS in a phenomena known as the “entourage effect”, which patients and physicians associate with an enhanced benefit.⁸

Other plants and foods also contain ECS-modulating compounds but not all of

these sources interact strongly with the ECS.⁷ Some of these compounds can directly influence the CB1 and CB2 receptors, while others work indirectly to help manufacture or breakdown anandamide and 2-AG.^{1,7,9} *Some sources of ECS-modulating compounds are shown in Figure 1.* Many have been used in traditional medicines for centuries.

The list of potential therapeutic uses for plant cannabinoids is very long. Some of the most promising therapeutic uses include managing symptoms of pain and anxiety, sleep disorders, low energy, and mood.^{5,9} Our scientific understanding about how plant cannabinoids can influence the ECS and benefit health is still at an early stage.⁴

Plant cannabinoids need to be fully tested in humans before we can conclude how to best use them to maintain health and to treat symptoms of illness and disease.^{1,9} The legalization of cannabis means that Canadian companies with a Cannabis Research License are now able to conduct the necessary human studies.¹⁰ We can look forward to more scientific information about how plant cannabinoids influence the ECS.

In addition to endocannabinoids and plant cannabinoids, there

are a number of synthetic or laboratory-derived cannabinoids.⁵ Although some are being manufactured for specific medical uses (such as Nabilone, a prescription medication used to prevent severe nausea and vomiting in cancer patients, and Sativex®, prescribed for neuropathic pain in patients with multiple sclerosis) many have unexpected or severe side effects.^{5,9}

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Figure 1 - Natural sources of ECS-modulating compounds



Cannabis

Active molecules:
THC, CBD, fatty acid
derivatives, terpenes,
polyphenols.



Chocolate

Active molecules:
fatty acid derivatives
(N-linoleolyethanolamide,
N-oleolyethanolamide).



**Carrots, parsley
celery & dill**

Active molecules:
fatty acid derivatives
(Polyacetylenic polyynes
falcarinol).



Echinacea

Active molecules:
fatty acid derivatives
(n-alkylamides).



Lemon and rosemary

Active molecules:
terpenoids (limonene).
Also found in other
citrus fruits.



Lavender

Active molecules:
terpenoids (D-linalool
and linalyl acetate).



Turmeric

Active molecules:
polyphenols
(curcuminoids).



Green tea

Active molecules:
terpenes (diterpene).



Hops

Active molecules:
terpenes (β -myrcene).



Szechuan pepper

Active molecules:
fatty acid derivatives,
terpenoids, flavonoids,
alkaloids.



Pine tree

Active molecules:
terpenoid (α -pinene).
Also found in other
conifers.



Clove

Active molecules:
terpenoid
(β -caryophyllene). Also
found in black pepper,
rosemary, hops, balsam.



“Start low and go slow” when using cannabis-derived medications



Choose products with low amounts of THC and equal or higher amounts of CBD.

**Start by using very small amounts only.*



Store cannabis-derived medications in a safe place, out of reach of children and youth.



Don't combine cannabis-derived medications with alcohol or other substances.



Don't drive while taking cannabis-derived medications.



Speak to your physician if you have questions about using cannabis for medical purposes.

For more information visit:
Canada.ca/cannabis



Selected References

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About Emerald Health Therapeutics

Emerald Health Therapeutics is led by a team of life science professionals that are dedicated to advancing health and wellness through science. Specifically, we have focused on harnessing the power of the endocannabinoid system and the cannabis plant with the goal of delivering better, more controlled outcomes for consumers seeking to enhance health and wellness.

Our team is here to assist you every step of the way with any questions or queries you may have.

Please visit www.emeraldhealth.ca for more information, or contact info@emeraldhealth.ca.