

Marijuana (medical or recreational), Cannabidiol (CBD), and Vaping: Implications for Commercial Driving

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Operator Health & Wellness Subcommittee

TRB Truck and Bus Safety Committee (ANB70)

Our Roadway Safety Landscapes are Changing

- **Recreational marijuana** is becoming widespread
- **Medical marijuana** and other Cannabinoids (CBD), e.g. oils, are prescribed, and self-administered for relief of pain/stress, et al.
- **Vaping**, sometimes containing THC, is now widely controversial
- What do we know about driving performance/safety risks?
- What are the “rules of the road” now? Employee Testing?
- What do we need to know? What do CMV drivers need to know?
- What are our safety research needs now?

Marijuana and Driving Impairment

- **Delta-9-tetrahydrocannabinol** or “THC” the active ingredient in Marijuana can seriously degrade driving performance for a period of several hours
- When activated, cannabinoid receptors promote changes in brain’s neurons producing classic effects of marijuana intoxication, including:
 - relaxation, euphoria, distorted input from one or more of the five senses, reductions in normal ability to recall memories, solve complex problems or think coherently.
- **Smoking** marijuana produces rapid THC-related effects, peak buildup of THC in bloodstream usually occurs before the end of a smoking session
- **Ingestion** of edible marijuana produces a relatively slow buildup of THC-related effects; it produces lower level of THC in the blood stream
- Actual effects depend on amount and potency of drug smoked or eaten, level of tolerance, and the setting in which it is used
 - (ref: Addiction.com; numerous other sources)

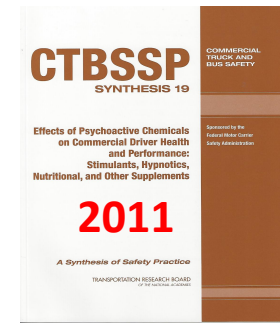
Alcohol and Marijuana Metabolize Differently

- **Alcohol** metabolizes in a linear steady state manner
 - peak blood levels may be 15-20 minutes after the last drink
- Alcohol dose measures (BAC, BrAC) correlate well with performance impairment; THC levels do not [Compton, NHTSA, 2017]
- **THC** blood levels peak in minutes; then decline exponentially; level drops rapidly after cessation of smoking, - a decrease of 80% in 30 min.
 - levels vary widely (smoking, oil, edibles) potency, & user characteristics
- Thus **passage of time** is important – how long after consumption before driving? How long before law enforcement blood draws? The level of BAC might still be high for several hours; but THC levels will be considerably lower over time

Marijuana and THC Effects on Task Performance

- For 1 to 2 hrs after smoking or eating marijuana to get “high” all marijuana users can experience significant decreases in task performance skills.
- Sometimes task impairments remain for as long as 24 hours
- Additional impairments may involve:
 - decreased hand-eye coordination, reduced ability to rapidly shift attention, track passage of time, or to accurately compute distance, increased sleepiness.
- NHTSA also adds that marijuana effects include:
 - poor ability to judge distance, or time needed to travel a given distance; inability to maintain ongoing vigilance for safe driving, e.g., not maintaining proper distance from other vehicles, swerving, reduced overall body coordination.
- On average, these THC driving impairments remain in effect for ~ **3 hrs**
- Once intoxicated, all marijuana users (experienced or not) make for dangerously poor drivers
 - (ref.: Addiction.com; others)

Science Literature: Marijuana & Driving



- Established: **alcohol degrades performance, increases accident risk**
- Evidence of marijuana's culpability in driving accidents is much less convincing [numerous literature reviews make similar statements]
- Various marijuana studies used lab tests, driving simulators, on-the-road observation
- Most studies (placebo vs marijuana) did not measure blood THC levels
- Cannabis intoxication mildly impairs psychomotor skills, but not as severely or long lasting as effects from alcohol intoxication
- Cannabis alone, particularly in low doses, has little effect on driving skills
- Cannabis use leads to a **more cautious style of driving**; but, it has a negative effect on decision time and trajectory
- In driving simulator testing, THC subjects decrease their driving speed and require greater time to respond to emergency situations; THC produces some mitigation to alcohol effect
- Marijuana subjects **realize they are impaired and compensate**; whereas, alcohol impaired subjects tend to drive in a more risky manner (e.g., more speeding)
- [ref.: Canadian Senate committee on illegal drugs (2002); others]

THC and Driving-Safety statistics

- Alcohol involved in ~30% of fatal crashes (710K fatalities per year) [NHTSA]
- Differing by specific city or region, rates for marijuana-involved accidents producing injuries or death, range from 4 – 14% of all vehicle-related injuries and fatalities [it's very difficult to acquire accurate statistics]
- Marijuana is more commonly detected in fatally injured drivers than other types of illicit drugs (TRB-Circular E-250: Traffic Injury Research Foundation, 2018)
- Highest rates of marijuana-influenced driving occur among adults
- But, high numbers of teenagers drive under influence of marijuana [NIDA]
- Men significantly outnumber women in driving with marijuana
- **Marijuana combined with alcohol effects** on driving performance paint a much different picture, and these safety statistics are dramatically **more impactful** to highway safety than effects of marijuana alone.

Marijuana, Cannabinoids, THC and CBD

- ~110 cannabinoids are found in cannabis plants (*cannabis sativa*)
- **THC and CBD** are widely talked about for their psychoactive effects
- Marijuana plants are bred for their buds, usually to contain as much THC as possible. THC is fat soluble & is stored in body's fatty tissues
- High quality marijuana plants contain far more CBD;
 - **CBD oils** derived from them are also high in quality
- Recreational and medical marijuana (particularly edibles) are becoming widespread across our country
 - [recreational marijuana is now legal in 11 states and in Wash, DC]

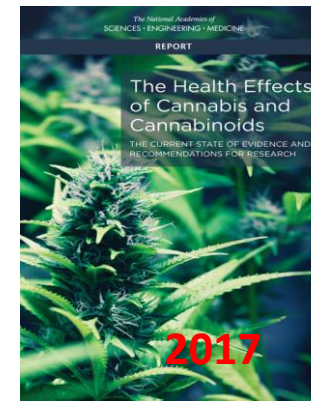
Does CBD oil contain THC ?

Marijuana vs Hemp CBD oil



- **CBD oil** is the concentrated liquid form of Cannabidiol, extracted from either hemp or marijuana plants
- CBD oil, is non-psychoactive; it will not make you feel high, or anxious; it does not produce many of the well-known effects of THC (e.g., no red eyes).
- Since high quality marijuana plants contain far more CBD, the oils derived from them are also high in quality
- Hemp plants are grown for their stalks and fibers. They have many industrial uses (plastics, fuel, lubricants, paint). Hemp oil is pressed from seeds and stalks.
- Hemp plants (bred for oil) are not legal unless they possess less than 0.3% THC
- In CBD oil **derived from marijuana or hemp plants**, the amount of THC legally allowable is the same. But, every brand differs in the **amount of THC** actually in their products; so, research them carefully to be informed of contents
- Hashish oil is more potent due to its concentrated form of cannabis oil-THC; it can be smoked, vaped, or dabbed; it will make you high

CBD oil extracted from hemp or marijuana plants



- To create CBD hemp oils strong enough to have medicinal effects, many more plants must be used in the process [higher risk of insecticide?]
- CBD oil, used for a variety of **medical applications**, is shown to help:
 - relieve anxiety, arthritis, migraines, sleeplessness, discomfort and pain, seizures, depression.
 - relieve shakiness symptoms of Parkinson's; promote a healthy heart; cancer symptom relief.
 - In Nov. 2019, **FDA** said its not clear CBD oil brings the above medical benefits; and there is not enough research to ensure CBD oil is **safe** to consume
- Note: many truck drivers quit careers due to anxiety/stress of the job
 - Are these reasons why they might seek relief from marijuana or CBD use ?

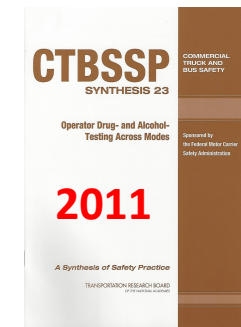
Dept. of Transportation Policy & Compliance Notice

- Dept of Justice (DoJ) issued guidelines for Federal prosecutors in states authorizing use of **medical marijuana**
- Dept of Transportation (DOT): the DoJ guidelines will have no bearing on DOT's regulated drug testing program. DOT **will not change** our regulated drug testing program.
- DOT's Drug and Alcohol Testing Regulation 49 CFR Part 40, at 40.151e does not authorize "medical marijuana" under a state law to be a valid medical explanation for a transportation employee's positive drug test result
- Medical Review Officers (MRO) will not verify a drug test as negative based upon information that a physician recommended the employee use "**medical marijuana.**"
- It remains **unacceptable** for any safety-sensitive employee subject to drug testing under DOT's drug testing regulations to use marijuana.
 - DOT notice updated in October 2019

Is it legal for CMV drivers to use CBD Oil? (the quick answer is: NO!)

- Marijuana use (both smoking and ingesting) will show positive THC test results, even up to a month after usage
 - Marijuana is a **DEA Schedule I controlled substance** [use or possession are prohibited]
- **Question is:** Will a driver pass a drug test while using **CBD oil**?
- While CBD oil itself might be legal in most states, THC is not !
- **CBD oil is technically illegal on a federal level**, particularly for safety-sensitive employees
- All brands of CBD oil likely contain at least a trace amount of THC
- Popular on-line sellers of CBD oil state:
 - “we cannot make any claims on whether or not any of our products will show up on a drug test.”
- While chances of some CBD oils showing up on a drug test may be low,
 - **CDL drivers using CBD oil take a risk** of a positive THC test

Equipment Operator Drug and Alcohol Testing across Modes of Transportation



- Safety-sensitive transportation employees in aviation, motor carriers (trucking, bus/motorcoach), rail, public transit, maritime, pipelines and other transportation industries – all are subject to testing Regs: 49 CFR Part 40
- DOT **alcohol** testing is a “**fit-for-duty**” testing program – aimed at preventing prohibited use of a legal substance while an employee is at work.
 - It is based on **breath** and **saliva** testing.
- DOT **drug** testing is aimed at “**detering use**” of illegal drugs regardless of the pattern and frequency of use in relationship to the job – it is almost exclusively based on **urine** testing [hair follicle testing not yet approved for gov’t test regs.]
- Alternative specimens: oral fluid (e.g., saliva), blood, hair, sweat, etc. - others?
- Tests are for drugs/metabolites (marijuana, opiates, codeine/morphine, cocaine), amphetamines, phencyclidine (PCP) et al. [Ref: **CTBSSP no. 23, 2012**]
- Testing may be for pre-employment, post-accident (within 8 & 32 hrs), random (10 & 50%), for reasonable suspicion, return-to-duty, follow-up to return-to-duty

Vaping implications for commercial drivers

- Many people vape to cut down on smoking habits and nicotine intake
- CBD, the concentrated liquid form of Cannabidiol, is produced in a cartridge for vape pens and in bottles for battery powered vaporizers.
- CBD oil can be heated and inhaled through a vaporizer or vape pen.
- **CBD hemp oil does not get people high; some medicinal benefits** may result.
- People vape CBD oil to ease side effects of pain, seizures, sleep disorders, leukemia, HBP, inflammation - a preventive approach,--not a cure.
- CBD oil extracted from marijuana contains too much THC and it will likely show a positive drug test
- Drug test results for THC contained in hemp oil are not certain.
- **CMV drivers** also need to be cognizant of vaping's **health/safety issues**

Vaping, e-cigarettes and driver safety



- E-devices contain a liquid, an atomizer or heating element, and a battery. The heating element vaporizes the liquid, which is inhaled in the same manner as traditional smoking methods
- FMCSA issued a safety advisory re: electronic smoking devices, e-cigs
- Safety incidents include **explosions, serious personal injuries & fires**
 - Ejection of a burning battery case or other components igniting nearby flammable or combustible materials
 - Some incidents occurred while the device was being charged; others during use, or while carrying such devices on one's person
 - There might be a risk for explosions or fires with checked items in **Motorcoach baggage compartments** or in truck driver sleeper berths
- No useful information was found said regarding driving performance implications of **vaping as an alternative** to smoking cigarettes

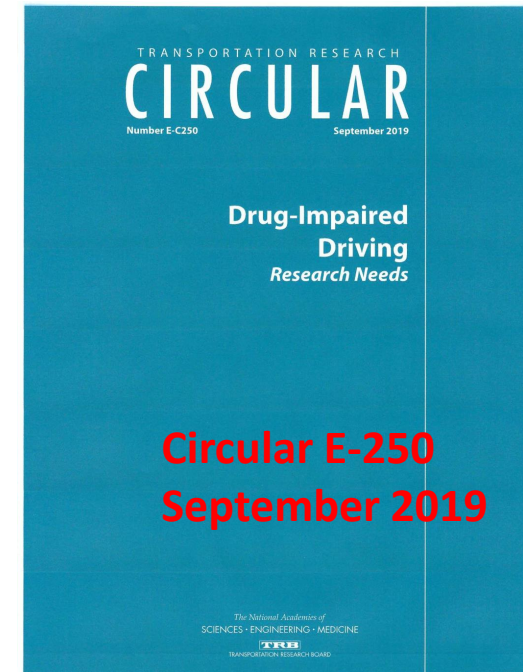
More about Vaping

- Recent surge in youth vaping, teenagers seem mostly attracted to an array of flavored e-cigarette pods
 - major concern is that teens become addicted to nicotine
 - the JUUL Labs company ignited the craze
 - new minimum age of 21 to buy tobacco products feeds demand for vaping
 - youth marijuana vaping **tripled** since 2017 (teens can't buy marijuana in any state)
- Recent **crisis** of 2,600+ “lung illnesses/injuries” (60+ deaths too) [**CDC**]
 - the causes, or risks, to health are not yet elucidated (e.g., blame on marijuana THC, vitamin E acetate, foreign made bad-products QA ?)
 - **CDC**: 86% of lung injury patients used products with THC before symptoms
- Slogan: “We Vape, We Vote” - anger over political threats to limit vaping
- Next generation technology “full spectrum hemp” oil is being explored
- At a minimum, **CMV drivers** need to be cognizant of vaping’s **health issues**
 - *New England Journal of Medicine* recently published numerous articles on Vaping diseases

Drug-Impaired Driving Research Needs

TRB Research Circular E-250 (Sept. 2019)

- TRB Circular E-250 (**Robyn Roberts et al.**) describes 8 priority research topics spanning several disciplines; details research needs in each:
 - Pharmacokinetics of alcohol and marijuana
 - Legislation and enforcement
 - Prosecution and courts
 - Toxicology
 - Supervision
 - Treatment
 - Public policy
 - Public education and awareness



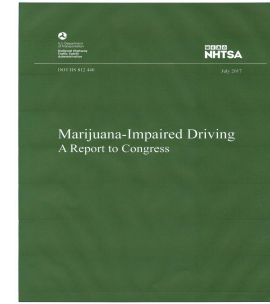
Research needs in pharmacokinetics

- Blood alcohol concentration (**BAC**) is a good measure of dose at a point in time; it's nicely co-related with performance effects, etc.
- There are many complications with **measures of marijuana presence**, as the absorption, distribution, and elimination of marijuana from the body does not occur at a steady rate, and therefore is substantially different than alcohol.
- **Marijuana does not display a concentration-response relationship**, like alcohol does.
- At present, detection of drug impairment among drivers is mostly reliant on **behavioral indicators**. Roadside indicators of behavioral impairment are not specific enough (large inter-individual variability, etc.)
- Tests need to distinguish between persons exhibiting impaired driving due to acute marijuana's THC, versus drivers who test positive for marijuana (THC detected) but do not exhibit driving impairment.

Pharmacodynamics research needs: marijuana and driving performance [TRB E-C250]

- What are the impairment effects of acute marijuana use on driving?
 - Chronic vs naïve users; route of ingestion: smoking, vaping, edibles, etc.
- What is the relationship between certain driving skills and crash risk?
 - THC produces a twofold increase in crash risk; but is it driving skill dependent?
- What characteristics of crashes are most strongly associated with marijuana impairment?
 - Marijuana drivers are more likely to be at fault; more data are needed
- What component or element of marijuana is the best indicator of impairment?
 - Further research on other THC psychoactive metabolites is warranted
- What key domains (**e.g., psychomotor and cognitive functions**) should be the focus of research to develop a test for marijuana impairment?
 - Need a scientifically validated test of marijuana impairment

Congressional Request of DOT: Marijuana Issues to be examined



**NHTSA Report to
Congress 2017**

R. Compton

- Methods to detect marijuana-impaired driving, including devices capable of measuring marijuana levels in motor vehicle operators
- A review of impairment standard research for driving under the influence of marijuana
- Methods to differentiate the cause of a driving impairment between alcohol and marijuana
- State-based policies on marijuana-impaired driving
- The role and extent of marijuana impairment in motor vehicle accidents
 - Fast Act, Section 4008, **2015**. See Richard Compton, **NHTSA Report to Congress, 2017**

Driving Safety Research Questions to Resolve

- 60 years of research on **alcohol effects** provides a good knowledge base. Much less is known about effects of marijuana-impaired driving; nor about combinations of THC and alcohol
- Some pot grown today is 4-5 times more potent. Prior research studies (1970s-1990s) must be replicated to determine whether higher quality marijuana produces bigger performance effects
- In the absence of a working roadside chemical test for THC, **psychomotor, behavioral or cognitive tests are needed. That will be difficult.**
- Substantial investment in research is essential to inform strategies to protect the public and reduce fatalities and injuries (TRB-E-Circular 250, **2019**).
- Interested parties are encouraged to consult TRB E-Circular 250 for **eight (8)** detailed research priorities & R. Compton's NHTSA Report to Congress (**2017**).

FMCSA's Drug & Alcohol Clearinghouse

- FMCSA activated its **Drug and Alcohol Clearinghouse January 6th, 2020**.
 - <https://www.transportation.gov/odapc/employee> [still has kinks in the system]
 - **Overhauls how fleets report and verify drivers' drug testing history,**
 - adds a new layer into hiring process, new administrative work for fleets of all sizes
 - the website contains **numerous questions/answers** on related matters, i.e.:
 - Why am I being tested? Should I refuse a test? Are my results confidential? Will my results follow me to other employers? What should I do if I believe my co-worker is an abuser? et al.
- Now we must **ascertain the clearinghouse's efficacy** over time.
- As a safety-sensitive employee, **you** are responsible for providing a safe work environment for your co-workers and the traveling public.
- This responsibility includes following DOT's rules on drug use and alcohol misuse.
- Congress passed Omnibus Transportation Employee Testing Act of **1991**, recognizing a safety need for ensuring drug- and alcohol-free transportation employees. In **1994** DOT added alcohol testing to regs.

More about marijuana

(gratuitous **political/medical** commentary)

- States vary greatly in how each approaches DUI of drugs (i.e., tolerance, criminality, penalties, etc.)
- Pot products are only lightly regulated by the **11 states** (& Canada) where cannabis has been legalized for recreational use
- Wall Street Journal editorial [12-26-19]: America is undertaking a risky social experiment by legalizing and destigmatizing cannabis – the potential effects are hard to foresee or control
- WSJ: the same political culture in a fury over legal opioids, and trying to bankrupt drug companies as compensation, seems to have **no problem** celebrating a drug (marijuana) that may damage young brains for a lifetime
- WSJ: Marijuana in adolescents has been linked to cognitive impairment, anxiety and psychosis later in life.

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CTBSSP

SYNTHESIS 19

2011

Effects of Psychoactive Chemicals on Commercial Driver Health and Performance: Stimulants, Hypnotics, Nutritional, and Other Supplements

Gerald P. Krueger,
Howard M. Leaman &
Gene Bergoffen

A Synthesis of Safety Practice

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COMMERCIAL
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BUS SAFETY

Sponsored by the
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SYNTHESIS 23

2011

Operator Drug- and Alcohol- Testing Across Modes

Dary Fiorentino,
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REPORT

The Health Effects of Cannabis and Cannabinoids

THE CURRENT STATE OF EVIDENCE AND
RECOMMENDATIONS FOR RESEARCH

2017

**Committee on Health Effects of Marijuana
Marie C. McCormick (Chair) et al.**

TRANSPORTATION RESEARCH
CIRCULAR
Number E-C250 September 2019

**Drug-Impaired
Driving**
Research Needs

Robyn D. Robertson
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TR Circular E-C250
September 2019

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DOT HS 812 440

July 2017

DOT HS 812 440 July 2017

Marijuana-Impaired Driving A Report to Congress

Prepared by Richard Compton

**See Also: DOT HS 811 268 (2009)
Same Title, but prepared by:
R. Compton, M. Vegega, & D. Smither**