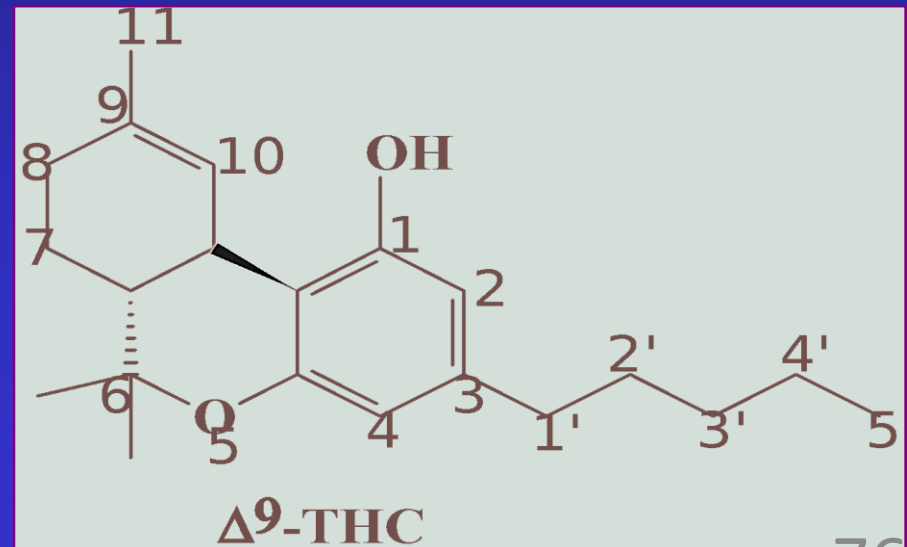


# The effect of the main substance of cannabis on the body

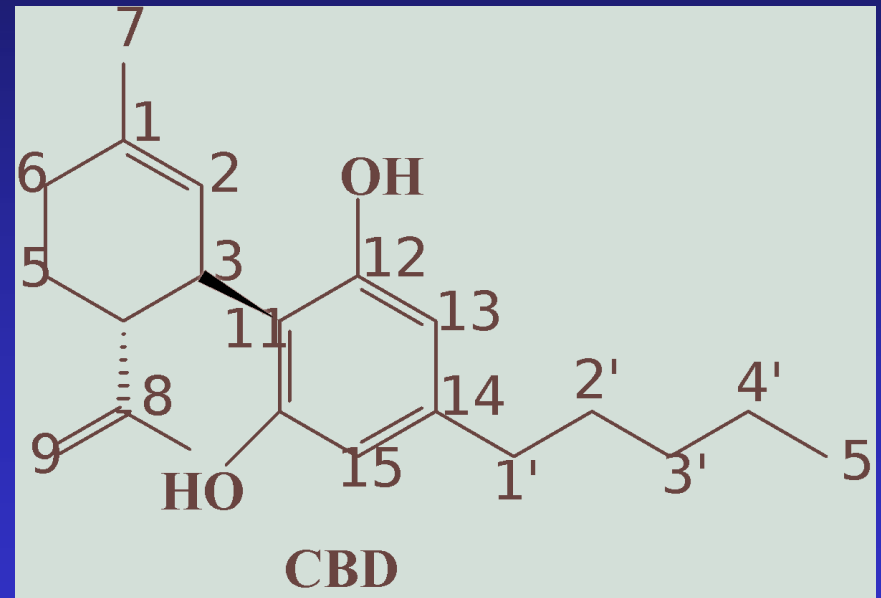
# Pharmacological actions of THC

- Psychotropic
  - Initial euphoria and relaxation
  - Followed by a depressant period
  - Alterations memory and cognitive perceptual abilities
- Immuno-suppressive/ immuno-modulation
- Cardiovascular (tachycardia, orthostatic hypotension, peripheral vasodilation)
- Analgesic
- Anti-emetic
- Appetite stimulant



# Pharmacological Effects of CBD

- Anticonvulsant
- Analgesic
- Anti-anxiety
- Anti-psychotic
- Anti-inflammatory
- Anti-arthritic
- Immunosuppressive



# Pharmacological Effects

## Acute Effects

- CNS depressant: drowsiness, ↓ alertness, impairment of short term memory, slowed reactions, ↓ accuracy of psychomotor task performance; ↓ motor coordination and muscle tone
  - Low doses: mild euphoria, relaxation, ↑ socialability, ↓ anxiety
  - High doses: dysphoria, ↑ anxiety and panic reactions (esp. inexperienced users) sensory distortions, hallucinations

## Acute Effects

- Dry mouth
- Stimulated appetite (munchies)
- Antiemetic (low doses)
- Nausea and vomiting (high doses)
- Dilate blood vessels (red eyes)
- Increased heart rate
- Orthostatic hypotension
- Impaired:
  - Attention
  - Short term memory
  - Some complex cognitive processes,
  - Motor abilities
- 
- Most effects are dose dependent and moderated by tolerance, comparable to those of moderate doses of alcohol (BAC approximately 0.05%)

# Pharmacological Effects (cont'd)

## Acute Effects

- Pain perception ↓ (exerted at CB<sub>1</sub> receptor)
- Antinauseant and antiemetic effects,  
↑ appetite (CB<sub>1</sub> receptors)
- Anticonvulsant effects (not via CB<sub>1</sub> receptors)

# Pharmacological Effects (cont'd)

## Neuromuscular system

- Centrally and peripherally mediated antispasticity

## Cardiovascular effects

- Tachycardia, ↑ cardiac output, ↑ myocardial oxygen need

# Pharmacological Effects (cont'd)

## Respiratory

Bronchodilation → ↓ airway resistance (acute)

Bronchial irritation → particulate fraction of cannabis smoke (chronic)

Cannabis smoke similar to tobacco smoke

## Eye

↓ IOP at doses that produce CNS effects

## Immune System

Effects unclear



# Chronic Effects

- CNS
  - cognitive changes include poor memory, vagueness of thought, decreased verbal fluency, learning deficits
  - daily high doses can cause chronic intoxication syndrome (apathy), confusion, depression, paranoia
  - cannabis dependence (DSM-IV criteria)

# Chronic Effects (cont'd)

## Respiratory System

↑ chronic inflammatory chest disease  
precancerous changes

# What Are the General Effects of Cannabis Use?

## Administration

Smoked (start 1-2 minutes -> ends 4 hours)

PO (start 30 minutes -> ends 6 hours)

## General effects of Cannabis use:

Potential Positives:

Euphoria, relaxation, laughing, >appreciation for music

Potential Negatives:

Anxiety, fear, paranoia, or panic

Hallucinations (rare)

Dissipate with time

## Effects with Long Term Use

### Impaired cognition

Attention

Memory

Problem solving

Mental flexibility

### Altered brain function on neuroimaging:

Prefrontal cortex

Cerebellum

Hippocampus

# Concentrations of CB<sub>1</sub> receptors

**Basal Ganglia<sup>1</sup>**  
Movement

**Cerebral Cortex<sup>1</sup>**  
Higher cognitive function

**Cerebellum<sup>1</sup>**  
Movement

**Hypothalamus<sup>2</sup>**  
Appetite

**Hippocampus<sup>1</sup>**  
Learning, memory, stress

**Medulla<sup>3,4</sup>**  
Nausea/vomiting,  
chemoreceptor  
trigger zone (CTZ)

**Spinal Cord<sup>1</sup>**  
Peripheral  
sensation  
including pain

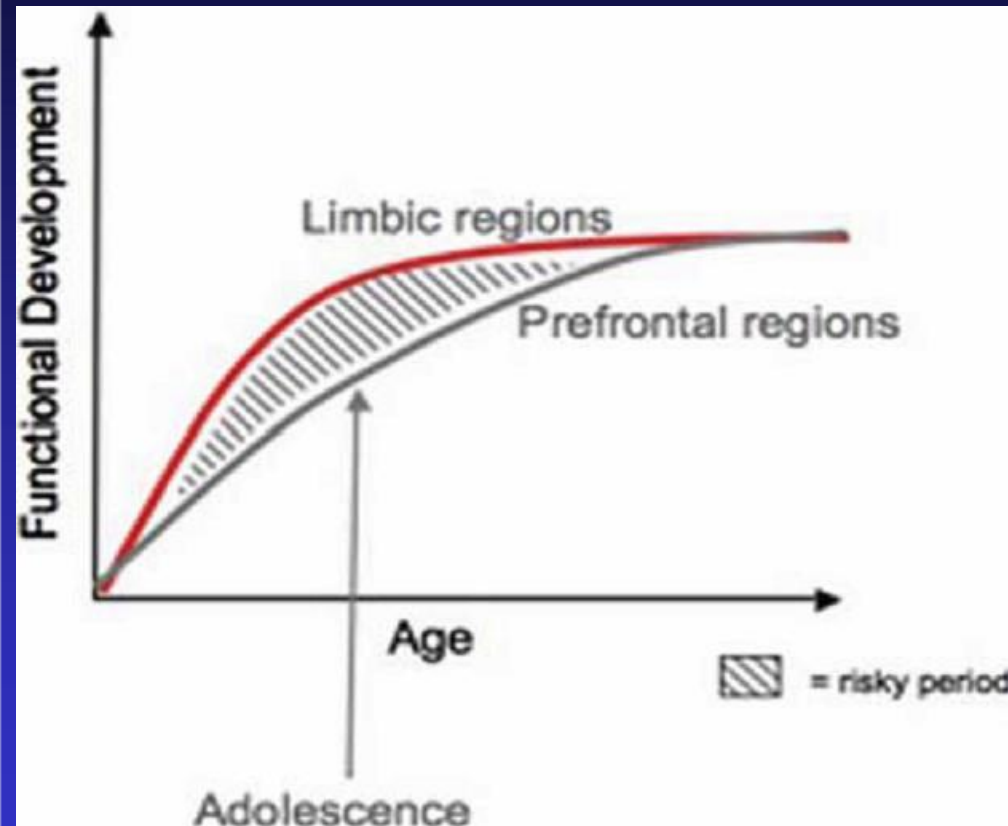
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87

## How Does Cannabis Interact with the Brain?

- Endogenous cannabinoid receptors (CB1, CB2) and 5 endogenous ligands
- CB1
  - Psychoactive and reinforcing effects
  - Highest concentrations
    - Basal ganglia (reward, learning, motor control)
    - Cerebellum (sensorimotor coordination)
    - Hippocampus (memory)
    - Cortex (planning, inhibition, higher-order cognition)
  - Dose and time dependent
  - Euphoria: increased dopamine in reward center

# Brain development in adolescence



## Accumbens

Immediate rewards  
Impulsive behavior



## Cortex

Long term gain  
Thoughtful behavior

<http://erichengelhardt.net/neuro-facts.html> accessed 5/28/2013

Amendment 64 prohibits the sale and use of cannabis products by those younger than 21 years. Why?

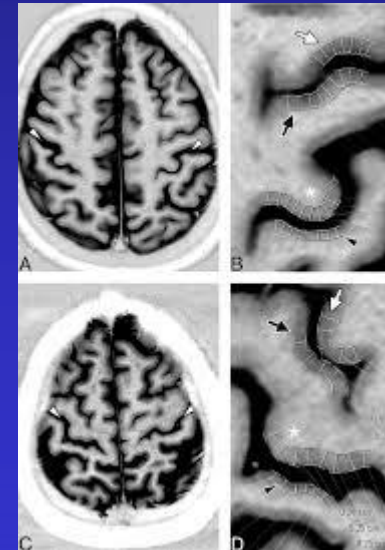
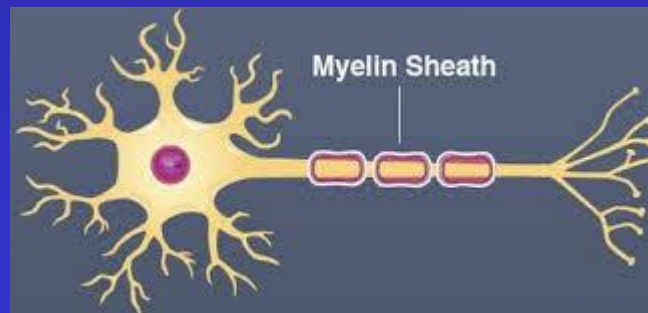
The adolescent brain is still developing. There is concern that the reward pathways and feedback loops may be altered if cannabis is used by those with still developing brains.



# How Does Cannabis Interact with the Teen Brain?

## Chronic or frequent use

- Impaired executive function
- Impaired higher-level control of attention
- Impaired working memory
- Decreased cortical thickness
- Possible decreased myelination



# Behavioral, Medical, and Psychiatric Adverse Effects

## Adolescents with regular use:

- Try other substances
- Develop substance use disorders
- Poor academic performance
- Drop out of school
- More delinquent behavior
- Psychiatric problems
- Emergency department visits
- Risky behavior
  - Drugged driving
  - Sexually transmitted diseases



# Cannabis and Schizophrenia

Using Cannabis → psychotic disorders

- Association repeatedly demonstrated

Higher risk

- Frequent use
- Early onset

Prior schizophrenia diagnosis

- Negative effect on course and treatment
- Possible positive effect on cognition

# Cannabis Withdrawal

- Experienced by most heavy users
- Cannabinoid antagonist → withdrawal
- Resume THC and symptoms abate
- Cannabis withdrawal syndrome
  - Begins 1-2 days after stopping
  - Peaks in 2-4 days
  - Lasts for 1-3 weeks
  - No major medical/psychiatric consequences
  - More severe withdrawal=worse prognosis

# Cannabis Withdrawal Symptoms

- Irritability/anger
- Nervousness/anxiety
- Sleep difficulty
- Decreased appetite
- Depressed mood
- Physical symptoms
  - Stomach pain
  - Tremor, headache
  - Fever, chills, sweating



Photo: Tony Fischer

## Cannabis Use and Misuse Risk Factors

Genetic

Environmental

\*Availability\*

Delinquent Behavior ผิดนัด

Chaotic Home ยุ่งวายน

Low socio-economic status

Other psychopathology

Low perceived risk of harm

Peer/Family Use

Use of other substances

Earlier initiation risk of CUD (cannabis use disorder)



Cannabis coffee shop in Amsterdam