



Working to Reform Marijuana Laws

Cannabis and Driving: A Scientific and Rational Review

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Policy debates regarding marijuana law reform invariably raise the question: "How does society address concerns regarding pot use and driving?" The subject is worthy of serious discussion. NORML's Board of Directors addressed this issue by ratifying a "no driving" clause to the organization's "Principles of Responsible Cannabis Use"¹ stating, "Although cannabis is said by most experts to be safer with motorists than alcohol and many prescription drugs, responsible cannabis consumers never operate motor vehicles in an impaired condition."

Nevertheless, questions remain regarding the degree to which smoking cannabis impairs actual driving performance. Unlike alcohol, which is known to increase drivers' risk-taking behavior and is a primary contributor in on-road accidents, marijuana's impact on psychomotor skills is subtle and its real-world impact in automobile crashes is conflicting.

Drugged Driving: True Threat Or False Panic?

Survey data indicates that approximately 112 million Americans (46 percent of the US population) have experimented with the use of illicit substances.² Of these, more than 20 million (8.3 percent of the population) self-identify as "current" or "monthly" users of illicit drugs,³ and more than 10 million Americans say that they've operated a motor vehicle while under the influence of an illicit substance in the past year.⁴ These totals, while far from negligible, suggest that the prevalence of illicit drug use among US drivers is far less than the prevalence of alcohol among this same population.⁵

To date, "[The] role of drugs as a causal factor in traffic crashes involving drug-positive drivers is still not well understood."⁶ While some studies have indicated that illicit drug use is associated with an increased risk of accident, a relationship has not been established regarding the use of psychoactive substances and crash severity.⁷ Drivers under the influence of illicit drugs do experience an enhanced fatality risk compared to sober drivers. However, this risk is approximately

¹ Adopted by NORML's Board of Directors, February 3, 1996. Read all of NORML's "Principles of Responsible Use" online at http://www.norml.org/index.cfm?Group_ID=3417

² US Department of Justice, Bureau of Justice Statistics. *Drug and Crime Facts: Drug Use Among the General Population*. Online document accessed November 24, 2007. <http://www.ojp.usdoj.gov/bjs/dcf/du.htm>

³ US Department of Health and Human Services, Substance and Mental Health Services Association, Office of Applied Studies. *2006 National Survey on Drug Use and Health: National Results*. Online document accessed November 24, 2007. <http://www.oas.samhsa.gov/nsduh/2k6nsduh/2k6Results.cfm#Fig2-1>

⁴ Ibid.

⁵ US Department of Transportation, National Highway Traffic Safety Administration. *State of Knowledge of Drugged Driving: FINAL REPORT*. September 2003.

<http://www.nhtsa.dot.gov/people/injury/research/StateofKnowledgeDrugs/StateofKnowledgeDrugs/>

⁶ Ibid.

⁷ Smink et al. 2005. Drug use and the severity of traffic accident. *Accident, Analysis and Prevention* 37: 427-433.

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three times lower than the fatality risk associated with drivers who operate a vehicle above or near the legal limit for alcohol intoxication.⁸ According to one recent review: “The risk of all drug-positive drivers compared to drug-free drivers is similar to drivers with a blood alcohol concentration of 0.05%. The risk is also similar to drivers above age 60 compared to younger drivers [around age 35].”⁹

Marijuana is the most common illicit substance consumed by motorists who report driving after drug use.¹⁰ Epidemiological research also indicates that cannabis is the most prevalent illicit drug detected in fatally injured drivers and motor vehicle crash victims.¹¹ Reasons for this are twofold. One, pot is by far the most widely used illicit drug among the US population, with nearly one out of two Americans admitting having tried it.¹² Two, marijuana is the most readily detectable illicit drug in toxicological tests. Marijuana’s primary psychoactive compound, THC, may be detected in blood for several hours, and in some extreme cases days after past use,¹³ long after any impairing effects have worn off. In addition, non-psychoactive byproducts of cannabis, known as metabolites, may be detected in the urine of regular users for days or weeks after past use.¹⁴ (Other common drugs of abuse, such as cocaine or methamphetamine, do not possess such long half-lives.) Therefore, pot’s prevalence in toxicological evaluations of US drivers does not necessarily indicate that it is a frequent or significant causal factor in auto accidents. Rather, its prevalence affirms that cannabis remains far more popular and is far more easily detectable on drug screening tests than other controlled substances.

Cruising On Cannabis: Clarifying The Debate

While it is well established that alcohol consumption increases accident risk, evidence of marijuana’s culpability in on-road driving accidents and injury is far less clear. Although acute cannabis intoxication following smoking has been shown to mildly impair psychomotor skills, this impairment is seldom severe or long lasting.¹⁵ In closed course and driving simulator studies, marijuana’s acute effects on psychomotor performance include minor impairments in tracking (eye

⁸ Franjo Grotenhermen. *Drugs and Driving: Review for the National Treatment Agency, UK*. Nova-Institut (Germany). November 2007.

⁹ Ibid.

¹⁰ US Department of Health and Human Services, Substance and Mental Health Services Association, Office of Applied Studies. *Driving After Drug or Alcohol Use, 1998*. Online document accessed November 24, 2007.

<http://www.oas.samhsa.gov/driverrprt/toc.htm>

¹¹ US Department of Transportation. 2003. op. cit.

¹² October 23-24, 2002 CNN/Time poll conducted by Harris Interactive.

¹³ Skopp et al. 2003. Serum cannabinoid levels 24 to 48 hours after cannabis smoking. *Archives of Criminology* (Germany) 212: 83-95.

¹⁴ Paul Cary. 2005. The marijuana detection window: Determining the length of time cannabinoids will remain detectable in urine following smoking. *Drug Court Review* 5: 23-58.

¹⁵ According to the US Department of Transportation, 2003. op. cit., “Experimental research on the effects of cannabis ... indicat[e] that any effects ... dissipate quickly after one hour.”

movement control) and reaction time, as well as variation in lateral positioning, headway (drivers under the influence of cannabis tend to follow less closely to the vehicle in front of them), and speed (drivers tend to decrease speed following cannabis inhalation).¹⁶ In general, these variations in driving behavior are noticeably less consistent or pronounced than the impairments exhibited by subjects under the influence of alcohol.¹⁷ Also, unlike subjects impaired by alcohol, individuals under the influence of cannabis tend to be aware of their impairment and try to compensate for it accordingly, either by driving more cautiously¹⁸ or by expressing an unwillingness to drive altogether.¹⁹

As a result, cannabis-induced variations in performance do not appear to play a significant role in on-road traffic accidents when THC levels in a driver's blood are low and/or cannabis is not consumed in combination with alcohol.²⁰⁻²⁰ For example, a 1992 National Highway Traffic Safety Administration review of the role of drug use in fatal accidents reported, "There was no indication that cannabis itself was a cause of fatal crashes" among drivers who tested positive for the presence of the drug.²¹ A more recent assessment by Blows and colleagues noted that self-reported recent use of cannabis (within three hours of driving) was not significantly associated with car crash injury after investigators controlled for specific cofounders (e.g., seat-belt use, sleepiness, etc.)²² A 2004 observational case control study published in the journal *Accident, Analysis and Prevention* reported that only drivers under the influence of alcohol or benzodiazepines experience an increased crash

¹⁶ Grotenhermen. 2007. op. cit. and US Department of Transportation. 2003. op. cit. Other summaries include: Ramaekers et al. 2006. Cognition and motor control as a function of Delta-9-THC concentration in serum and oral fluid: Limits of impairment. *Drug and Alcohol Dependence* 85: 114-122; David Hadorn. "A Review of Cannabis and Driving Skills," In: *The Medicinal Uses of Cannabis and Cannabinoids*. (eds: Guy et al). Pharmaceutical Press, 2004; Canadian Senate Special Committee on Illegal Drugs, *Cannabis: Summary Report: Our Position for a Canadian Public Policy*. 2002. (See specifically: Chapter 8: "Driving Under the Influence of Cannabis"); Alison Smiley. "Marijuana: On-Road and Driving-Simulator Studies," In: *The Health Effects of Cannabis*. (eds. Kalant et al) Canadian Centre for Addiction and Mental Health, 1999.

¹⁷ David Hadorn. 2004. op. cit. and US Department of Transportation. 2003. op. cit.

¹⁸ According to the US Department of Transportation, 2003. op. cit., "The extensive studies by Robbe and O'Hanlon (1993), revealed that under the influence of marijuana, drivers are aware of their impairment, and when the experimental task allows it, they tend to actually decrease speed, avoid passing other cars, and reduce other risk-taking behaviors."

¹⁹ Menetrey et al. 2005. Assessment of driving capability through the use of clinical and psychomotor tests in relation to blood cannabinoid levels following oral administration of 20mg dronabinol or of a cannabis decoction made with 20 and 60mg delta-9-THC. *Journal of Analytical Toxicology* 29: 327-338.

²⁰ United Kingdom Department of Environment, Transport and the Regions, Road Safety Division *Cannabis and Driving: A Review of the Literature and Commentary*. Online document accessed November 24, 2007.

²⁰ <http://www.dft.gov.uk/pgr/roadsafety/research/rsrr/theme3/cannabisanddrivingareviewoft4764> "Overall, we conclude that the weight of the evidence indicates that ... there is no evidence that consumption of cannabis alone increases the risk of culpability for traffic crash fatalities or injuries for which hospitalization occurs, and may reduce those risks."

²⁰ Gregory Cheshier and Marie Longo. "Cannabis and Alcohol in Motor Vehicle Accidents," In: *Cannabis and Cannabinoids: Pharmacology, Toxicology, and Therapeutic Potential*. (eds. Grotenhermen et al.) Haworth Press, 2002.

²¹ US Department of Transportation, National Highway Traffic Safety Administration. *The Incidence and Role of Drugs in Fatally Injured Drivers: Final Report*. October 1992.

²² Blows et al. 2004. Marijuana use and car crash injury. *Addiction* 100: 605-611.

risk compared to drug-free controls. Investigators did observe increased risks – though they were not statistically significant – among drivers using amphetamines, cocaine and opiates, but found, “No increased risk for road trauma was found for drivers exposed to cannabis.”²³

A handful of more recent studies have noted a positive association between very recent cannabis exposure and a gradually increased risk of vehicle accident. Typically, these studies reveal that drivers who possess THC/blood concentrations above 5ng/ml – implying cannabis inhalation within the past 1-3 hours²⁴⁻²⁵ – experience an elevated risk of accident compared to drug-free controls.²⁶⁻²⁷ (Motorists who test positive for the presence of THC in the blood at concentrations below this threshold typically do not have an increased risk compared to controls.²⁸) However, this elevated risk is below the risk presented by drivers who have consumed even small quantities of alcohol.

Two recent case-controlled studies have assessed this risk in detail. A 2007 case-control study published in the *Canadian Journal of Public Health* reviewed 10-years of US auto-fatality data. Investigators found that US drivers with blood alcohol levels of 0.05% – a level well below the legal limit for intoxication – were three times as likely to have engaged in unsafe driving activities prior to a fatal crash as compared to individuals who tested positive for marijuana.²⁹ A 2005 review of auto accident fatality data from France showed similar results, finding that drivers who tested positive for any amount of alcohol had a four times greater risk of having a fatal accident than did drivers who tested positive for marijuana in their blood.³⁰ In the latter study, even drivers with low levels of alcohol present in their blood (below 0.05%) experienced a greater elevated risk as compared to drivers who tested positive for high concentrations of cannabis (above 5ng/ml). Both studies noted that overall few traffic accidents appeared to be attributed to driver’s operating a vehicle while impaired by cannabis.

Defining A Rational ‘Drugged Driving’ Policy

²³ Movig et al. 2004. Psychoactive substance use and the risk of motor vehicle accidents. *Accident Analysis and Prevention* 36: 631-636.

²⁴ Huestis et al. 1992. Blood cannabinoids: Absorption of THC and formation of 11-OH-THC and THCCOOH during and after smoking marijuana. *Journal of Analytical Toxicology* 16: 276-282.

²⁵ Mushoff et al. 2006. Review of biologic matrices (urine, blood, hair) as indicators of recent or ongoing cannabis use. *Therapeutic Drug Monitor* 2: 155-163.

²⁶ Drummer et al. 2004. The involvement of drugs in drivers killed in Australian road traffic crashes. *Accident, Analysis and Prevention* 36: 239-248.

²⁷ Grotenhermen et al. 2007. Developing per se limits for driving under cannabis. *Addiction* (E-pub ahead of print).

²⁸ Grotenhermen. 2007. op. cit.

²⁹ Bedard et al. 2007. The impact of cannabis on driving. *Canadian Journal of Public Health* 98: 6-11.

³⁰ Laumon et al. 2005. Cannabis intoxication and fatal road crashes in France: a population base case-control study. *British Medical Journal* 331: 1371-1377.

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The above review illustrates the need for further education and understanding regarding the effects of cannabis upon driving behavior. While pot's adverse impact on psychomotor skills is less severe than the effects of alcohol, driving under the acute influence of cannabis still may pose an elevated risk of accident in certain situations. However, because marijuana's psychomotor impairment is subtle and short-lived, consumers can greatly reduce this risk by refraining from driving for a period of several hours following their cannabis use.

By contrast, motorists should never be encouraged to operate a vehicle while smoking cannabis. Drivers should also be advised that engaging in the simultaneous use of both cannabis and alcohol can significantly increase their risk of accident compared to the consumption of either substance alone.³¹⁻³² Past use of cannabis, as defined by the detection of inactive cannabis metabolites in the urine of drivers, is not associated with an increased accident risk.³³

Educational or public service campaigns targeting drugged driving behavior should particularly be aimed toward the younger driving population age 16 to 25 – as this group is most likely use cannabis³⁴ and report having operated a motor vehicle shortly after consuming pot.³⁵ In addition, this population may have less driving experience, may be more prone to engage in risk-taking behavior, and may be more naïve to pot's psychoactive effects than older, more experienced populations. This population also reports a greater likelihood for having driven after using cannabis in combinations with other illicit drugs or alcohol.³⁶ Such an educational campaign³⁷ was recently launched nationwide in Canada by the Canadian Public Health Association and could readily be replicated in the United States. Arguably, such a campaign would enjoy enhanced credibility if coordinated by a private public health association or traffic safety organization, such as the American Public Health Association or the AAA Automobile Club, as opposed to the federal Office of National Drug Control Policy – whose previous public service campaigns have demonstrated limited influence among younger audiences.³⁸

³¹ Ramaekers et al. 2004. Dose related risk of motor vehicle crashes after cannabis use. *Drug and Alcohol Dependence* 73: 109-119. "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."

³² Williams et al. 1985. Drugs in fatally injured young male drivers. *Public Health Reports* 1: 19-26.

³³ Ramaekers et al. 2004. op. cit.

³⁴ US Department of Justice, Bureau of Justice Statistics. op. cit.

³⁵ US Department of Health and Human Services, Substance and Mental Health Services Association, Office of Applied Studies. 1998. op. cit.

³⁶ Ibid.

³⁷ Canadian Public Health Association. "The Pot and Driving Campaign." <<http://www.potanddriving.cpha.ca/index.html>>

³⁸ US Government Accountability Office. *ONDPC Media Campaign: Contractor's National Evaluation Did Not Find that the Youth Anti-Drug Media Campaign Was Effective in Reducing Youth Drug Use: Report to the Subcommittee on Transportation, Treasury, the Judiciary, Housing and Urban Development, and Related Agencies, Committee on Appropriations, U.S. Senate.* August 25, 2006.

Finally, increased efforts should be made within the law enforcement community to train officers and DREs (drug recognition experts) to better identify drivers who may be operating a vehicle while impaired by marijuana. In Australia, efforts have been made to adapt elements of the roadside Standardized Field Sobriety Test to make it sensitive to drivers who may be under the influence of cannabis. Scientific evaluations of these tests have shown that subjects' performance on the modified SFSTs may be positively associated with dose-related levels of marijuana impairment.³⁹ Similarly, clinical testing for cannabis impairment among suspected drugged drivers in Norway has been positively associated with identifying drivers with THC/blood concentrations above 3ng/ml.⁴⁰

Though the development of such cannabis-specific impairment testing is still in its infancy, an argument may be made for the provisional use of such tests by specially trained members of law enforcement. In addition, the development of cannabis-sensitive technology to rapidly identify the presence of THC in drivers, such as a roadside saliva test, would provide utility to law enforcement in their efforts to better identify intoxicated drivers. The development of such technology would also increase public support for the taxation and regulation of cannabis by helping to assuage concerns that liberalizing marijuana policies could potentially lead to an increase in incidences of drugged driving.⁴¹ Such concerns are a significant impediment to the enactment of marijuana law reform, and must be sufficiently addressed before a majority of the public will embrace any public policy that proposes regulating adult cannabis use like alcohol.

Paul Armentano is the Deputy Director of NORML and the NORML Foundation. Mr. Armentano is an expert in the field of marijuana policy, health, and pharmacology. He has spoken at numerous national conferences and legal seminars, testified before several state legislatures and federal bodies, and assisted dozens of criminal defense attorneys in cases pertaining to the use of medicinal cannabis and drugged driving. He has attended various international conferences on the subject of cannabis and psychomotor impairment, including those sponsored by the Society of Forensic Toxicologists (SOFT) and the The International Council on Alcohol, Drugs & Traffic Safety (ICADTS), and coordinated lobbying efforts to successfully liberalize so-called 'zero tolerant' drugged driving laws in Virginia and Ohio. He is the author of the 2006 cover story, "Cannabis and Zero Tolerance Per Se DUI Legislation: A Special (and Problematic) Case," for Florida Defender, the journal of the Florida Association of Criminal Defense Lawyers. (FACDL). He may be contacted via e-mail at: paul@norml.org.

³⁹ Papafotiou et al. 2005. An evaluation of the sensitivity of the Standardised Field Sobriety Tests (SFSTs) to detect impairment due to marijuana intoxication. *Psychopharmacology* 180: 107-114.

⁴⁰ Khiabani et al. 2006. Relationship between THC concentration in blood and impairment in apprehended drivers. *Traffic Injury Prevention* 7: 111-116.

⁴¹ Looby et al. 2007. Roadside sobriety tests and attitudes toward a regulated cannabis market. *Harm Reduction Journal*. Online document accessed November 24, 2007. <<http://www.harmreductionjournal.com/content/4/1/4/abstract>>