Going Out on a Leaf: Cannabis Treatment for a Severely Brain Injured Individual

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Overview

- What is cannabis?
- How does it act on the body?
- Review of the evidence
- A case study

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Cannabis

Over 113 different chemical compounds known as cannabinoids.

Understanding possible Effects of THC and CBD

THC

- **Psycho-active: Creates euphoria, or "high"**
- Analgesic: Relieves pain and inflammation
- Relaxing
- Induces sleep
- Appetite Stimulant: Creates urge to eat by acting on ghrelin receptors in the brain
- Uses: Treatment of pain, PTSD, nausea, sleep apnea, stress, combat symptoms of chemotherapy, MS, glaucoma, AIDS, or spinal injuries

CBD

- Not psycho-active
- Anti-inflammatory
- Anticonvulsant
- Anti-emetic: Reduces nausea and vomiting
- Can act as an antipsychotic
- Combats anxiety and depression
- Combats tumour and cancer cells
- May have neuro-protective effects
- Uses: Treat inflammation, stress, depression and anxiety, while also being used to combat cancer, epilepsy, schizophrenia, MS, migraines, arthritis, and the side effects of cancer treatments

Cannabis Strains and THC Content

- Different strains have different compositions
- Range of THC by weight from 0.3% up to 20%
- Average THC concentrations (National Highway Traffic Safety Administration):
  - Marijuana: 1-5%
  - Hashish: 5-15%
  - Hashish oil: 20%
- Lower concentrations of THC result in decreased psychoactive effects

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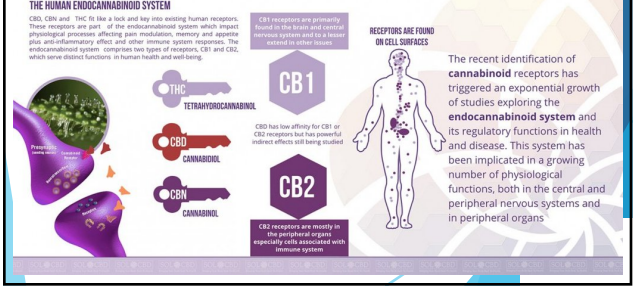
ENDOCANNABINOID SYSTEM



The recent identification of **cannabinoid** receptors has triggered an exponential growth of studies exploring the **endocannabinoid system** and its regulatory functions in health and disease. This system has been implicated in a growing number of physiological functions, both in the central and peripheral nervous systems and in peripheral organs

Demographics

- An estimated 119-224 million people around the world used cannabis in 2010 (2.5%-5% of the world's population) (UN Office on Drugs and Crime World drug report 2011)
- 22.2 million Americans ages 12+ report using cannabis in the past 30 days.
- Largest group of users are age 15-34 years. (Hall, 2007)
- 63% of the 2.1 million first time users were under the age of 18 (UN Report, 2011). Of those who used cannabis more than 5 times, half continued to use the drug 10 years later (Perkonnig, 2008)

What about Medicinal Marijuana?

Review of Evidence

THERAPEUTIC EFFECTS

In adults with chemotherapy-induced nausea and vomiting, oral cannabinoids are effective antiemetics.

In adults with chronic pain, patients who were treated with cannabis or cannabinoids are more likely to experience a clinically significant reduction in pain symptoms.

In adults with multiple sclerosis (MS)-related spasticity, short-term use of oral cannabinoids improves patient-reported spasticity symptoms.

For these conditions, the effects of cannabinoids are modest; for all other conditions evaluated, there is inadequate information to assess their effects.

- Substantial evidence
  - CBD is effective in the treatment of epilepsy (Dravet syndrome and Lennox-Gastaut) (Perucca, 2017)
- **There is moderate evidence that cannabinoids, primarily nabiximols, are an effective treatment to improve short-term sleep outcomes in individuals with sleep disturbance associated with obstructive sleep apnea syndrome, fibromyalgia, chronic pain, and multiple sclerosis.**

** Taken from a review by the National Academies of Sciences, Engineering, and Medicine Committee on the Health Effects of Marijuana, 2017*

Limited Evidence

There is limited evidence of a statistical association between cannabinoids and better outcomes (i.e., mortality, disability) after a traumatic brain injury or intracranial hemorrhage.

IMMUNITY

There exists a paucity of data on the effects of cannabis or cannabinoid-based therapeutics on the human immune system.

There is insufficient data to draw overarching conclusions concerning the effects of cannabis smoke or cannabinoids on immune competence.

There is limited evidence to suggest that regular exposure to cannabis smoke may have anti-inflammatory activity.

There is insufficient evidence to support or refute a statistical association between cannabis or cannabinoid use and adverse effects on immune status in individuals with HIV.

Full report: www.NATIONALACADEMIES.ORG/CANNABISHEALTHEFFECTS

** Review by the National Academies of Sciences, Engineering, and Medicine Committee on the Health Effects of Marijuana, 2017*

Risks of Cannabis

Effects of Short Term Use

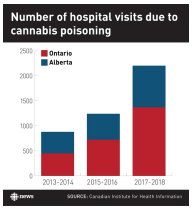
- Impaired short term memory, motor coordination and judgement.
- Increased risk of a car accident (2-3x more likely)
- Altered judgment, increasing the risk of sexual behaviors that facilitate the transmission of sexually transmitted diseases
- In high doses, **paranoidal ideation and psychotic symptoms**
- Associated with a 40% increased risk of psychosis

Effects of Long-Term or Heavy Use

- Altered brain development
- Poor educational outcome, with increased likelihood of dropping out of school
- Cognitive impairment, with lower IQ amongst those who used frequently in adolescence
- Diminished life satisfaction and achievement
- Increased incidence of chronic bronchitis and respiratory tract infections and pneumonia.
- Addiction

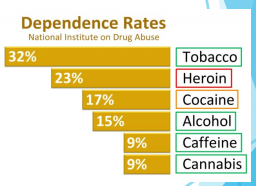
Taken from Volkow, "Adverse Effects of Marijuana Use", New England Journal of Medicine, 2014

Risks



Addiction

- Marijuana is addictive
- Developing dependence is less likely than tobacco and alcohol, and quitting is also easier
- Cannabis is addictive, causing significant problems for work, school and relationships in 9% of adult and 17% of adolescent users (Hall, 2009)
- Approximately 10% of first time users and 50% of daily users develop dependence (Hall, 2007)
- Risk of developing addiction rises to 17% for those who start using in their teens (Anthony, 2006).
- Quitting after addiction has physical effects of withdrawal comparable to tobacco (cravings, sleep disturbances, anxiety, and depression are common). (APA, DSM 5)



Cannabis and Brain Injury

- Role in neuroplasticity?
- Treatment for chronic pain, sleep, anxiety and depression
- Addiction risk
- Seizures
- Recreational use
- Experimental treatment

Cannabis Treatment for a Severely Brain Injured Individual

Client A – Severe Brain Injury

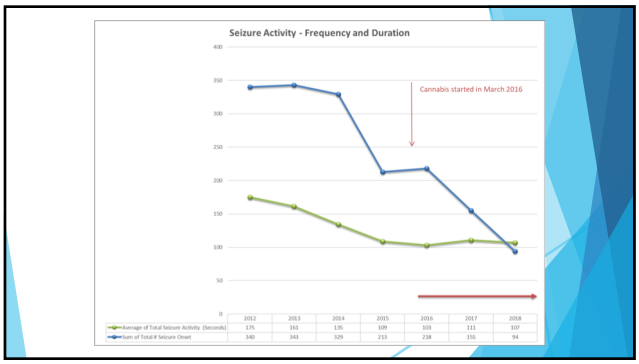
- Born in 1979, currently 39 years old.
- Contracted viral Meningitis that led to anoxic encephalopathy at 21 months. Initially lost ability to walk and talk, but later regained those functions.
- At age 5, developed and diagnosed with Lennox-Gastaut Syndrome, a seizure disorder.
- Lived at home until age 21 (2000), at which time transitioned to an ABI residential program due to severe behaviours and seizures.
- At age 26 (2005), moved to current residence at PHD West (highest needs facility, staffed 24/7).
- The family tried every medication available to treat seizures but had no success.
- March 2016 - Was prescribed cannabis as an "experimental treatment" to help with their seizures.

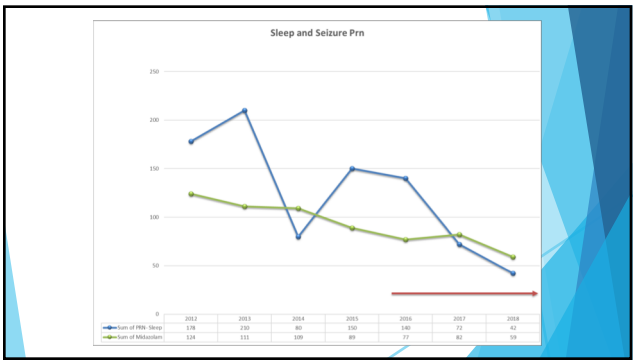
Client A: Behaviour, Communication, and Sleep

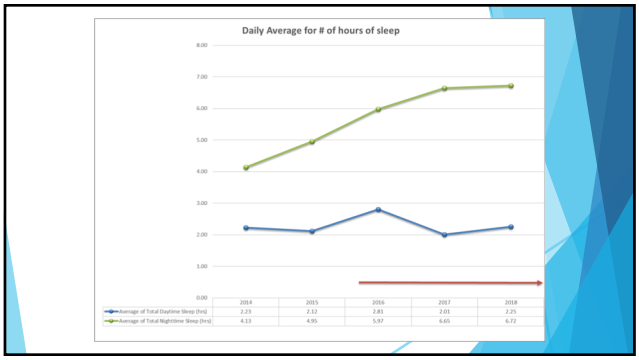
- Presents with non-compliance, verbal and, though rare, physical aggression.
- Independent with toileting. They wear pull-up
- Dependent on staff for the completion of both their shower and oral care.
- Experiences seizure activity on a regular basis. A seizure episode may last as long at 25+ minutes.
- Does not have a consistent sleep cycle. All aspects of Client A level of functioning are affected by poor sleep (seizures, target behaviours, engagement & compliance). As such, Client A has a PRN to help them get a good night sleep.

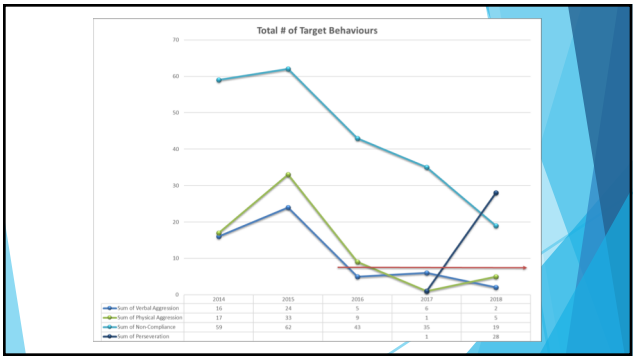
Cannabis Administration

- Preparation for dispensing cannabis oil: 1ml syringe, medication cup, capsules and a holding tray.
- The cannabis is poured into the medication cup and the syringe extracts the dose amount.
- Half of an empty capsule is placed in the holding tray and the cannabis is dispensed into the capsule and is then capped.
- Client A's daily dose amount is 2 ml divided into 3 separate doses: 2x 0.5ml during the daytime and 1x 1ml at nighttime.



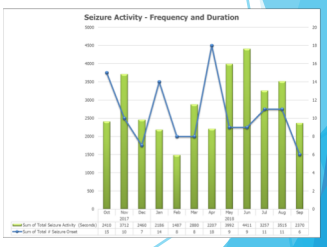






Change in Cannabis – Addition of more THC

- Cannabis dosing
  - March 2016 - May 2018
    - Cannimed Oil 10:10
    - 9.8 mg/mL THC
    - 9.9 mg/mL CBD
  - May 2018 - Sept 2018
    - Cannimed oil 18:0 added at nighttime
    - 18.3 mg/mL THC
    - 0.2 mg/mL CBD
- Observed behavioural differences beginning in July-Aug 2018
  - Increased inappropriate sexual behaviours
  - Increased giddiness (giggling, hugs)
  - Increased total seizure activity



Summary

- Introduction of cannabis oil resulted in
  - Decrease in seizure activity
  - Increase in nighttime sleep and decrease in daytime sleep
  - Decreased in behaviours
  - Decrease # of PRNs needed for seizure activity AND sleep
- Treatment was and still is considered "experimental"
- Different combinations of THC and CBD can lead to significant changes in behavior and seizure activity.
- Overall, medicinal cannabis can be an effective treatment, depending on the needs of the client. Risks and benefits must be weighed carefully.

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