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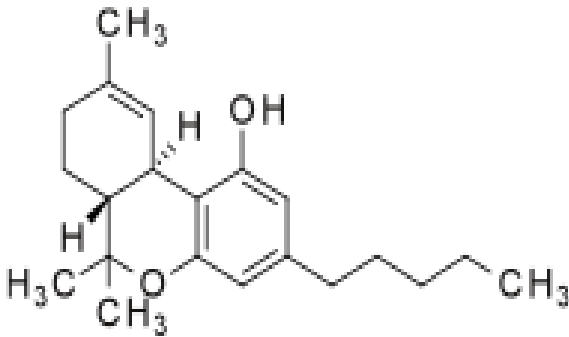
What is Alzheimer's Disease?

Alzheimer's Disease (AD) is a progressive disease that destroys memory, ability to think and alters the persons behavior. This disease is known as a neurodegenerative disease which means that there is progressive brain cell death that continuously happens over time. Research has discovered that there are two abnormal structures known as beta-amyloid plaques and tangles of protein known as tau that have been deemed as the prime suspects in damaging and killing nerve cells (Hughes & Herron, 2018). Beta-amyloid proteins begin to build up in the spaces between nerve cells; while tangles of twisted tau fibers build up inside cells causing a depreciation of neural tissues and connectivity.

- **Role of plaque and tangles:**
  - Currently, scientists have not discovered the exact role that these issues play in Alzheimer's disease; however, the assumption is that they block communication among nerve cells. As production of plaque and tangles increase, there is a disruption in processes that cells need to survive ("Alzheimer's Association", 2019).
- **Symptoms:**
  - Most common symptom is difficulty remembering newly learned information. The reason this is the first to be affected is AD changes typically begin in the part of the brain that affects learning… the frontal lobe. Possible signs of AD maybe more obvious to family members or friends rather than the person themselves. Symptoms may include:
    - Disorientation
    - Mood/Behavior changes
    - Deepening confusion about events, time and place
    - Unfounded suspicions about family, friends, professionals, or caregivers
    - Difficulty speaking, swallowing, and walking
- **Treatment:**
  - Alzheimer's has no current cure, but treatments for symptoms are available and research continues. Although current treatments cannot stop AD from progressing, the make great strides to slow down the production of beta-amyloid plaques and tau protein tangles.

Preclinical AD

Mild to moderate AD

Severe AD
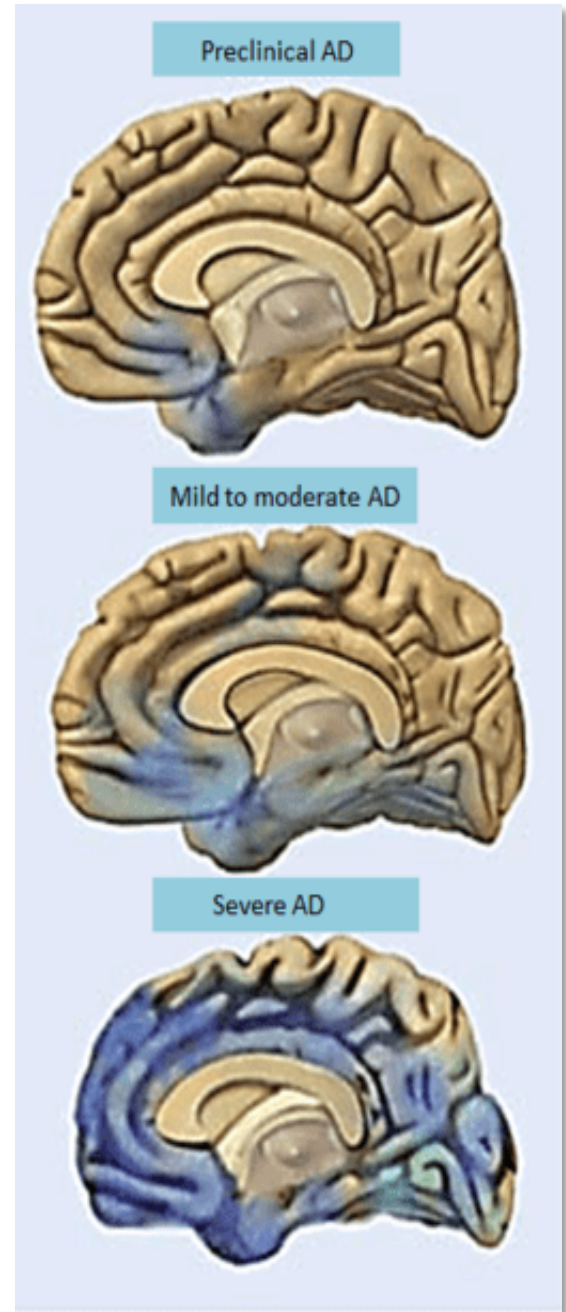
Cannabis in Alzheimer's Disease

Alzheimer's Disease (AD) is the most common form of dementia and currently accounts for 5.7 million Americans that are living with this prevalent disease; therefore, placing AD as the sixth leading cause of death in the United States ("Alzheimer's Association", 2018). Due to an increase in life expectancy, this prevalence is expected to nearly quadruple by 2050. With these rapidly growing numbers, researchers are motivated more than ever to discover a solution to prevent and treat AD; putting cannabis among those being considered.


Though current research is relatively new and limited attention has been given to cannabinoids for AD, the studies hold unique promise. In 2014, a preclinical study published in the *Journal of Alzheimer's Disease* found that small doses of tetrahydrocannabinol (THC) , a chemical found in marijuana, can slow the production of beta-amyloid proteins.

Theory of Inflammation

With a focus on the theory of *Chronic Inflammation,* researchers found that by exposing beta-amyloid proteins to THC, it reduced the levels of plaque production and in turn stopped the inflammatory response from nerve cells caused by beta-amyloid proteins; allowing the nerve cells to survive. Another studied found that "cannabinoids showed anti-oxidant and anti-inflammatory properties leading to neuroprotection" (Gugliandolo, Bramanti, Mazzon, Pollastro, & Grassi, 2018).

Much energy has been placed in devising ways to get rid of beta-amyloid plaques because the belief is that if we are able to eliminate the plaques, we can eliminate Alzheimer's disease overall. Unfortunately, it is not this simple because the proteins that form these plaques still have an important role in brain cell function. An alternative approach could be to limit the harmful consequences of having plaques, versus eliminating it in all.
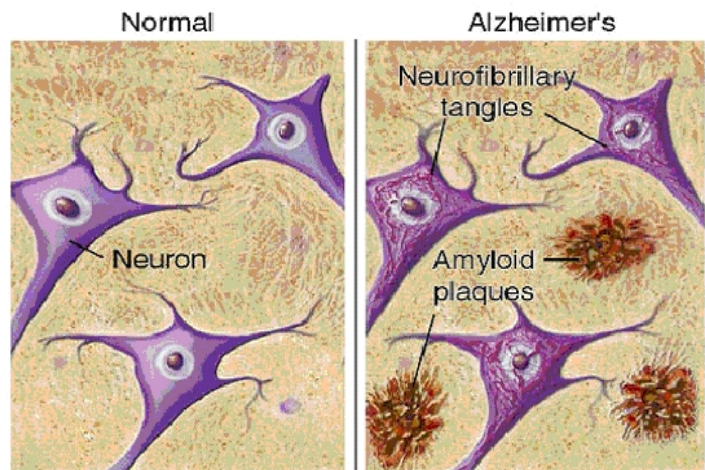
CBD in Alzheimer's Disease

Cannabidiol (CBD) is a non-psychotomimetic molecule that has been proven in various studies to induce inflammation by limiting the toxic effects of beta-amyloid plaques on brain cells. How this happens is that CBD activates one of its targets, the PPAR-y receptor, which improves brain cell survival. Research has concluded that, "CBD increases neuronal survival by reducing apoptosis and decreasing amyloid precursor protein (APP) levels through activation of PPAR-γ receptors. CBD can suppress proinflammatory pathway and neuroinflammation" (Vallée, Lecarpentier, Guillevin & Vallée, 2017).

Overall, the benefits of CBD on memory and cognition result largely from its ability to protect the brain's *hippocampus* from toxins and disease. One major way CBD has the ability to provide protection to these brain cells is by reducing the activation of microglia (another factor of cause for AD). Microglia's are similar to neurons and are activated in disease. Though the main purpose of microglia is to protect other brain cells, chronic activations leads to more harm than good. When activated, microglia's release substances such as glutamate, cytokines, and other materials that over time kill neurons; thus, making microglia's a contributor to AD as well. Cannabis presents a well-tolerated strategy to dampen the activation of these microglia ("Leafly", 2018).

Cannabis and Quality of Life

Among the promising benefit that cannabis seems to provide in relations to preventative measures for Alzheimer's Disease; cannabis has also shown to be able to generally improve quality of life for those diagnosed with AD. Common improvements are:

- Improvement in Sleep
- Reduced Agitation
- Increased Appetite
- Reduced Anxiety

Cannabis: What You Should Know

What is Cannabis Used For?

Cannabis consumption can generally be divided into two primary uses: recreational and medical. Recreational use is when a person is using it for personal matters such as enjoyment, stress relief, or creative stimulation. Medical consumers use cannabis in hopes to alleviate symptoms such as chronic pain, anxiety, appetite loss and much more. Cannabis contains hundreds of active compounds that provide a range of medical benefits. THC and CBD being two of cannabis' well-known compounds. For the purpose of the research conducted for this book, we will focus on the medicinal aspects of the plant.

Strains

Generally speaking, a strain is a genetic variant or subtype of a microorganism (e.g. virus or bacterium or fungus)**.** The term *strain* is used interchangeably with "cultivar", "variety", and "selection" within the cannabis industry. Commonly, cannabis is divided into three categories in relations to strain which are:

- **Indica:** This strain originates from the Hindu Kush mountains of India. The belief is that it processes a relaxing effect on the user.
- **Sativa:** Known to provide a more energizing effect
- **Hybrid:** combination of the two

Strains are essentially different breeds of cannabis, and they're bred to have specific effects on the user.

Choosing a strain depends on the desired effect. As mentioned earlier, cannabis offers a wide range of medical uses, but some strains are better for certain conditions than others. Always make sure to research the adverse effects of the strain. A few common issues are dry mouth, dry eyes, and dizziness which can create additional issues for someone diagnosed with Alzheimer's Disease.

Below are common strains implemented in interventions for those living with Alzheimer's Disease.

ENERGIZING

Acapulco Gold
Sour Diesel
Maui Wowie
White Widow
Pineapple Express

Strains that promote an increase in energy are known to have mood-lifting, euphoria-inducing, energizing effects. Some benefits are:

- Improved mood
- Reduces pain/stress
- Reduces depression
- Increases energy

RELAXING

Blue Dream	Granddaddy Purple
Bubba Kush	Northern Lights
LA Confidential	Pineapple Express
Afghan Kush	Fruity Pebbles

These strains are known as sleep-inducing strains. They are perfect for helping:

- Fight insomnia
- Reducing stress
- Increase appetite
- Anti-inflammatory (LA Confidential)

PAIN RELIEF

Acapulco Gold	Afghan Kush
Blue Dream	LA Confidential
Purple Kush	Northern Lights
Sour Diesel	White Widow
Bubba Kush	Super Silver Haze

The strains listed are known to alleviate pain. Some specific strains to consider are:

- **Purple Kush:** It's often used for reducing pain and muscle spasms.
- **LA Confidential:** Has noticle anti-inflammatory and pain-reducing effects, which make it a favorite among people with chronic pain.

CHECK WITH YOUR PHYSCIAN…

If you're interested in trying cannabis, and you're looking to help treat a medical condition or currently taking medications, speak with your doctor first

Terpenes

Terpenes play a key role in differentiating the effects of various cannabis strains. They secrete from the same glands that produce cannabinoids like THC and CBD. The effect of any given terpene may change when mixed with other compounds; but more research is needed to understand each terpene's effect when used in unison with other elements. Terpenes may offer additional medical value as they mediate our body's interaction with therapeutic cannabinoids.

Currently, there is little research conducted on this but has raised awareness and is quickly becoming the subject of research. In cannabis analysis labs, they now test terpene content to gain better knowledge of what effects a strain may be able to produce.

Most Common Cannabis Terpenes in Alzheimer's Disease.

Aroma: Floral

Potential Effects: Mood enhancement, sedation

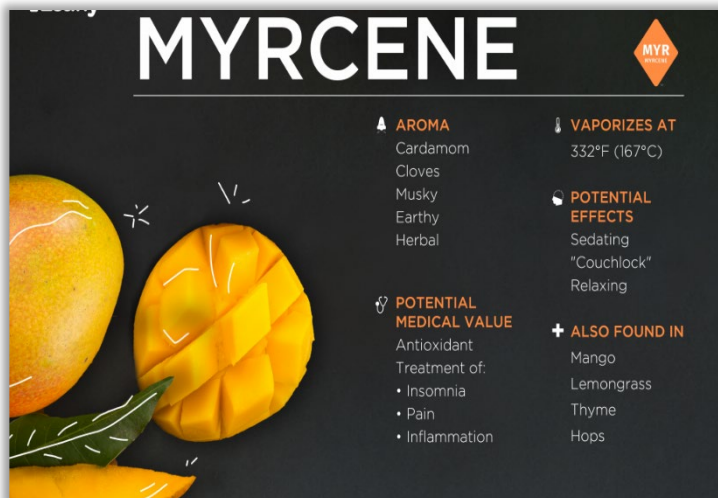**Potential Medical Value:** Neurodegenerative disease, inflammation, anxiety, insomnia, pain, depression

Found In: Lavender

Aroma: Cardamom, cloves, musky, earthy, herbal

Potential Effects: Sedating effect, relaxing

Potential Medical Value: Antioxidant, treatment of insomnia, pain, and inflammation

Found in: Mango, Lemongrass, thyme, hops

Aroma: Citrus

Potential Effects: Elevated mood, stress relief

Potential Medical Value: Treatment of anxiety, depression, inflammation, pain

Found in: Fruit rinds, rosemary, juniper, peppermint

Aroma: Hops, woody, earthy

Potential Medical Value: Anti-inflammatory

Found in: Hops, coriander, cloves, basil

When choosing a strain based on its terpene content, keep in mind that different harvests may demonstrate different terpenoid profiles. Lab-tested products are the main way of knowing a strain's terpene potency.

CHECK WITH YOUR PHYSCIAN…

If you're interested in trying cannabis, and you're looking to help treat a medical condition or currently taking medications, speak with your doctor first

Methods of Ingestion

There is not one specific way to intake the benefits of cannabis. Depending on one's medical needs, budget and physical abilities, a person may prefer one method over another. In the chart below are the most common ways of implementation for those diagnosed with AD.

SMOKE	Smoking cannabis provides instant relief when it comes to extracting the medical benefits from the plant. There are several ways to smoke cannabis, including: • through a smaller handheld pipe or device • a water bong (a pipe with a long neck) • a joint (where you use rolling papers) *Smoking is typically the cheapest option*.
CONSUME	Cannabis can be infused into foods and drinks to help ease the process of consumption. Essentially, the THC just needs to be extracted from the cannabis, then mixed in with whatever food/drink desired. Some common foods are: • brownies • candy • cookies Consuming cannabis usually takes longer to take effect. Make sure to be aware of your measurements because it can make a huge difference in effects and tolerance.
TOPICAL TREATMENTS	Topical treatments like lotions, oils, and creams can help relieve ailments like: • muscle soreness • arthritis • Joint pain Because they're applied through the skin, topicals don't give you the "high" often associated with cannabis. They also allow you to target one specific area of pain rather than inducing a full body effect for one localized area of pain.
DROPLETS	Using droplets or sprays can help you control the dosage you're taking. You place the treatment underneath your tongue, letting the saliva and tissues absorb the THC. Also, can drop a few drops in your water/drink While not as immediate as smoking, using sprays is more cost effective, especially if you need smaller doses.

The Cannabis Man

The *Cannabis Man* is used to explain what cannabis chemical would best treat that system of the body and how it does so.

NERVOUS SYSTEM
CBN
Aids in Sleep
CBD THCv
Reduces Seizures and Convulsions
CBD
Anxiety Relief
Tranquilizing

DIGESTIVE SYSTEM
CBD
Reduces Contractions in the Small Intestins
THC
Appetite Stimulant
THCv
Appetite Supressent

MUSCULAR & SKELETAL
CBC CBD CBG THCv
Promotes Bone Growth
CBD CBN THC
Supresses Muscle Spasms
CBC CBD THC
Reduces Inflammation

ENDOCRINE SYSTEM & IMMUNE RESPONSE
CBD CBG
Kills or Slows Bacteria Growth
CBG
Treats Fungal Infections
CBD
Reduces Blood Sugar Levels
Treats Psoriasis

CIRCULATORY SYSTEM
CBD
Reduces Risk of Artery Blockage
CBD THC
Increases Cerebral Blood Flow

WHOLE BODY RELIEF & PROTECTION
CBC CBD CBG THC
Inhibits Cell Growth in Tumors and Cancer Cells
CBC CBD CBN THC
Reduces or Eliminates Pain

<p style="text-align: center;">**Additional Information**</p>

California Law

In November of 2016, California passed Proposition 64, which is *The Adult Use Marijuana Act* (AUMA), legalizing recreational marijuana use for adults 21 years of age or older. Then, on January 1, 2018, California was able to legally use marijuana.

Possession. Those who are 21 years or older are able to possess up to 28.5 grams (g) of marijuana flower and up to 8g of marijuana concentrate. Additionally, adults are allowed to possess up to six living cannabis plants within their private residence.

Purchasing limits. As long as you are 21 years of age or older and have a valid government-issued identification to prove you are of age, you have a constitutional right to possess, purchase and consume cannabis in California.

Consumption. As many other states, you are NOT allowed to consume legal cannabis in the following places:

- ANY public place or area
- ANY location where tobacco smoking is prohibited
- Within 1,000 feet of a school, youth center or day care where children are present while not inside the confines of a private residence

You ARE able to consume legal cannabis in any of the following places:

- Private residences
- Accessory structures located on the grounds of a private residence that is enclosed and secure from the public
- Outdoors on a private residence so long as the city/county the residence is located in does not prohibit such action

Local Dispensaries

Here are just a few local cannabis dispensaries that serve the Sacramento area. Not only do they sell products, but they pride themselves on the knowledge they possess on the numerous products they carry and strive to continue to educate others on benefits cannabis has to offer.

Name: KOLAS

Location: 1115 Fee Dr, Sacramento, CA. 95815

Phone: (916) 646-6340

Hours of Operation: Mon-Sun; 7:00am-9:00pm

Price Range: $2.08- $110.34

Cash Only

Name: Alternative Medical Center

Location: 1220 Blumenfeld Drive, Sacramento, CA. 95815

Phone: (916) 564-1100

Hours of Operation: Mon-Sun; 7:00am-9:00pm

Price Ranges: $1.84-$441.36

Offers 10% discounts for veterans and Seniors 60+

Name: Cloud 9

Location: 5711 Florin Perkins Road , Sacramento, CA. 958282

Phone: (916) 387-8605

Hours of Operation: Mon-Sun; 7:00am-9:00pm

Price Ranges: $0.92- $110.85

Name: Doctor's Orders

Location: 1704 Main Ave, Sacramento, CA. 95838

Phone: (916) 564-2112

Hours of Operation: Mon-Sun 7:00am-9:00pm

Price Ranges: $1.85-$124.71

Offers 10% off to Veterans (with military ID) & Seniors 60+

RESOURCEFUL WEBSITES	
Leafly	https://www.leafly.com/
Weed Maps	https://weedmaps.com/
Aging.com National Council for Aging Care	https://www.aging.com/the-complete-guide-to-medical-marijuana-for-seniors/
CA.gov California Cannabis Portal	https://cannabis.ca.gov/cannabis-regulations/

Conclusion

Though research on the effects of cannabis in Alzheimer's Disease is scarce, current research and findings look promising. More and more research is surfacing and is showing that the two main chemicals THC and CBD which are primarily found in cannabis, offers anti-inflammatory and antioxidant components that allow the beta-amyloid plaque build-up to breakdown. Like research states, "we need to support scientific research on this age-old remedy that has found new purpose in our society, to ensure that our medical marijuana certifications are in the best interest of our patients and that our practice is evidence-based" (Inga, Kelly, & Anton, 2016). Globally, there is a need for this research because it could be the solution to eventually preventing the onset of Alzheimer's disease.

If you're interested in trying cannabis, and you're looking to help treat a medical condition or currently taking medications, speak with your doctor first. When beginning to implement the use of cannabis, remember to start low and slow!

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