

# *Imposing Per Se Limits For Cannabis: Practical Limitations and Concerns*

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# NORML's Principles of Responsible Use

- Adults only
- **No driving**
  - *The responsible cannabis consumer does not operate a motor vehicle or other dangerous machinery while impaired by cannabis. ... **Public safety demands not only that impaired drivers be taken off the road, but that objective measures of impairment be developed and used.***
- Set and setting
- Resist Abuse
- Respect the rights of others

*\*\*Adopted by the NORML Board of Directors, February 3, 1996*

# Acute Cannabis Intoxication May Be Associated With Changes In Psychomotor Performance

- Changes in performance are typically dose-related
- Changes in performance are most acute in naïve users
- Changes in performance are typically short-lived
  - 70 percent of subjects manifest ‘significant’ psychomotor impairment **20-40 minutes** following cannabis inhalation; **this percentage falls to 30 percent after 60 minutes** (Berghaus et al., 1998 as cited by Gieringer)
  - **Peak acute effects following cannabis inhalation are typically obtained within 10 to 30 minutes** (NHTSA. 2004. *Drugs and Human Performance Facts Sheets*)
  - “Experimental research on the effects of cannabis ... indicat[e] that any effects ... **dissipate quickly after one hour.**” (NHTSA. 2003. *State of Knowledge of Drug-Impaired Driving: FINAL REPORT*)
  - “[T]he cannabis effect (on driving performance) tends to disappear after the first 60 minutes of use.” (Pulido et al., 2011. *Cannabis use and traffic injuries.*)

# Acute Cannabis Intoxication May Be Associated With Changes In Psychomotor Performance

- Cannabis-influenced changes in performance are typically subtle (particularly when compared to those associated w/ alcohol)
  - **“THC’s adverse effects on driving performance appear relatively small.”** (Robbe. 1993. *Marijuana and actual driving performance: Final report for DOT*)
  - **“[M]ost marijuana-intoxicated drivers show only modest impairments on actual road tests.** ... Although cognitive studies suggest that cannabis use may lead to unsafe driving, experimental studies have suggested that it can have the opposite effect.” (Sewell et al., 2009. *The effect of cannabis compared with alcohol on driving*)
  - “Performance as rated on the Driving Proficiency Scale did not differ between treatments (cannabis versus placebo). **It was concluded that the effects of low doses of THC ... on higher-level driving skills as measured in the present study are minimal.**” (Lamers et al., 2001. *Visual search and urban driving under the influence of marijuana and alcohol.*)

# Acute Cannabis Intoxication Is Associated With Changes In Psychomotor Performance

- Experienced users tend to become tolerant to many of cannabis' performance-impairing effects
  - **“[F]requent marijuana users may show fewer behavioral signs of disruption during intoxication than infrequent users, even when difficult memory tasks are used to assess cognitive performance.”** (Hart et al., 2010. *Neurophysiological and cognitive effects of marijuana in frequent users* )
  - “The present study confirms that heavy cannabis users develop tolerance to some of the impairing behavioral effects of cannabis.” (Theunissen et al., 2011. *Neurophysiological functioning of occasional and heavy cannabis users during THC intoxication*)
  - “[T]he present study generally confirms that heavy cannabis users develop tolerance to the impairing effects of THC on neurocognitive task performance (Ramaekers et al., 2010. *Tolerance and cross-tolerance to neurocognitive effects of THC and alcohol in heavy cannabis users*)
  - **“Experienced smokers who drive on a set course show almost no functional impairment under the influence of marijuana.”** (Sewell et al., op. cit.)

# Acute Cannabis Intoxication Is Associated With Changes In Psychomotor Performance

- Combining alcohol with cannabis may increase psychomotor impairment in a synergistic manner
  - “This study demonstrates that cannabis impairs driving ability in a concentration-related manner. The effect is smaller than for ethanol. **The effect of ethanol and cannabis taken simultaneously is additive.**” (Bramness et al., 2010. *Impairment due to cannabis and ethanol: clinical signs and additive effects*)
  - “Experimental studies have **shown alcohol and THC combined can produce severe performance impairment even when given at low doses.** The combined effect of alcohol and cannabis on performance and crash risk appeared additive in nature, i.e. the effects of alcohol and cannabis combined were always comparable to the sum of the effects of alcohol and THC when given alone.” (Ramaekers et al., 2004. *Dose related risk of motor vehicle crashes after cannabis use*)

# Manifestations of Changes In Psychomotor Performance Following Cannabis Use

- Increase in break latency (Ligouri et al., 1998. *Effects of marijuana on equilibrium, psychomotor performance, and simulated driving*)
- Increase in variability of lateral position (sdlp/weaving) (Robbe. 1993. op. cit.)
- Decreased performance in critical tracking test (eye-hand coordination) (Ramaekers et al., 2006. *Cognition and motor control as a function of Delta9-THC concentration in serum and oral fluid: limits of impairment*)
- Increased reaction time (Ronen et al., 2008. *Effects of THC on driving performance, physiological state and subjective feelings relative to alcohol*)
- Changes in peripheral vision, steadiness of speed, decision making

# How Do Cannabis-Induced Changes In Performance Differ From Alcohol?

- Less aggressive driving
  - “In contrast to the compensatory behavior exhibited by subjects under marijuana treatment, subjects who have received alcohol tend to drive in a more risky manner.” (Smiley, 1999. *Marijuana: On-Road and Driving-Simulator Studies*. In: Kalant et al., *The Health Effects of Cannabis*.)
- Slower speed
  - “After THC administration, **subjects drove significantly slower than in the control condition**, while after alcohol ingestion, subjects drove significantly faster than in the control condition.” (Ronen et al., 2008. op. cit.)
- Increased distance between vehicles
  - “Coefficient of headway variation increased slightly following THC.” (Robbe, 1993. op. cit.)

# How Do Cannabis-Induced Changes In Performance Differ From Alcohol?

- Overestimation of time
  - “While alcohol causes an underestimate of time, marijuana causes an overestimate of time” (NHTSA. 2003. op. cit.)
- Subjects are aware of their impairment and try to compensate accordingly
  - “[S]ubjects in the marijuana group were not only aware of their intoxicated condition, but were ... attempting to compensate for it. These ... findings ... support ... the common belief that drivers become overconfident after drinking alcohol and ... that **they become more cautious and self-critical after consuming low doses of THC, as smoked marijuana.**” (Robbe. 1993. op. cit.)
- Refusal to drive altogether
  - “The willingness to drive was influenced by the importance of the requested task. Under significant cannabinoids influence, the participants refused to drive.” (Menetrey et al., 2005. *Assessment of driving capability ... following oral administration of 20 mg dronabinol or of a cannabis decoction made with 20 or 60 mg Delta9-THC.*)

# How Do LEOs Presently Identify DUI Cannabis Drivers?

- LEO's personal observations at the scene
  - erratic driving
  - smell of burnt marijuana in the vehicle
  - bloodshot eyes
  - marijuana in plain view
  - driver's admission of having consumed cannabis
- Suspects' performance of FSTs
  - “The current results highlight the utility of the ... OLS (one leg stand) test to accurately identify the consumption of THC.” ” (Downey et al., 2012. *Detecting impairment associated with cannabis with and without alcohol on the Standardized Field Sobriety Tests*)

# How Do LEOs Detect Suspected DUI Cannabis Drivers?

- DRE examination
  - Lack of convergence
  - elevated blood pressure
  - perception of time
  - pupil size
  - conjunctiva of the eye
- Toxicological exams
  - Blood test and/or urinalysis

# Are Present Methods Effective For Identifying Suspected DUI Cannabis Drivers?

- Washington prosecutors enjoy an estimated **80 percent conviction rate** in criminal cases where suspects are charged with DUI and request an administrative hearing
- **“The Washington State Patrol has earned distinction as the top DUI-enforcement agency on the entire continent.** ... The International Association of Chiefs of Police announced the honor this week. ... Police agencies in this state make about 40,000 DUI arrests per year, ... About eight percent of DUI arrests were drug-related. ... The number of arrests, however, isn't the only thing the IACP took into consideration. **The award recognizes a sustained, anti-DUI effort put forth through strong policies, officer training, and public education.**”  
(Jonathan Walczak, *The Seattle Weekly*, July 29, 2011)

# Overall, Traffic Fatalities Are Declining



# Passage Of Medical Cannabis Laws Have Generally Not Been Associated With Rises In Accidents

- NHTSA: Fatal accidents per 100 miles driven fell 20 percent in Washington between the years 1994 and 2009
  - Medical marijuana law took effect November 4, 1998
- Among states with the highest traffic accident crash risk, Washington ranked #46 (#50 being the lowest) for the year 2009 (<http://www-fars.nhtsa.dot.gov>)
- “To date, 16 states have passed medical marijuana laws, yet very little is known about their effects. ... **Using data from the Fatality Analysis Reporting System (FARS) for the period 1990- 2009, we find that traffic fatalities fall by nearly 9 percent after the legalization of medical marijuana.**” (Anderson and Rees. 2011. *Medical Marijuana Laws, Traffic Fatalities, and Alcohol Consumption*)

# Practical Limitations Of Proposed *Per Se* DUI Cannabis Standards For THC

- There is **no consensus** regarding what THC/blood standards are appropriate predictors of psychomotor impairment
- There is a wide variance of THC's effects among individual consumers
- Cannabis consumption impacts the psychomotor performance of naïve and experienced subjects differently
- **Residual levels of THC may be present in the blood** of chronic consumers for several days without evidence of new use or any associated impairments of psychomotor performance
- Estimated limits are based on retrospective, not prospective (e.g., Grand Rapids model) case-control studies
- No practical way for LEOs to collect a blood sample in a time-sensitive manner
- **Imposition of such standards in other states is not associated with reduced traffic fatalities**

# No Consensus RE What THC/blood Standards Are Predictors of Psychomotor Impairment

- “In terms of attempting to link drug concentrations to behavioral impairment, blood is probably the specimen of choice. However, **forensic toxicologists generally have failed to agree on specific plasma concentrations that could be designated as evidence of impairment.**” (NHTSA. 2003. op. cit.)
- **“One of the program's objectives was to determine whether it is possible to predict driving impairment by plasma concentrations of THC and/or its metabolite, THC-COOH, in single samples. The answer is very clear: it is not.** (Robbe, 1993. op. cit.)
- “I'll be dead — and so will lots of other people — from old age, before we know the impairment levels (for marijuana).” (statement of Gil Kerlikowske to the Associated Press, March 18, 2012.)

# There Is a Wide Variance of THC's Effects Among Individual Consumers

- **“Individual drivers can vary widely in their sensitivity for THC induced impairment** as evinced by the weak correlations between THC in serum and magnitude of performance impairment.”  
(Ramaekers et al., 2009. *Dose related risk of motor vehicle crashes after cannabis use: an update*. In: *Drugs, Driving, and Traffic Safety*. World Health Organization)
- “It should be stressed however that the predictive validity of any *per se* limit is confined to the driving population at large, **and not necessarily applicable to each and every driver as an individual.**”  
(Ramaekers et al., 2009. *op. cit.*)
- Plasma of drivers showing substantial impairment in these studies contained both high and low THC concentrations; and **drivers with high plasma concentrations showed substantial, but also no impairment, and even some improvement.**” (Robbe, 1993. *op. cit.*)

# Cannabis Impacts The Psychomotor Performance of Naïve and Experienced Subjects Differently

- “THC did not affect performance of heavy cannabis users in the critical tracking task, the stop-signal task, and the Tower of London. These tasks have previously been shown to be very sensitive to the impairing potential of THC when administered to infrequent cannabis (users). **The lack of THC on these tasks basically confirms the previous notions that heavy cannabis users can develop tolerance to behaviorally impairing effects of THC.**” (Ramaekers et al., 2010. op. cit.)
- “**No significant differences were observed** for critical-tracking or divided-attention task performance in this cohort of heavy chronic cannabis consumers.” (Schwope et al. 2012. *Psychomotor performance ... and whole blood THC concentrations in heavy chronic cannabis smokers following acute smoked cannabis*)
- “**Experienced smokers who drive on a set course show almost no functional impairment under the influence of marijuana.**” (Sewell et al., op. cit.)

# Residual Levels of THC May Be Present in The Blood of Chronic Consumers For Several Days

- **“On day 7, 6 full days after entering the unit, six participants (out of 25) still displayed detectable THC concentrations.** ... The highest observed THC concentrations on admission (day 1) and day 7 were 7.0 and 3.0 ng/ml, respectively. ... Conclusions: **Substantial whole blood THC concentrations persist multiple days after drug discontinuation in heavy chronic cannabis users.** ... These findings also may impact on the implementation of per se limits in driving under the influence of drugs legislation.” (Karschner et al., 2009. *Do Delta-9-tetrahydrocannabinol concentrations indicate recent use in chronic cannabis users?*)

# Residual Levels of THC May Be Present in The Blood of Chronic Consumers For Several Days

- “A threshold of 2-3ng/ml THC as an indicator of recent drug use (i.e, smoking within the previous 6 hours) as recommended by Huestis et al **appears to be valid only for occasional users**. Heavy users might exhibit measurable cannabinoid concentrations in blood (median: 3.2ng/ml THC in blood serum), even if the last cannabis use was more than 24 hours ago. ... Therefore, **cannabinoid concentrations in heavy users’ blood from a later elimination phase might not be distinguished from an acute use of an occasional user.**” (Toennes et al., 2008. *Comparison of cannabinoid pharmacokinetic properties in occasional and heavy users smoking a marijuana or placebo joint*)
- “**[D]etection of psychoactive cannabinoids seem possible over a time period of more than 24-48 hours after abstaining from cannabis smoking. ...** Impairment could not be assessed ... in any subject at the time of blood sampling.” (Skopp et al., 2008. *Cannabinoid concentrations in spot serum samples 24-48 hours after discontinuation of cannabis smoking.*)

## Estimated Limits Are Based on Retrospective, Not Prospective Case-Control Studies

- “Our study is an epidemiological study including a control group of non-accident drivers selected randomly from the moving traffic flow. The key advantage of this study is that the control (non-accident) drivers were legally stopped, tested for drug use and compared with a representative group of seriously injured drivers. ... In our study, **no association was found between exposure to cannabis and road accidents.**” (Movig et al. 2004. *Psychoactive substance use and the risk of motor vehicle accidents*)

# LEOs Can Not Collect a Blood Sample in a Time-Sensitive Manner

- “[I]n DUID cases, the delay between the accident and the final blood draw can be long and **back-extrapolation is not an option** due to the complex pharmacokinetic profile of THC.” (Wille et al., 2010. *Conventional and alternative matrices for driving under the influence of cannabis.*)
- “[A]lcohol is excreted to a small extent on the breath and the ratio of breath to blood of alcohol is reasonably constant. ... **Drugs other than alcohol, particularly cannabis, do not share these convenient pharmacokinetic properties.**” (Chesher et al., 2002. *Cannabis and alcohol in motor vehicle accidents.* In: *Cannabis and Cannabinoids: Pharmacology, Toxicology, and Therapeutic Potential.* Haworth Press)

# Imposition of Per Se Standards in Other States Is Not Associated With Reduced Traffic Fatalities

- “To date, 16 states have passed per se drugged driving laws, yet little is known about their effectiveness. The current study examines the relationship between these laws and traffic fatalities. ... Our results provide no evidence that per se drugged driving laws reduce traffic fatalities. **... As currently implemented, laws that make it illegal to drive with detectable levels of a controlled substance in the system have little to no effect on traffic fatalities.**” (Anderson and Rees. 2012. *Per Se Drugged Driving Laws and Traffic Fatalities*)
- **“[T] here have been no studies which have demonstrated their (zero tolerance per se laws) effectiveness, so they cannot yet be characterized as ‘evidence based.’”** (Robert Dupont. 2011. *Drugged Driving Research: A White Paper Prepared for the National Institute on Drug Abuse*)

# Practical Alternatives To Proposed *Per Se* DUI Cannabis Standards

- Better training/greater use of DREs
- Better development of cannabis-specific FSTs
  - SFSTs were developed for alcohol, not cannabis
  - Inclusion of HMJ (head movement and/or jerks) “increases the likelihood of classifying an individual who has consumed THC as impaired” (Downey et al., 2012. op. cit.)
- Greater public education
  - “Current research suggests that acute impairment from cannabis typically clears 3-4 hours after use. This time span could be recommended to users as a minimum wait period before driving.” (Fischer et al. 2011. Lower Risk Cannabis Use Guidelines for Canada (LRCUG): *A Narrative Review of Evidence and Recommendations*)
- Development of cannabis-specific POCT devices (e.g., oral swab testing)
- Possible enforcement of administrative, but not criminal, sanctions for violations of *per se* DUI cannabis

# About Me

- Paul Armentano is the Deputy Director of the National Organization for the Reform of Marijuana Laws (NORML). His writing has appeared in over 750 publications and in over a dozen academic textbooks. He has authored papers regarding cannabis and psychomotor performance that have appeared in various peer-reviewed journals and anthologies. He has spoken at numerous national conferences and legal seminars, testified before state legislatures and federal agencies, and assisted dozens of criminal defense attorneys in cases pertaining to the use of medicinal cannabis, drug testing, and drugged driving. He has appeared as an expert witness in federal court on issues pertaining to the proper interpretation of drug testing examinations and has consulted on dozens of cases involving cannabis and psychomotor performance. He is a faculty member at Oakland University in Oakland, where he lectures on the medicinal properties of cannabinoids, as well as on issues pertaining to workplace drug testing. In 2009, Mr. Armentano co-authored the book *Marijuana is Safer: So Why Are We Driving People to Drink?* (2009, Chelsea Green), which has been translated internationally.
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