Nevada’s Adoption of Recreational Marijuana Use Compels Amending Nevada Revised Statutes’ Testing for Presumed Cognitive Impairment by Marijuana and Marijuana Metabolites

Graham Lambert, OMSII, Charles Cullison, OMSII, Amina Sadik, MS., Ph.D., MSMEDL
Touro University Nevada College of Osteopathic Medicine, Henderson, NV

[ ABSTRACT ]
Since the enactment of the 1970 Controlled Substance Act, the United States Federal Government has maintained its position that marijuana is a Schedule I drug. Schedule I drugs are defined as drugs with no currently accepted medical use and a high potential for abuse, and are also deemed “the most dangerous drugs of all the drug schedules with potentially severe psychological or physical dependence” (2). In recent years, medical marijuana has become more widely used in the U.S. and is currently approved in 25 states (5). The 2003 Nevada Constitutional Amendment providing for the medical use of marijuana and now, Nevada’s adoption of legalizing marijuana for recreational use, compels optimization and standardization of testing to determine whether individuals are violating state law by operating motor vehicles while cognitively impaired. Currently, NRS 484C.110 prohibits individuals from operating a motor vehicle while having marijuana or marijuana metabolite urine values above 10 and 15ng/mL, respectively, determined by immunassay and GS/MS (17,19). This test is not relevant because urine tests solely for THC-COOH (11-Nor-Δ9-carboxy-Δ9-THC) which is not psychoactive and cannot predict cognitive impairment; its presence only indicates that use of marijuana products has occurred (20,21,22,23,25,26). This compound has been shown to remain in body fluid for up to 76 days after the cessation of marijuana product use (18).

In contrast, blood testing can detect Δ9-THC (marijuana) and 11-OH-THC (marijuana metabolite), the primary psychoactive components of marijuana, providing an accurate measurement of the cognitively active chemicals. Forensic lab managers in Washoe’s Sheriff’s office and at the Las Vegas Metropolitan Police Department test blood samples for Δ9-THC and for THC-COOH, although they have no capacity to detect for THC-COOH metabolite (26,27).

For accurate determination of possible cognitive or motor impairment from marijuana use, Nevada law should be amended to provide testing for Δ9-THC and 11-OH-THC only, using blood samples, and eliminate testing for the inert THC-COOH.

[ RESULTS ]

Metabolic Pathway of Δ9-Tetrahydrocannabinol
Marijuana plants contain over 100 compounds capable of having different effects on the human body, however Δ9-THC (hereinafter THC) is the primary compound responsible for the psychoactive effects (4,7,17,25). THC binds to a specific receptor, known as CB1, which is found throughout the body, but is especially concentrated in the brain. This binding modulates neurotransmitter release, in the basal ganglia, hypothalamus, and limbic cortex (4,12,25). THC is metabolized by Cytochrome P450 enzymes in the liver to yield 11-OH-THC, an even more potent metabolite than THC, providing the possibility of testing for more readily than THC (7.25). When marijuana is orally ingested, more THC is metabolized by the liver to 11-OH-THC than when smoked, as shown in Figure 2 (25). 11-OH-THC is further metabolized to produce the primary inactive metabolite, THC-COOH, the primary marijuana metabolite tested in urine (17,26).

THC-COOH is eliminated from the body in urine. Another route of THC metabolism converts THC into a less psychoactive metabolite (8-Hydroxy-Δ9-THC or Δ9-THD), prior to its conversion to the inactive metabolite (8,11-dihydroxy-Δ9-THC) (12,17,25) which is eliminated in urine. However, these second pathway compounds occur in such low levels to be impractical for testing.

While current Nevada law provides for presumptive cognitive impairment for marijuana (Δ9-THC) greater than 10ng/mL in urine. The Medical Toxicology of Drug Abuse (Synthesized Chemicals and Psychoactive Plants) states that the level of THC excreted in the urine is undetectable (28). In fact, no Nevada forensic tests for Δ9-THC in urine samples. NRS 484C.110 therefore conflicts with science and forensic lab practice in Nevada.

Blood Testing is More Accurate
The blood test is more inconvenient for an employer or law enforcement officer because it requires a trained technician invasively to obtain a blood sample. Blood testing is substantially more expensive than urine testing, averaging 275 dollars (17). Despite, the higher cost, invasiveness, and inconvenience, blood testing provides the reliable method for determining levels of marijuana (Δ9-THC) and levels of its primary psychoactive metabolite, 11-OH-THC (17.21,22,25,26). Thus, State laws for presumptive cognitive impairment may be promulgated on a rational and scientific basis.

Urine Is No Longer Relevant
In states where marijuana is not legal, employers and law enforcement have been able to use many methods to determine illegal use. Urinalysis for the presence of THC-COOH is the common modality to screen for prior marijuana use. If not tested regularly, THC-COOH is present in urine for about 5 hours, while THC is present for about 2 hours depending on the strain consumed.

When States legalize the use of medical marijuana “a positive urine test for cannabinoids indicates only that the drug exposure has occurred. It does not provide information on the route of administration, drug exposure occurred, or, most importantly, any degree of impairment” (27). The slow rate of clearance for inactive THC metabolites, discoverable by urinalysis, may incorrectly assume an individual to have cognitive alteration long after any psychoactive compound has been eliminated from the body (21,22,23,25). See Figure 1. Thus, individuals legally consuming marijuana for medical or recreational purposes are subject to inappropriate conviction by Nevada State law.

[ CONCLUSION ]

Under current Nevada State law the medical use of marijuana is legal, and the recent passing of Nevada Question 2 will greatly increase the number of recreational legal users in this State effective January 1, 2017. For those in Nevada using marijuana legally, Nevada law must provide for accurate testing for presumptive cognitive impairment while operating a motor vehicle and for determining cognitive impairment in certain employment circumstances (operating heavy or dangerous equipment, for example). Current Nevada law, as provided in NRS 484C.110, specifies certain levels of presumptive legal test for both marijuana and marijuana metabolites in both urine and blood. Urine testing for “marijuana” is not performed in our forensic laboratories because Δ9-THC is not practically detectable. Urine level for the “marijuana metabolite” THC-COOH is inappropriate because this inert metabolite has no effect on cognition. Thus, urine tests for cognitive impairment should be eliminated as evidenced from Nevada statutes.

Blood testing for Δ9-THC and its metabolite, 11-OH-THC, should be adopted into Nevada law, amending NRS 484C.110, because these psychoactive compounds are associated with cognitive impairment and blood levels can be readily determined.

[ REFERENCES ]

Available upon request.

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