K44 Driving Under the Influence of Cannabis: Are Science-Based Concentration Limits for Tetrahydrocannabinol (THC) in Blood Practical to Enforce?

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Those attending this presentation will acquire up-to-date information about various forensic aspects of driving under the influence of cannabis. The age and gender of offenders are reported in relation to the concentra- tions of tetrahydrocannabinol (THC) in blood of motorists apprehended over a 10-year period. Results are compared from before and after a zero- tolerance law for driving under the influence of drugs (DUID) was introduced in Sweden. The forensic community in North America will learn about the effectiveness of zero tolerance legislation as a practical and pragmatic way to simplify the prosecution of offenders.

Although cannabis and its various preparations are considered illicit drugs in most countries, these psychoactive substances are widely used for recreational purposes and as such represent a problem for traffic safety. Some countries have a fairly liberal attitude towards possession of cannabis for personal use, whereas in other nations, this constitutes a criminal offence. Accordingly, there is much ambivalence about the danger of cannabis use and abuse in society and re-classification as a scheduled substance is sometimes considered. Indeed, there is increasing discussion and debate among scientists and politicians about the pros and cons of cannabis as a recreational drug and the legal prescribing of cannabinoids for treatment of certain medical conditions.

The pharmacologically active constituent of cannabis, hashish and marijuana is Δ^9-tetrahydrocannabinol (THC), which displays a complex pharmacokinetic profile owing to its high lipid solubility, protein binding and large distribution volume. The forensic evidence necessary to verify that a person has taken cannabis comes from finding THC or its main metabolites (6-hydroxy-THC and carboxy-THC) in blood, urine or other body fluids. Knowledge about the concentration of THC in blood is necessary to permit drawing conclusion about the effects on a person's performance and behavior and the likelihood of drug-related impairment and the risk of a traffic crash. In our laboratory THC is determined in blood samples by gas chromatography-mass spectrometry with deuterium labeled internal standards (d_3-THC). The limit of quantitation (LOQ) of this method in routine use is 0.0003 mg/L (0.3 ng/mL).

Enforcement of laws pertaining to driving under the influence of drugs (DUID) other than alcohol are either structured around measuring drug- related effects on the individual concerned or some threshold concentration in blood is set by statute, above which a person is liable to prosecution. The creation of zero-.tolerance laws is increasingly favored in European nations for illicit drugs so that any measurable amount in a specimen of blood constitutes an offence of impaired driving. The presence of such a drug or its metabolites in urine but not in blood does not motivate charging a person with DUID in European nations.

Considerable interest exists in trying to establish so-called "science based" concentration limits for driving under the influence of cannabis. The scientific background for this stems from measurement of cognitive and psychomotor impairment after smoking marijuana, clinical correlates of THC concentrations in blood, epidemiological surveys of cannabis-related traffic crashes and also a limited number of on-the-road driving performance tests. Roadside surveys of the risk of a crash as a function of the blood alcohol concentration exist (e.g., the Grand Rapids study) but equivalent studies for cannabis are lacking. The threshold concentration limit of THC in blood under such a *per se* statute has not yet decided but this will most likely be set fairly high at 0.002-0.003 mg/L (2-3 ng/mL) or even higher.

Over a 10-year period between 18% and 30% of all DUID suspects apprehended in Sweden had measurable amounts of THC in their blood (> 0.0003 mg/L) either alone or together with other drugs. The mean age (± SD) of cannabis users was 32.6 ± 9.4 y (range 15-66 y) with a strong predominance of men (94%). The frequency distribution of the concentra- tions of THC in blood (N = 8,803) was markedly skewed to the right with mean, median and highest values of 0.0021 mg/L, 0.0010 mg/L and 0.067 mg/L, respectively. The concentrations of THC were less than 0.001 mg/L in 42% of cases and below 0.002 mg/L in 60% of cases. No statistically significant correlation existed between the concentration of THC in blood and the person's age (r = -0.027). THC concentrations in blood were higher when this was the only psychoactive substances present (N = 1,281); mean 0.0036 mg/L, median 0.002 mg/L and 26% were below 0.001 mg/L and 40% were now less than 0.002 mg/L. The concentrations of THC in blood were similar in a population of users of illicit drugs (non-traffic cases). Based on studies from Sweden it can be shown that at least 40% of drivers abusing cannabis would evade prosecution if the THC limit in blood was set at 0.002 mg/L (2 ng/mL).

The complex kinetics of THC means that the concentrations in blood at the time of driving are likely to be considerably greater than at the time of sampling blood, which occurs about 30-90 min afterwards, owing to movement of the active substance (THC) from the central blood into peripheral tissues and lipid compartments. The notion of establishing a science-based concentration limit for THC in blood (e.g., 0.002-0.003

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mg/L) or higher, as being discussed by some investigators, would mean that many individuals who had smoked marijuana before driving would evade prosecution. Zero-tolerance or LOQ laws are a much more pragmatic way to enforce DUID legislation.

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