CANNABIS AND HEMP association

ENDOCANNABINOIDS: AEA and 2-AG Explained

Part 1. Anandamide

In 1992, researcher Raphael Mechoulam was able to isolate a chemical he aptly named “anandamide” (AEA) located in the human body. Anandamide is a cannabinoid neurotransmitter and a powerful anti inflammatory.

“Anandamide” was discovered thanks to the chemical THC. The discovery of the way THC binds to receptors in the brain like a key in a lock lead to the realization that the body was already creating a chemical designed to fit that receptor.Nearly 28 years after discovering THC, Doctors discovered Anandamide.

When anandamide is released in the brain it stimulates appetite, pain, and memory. Anandamide also plays a critical role in forgetting. As anyone can see, cannabis induces many of these same effects.

Receptors for anandamide are the same as THC and are known as CB1 receptors. These receptors are found deeply located in four parts of the brain:

1. Prefrontal Cortex
2. Anterior Singulate Cortex
3. Amygdala
4. Hippocampus

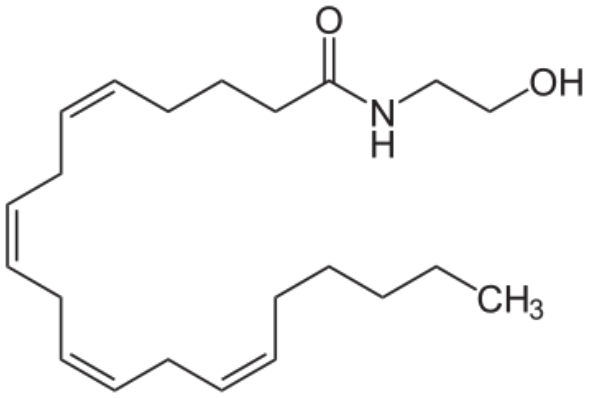

Figure 1. Anandamide

In addition to the CB1 receptors in brain and other areas of the central nervous system, anandamide also binds to receptors known as CB2 as well.

Anandamide:

- Is found only in one known place outside of the human body, black truffles, According to Dr. Maccarone, it is anandamide which is the chemical which causes consumers of black truffles the euphoria involved with eating them. Interestingly, truffles do not have an endocannabinoid system, so it appears that the chemical is produced exclusively to attract predators.

- Plays an important role in the regulation of appetite, pleasure and reward, and elevated levels may increase the pleasure experienced on consumption of food. Anandamide has been found in chocolate, and is thought to be partly responsible for the intense enjoyment experienced while eating it. Anandamide may also be partly responsible for pain regulation and sleep patterns.

- Has an important and as yet poorly understood role in hormonal balance and the reproductive system. During ovulation, plasma levels of anandamide are at their highest, as are levels of the sex hormones gonadotrophin and estradiol (a type of estrogen). However, it is not clear exactly what relationship these substances have with each other.

Therapeutic Uses

Analgesic – Relieves pain.
Angiogenic – Anandamide is unique among cannabinoids for its ability to cause blood cells to split and form new blood cells. This process is known as angiogenesis and its proper functioning is crucial to fighting off the spread of cancer due to the necessity of oxygen, nutrients, and bodily waste removal that come with it.
Anti-inflammatory – Reduces inflammation systemically.
Anti-Proliferative – Inhibits cancer cell growth.
Anxiolytic – Relieves anxiety.
Euphoriant – Produces feelings of euphoria, promotes happiness and relaxation.
Neurogenic – Promotes the growth of new brain cells. Specifically within the Hippocampus, an area of the brain responsible for memory and spatial awareness (just like CBD).
Anxiety: Anandamide, like THC, has been shown to reduce anxiety. This 2009 study, while done on mice, still sheds plenty of light on the mechanisms that AEA uses to reduce mental stress and anxiety in those experiencing it.
Cancer: As early as 1998, Anandamide had been identified as an anti-proliferative compound. This means that, like most cannabinoids, Anandamide helps slow the growth and spread of cancerous cells. Specifically the 1998 study looked at its role in inhibiting the proliferation of breast cancer cells. A more recent study from 2007 showed that AEA not only suppressed the growth of tumors it also spurred the formation of new blood cells. If that

wasn't enough Anandamide also induces COX-2-dependant cell death, a type of apoptosis that helps control the growth of cancerous cells. Specifically, AEA was found to do this in apoptosis resistant colon-cancer cells.
Memory Consolidation: Anandamide has been shown to boost in memory consolidation, a process where things in the short term memory get transferred into the long term memory. This gives Anandamide a very unique and important role in allowing people to function normally and to build on their prior knowledge, rather than having to relearn the same things constantly. You can think of memory consolidation as a fancy way to say learning.

The reason the therapeutic use is similar to that of THC, is a little reported fact that it is the release of chemicals such as dopamine which are triggered that provide the medical efficacy. With THC being a *partial agonist* at the CB1 receptor and Anandamide being a *full agonist.* Synthetic cannabinoids such as JWH-018 act as full agonists at the CB1 level.

Part 2 - 2-AG (2-Arachidonoylglycerol)

It is an ester formed from the omega-6 fatty acid arachidonic acid and glycerol. It is present at relatively high levels in the central nervous system, with cannabinoid neuromodulatory effects. It has been found in maternal bovine and human milk.

2-AG is the most abundant endogenous agent in the body that interacts with the CB1 and CB2 receptors.

2-AG is the most abundant endocannbinoid found in the human eye.

2-AG is present at relatively high levels in the central nervous system; it is the most abundant molecular species of monoacylglycerol found in mouse and rat brain. Shimon Ben-Shabat, of Ben-Gurion University, discovered the chemical but the isolation of 2-AG in the canine gut was first reported in 1995 by the research group of Raphael Mechoulam.

See attachment for the latest studies on cannabinoids from the National Institute of Health. Pain, inflammation, and therapeutic use for substance abuse, withdrawal, and dependance were all cited in the study.

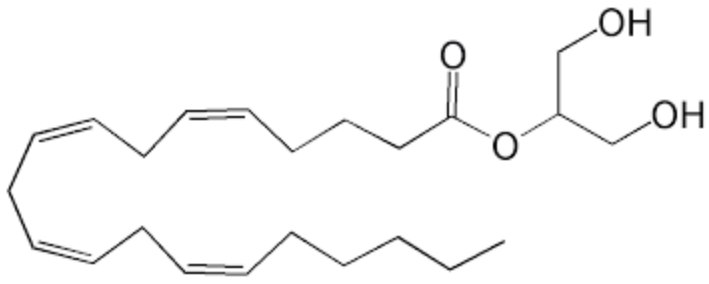

Figure 2. 2 - AG

Works Cited

http://en.wikipedia.org/wiki/2-Arachidonoylglycerol
http://en.wikipedia.org/wiki/Anandamide
http://www.jbc.org/content/274/5/2794.long
https://books.google.com/books?id=-NCxms3dz5IC&pg=PA64&lpg=PA64&dq=2-ag+therapeutic+uses&source=bl&ots=3DSOWJNewG&sig=J5iaQGGePIwf0c89zMrREN6qTZA&hl=en&sa=X&ei=qfBRVYzFJIvkoATp14DoBg&ved=0CE8Q6AEwBg#v=onepage&q=2-ag%20therapeutic%20uses&f=false
http://www.state.ia.us/odcp/docs/NIHCannabisMarch2014.pdf
http://theleafonline.com/c/science/2014/08/endocannabinoid-profile-crash-course-anandamide