IMPAIRMENT IN DRIVERS DUE TO CANNABIS IN COMBINATION WITH OTHER DRUGS

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Summary

Blood samples from 425 suspected drugged drivers who were clinically impaired and negative for alcohol were analysed. Fifty-six percent of the samples were positive for tetrahydrocannabinol (THC). Tetrahydrocannabinol-positive blood samples were analysed for amphetamines, barbiturates, benzodiazepines, cocaine metabolites and opiates. Eighty-two percent of the samples were found to be positive for one or more drugs in addition to THC, and the concentrations of these drugs were often high. Thus, THC in combination with other drugs seems to be a much more frequent reason for impairment than THC alone among Norwegian drugged drivers.

Key words: Cannabis; Drugs; Impairment; Poly-drug use

Introduction

Smoking or ingestion of cannabis causes perceptual, cognitive, affective, and behavioral changes [1]. Psychomotor performance is impaired for the purpose of operating of a motor vehicle [1.2].

Delta-9-tetrahydrocannabinol (THC), the major psychoactive compound of cannabis, is the most frequent drug found in blood samples from suspected drugged drivers in Norway. In 1989, 1223 blood samples from suspected drugged drivers were analysed at the National Institute of Forensic Toxicology. Tetrahydrocannabinol was found in 603 (49%) of the samples (unpublished observations).

When a blood sample is taken from a suspected drugged driver shortly after the arrest, a clinical test of impairment is normally performed by a physician. The aim of the present investigation was to study drivers who were clinically impaired by drugs to see whether THC alone or in combination with other drugs was a frequent reason for impairment.

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Materials and Methods

Selection of THC-positive blood samples from impaired drivers

Blood samples from all clinically impaired drivers (as evaluated by a clinical test) arrested by the police on suspicion of driving under the influence of drugs during the period from June 1st 1989 to June 1st 1990 were studied. Blood samples with blood alcohol concentrations above 0.01% (w/w) were excluded.

Analytical methods

The blood samples were screened for amphetamines, barbiturates, cannabinoids, cocaine metabolites and opiates by EMIT [3] and for benzodiazepines using gas chromatography [4]. Samples found to be positive for drugs by EMIT were analysed by chromatographic methods. Amphetamines were analysed by GC using a packed column [5]. Tetrahydrocannabinol was analysed using gas chromatography-mass spectrometry (GC-MS) [6]. Codeine and ethylmorphine were analysed by GC or GC-MS [7,8]. Morphine was analysed using GC-MS [8]; in some cases, the extraction was done as described by Edlund [9]. Due to capacity problems, not all of the positive samples for opiates by EMIT were analysed by chromatographic methods.

Results and Discussion

During the 12 months studied, samples from 425 clinically impaired alcohol negative (BAC $\leq 0.01\%$) drivers were analysed. THC was found in 239 (56%) of these samples. A large proportion (82%) of the THC-positive samples were found to be positive for amphetamine, benzodiazepines or opiates also (Table 1). No sample was positive for barbiturates or cocaine. As shown in the table,

TABLE 1

	Positives (%)	Blood drug concentrations (mg/l)		
		Range	Median	
Amphetamine	23	0.04-0.84	0.24	
Diazepam	49	0.06-4.0	0.28	
Flunitrazepam	29	0.003 - 0.075	0.009	
Oxazepam	2	0.66 - 2.3	1.5	
Nitrazepam	2	0.03 - 0.42	0.08	
Codeine*	>9	0.01 - 0.87	0.15	
Morphine*	>7	0.01 - 0.26	0.03	
Ethylmorphine*	>1	0.09 - 0.25	0.09	

ANALYTICAL RESULTS OF THC-POSITIVE BLOOD SAMPLES FROM IMPAIRED DRIVERS (N = 239)

*Seventy-seven samples (32%) were found to be positive for opiates by EMIT, only 48 were analysed by chromatographic methods due to capacity problems. Thirty-nine of these samples were positive for codeine, morphine or ethylmorphine.

TABLE 2

THC conc. (µg/l)	Samples negative for other drugs (n = 42)	Samples positive for other drugs (n = 197)	
0.3-1.2	26	42	
1.3 - 2.5	12	22	
2.6 - 5.0	12	18	
5.1-7.5	29	7	
7.6+	21	11	

DISTRIBUTIONS (%) OF THE CONCENTRATIONS IN BLOOD SAMPLES FROM IMPAIRED DRIVERS

diazepam (sedative) was the most frequent drug found, with flunitrazepam (hypnotic) as the second most frequent drug. The median values for diazepam, flunitrazepam, nitrazepam, morphine and ethylmorphine were within therapeutic levels (Table 1), but so high that they might have caused impairment in subjects who had not developed tolerance to these or similar drugs. The median levels for amphetamine, oxazepam and codeine were higher than normal therapeutic levels. In fact, 55% of the drivers had blood drug concentrations corresponding to the median values or higher.

Only 42 (18%) of the THC-positive samples from impaired subjects were negative for amphetamines, barbiturates, benzodiazepines, cocaine metabolites and opiates. The THC concentrations of these samples and of the samples which were positive for other drugs in addition to THC (poly-drug cases) are presented in Table 2. As shown in the table, the THC concentrations found in the poly-drug cases were often low. Only 18% of these subjects had THC concentrations above $5.0 \ \mu g/l$ (16 nmol/l). In cases where only THC was found, 50% had THC concentrations above $5.0 \ \mu g/l$.

Conclusions

Even though THC is the most frequent drug found in blood samples from arrested Norwegian drugged drivers, impairment due to THC alone was not common. In most THC-positive cases, other drugs were also used in addition to cannabis, and the impairment observed was most likely a combined effect of THC and other drugs, in some cases perhaps mainly due to other drugs. Thus, when a blood sample from a suspected drugged driver is positive for THC and negative for alcohol, the sample should also be analysed for other drugs.

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