

THC – The Good, the Bad, and the Ugly

Jeffrey E. Hansen, Ph.D.

Center for Connected Living, LLC

“The views expressed are those of the author and do not reflect the official policy of the Department of the Army, the Department of Defense or the U.S. Government.”



Highly recommended lectures on THC use and the sources for much of the content in this PowerPoint

Please click the link below to listen to addiction medicine physician Dr. Ruth Potee's fantastic school talk on addiction and the teenage brain:

https://www.youtube.com/watch?v=25mK4yXzOkQ&ab_channel=1623Studios



Please click the link below to listen to Stanford neuroscientist. Dr. Andrew Huberman's superlative lecture on the dangers of THC use. It the best and most thorough discussions on the topic that I have heard.

https://www.youtube.com/watch?v=gXvuJu1kt48&ab_channel=AndrewHuberman



Cannabis, It's Complicated by Kim Porter who is an excellent advocate against teen use of THC. Please click the link below to listen:

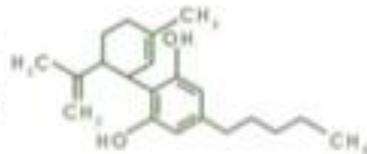
https://www.youtube.com/watch?v=fdguiE_dTu0&t=2s&ab_channel=BeaPartoftheConversation



THC and its cousin, CBD



CBD

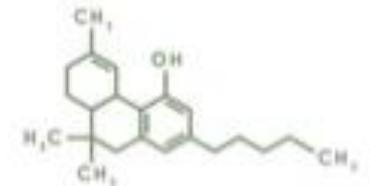


CBD, or *cannabidiol*, is a cannabinoid that doesn't make people "high." CBD products aren't popular for recreational use because they aren't intoxicating. It may be useful in reducing pain and inflammation, controlling epileptic seizures, and possibly even treating mental illness and addictions.

Cannabidiol might also block some of the psychoactive effects of THC. Also, cannabidiol seems to reduce pain and anxiety.



THC



THC, or *delta-9-tetrahydrocannabinol*, is the chemical responsible for most of marijuana's psychological effects. Causes slowed reaction time; problems with balance and coordination; increased heart rate and appetite; problems with learning and memory; anxiety. Withdrawal symptoms include irritability, trouble sleeping, decreased appetite, anxiety.

Today's THC is not like what the good old hippies smoked



Today's Cannabis is much more potent

Dried Plant



- THC levels in the 60's and 70's 1%
- THC levels in the 80's and 90's 3%
- Average THC level today 13%
- Highest potency in dried plant 30%

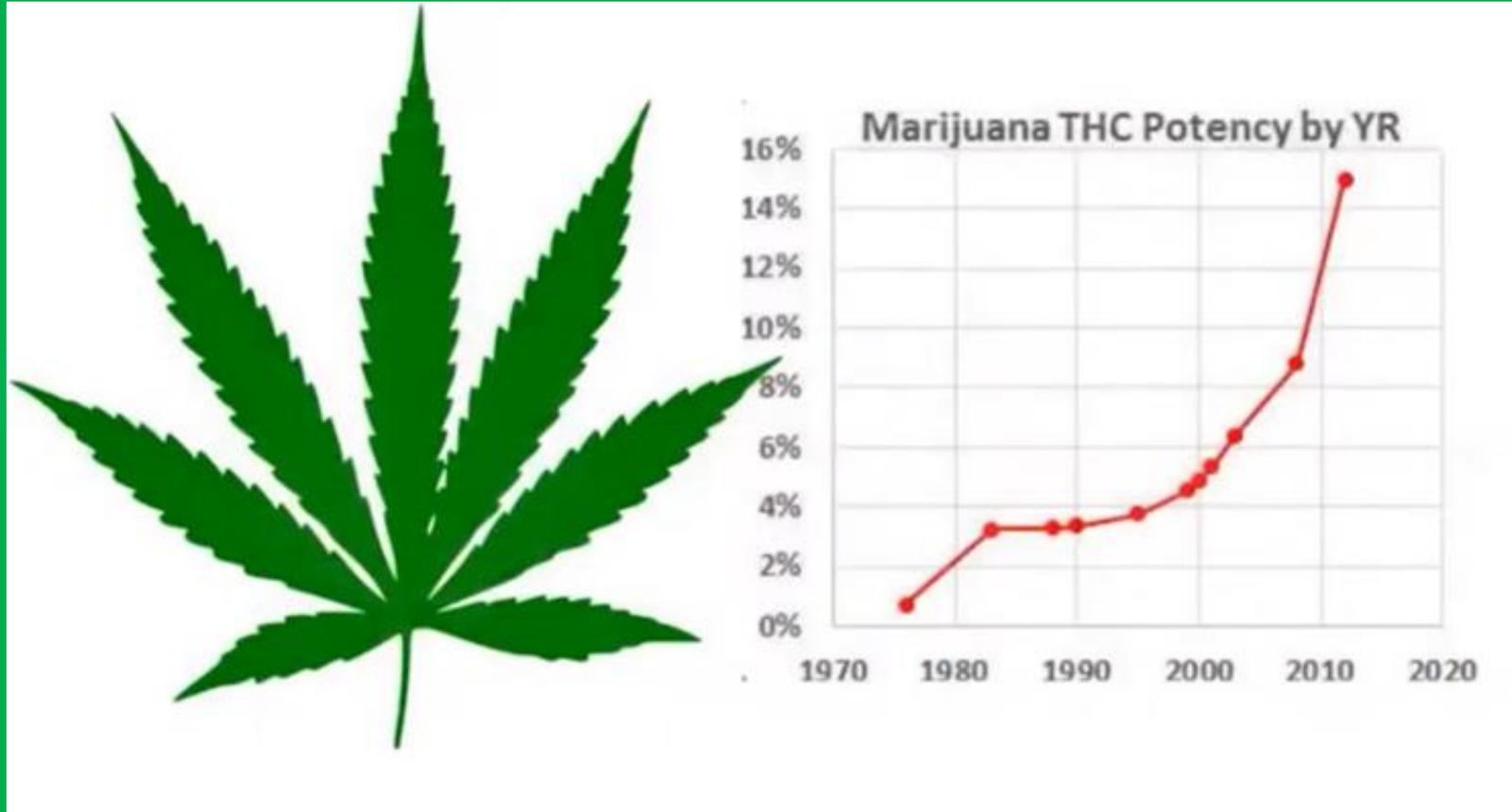
Concentrates



- Concentrates have much higher levels of THC up to 80%
- Edibles present their own set of problems



It just keeps getting stronger, hence, the impact on the brain and body greater.



THC Potencies

	Format	THC Potency
	Dried Flower	10 - 30% ¹
	Shatter, Budder, Crumble	60 - 80%
	Live Resin	65 - 95%
	Distillate	85 - 90%
	Edibles	5 - 10 mg* *per serving

Edibles are dosed in serving sizes, and the average serving size of an edible in a recreational marijuana state is 10 mg, with the entire edible typically at 100mg total (the maximum amount allowed in California, for example). Edible producers do not have to state the percentage of the starting material used to make the edibles, only the milligrams per dosage in the final product. When looking at THC percentage in edibles, always look for the milligram serving.

Hemp

Hemp

Hemp is a cannabis plant that contain **less than 0.3 percent THC** (delta-9-tetrahydrocannabinol).

Grown for use in textiles, paper, construction products, body care and food products.

CBD products are only federally legal if they're derived from hemp and contain less than 0.3 percent THC.

The 2018 Farm Bill legalized the production and sale of hemp and its extracts. Hemp, by federal law, cannot contain more than 0.3 percent THC (tetrahydrocannabinol).

Anything with more THC is classified as marijuana, is considered a schedule 1 drug by the Drug Enforcement Administration and is federally illegal.



Delta-8 and Delta- 10 THC

Delta-8 THC

Concentrated amounts of delta-8 THC are typically manufactured from hemp-derived cannabidiol (CBD), therefore are not federally illegal and can be sold online and in stores.

- Derived from the hemp plant.
- Products range from gummies, tinctures, and vapes.

Delta-10 THC

Like CBD, Delta 10 is a cannabinoid derived from cannabis.

Unlike CBD, Delta 10 is elusive and difficult to derive, which is why it's most often completely synthesized in laboratories. Not as potent as Delta-8 THC or THC-O.



Kratom

Kratom *Mitragyna speciosa*, a tree native to Southeast Asia

- Takes effect within 5-15 minutes and remains effective for 2-5 hours.
- In low doses, is considered to be a stimulant that increases sociability and alertness.
- In higher doses, kratom may have effects similar to those of opioid drugs. These effects include:
 - Reduced anxiety
 - Sedation
 - Lowered pain sensations
 - Relaxation
 - Pinpoint pupils
 - May produce a rush of euphoria that is akin to the effects of opioids



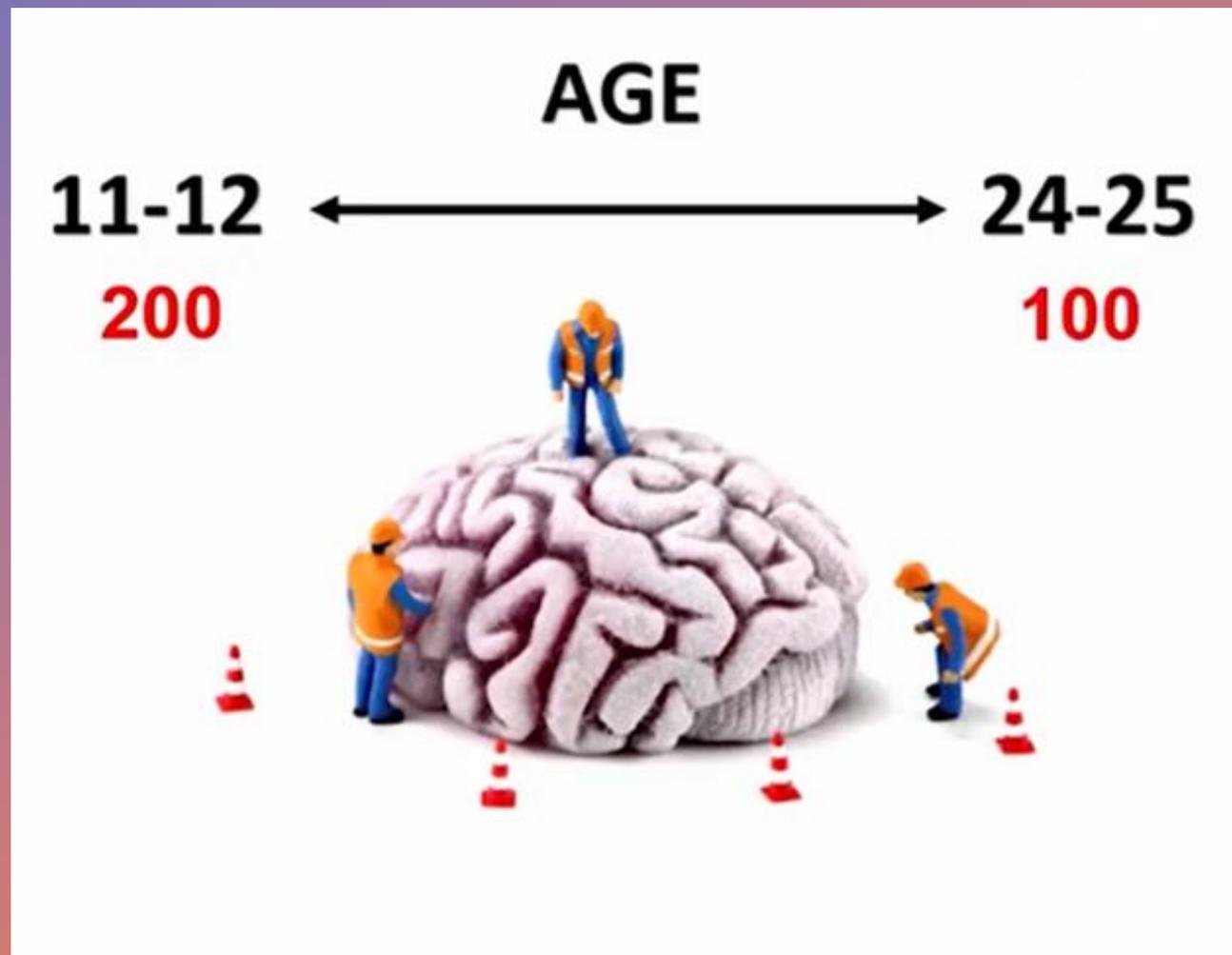


The impact of THC on Brain Development

Using marijuana before age 18 may affect how the brain builds connections for functions like attention, memory, and learning. Marijuana's effects on attention, memory, and learning may last a long time or even be permanent

The Second Phase of Brain Growth

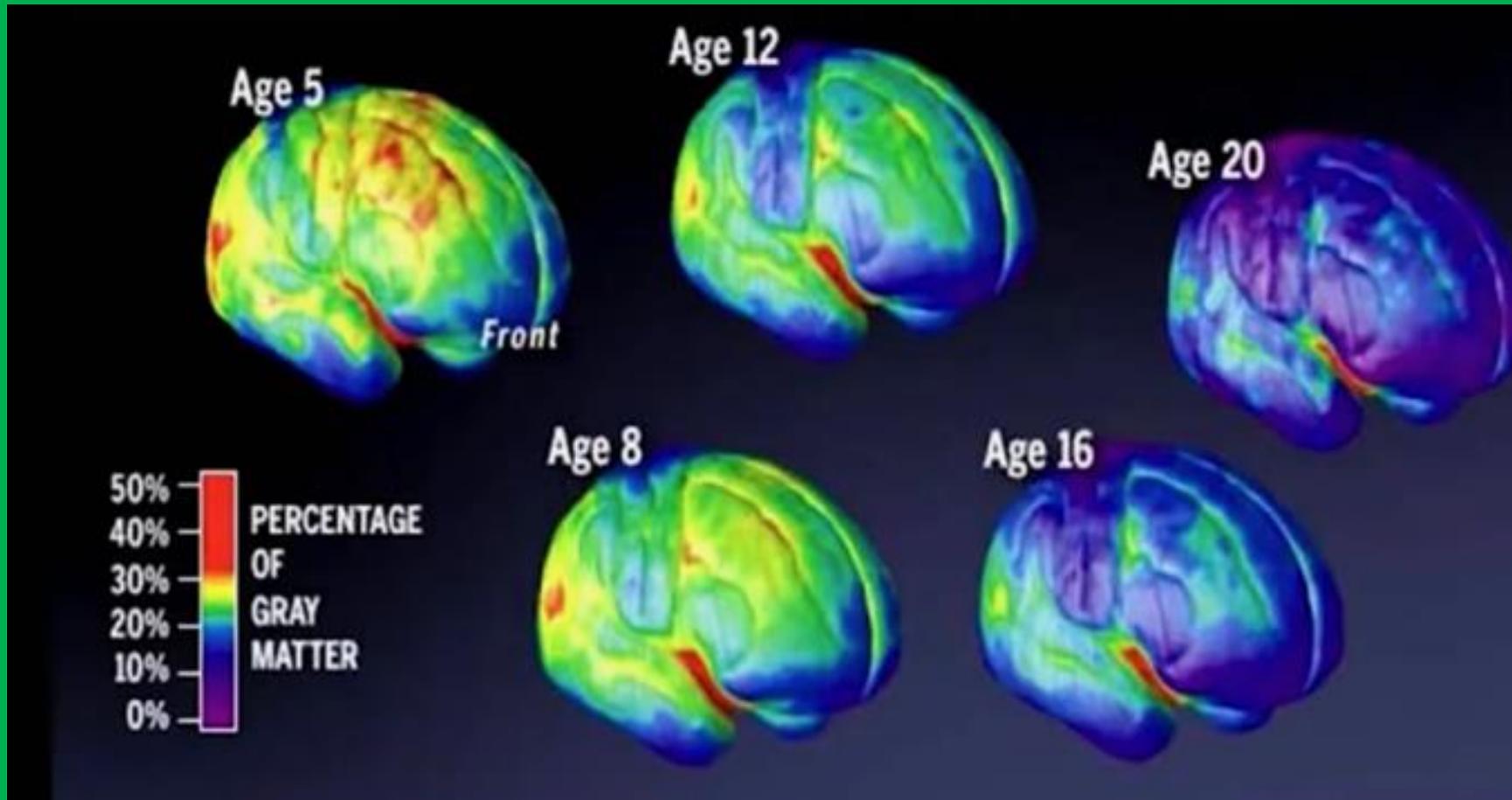
The second phase of brain growth starts at about 12 and continues to age 25. During this time, the brain prunes out little-used/unnecessary neurons and the brain thus decreases from 200 billion to 100 billion neurons. During this time, pathways that are used myelinate to increase efficiency. So, ensure that a teen is learning and doing good things during this time as this will wire into what becomes the adult brain.



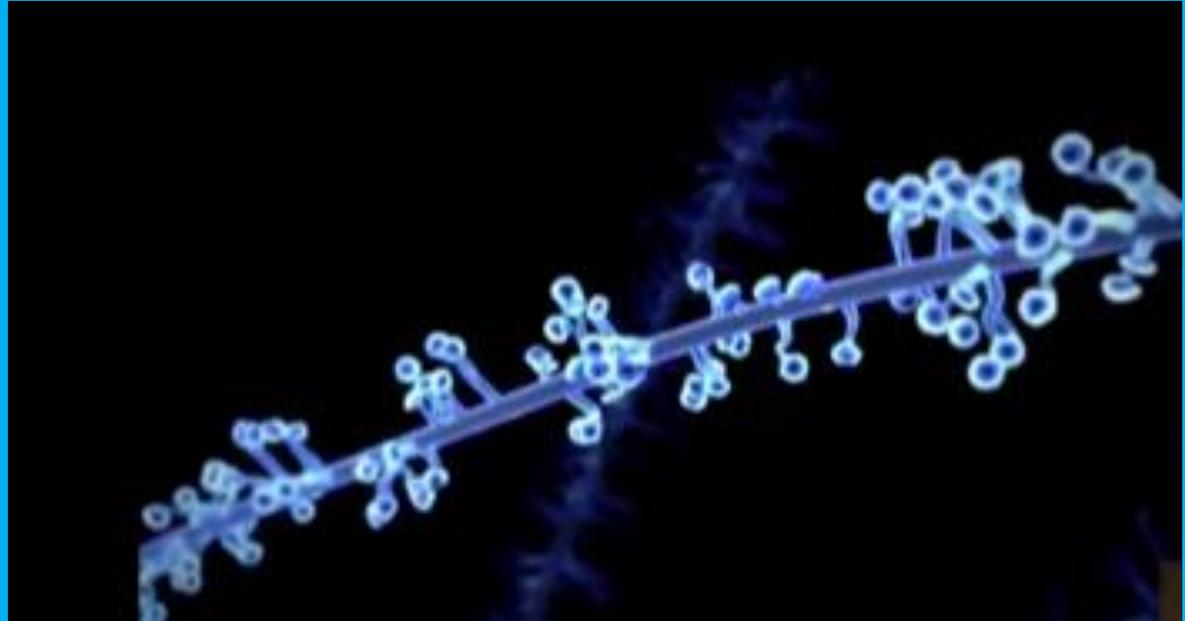
The infant neuron and its dendritic tree shown on the left is quite simple and you can see how its dendritic tree increases in complexity across the lifespan.



As the brain develops gray matter or unmyelinated neurons become myelinated to become white matter. This slide nicely how much growth occurs across childhood into early adulthood. THC and other drugs arrest this growth process.



Excessive dopamine flow triggered by THX addiction causes dendritic growth on the neuron which results in permanent changes in the brain. This explains why craving is an everlasting consequence that must be respected throughout the lifetime.



Long Term Impact on the Developing Brain



- Decline in IQ (up to 8 points)
- Poor school performance and higher chance of dropping out
- Impaired thinking and ability to learn and perform complex tasks
- Amotivational Syndrome
- Antisocial behavior including stealing money or lying
- Financial difficulties
- Cannabis-withdrawal syndrome

*What are marijuana's effects on general physical health? NIDA, Mar 2010; "Drop in IQ linked to heavy teenage cannabis use," Nature magazine, Aug 2012

*How does marijuana produce its effects? NIDA, Mar 2010; "Persistent cannabis users show neurophysiological decline from childhood to middle age," NCBJ, Oct 2012

Dr. Collier notes that THC along with many other drugs slows or even arrests brain development, most specifically executive functioning which impacts your entire life.

Executive Functioning



Elementary/Middle

- Task Initiation
- Flexible Thinking
- Planning and Prioritizing
- Organization
- Working Memory
- Self-Monitoring
- Selective Attention
- Coordination

Middle/High School

- Abstract; conceptual understanding
- Impulse Control
- Problem-Solving
- Decision-Making
- Judgment
- Emotion Regulation
- Frustration Tolerance
- Ability to Feel Empathy

Dr. Collier
summarizes the
causes of arrested
development.

- Chemical Use
- Trauma
- Neglect
- Intense Emotions –
Anger, Fear
- Chronic Stress
- Overindulgence



Alarming side effects of THC



How does **cannabis** affect my mental health?

If you need trusted information on **cannabis** and its impact on mental health, you can turn to us.



Decreases gray matter in the prefrontal cortex – this may not be recoverable and is more problematic in children/teens as the brain is still developing.

When smoked or vaped, endothelial cells which form the inner lining of a blood vessel and provide an anticoagulant barrier between the vessel wall and blood are damaged which significantly increases the risk of stroke.

The brain down-regulates CB1 receptors (tolerance) so more is needed to achieve the same effect.

IQ decreased by an average of 8 points when you start as a teen.

So – use the brain and wire in good stuff during adolescence or you lose good brain function in adulthood



Alarming Side Effects of Chronic THC USE

*Chronic is defined as 2 or more times per week

Decreases testosterone levels

Increases gynecomastia (breast tissue in males)

Decreases libido

Increases anxiety – typically after one year of use

4X more likely to develop Major Depressive Disorder

4X more likely to develop a psychotic disorder such as schizophrenia



Cannabis
Toxicity aka
“Greening
Out”

Cannabis Toxicity or “Greening Out”

- High levels of anxiety
- Panic attack
- Rapid heart rate
- Difficulty conversing
- Poor coordination
- High or low blood pressure
- Nausea and vomiting
- Extreme confusion and memory problems
- Paranoia
- Hallucinations
- Seizures



CHS PATIENT

Cannabinoid Hyperemesis Syndrome

- Cannabinoid hyperemesis syndrome (CHS) is a condition in which a patient experiences cyclical nausea, vomiting, and abdominal pain after using cannabis. It can in rare cases, kill you.
- This disorder is characterized by 1) several years of preceding cannabis use, predating the onset of illness; 2) a cyclical pattern of hyperemesis every few weeks to months, at which time the patient is still using cannabis and 3) resolution of the symptoms after cessation of cannabis use, confirmed by a negative urine drug screen.
- The almost pathognomic aspect of a patient's presenting history is that their symptoms are relieved by hot baths or shower or hot peppers.
- Please click the link below to hear this mother's story of the tragic loss of her son to CHS:
- https://www.youtube.com/watch?v=E1laVfwz1yQ&ab_channel=YahooNews



THE RESULTS



Another meta-analysis of three case-control studies of testicular cancer found a statistically significant link between heavier pot smoking and one type of testicular cancer. But this evidence was judged to be “limited” because of limitations in the research (all of which was from the 1990s).



STUDY SOURCE: BMC CANCER

TITLE: CANNABIS EXPOSURE AND RISK OF TESTICULAR CANCER: A SYSTEMATIC REVIEW AND META-ANALYSIS

2013

This is really scary! But to be fair, is not widely researched.

THC Facts

30 – 50% more addictive than nicotine

Anandamide was the first endocannabinoid to be discovered and participates in the body's endocannabinoid system by binding to cannabinoid receptor. This helps determine what gets pruned in the brain in adolescence. THC mimics and blocks this process and hence hampers brain maturation in teens.

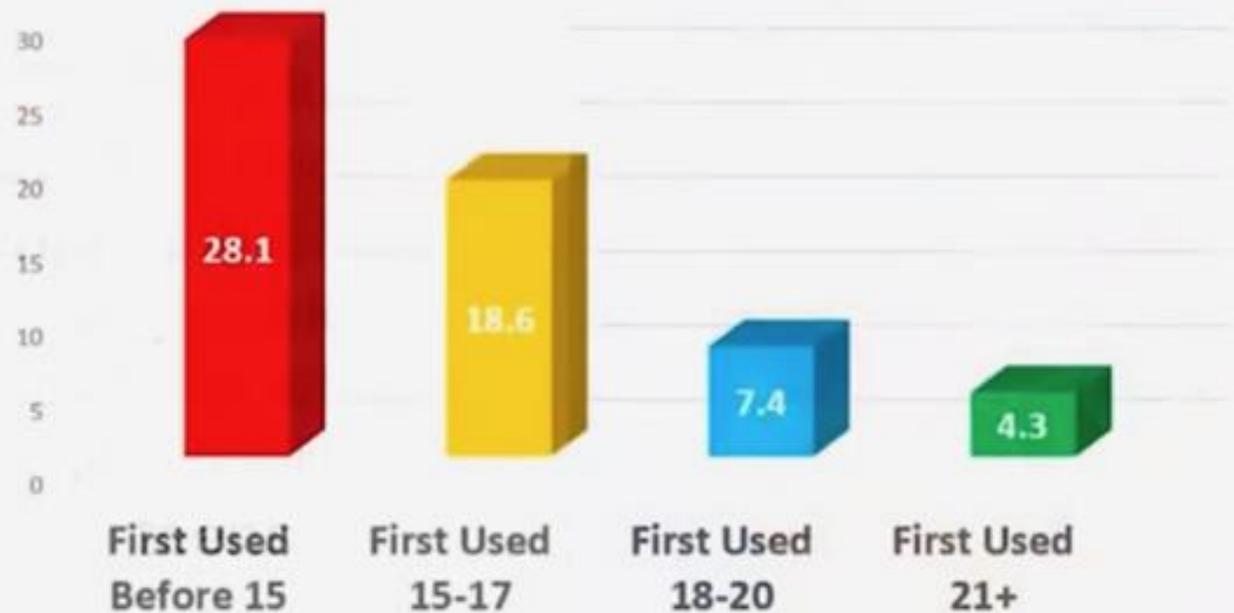
For each year a teen delays THC use, there is an 8% decreased chance of becoming addicted to the substance as an adult.

There are two cannabinoid receptors: CB₁ and CB₂. The CB₁ receptor is one of the most abundant G protein-coupled receptors (GPCRs) in the CNS and is found in particularly high levels in the neocortex, hippocampus, basal ganglia, cerebellum and brainstem. The CB₂ receptor exhibits a more defined pattern of expression in the brain than CB₁ receptors, and is found predominantly in cells and tissues of the immune system



The earlier a teen uses THC, the greater risk of a lifetime addiction.

The Earlier Teens Use Any Substance the Greater Risk of Addiction

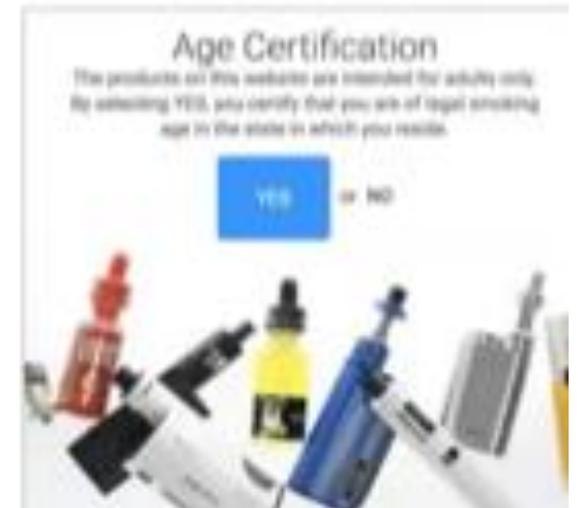


Center on Substance Abuse and Addiction (2008)

Getting Vapes is Easy

How Do Teens Get Vapes?

- A friend or relative
- Local Vape shops and gas stations
- Many online vendors also sell vape devices and e-juice. Underage youth may use Visa Gift Cards or PayPal accounts
- Parents should look out for package deliveries



E-sigs and THC

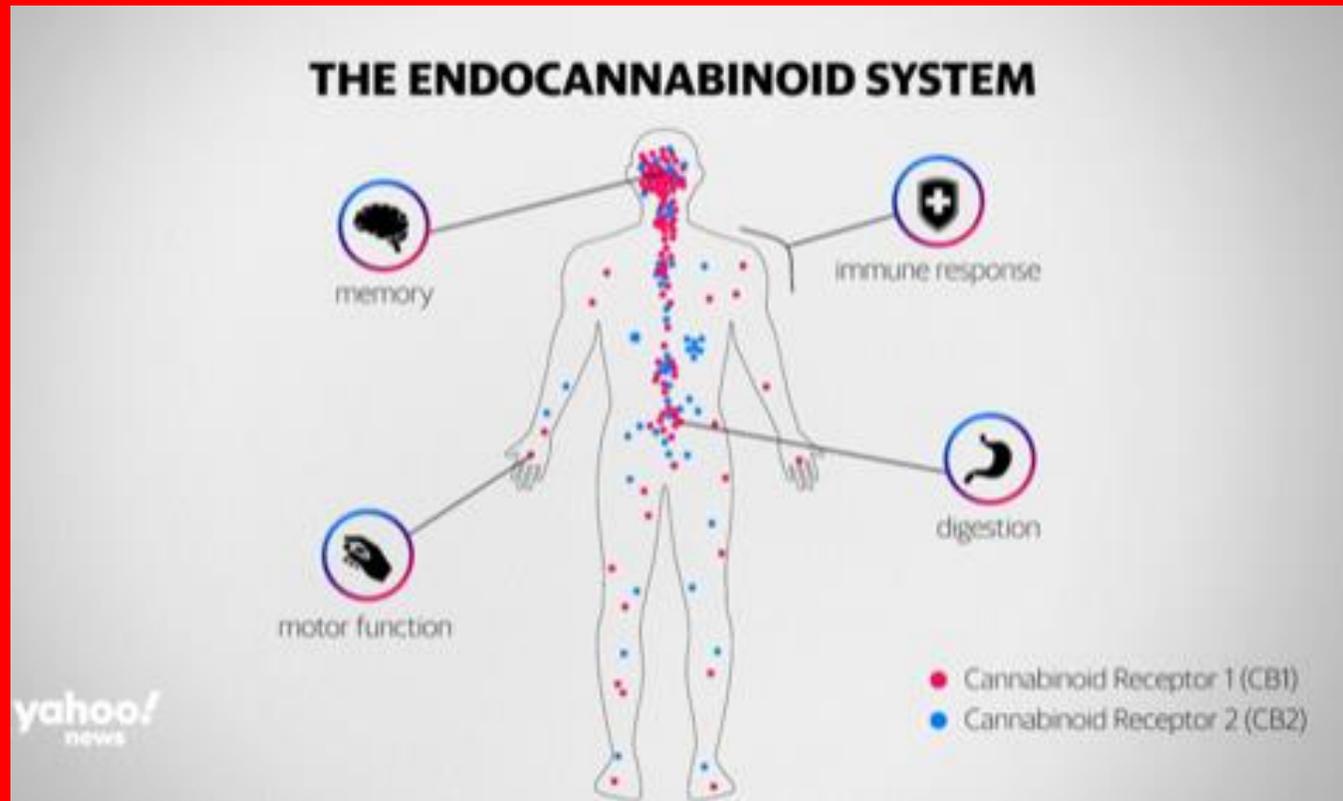
Teens who report
using e-cigarettes were

3.5 x

more likely to report
using cannabis than
non-e-cigarettes users.



<https://jamanetwork.com/journals/jamapediatrics/article-abstract/2748303>



The Endocannabinoid System. Higher concentrations of CB1 in the brain and CB2 in the body.

To teens: The longer you delay using the better. Avoidance is even better. Genetics, trauma, and age you start all add up to determine the likelihood you will become chronically addicted as an adult.

Many people use THC to quell the pain of trauma which works initially but, as in the Grim Reaper, always demands payment later, which far too often, is a lifetime of addiction and the problems it creates.

Talk Early, Talk Often

“Delay, Delay, Delay or Avoid Altogether”



Genetics



Trauma

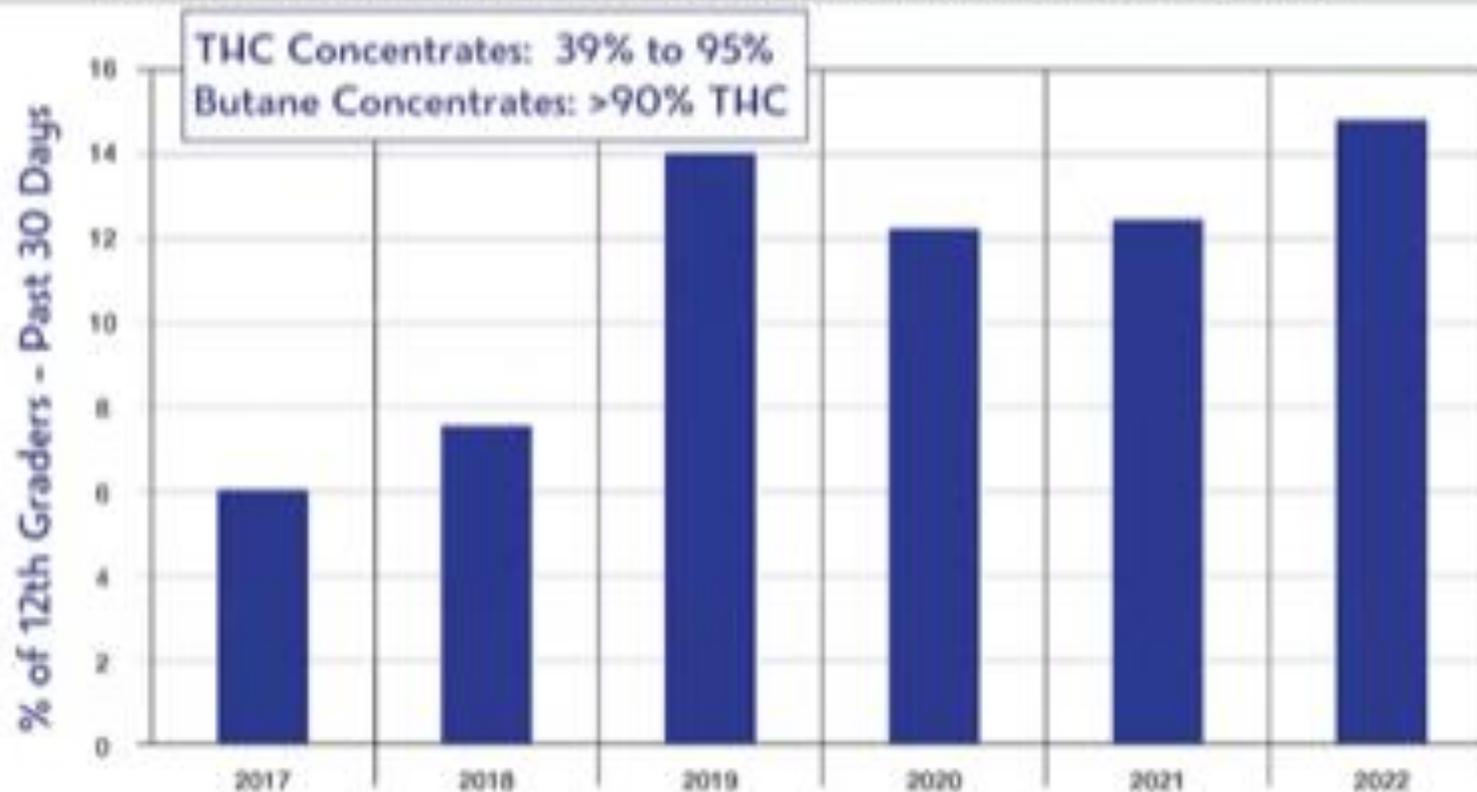


Early Use



Increase in Adolescent Vaping of High Potency THC

2023 JAMA Pediatrics & 2022 Monitoring the Future Survey

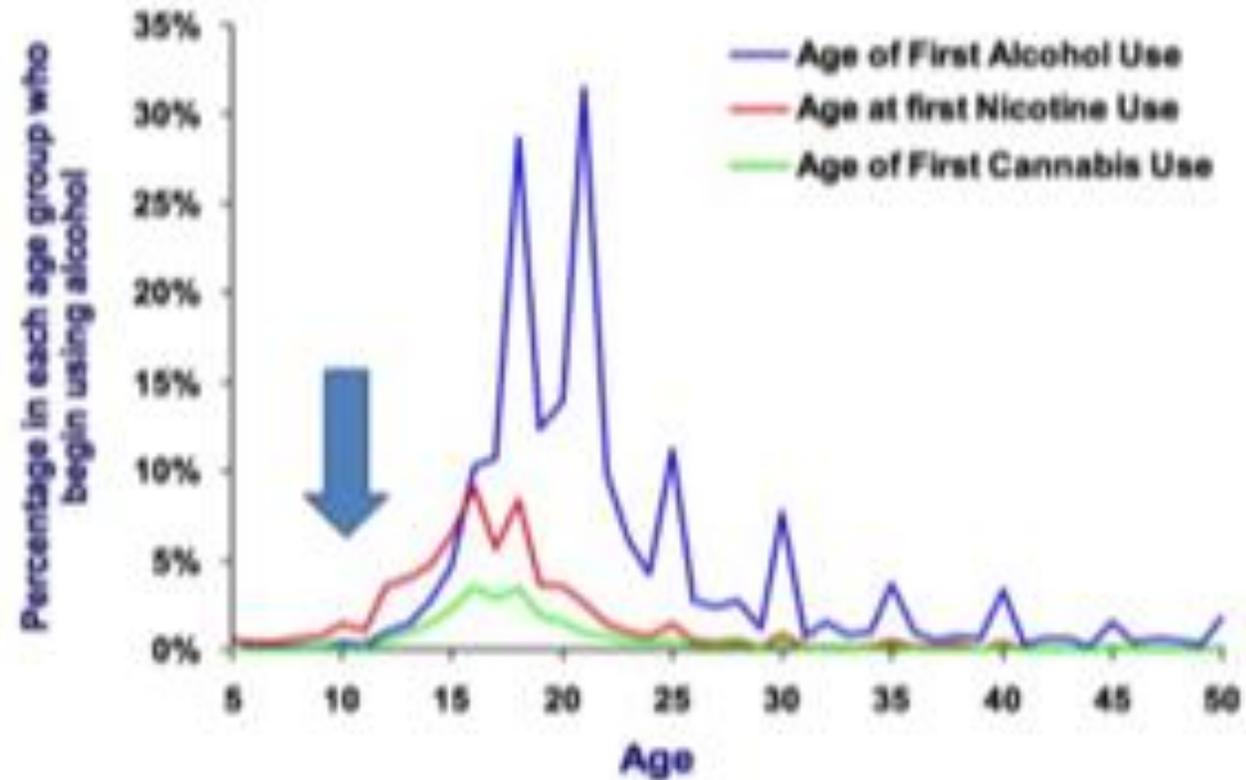


Vargas G, Shiner LA, Chack N, Harris EK. High-Potency Cannabis Use in Adolescence. *J Pediatr*. 2023 Jan;252:185-197.e1. doi: 10.1016/j.jpeds.2022.07.034. Epub 2022 Aug 14. PMID: 35977621. Monitoring the Future National Survey Results on Drug Use, 1975 - 2022. Secondary School Students. Ann Arbor: Institute

Entering the highway to addiction far too young!



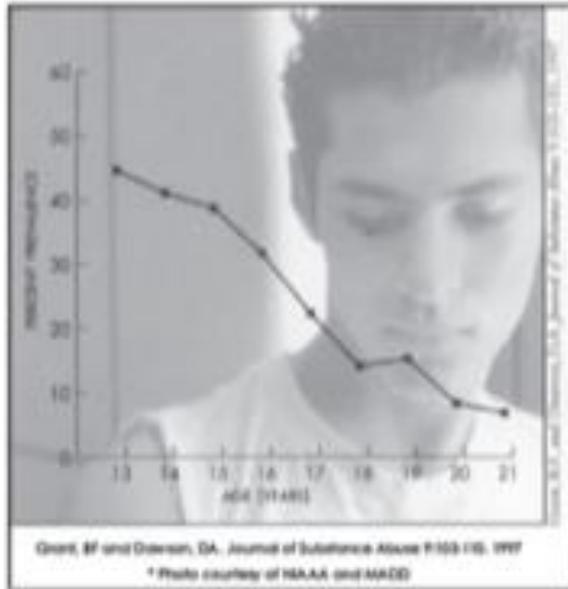
Addiction is a Developmental Pediatric Disease



Source: NIAAA National Epidemiologic Survey on Alcohol and Related Conditions, 2003

Use of substance in teens wires the developing teen brain for addiction.
THC sellers know that if they get you early, they have a customer for life.

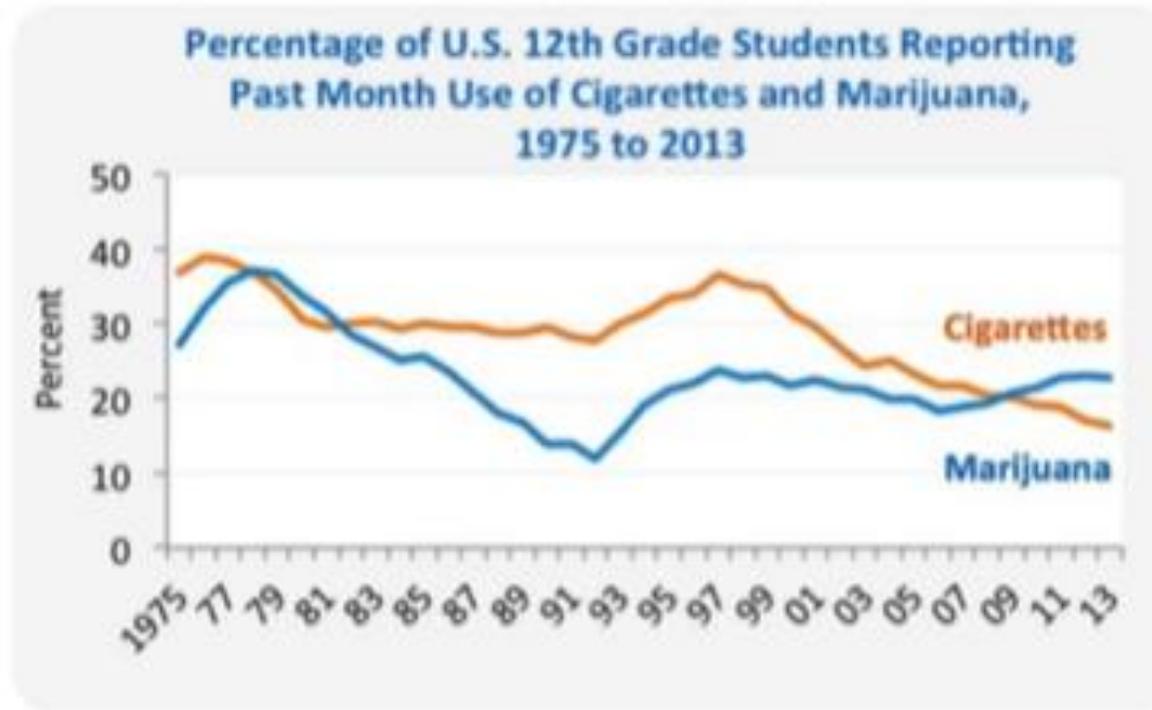
Teen Alcohol Use Wires The Brain For Addiction



40% of kids who begin drinking at age 15 will become alcoholics.

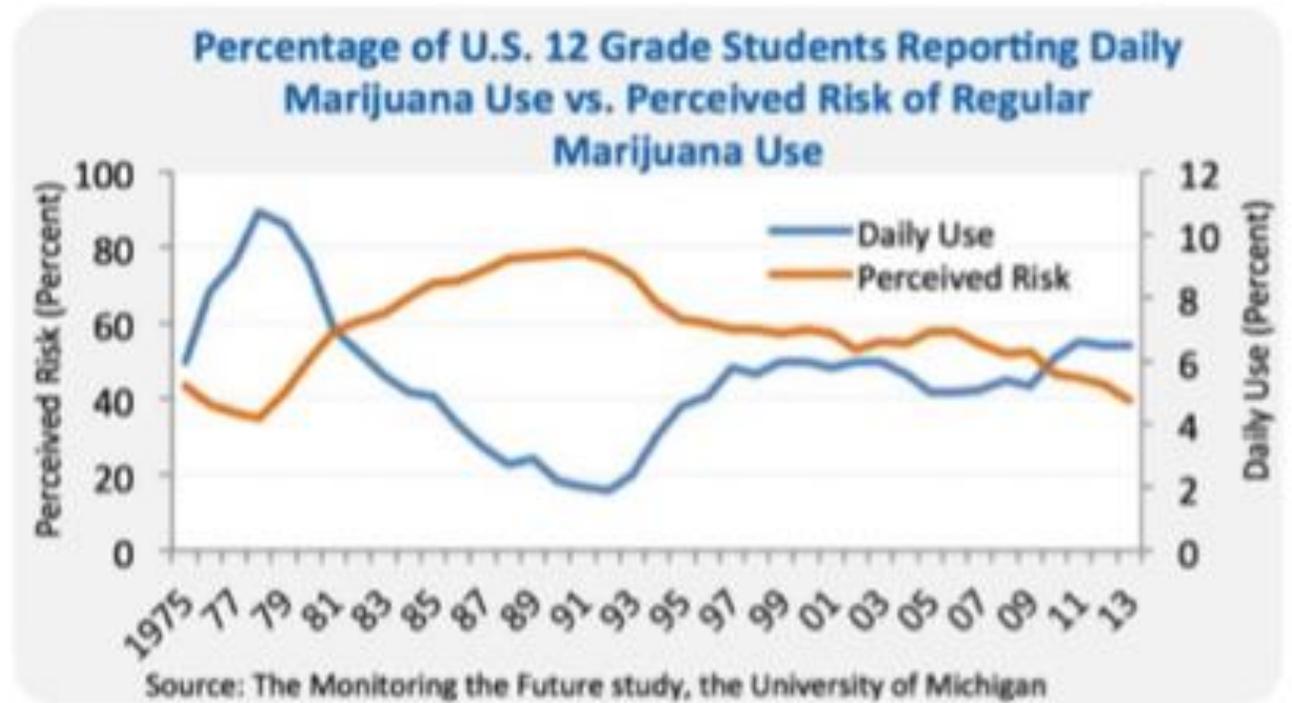
Only 7% of those who begin drinking at age 21 become alcoholics.





In 2009, THC use surpassed cigarette use in teens.

For teens: Since 2009, as your daily use increases, your perceived risk goes down. This is very dangerous - as you are sinking into quicksand, you fail to appreciate the increasing peril you are in.



Start early
and you risk
being an
addict for
life!

