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Deterring driving under the influence of cannabis

Cannabis use may increase with widening legalization and approval for medical use. With evidence that cannabis use increases accident risk, but can be detected in biological fluids in the absence of impairment, societies face complex challenges for deterring driving under its influence.

The world-wide debate on the legal status of cannabis continues, with potential therapeutic benefits leading to approval for medical use. In the United States, four states and the District of Columbia recently legalized recreational marijuana, while use has been legal in Uruguay since 1974.

The three primary reasons for concern about legalized cannabis are: evidence that cannabis may adversely affect the developing brain's neural connections [1], an increase in treatment requests for cannabis dependence occurring in the United States and the safety consequence of increased incidence of cannabis intoxication, particularly when driving.

In 2012, recreational cannabis use was legalized in Washington State. From 2009–12, 19.1% of suspected impaired drivers were positive for Δ9-tetrahydrocannabinol (THC). This increased to 24.9% in 2013, while there were no changes in prevalence of alcohol or other psychoactive drugs [2]. In the 2007 National Roadside Survey, 8.6% of weekend night-time drivers were THC-positive; in 2013–14, 12.6% were positive [3].

We have recently reviewed laboratory-based, on-the-road driving and epidemiological data demonstrating cannabis-impaired driving [4]. THC blood concentrations increase rapidly during smoking, peak prior to the last puff, and decrease quickly, providing a short detection window of < 6 hours in occasional cannabis smokers [5]. Blood collection delays, generally 1.5–4 hours, reduce detection rates. It is also worth noting that in early traffic crash culpability studies, where the percentage of cannabinoid-positive drivers were compared with cannabinoid-negative drivers, the inactive metabolite, 11-nor-9-carboxy-THC (THCCOOH), was used, which contributed to the failure to find evidence for an effect of cannabis.

The endogenous cannabinoid system has cognitive, psychomotor and physiological functions that are disrupted by cannabis intake. Chronic frequent cannabis users have a large THC body load that is released slowly over time. In fact, THC can be measured in some cannabis smokers' blood up to 30 days after last use [6]. There is also significant down-regulation of CB1-cannabinoid receptor density [7] and impaired performance in critical tracking and divided attention tasks for 3 weeks after the most recent cannabis smoking episode [8].

There is strong epidemiological evidence of the impairing effects of cannabis on driving. Two recent meta-analyses documented significantly increased motor vehicle crash risk; drivers were 2.66 [9] or 1.92 [10] times more likely to be culpable with measureable blood THC. The adjusted odds ratio for crash responsibility was 2.7 for drivers with any blood THC, increasing to 6.6 at 5 μg/l [11]. French drivers involved in fatal accidents with THC (but no other psychoactive drug) in their blood were found culpable 2.3 times more frequently than those without cannabis or alcohol [12]. An approximate twofold increase in crashes occurs when the driver's blood contains THC. The Driving Under the Influence of Drugs and Medicines (DRUID) project examined vehicle crashes and found no statistically significant increase in injuries in drivers with THC-positive blood, but a significant increase in risk of being responsible for a fatal accident [13].

In the first evaluation of an illicit drug on driving performance in the National Advanced Driving Simulator, cannabis and alcohol increased standard deviation of lateral position (SDLP) or weaving within the lane [14]. In 18 participants, 8.2 and 13.1 μg/l blood THC during driving increased SDLP, similar to 0.05 and 0.08% alcohol. Cannabis-alcohol SDLP effects were additive rather than synergistic, with 5 μg/l THC + 0.05% alcohol showing similar SDLP to 0.08% alcohol alone. Low-dose alcohol increased peak THC blood concentration significantly [15], and oral fluid (OF) THC was not affected by alcohol presence [16].

How can we best assess cannabis-impaired driving in this era of potentially increasing cannabis consumption? In Australia, *per se* OF THC cutoffs were established and enforced strictly with highly visible random traffic stops and roadside OF drug testing. An excellent public education program on the dangers of cannabis-impaired driving rallied public support. Penalties were not high under the *per se* program, but if impairment was documented, they were much greater. This is similar to European laws with *per se* OF testing and administrative penalties; drivers incur much greater punishment with police or physician-documented impairment.

In the United States, legislators have sought one blood or OF THC concentration that signifies impairment in everyone, does not falsely capture unimpaired chronic frequent cannabis users due to residual THC and does not miss impaired occasional cannabis users with lower THC concentrations. Administrative thresholds for alcohol vary from 0.02% in Sweden to 0.08% in the United

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States and United Kingdom. The dangers of alcohol-impaired driving are weighed against the rights of drivers to consume legal alcohol.

In an ideal world, trained professionals would evaluate suspected impaired drivers at the roadside, with tools sensitive to the effects of all potentially impairing drugs and drug combinations. Roadside OF tests are now available for cannabis in drivers suspected of impairment. This will help with the problem of rapidly decreasing blood THC concentrations following most recent ingestion, but could still detect residual THC in frequent cannabis users long after last exposure. Standardized field sobriety tests can be useful for detecting alcohol impairment for which they were designed, and helpful for detecting other drug impairment, but availability of specially trained drug recognition examiners (DRE) is limited, and time delays reduce impairment that may have been present at the time of driving.

As with alcohol, decisions on illegal blood and OF THC cutoffs during driving will be made by each society, with each finding its own solution. In my view, it would be a mistake to try to avoid identification of residual THC in frequent cannabis users by selecting *per se* cutoffs that were too high to detect impairment in occasional cannabis users, as is being considered currently by some US legislators. In fact, residual active THC in the blood and brain may still impair performance.

A two-tiered system, with reduced penalties for *per se* THC violations, and more severe penalties for documented impairment, appears to deter cannabis use and driving. Public education on drugged driving may also play a role in reducing serious injuries and fatalities. Cannabis is the number one illicit drug identified in motor vehicle crashes and fatalities. Public health and safety on the roads require that we develop policy and legislation to address and assess cannabis-impaired driving.

Declaration of interests

None.

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