Marijuana Health Effects

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Presentation Overview

- My program at CDPHE
- Cannabinoid molecules and receptors
- Medicinal effects of marijuana
- Non-medicinal health effects of marijuana
- Ongoing and future research

Introduction

Marijuana Health Monitoring & Research Program

Colorado Department of Public Health and Environment

1. Review existing and emerging research literature on health effects of marijuana
2. Data monitoring
   a) Monitor health impacts
   b) Monitor patterns of use
3. Marijuana research grants
   a) Medical efficacy
   b) Public health concerns


MEDICAL MARIJUANA
HELPS TO SAVE LIVES

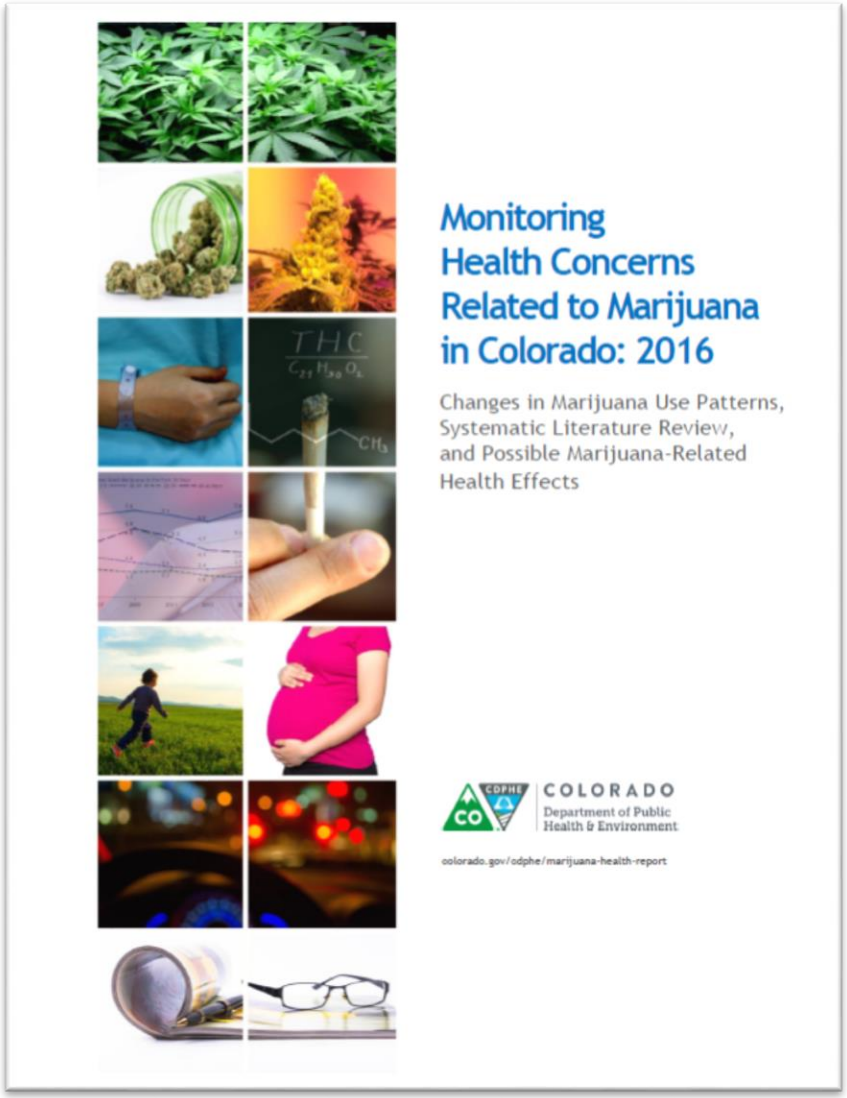
SAFE


Yes, it's bad for you
Don't lie to yourself
Although legalization activists and many marijuana users believe smoking pot has no negative effects, scientific research indicates that marijuana use can cause many different health problems
* Distorted perception (sights, sounds, time, touch)
* Problems with memory and learning
* Loss of coordination
* Trouble with thinking and problem-solving
* Increased heart rate, reduced blood pressure
* Hallucinations
* Delusions
* Impaired memory
* Disorientation
* Daily cough and phlegm production
* More frequent acute chest illnesses
* Increased risk of lung infections
* Obstructed airways
Buddy, T. "The Health Effects of Marijuana." Alcoholism & Drugs. 31 Mar. 2009. New York Times Company. 20 Apr. 2009 <http://alcoholism.about.com/od/illegaldrugs/a/effects.htm>

We have evaluated the current research on these topics

- Adolescents and Young Adults
- Cancer
- Cardiovascular Effects
- Dose, Metabolism and Drug Interactions
- Driving
- Injury
- Gastrointestinal and Reproductive Effects
- Cognitive and Mental Health Effects
- Pregnancy/Breast Feeding
- Respiratory Effects
- Unintentional Exposure in Children

Detailed Report



- Retail Marijuana Public Health Advisory Committee

- www.colorado.gov/cdphe/marijuana-health-report

- OR search "monitoring marijuana CO"
  - first link ("trends and health effects")

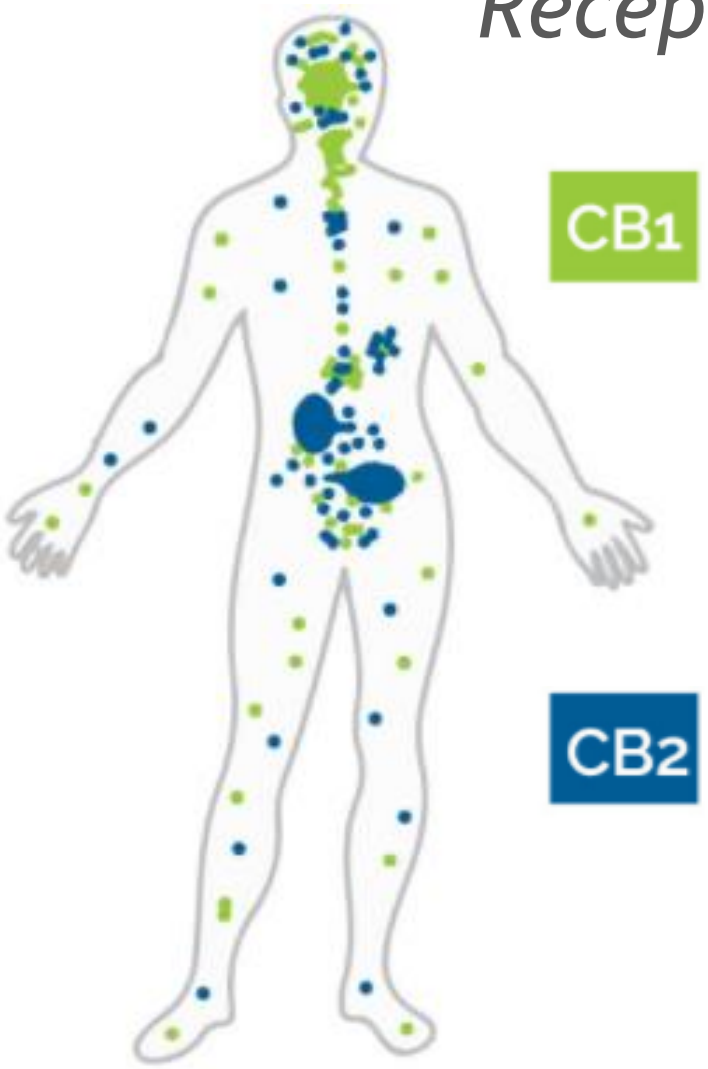
Marijuana Use in Colorado

- 15% of all adults are current users[1]
- One-in-eight 18-25yr olds use daily or near daily[1]
- Many adults use three or more times per day[2]
- Top reasons for use: sleep, anxiety and feel good[2]
- 25% of HS juniors and seniors are current users[3]
- Smoking remains the most common method of use[1,2,3]

1. Behavioral Risk Factor Surveillance System
2. Cannabis Users Survey on Health
3. Healthy Kids Colorado Survey

Cannabinoids: Molecules and Receptors

The Endocannabinoid System: Receptors & Endocannabinoids



Two primary endogenous cannabinoids have been found:

- Anandamide
  - Primarily CB1 receptors
- 2-AG
  - Both CB1 and CB2 receptors

CB1 receptor locations in the brain

Basal ganglia

Movement regulation and behavior control

Hippocampus

Short-term memory, spatial memory and navigation

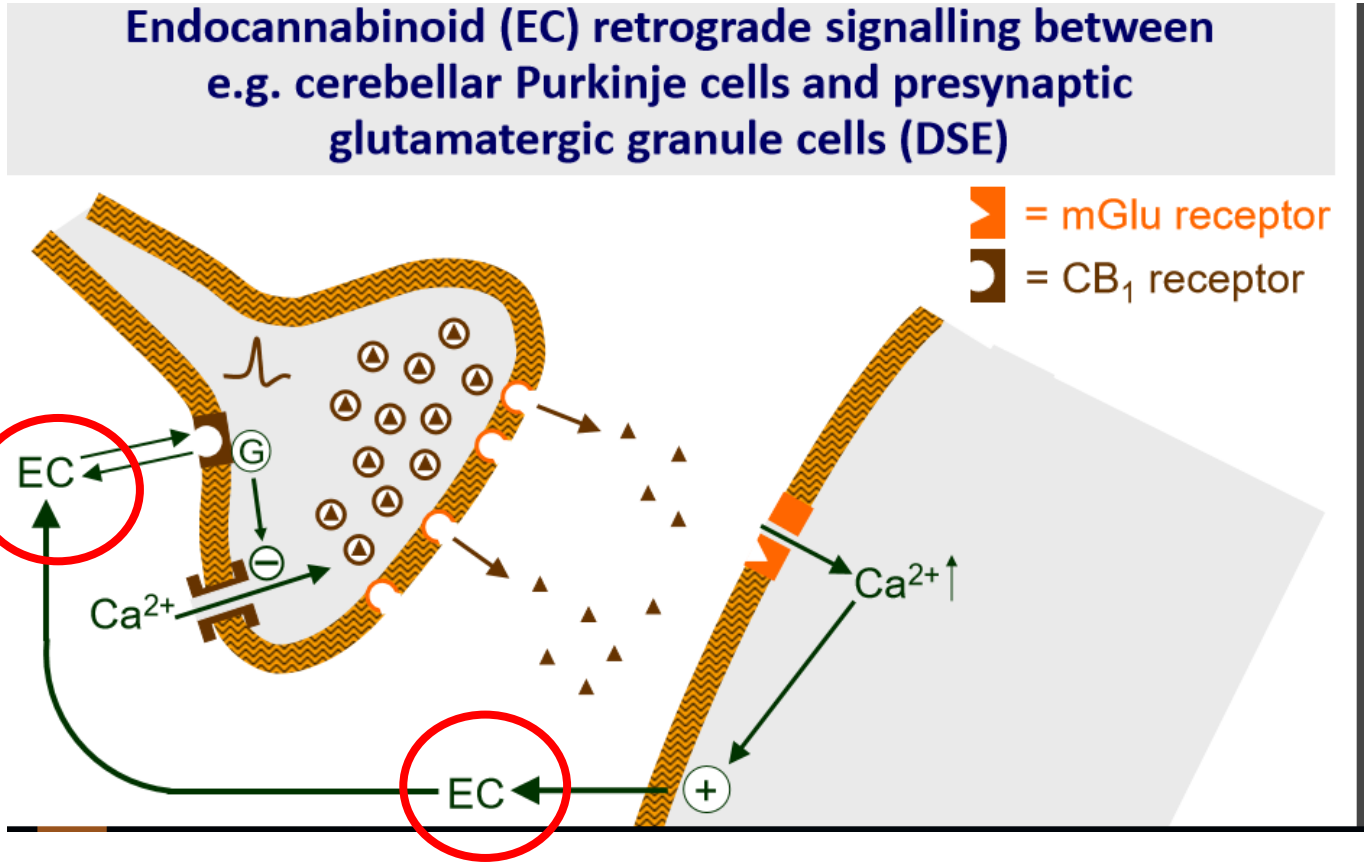
Cerebellum

Coordination and motor learning

Cerebral cortex

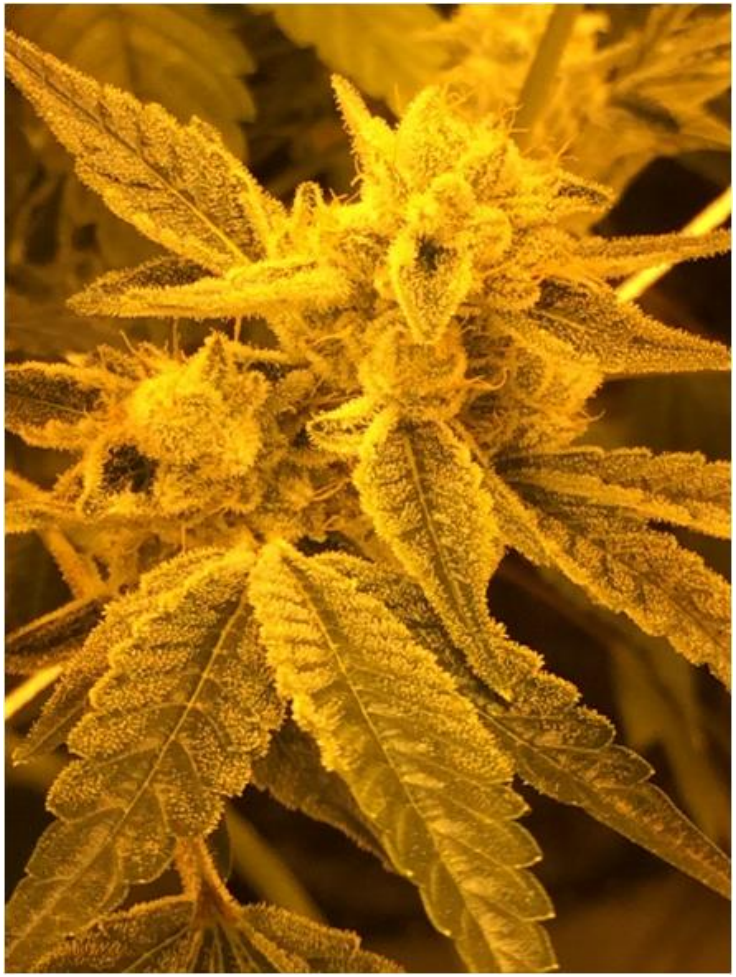
Attention, memory, problem solving, decision making, reasoning, judgement, language (i.e. cognition)

The Endocannabinoid System: Transmitters



This is perhaps not a “system”, but rather a series of local feedback mechanisms.

Image from EpLink | The Epilepsy Research Program of the Ontario Brain Institute www.eplink.ca



Cannabis is a plant that produces exogenous (external) cannabinoids:

THC (tetrahydrocannabinol)

CBD (cannabidiol)

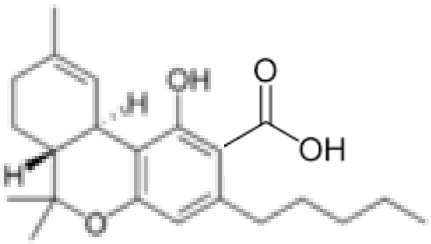
Many others

← The crystals seen on the plant are called “tricomes” and contain the cannabinoids.

THC and CBD do not act exclusively at one receptor or the other.

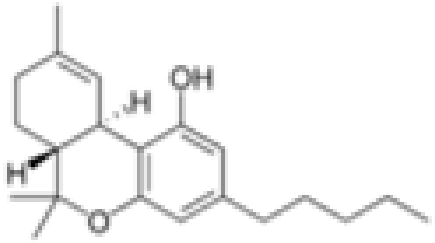
THC and Metabolites

Psychoactive and Non-psychoactive



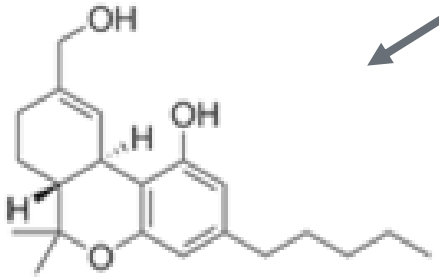
THC acid or THC-A

Heating



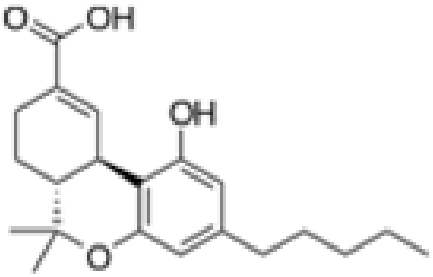
“THC” or Δ9-THC

Liver



“hydroxy-THC” or 11-OH-THC

Liver



“carboxy-THC” or 11-COOH-THC

Metabolism

THC blood levels after inhaling – peak at 12 minutes

Figure 1. Plasma THC vs. time in 6 subjects during and after smoking a single marijuana cigarette of 3.55% THC using a paced smoking protocol. From Huestis et al 1992 (57)

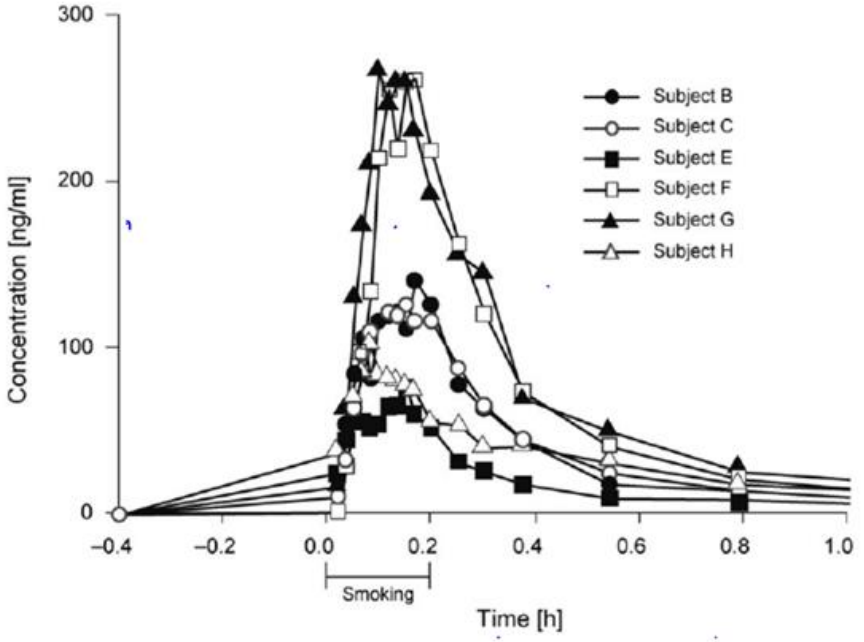
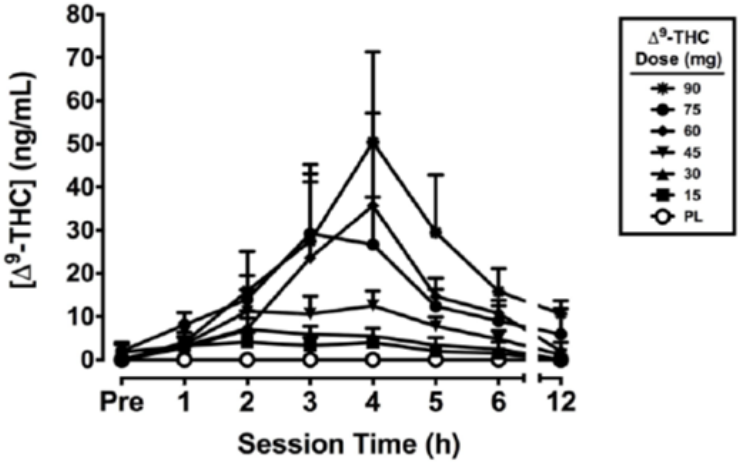


Figure 5. Mean plasma THC levels vs. time after oral THC doses of 0 (placebo) to 90 mg in 5 to 7 subjects. From Lile et al (2013).(34)



THC blood levels after ingesting – peak at 4 hours

Medicinal Effects of Marijuana

Efficacy of MMJ - "Popular View"

- Parkinson's disease
- Epilepsy
- Crohn's disease
- Hepatitis C
- ALS
- Alzheimer's disease
- Mitochondrial disease
- Sickle cell disease
- Muscular dystrophy
- Cancer
- Glaucoma
- HIV/AIDS
- Cachexia
- Pain
- Nausea
- Seizures
- Muscle spasms
- Multiple sclerosis
- Lupus
- Tourette's syndrome
- Inflammatory bowel disease
- PTSD
- Huntington's disease
- Anorexia
- Arthritis
- Migraines

Efficacy of MMJ "Medical Establishment View"

Condition	Hill[1]	Whiting et al[2]	National Academies[3]
Chronic Pain	High Quality	Moderate Quality	Substantial Evidence
Muscle Spasticity	High Quality	Moderate Quality	Substantial Evidence
Nausea/Vomiting		Low Quality	Substantial Evidence
Sleep			Moderate Evidence
Cachexia/wasting		Low Quality	Limited Evidence

1. Hill, K.P. Medical marijuana for treatment of chronic pain and other medical and psychiatric problems: A clinical review. JAMA. 2015; 313(24)2474-2483.
2. Whiting et al. Cannabinoids for medical use: a systematic review and meta-analysis. JAMA. 2015; 313(24)2456-73
3. National Academies of Science, Engineering and Medicine. The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research. 2017

The National Academies of Sciences, Engineering and Medicine

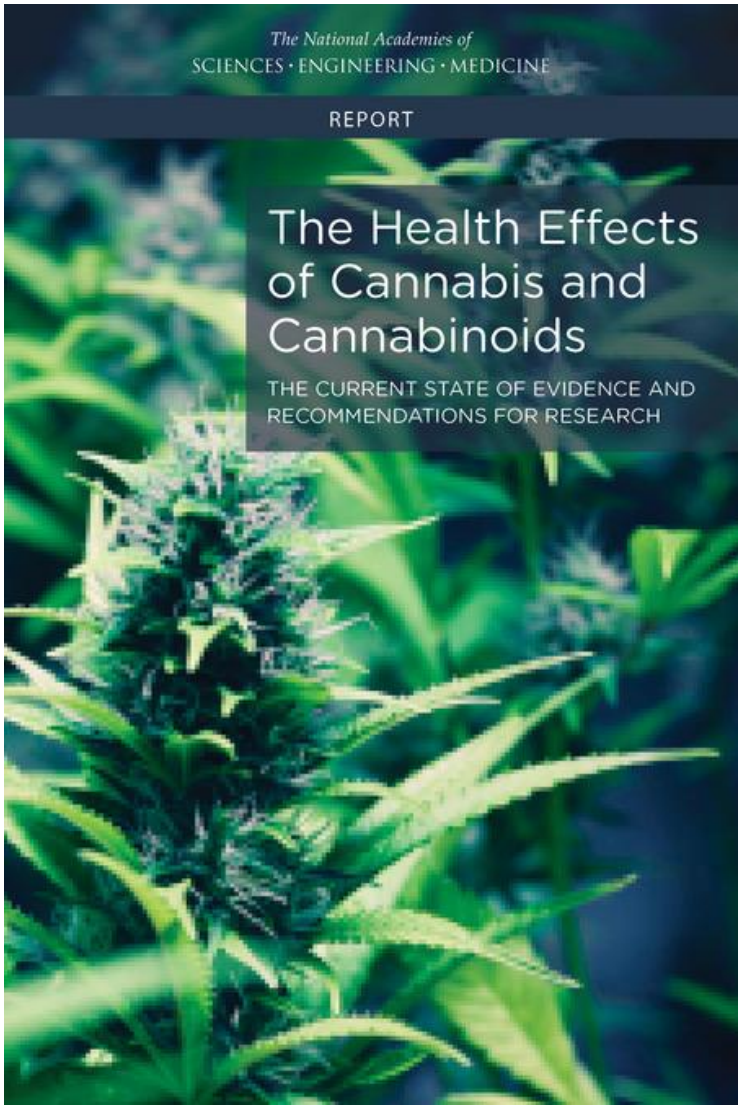
reviewed the research literature on cannabis in January 2017

and produced this report:

The Health Effects of Cannabis and Cannabinoids:

The Current State of Evidence and Recommendations for Research

It addresses both medical efficacy and potential health risks

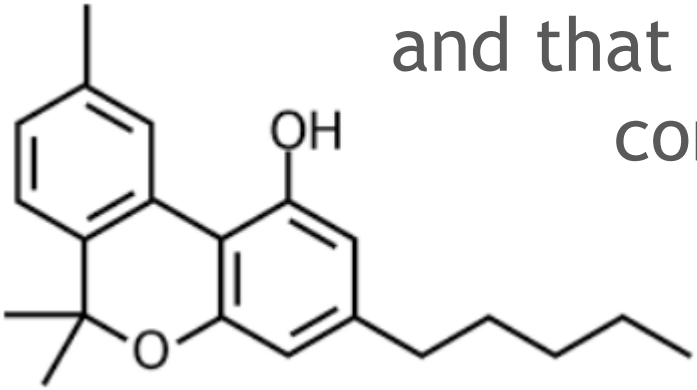


Non-medicinal Health Effects of Marijuana (Prenatal and Children)

Pregnancy and Breast Feeding

- Biological evidence shows that THC is passed through the placenta of women who use marijuana during pregnancy and that the fetus absorbs and metabolizes the THC.

- Biological evidence shows that THC is present in the breast milk of women who use marijuana and that infants who drink breast milk containing THC absorb and metabolize the THC.



Pregnancy and Breast Feeding

- We found MODERATE evidence that maternal use of marijuana during pregnancy is associated with these outcomes in exposed offspring:
  - Reduced cognitive function
  - Decreased IQ scores
  - Attention problems
  - Decreased growth

Unintentional Exposures among Young Children

Substantial Evidence

Legal marijuana access is strongly associated with increased numbers of unintentional exposures in children, which can lead to hospitalizations.

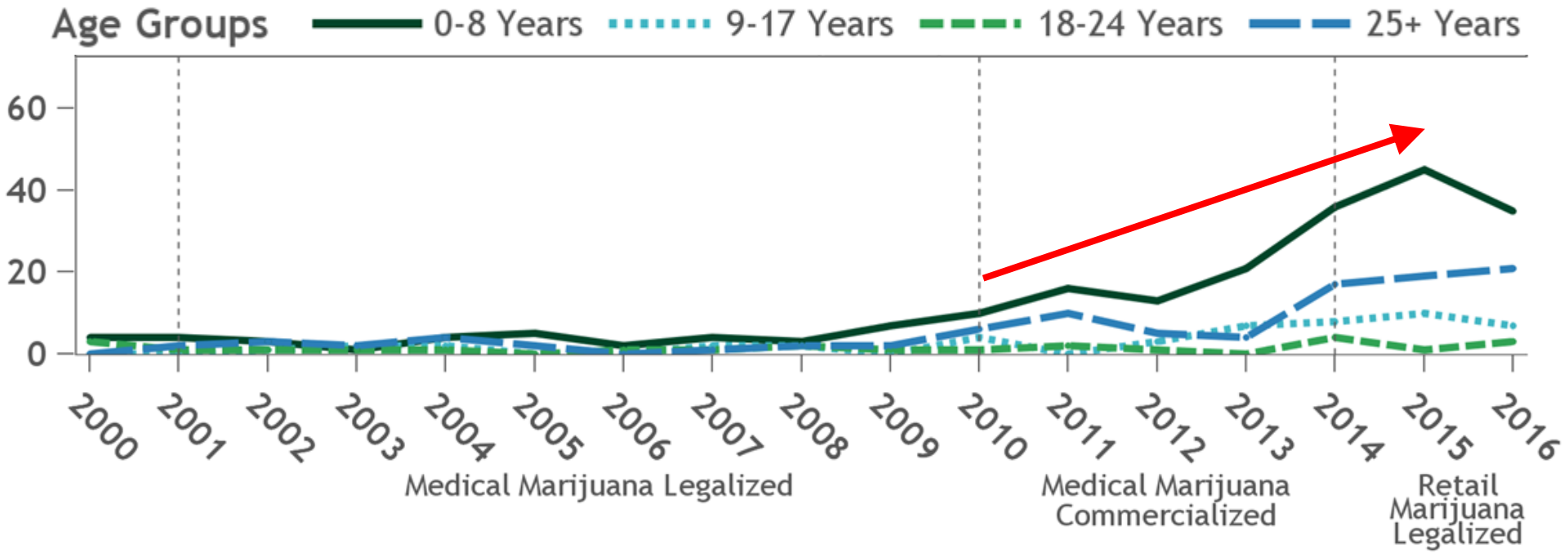
Moderate

Child resistant packaging prevents exposure to children from potentially harmful substances (not marijuana specific).

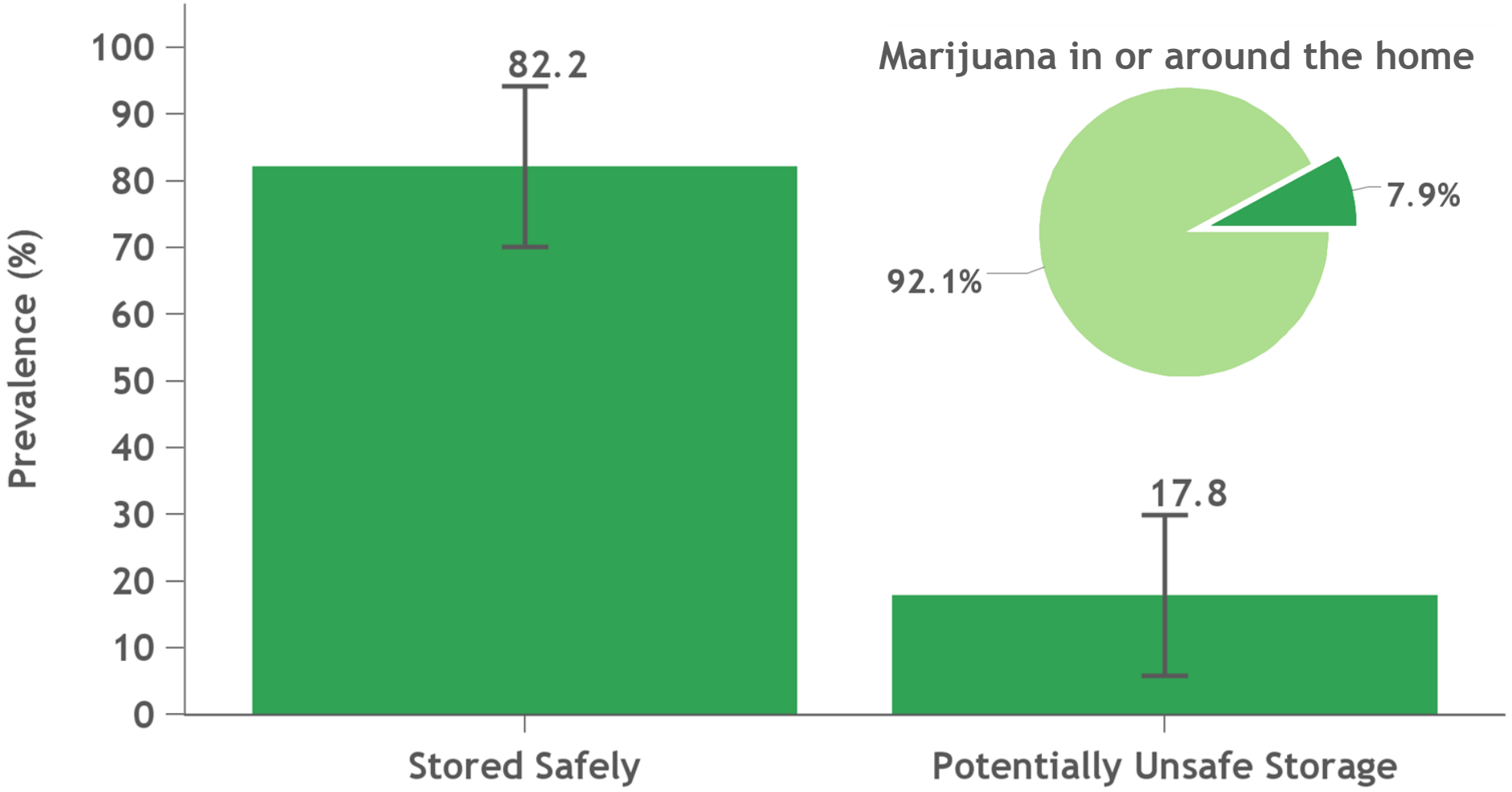
Exposure Data Young Children

Ages 0 through 8 years

Number of Unintentional Exposure Calls to the Poison Center, by Age



Percent of adults with children and marijuana in or around the home who store their marijuana in a safe place



Safe Storage

Can reduce unintentional poisonings by ~70%
Home grows must be enclosed and locked separate from anyone under age

Non-medicinal Health Effects of Marijuana (Adolescents)

Cognitive and achievement effects

Adolescent use of marijuana weekly or more frequently is associated with:

- Impaired learning, memory, math and reading achievement, even 28 days after last use
  - These worsen with more frequent marijuana use
- Failure to graduate from high school
- Not attaining a college degree after starting

Source: Colorado Department of Public Health and Environment, Monitoring Health Concerns Related to Marijuana: 2016

Mental health effects

Adolescent use of marijuana is associated with:

- Developing psychotic symptoms in adulthood, such as hallucinations, paranoia and delusional beliefs
  - This risk is higher with more frequent marijuana use
  - Daily or near-daily use is associated with developing a psychotic disorder in adulthood, such as schizophrenia

Source: Colorado Department of Public Health and Environment, Monitoring Health Concerns Related to Marijuana: 2016

Addiction and quitting

Some marijuana users become addicted to marijuana.

There are treatments for marijuana addiction that can reduce use and dependence.

Adolescents who quit using marijuana reduce their risk of adverse cognitive and mental health effects compared with those who continue to use.

Mixed Evidence

There is Mixed Evidence about whether or not adolescent marijuana use is associated with these effects:

- IQ changes
- Depression or anxiety
- Suicidal thoughts or attempts

Discussing Marijuana with Youth

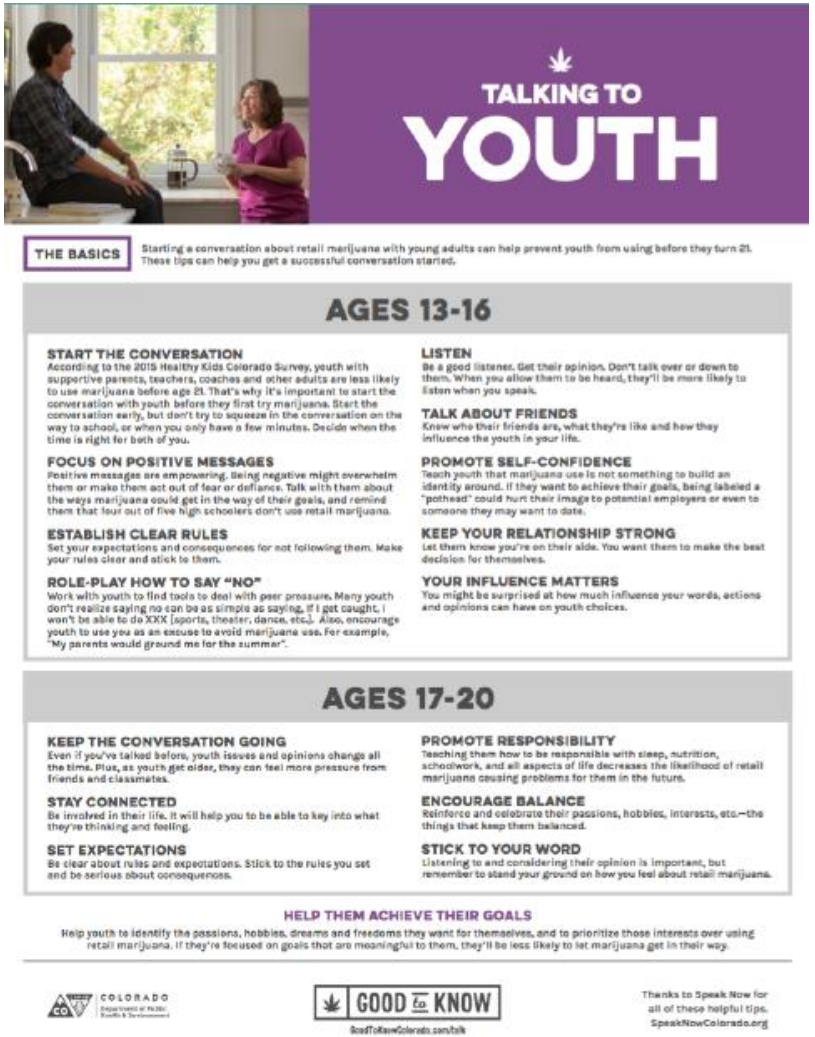
ADULTS CAN HELP REDUCE YOUTH MARIJUANA USE

Supportive Teachers:
Youth who agree that teachers care and encourage them are 1.7x LESS likely to use.

Talking with Parents:
Youth who can ask a parent/guardian for help are 1.6x LESS likely to use.

Family Rules:
Youth who have clear family rules are 1.7x LESS likely to use.

Parents' Opinion:
If a parent feels like it's wrong, their children are 4x LESS likely to use.



TALKING TO
YOUTH

THE BASICS Starting a conversation about retail marijuana with young adults can help prevent youth from using before they turn 21. These tips can help you get a successful conversation started.

AGES 13-16

START THE CONVERSATION
According to the 2015 Healthy Kids Colorado Survey, youth with supportive parents, teachers, coaches and other adults are less likely to use marijuana before age 21. That's why it's important to start the conversation with youth before they first try marijuana. Start the conversation early, but don't try to squeeze in the conversation on the way to school, or when you only have a few minutes. Decide when the time is right for both of you.

FOCUS ON POSITIVE MESSAGES
Positive messages are empowering. Being negative might overwhelm them or make them act out of fear or defiance. Talk with them about the ways marijuana could get in the way of their goals, and remind them that four out of five high schoolers don't use retail marijuana.

ESTABLISH CLEAR RULES
Set your expectations and consequences for not following them. Make your rules clear and stick to them.

ROLE-PLAY HOW TO SAY "NO"
Work with youth to find tools to deal with peer pressure. Many youth don't realize saying no can be as simple as saying, if I get caught, I won't be able to do XXX (sports, theater, dance, etc.). Also, encourage youth to use you as an excuse to avoid marijuana use. For example, "My parents would ground me for the summer".

LISTEN
Be a good listener. Get their opinion. Don't talk over or down to them. When you allow them to be heard, they'll be more likely to listen when you speak.

TALK ABOUT FRIENDS
Know who their friends are, what they're like and how they influence the youth in your life.

PROMOTE SELF-CONFIDENCE
Teach youth that marijuana use is not something to build an identity around. If they want to achieve their goals, being labeled a "pothead" could hurt their image to potential employers or even to someone they may want to date.

KEEP YOUR RELATIONSHIP STRONG
Let them know you're on their side. You want them to make the best decision for themselves.

YOUR INFLUENCE MATTERS
You might be surprised at how much influence your words, actions and opinions can have on youth choices.

AGES 17-20

KEEP THE CONVERSATION GOING
Even if you've talked before, youth issues and opinions change all the time. Plus, as youth get older, they can feel more pressure from friends and classmates.

STAY CONNECTED
Be involved in their life. It will help you to be able to key into what they're thinking and feeling.

SET EXPECTATIONS
Be clear about rules and expectations. Stick to the rules you set and be serious about consequences.

PROMOTE RESPONSIBILITY
Teaching them how to be responsible with sleep, nutrition, schoolwork, and all aspects of life decreases the likelihood of retail marijuana causing problems for them in the future.

ENCOURAGE BALANCE
Reinforce and celebrate their passions, hobbies, interests, etc.—the things that keep them balanced.

STICK TO YOUR WORD
Listening to and considering their opinion is important, but remember to stand your ground on how you feel about retail marijuana.

HELP THEM ACHIEVE THEIR GOALS
Help youth to identify the passions, hobbies, dreams and freedoms they want for themselves, and to prioritize those interests over using retail marijuana. If they're focused on goals that are meaningful to them, they'll be less likely to let marijuana get in their way.

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GOOD to KNOW
GoodToKnowColorado.com/talk

Thanks to Speak Now for all of these helpful tips.
SpeakNowColorado.org

https://www.colorado.gov/pacific/marijuana/shareable-resources

speaknow!

ESPAÑOL

SEARCH

HOME | PARENT INFO | COMMUNITY RESOURCES | FACT ZONE | ABOUT | VIDEOS | QUIZ

Scenarios for Parents

Use these scenarios and helpful suggestions to help successfully navigate future similar situations:

Read each of the following scenarios, and think about how you'd respond.

Then, click the green bar below each suggestion to reveal suggestions that could prove helpful if you encounter a similar situation with your adolescent or teen.

Got a light?

While doing the family laundry, you find a lighter stuffed inside your 12-year-old son's pants pocket. A little online research reveals such a discovery is fairly common, and you don't smell tobacco or marijuana on him or his clothes. You ask what he needs a lighter for, and he says he likes the way it looks and he uses it to perform cool tricks for friends. What should you tell him next?

IT'S GETTING HOT IN HERE... NEED A SUGGESTION? →

A little (Rx) help from her friends

Your 18-year-old daughter is almost through her first semester of college. There's just one thing: that dreaded Accounting 101 final. You learn your daughter took some prescribed pills offered by a "helpful" roommate to help her focus on schoolwork. No harm done?

SO MUCH IS ON THE LINE — TIME TO GET DIALED IN →

Party Emergencies

Knowing he is heading to a party in a few days, you're talking with your 17-year-old son about alcohol and marijuana use, and the misuse of prescription

- Speak Now, Here's How
- Identify High Risk Behaviors
- Healthy Habits Plan
- Know the Law
- Scenarios
- Other Drugs
- Links
- Worried About Your Child?

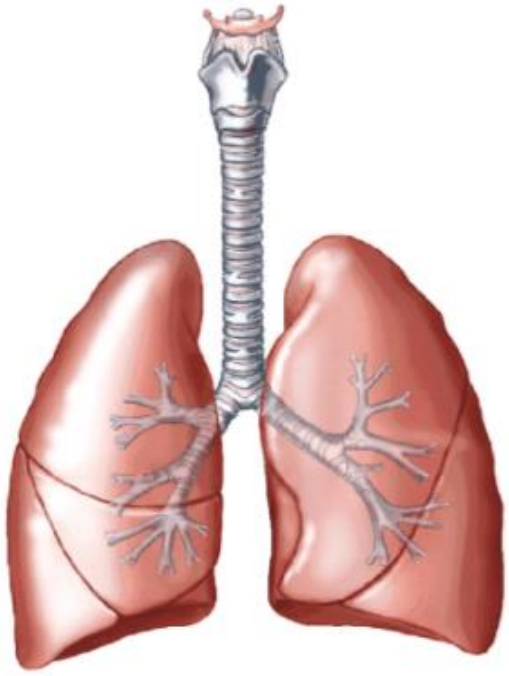
https://www.youtube.com/watch?v=BIc72hzW7No

Non-medicinal Health Effects of Marijuana (Adults)

Respiratory

- We found LIMITED evidence that daily or near-daily marijuana smoking is associated with bullous lung disease leading to pneumothorax in individuals younger than 40 years of age.

- We found LIMITED evidence that after one month, weekly or daily marijuana smokers who switched to vaporizing had fewer respiratory symptoms and improved pulmonary function.



Cancer

- We found SUBSTANTIAL evidence that marijuana smoke, both mainstream and sidestream, contains many of the same cancer-causing chemicals as tobacco smoke.

- We found SUBSTANTIAL evidence that daily or near-daily marijuana smoking is associated with pre-malignant lesions in the airway.

Cancer

- We divided lung cancer evidence at 10 “joint-years” (equivalent to one joint/day for 10 years)
  - We found MIXED evidence for whether or not marijuana smoking greater than 10 joint-years is associated with lung cancer.
  - We found a MODERATE body of research *that failed to show an association* between marijuana smoking less than 10 joint-years and lung cancer.

Cardiovascular

- We found LIMITED evidence that acute marijuana use increases risk of myocardial infarction.
- We found LIMITED evidence that marijuana use increases risk of ischemic stroke in individuals younger than 55 years of age.

Driving

Recent marijuana use is strongly associated with:

- Increased motor vehicle crash risk (~double)
  (Based on testing in drivers)
- Driving impairment
  (Based on simulator tests with controlled marijuana use)
- Using marijuana and alcohol together increases risk more than either alone

Time to wait before driving

For moderate doses of marijuana, it takes up to:

- 6 hours after smoking marijuana for driving impairment to resolve or nearly resolve
- 8 hours after ingesting edible marijuana for driving impairment to resolve or nearly resolve

For higher doses of marijuana, evidence is lacking on the time it takes for driving impairment to resolve

- Existing studies only tested 8 hours out

Source: Colorado Department of Public Health and Environment, Monitoring Health Concerns Related to Marijuana: 2016

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Gastrointestinal

- We found MODERATE evidence that long-time, daily or near-daily marijuana use is associated with cyclic vomiting (some medical experts call this cannabinoid hyperemesis syndrome).

Opioids – state level comparisons

- We found INSUFFICIENT evidence to determine whether or not there is an association between the availability of legal medical marijuana and the prevalence of opioid use.
- We are currently reviewing studies on rates of opioid overdose, opioid-related hospitalizations, and other severe opioid-related outcomes.

Opioids – individual level comparisons

- We found MIXED evidence for whether or not marijuana use is associated with a reduction in the number of patients using opioids or the amount of opioid use among chronic pain patients.
- We found MIXED evidence for whether or not marijuana use is associated with a reduction in opioid use among individuals with a history of problem drug use (injection drug use or opioid addiction treatment).

Cannabis-Medication Interactions

- There is credible evidence of clinically important drug-drug interactions between cannabis and the following medications:

- Chlorpromazine
- Clobazam
- Clozapine
- CNS depressants (e.g. benzodiazepines)
- Disulfiram
- Hexobarbital
- Hydrocortisone
- Ketoconazole
- MAO inhibitors
- Phenytoin
- Protease inhibitors (e.g. indinavir, nelfinavir)
- Theophylline
- Tricyclic antidepressants
- Warfarin

Ongoing & Future Marijuana Research

Colorado Funded Marijuana Research

Medical Marijuana Efficacy: 9 studies underway, ~$9 million

- IBD
- Parkinson's Disease tremors
- PTSD (2)
- Pediatric epilepsy (2)
- Pediatric palliative care
- Analgesic vs. oxycodone
- Sleep

New funding $3 million, probably 2 studies

Recreational Marijuana Public Health Effects, 7 studies, ~$2.3 million

- Driving impairment assessment (heavy vs. occasional users)
- Effects of dabbing on impairment, cognitive functioning
- Duration in breast milk
- Effects in elderly
- Adverse effects of edibles
- Data analysis of pre- post recreational legalization
- Cardiovascular effects in at-risk patients

Topics Lacking Research

- Effects of more frequent use, higher quantity of use and higher concentrations of THC
- Driving impairment:
  - In frequent users
  - With higher doses of THC
  - Evaluation methods that more accurately correlate with impairment
- Effects of secondhand cannabis smoke exposure
- Interactions between cannabis and prescription medications (drug-drug interactions)

Topics Lacking Research

- More on effects of prenatal exposure, especially miscarriage, birth weight and early childhood development
- Cannabinoid presence/duration in breastmilk and effects on exposed infants
- Factors related to adolescent initiation, including legalization, perceptions, marketing & merchandising, parental influences and education efforts

Improvements Needed in Research

- More prospective longitudinal studies would be ideal – most likely nested in broader studies
- Better classification of exposure
  - Collect use data on times/day or times/week
  - Separate groups with occasional or heavy use
  - Effects of former use after various periods of abstinence to assess duration
- Improved data collection and analysis for potential confounders
- Trials, such as driving impairment studies, should use doses consistent with current THC

Study Evaluation Resources

- Newcastle-Ottawa Scale for evaluating observational studies
  - Meta-analysis Of Observational Studies in Epidemiology (MOOSE)
  - http://www.ohri.ca/programs/clinical_epidemiology/oxford.asp
- Grading of Recommendations Assessment, Development and Evaluation (GRADE)
  - More focused on randomized trials
  - http://training.cochrane.org/path/grade-approach-evaluating-quality-evidence-pathway


Questions?
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