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CANNABIS AND ALCOHOL USE AMONG DRIVERS AND PEDESTRIANS FATALLY INJURED IN TRAFFIC CRASHES

# ALAN C. DONELSON

The Traffic Injury Research Foundation of Canada, 171 Nepean Street, 6th Floor, Ottawa, Ontario K2P OB4 (Canada)

# INTRODUCTION

Based on a limited number of epidemiologic studies, the drug other than alcohol most often implicated in impaired driving is cannabis (1-2). For example, a comprehensive study in Ontario, Canada, included tests for over 90 psychoactive drugs in blood and urine from driver and pedestrian fatalities (3-4). As expected, alcohol was most frequently detected (55%). Evidence of cannabis use was found in 12% of the cases; "recent" cannabis use, defined as a measurable concentration of delta-9-tetrahydrocannabinol (THC) in blood, was indicated in 3% of the cases. No other drug was detected as frequently as alcohol or cannabis.

This paper highlights findings from a subsequent study that monitored the use of cannabis and alcohol among drivers and pedestrians fatally injured in traffic crashes in Ontario from March 1982 through July 1984 (5). The study served two general purposes. Firstly, the results would provide an indication of consequences that trends and changes related to cannabis use might have for health and safety (6). Secondly, the study offered an opportunity to advance knowledge about the relationship between cannabis use and traffic crashes (7).

#### METHOD

### Selection of Cases

Criteria for including traffic fatalities in the study were as follows. The person had to have been a driver or pedestrian fatally injured in a motor vehicle accident, 14 years of age or older, dying within one hour of crash involvement. In addition, the laboratory had to receive body-fluid specimens (either blood and urine or blood only) in a condition and quantity suitable for toxicologic analyses.

## Toxicologic Analyses

Methods of collecting and analyzing specimens of blood and urine for alcohol and cannabinoids have been described elsewhere (5). Here, the approach to detecting and quantitating cannabinoids is briefly summarized. Whole blood and, when available, urine specimens were initially screened for cannabinoids by a series of radioimmunassays (RIAs). If one or more results 271

exceeded preestablished values, then quantitative analysis of THC in blood by a gas chromatographic/mass spectrometric (GC/MS) method followed.

RIA kits specific for THC and for ll-nor-9-carboxy-delta-9-tetrahydrocannabinol (carboxy-THC) in blood were supplied by the Research Triangle Institute through the courtesy of the U.S. National Institute on Drug Abuse. When RIA tests showed apparent THC values equal to or greater than 2 ng/ml, or apparent carboxy-THC values equal to or greater than 2.5 ng/ml, then blood specimens were analyzed for THC by GC/MS. As in the prior study (3), RIA reagents that selectively screen for cannabinoids and their metabolites in urine were purchased from Collaborative Research Inc. (products have since been discontinued). Results equal to or greater than 12.5 ng/ml were considered "positive" and thus indicated quantitative analysis of blood for THC by GC/MS.

# RESULTS

From 1 March 1982 through 31 July 1984, 2,655 fatal motor vehicle crashes occurred in Ontario. In 1,576 crashes, one or more drivers and pedestrians, 14 years of age or older, died within one hour of crash involvement. Results of toxicologic analyses were reported for 1,169 of 1,335 eligible driver cases (88%) and for 225 of 288 eligible pedestrian cases (78%).

Alcohol was detected in blood in 667 of 1,169 (57%) driver cases and in 120 of 225 (53%) pedestrian cases. THC was detected in blood in 127 of 1,169 (11%) driver cases and in 17 of 225 (8%) pedestrian cases. In about 48% of both driver and pedestrian cases, only alcohol was detected in blood. Similarly, only THC was detected in about 2% of both sets of cases. Sets of driver and pedestrian cases differed in that both alcohol and THC were detected in 9% (107/1169) of driver cases compared to 6% (13/225) of pedestrian cases.

For drivers testing positive for alcohol, blood alcohol concentration (BAC) values ranged from 0.09 to 4.41 promil (w/v) (mean =  $1.66 \pm 0.80$ ; median = 1.72). Of 1,169 drivers, 560 (47.9%) had BACs equal to or greater than Canada's statutory limit of 0.80 promil (w/v). For pedestrians, BAC values ranged from 0.06 to 3.57 promil (w/v) (mean =  $1.84 \pm 0.79$ ; median = 2.04).

Quantitative results of THC analyses for drivers ranged from 0.2 to 37 ng/ml (mean =  $3.1 \pm 5.0$ ; median = 1.6). For pedestrians, THC concentrations ranged from 0.6 to 7.9 ng/ml (mean =  $2.4 \pm 2.3$ ; median = 1.5). Alcohol was also detected in 107 of 127 (84%) THC-positive drivers and in 13 of 17 (76%) of THC-positive pedestrians.

Table I presents toxicologic results for drivers grouped by age, sex, and BAC. (The number of cases in each BAC category also positive for THC in

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blood is indicated in parentheses.) About 86% (999/1168) of the cases were male. Male driver fatalities accounted for 93% of the alcohol-positive cases (620/667) and 98% of the THC-positive cases (124/127). Of four age-sex groups, 14-24 year-old males evidenced the highest frequency of drug use. In that group, 277 of 400 (69%) had been drinking and 223 (56%) had BACs equal to or greater than the legal limit of 0.80 promil (w/v). Of those who had higher BACs, 60 (27%) also had detectable amounts of THC in blood. Among males aged 25 years or older, alcohol and THC were detected less frequently. About 57% (343/599) had been drinking and 50% (300/599) had BACs of 0.80 promil (w/v) or greater; about 8% of those with higher BACs also had THC in blood (25/300). The frequencies of alcohol and cannabis use among female driver fatalities were much lower. About 28% of all females had been drinking (47/167), and 22% had BACs of 0.80 promil or greater (37/167). Only 2% (3/169) had THC in blood.

## TABLE I

TOXICOLOGIC FINDINGS FOR DRIVERS GROUPED BY AGE, SEX, AND BAC

Age/Sex Group	Cases (% Total)	Blood Alcohol (	ncentration Groups	(promil, w/v)
		(also THC+)	(also THC+)	(also THC+)
14-24 Male	400 (34.2)	123 (10)	54 (18)	223 (60)
14-24 Female	47 (4.0)	30 (0)	3 (1)	14 (2)
≥25 Male	599 (51.3)	256 (10)	43 (1)	300 (25)
≥25 Female	122 (10.4)	92 (0)	7 (0)	23 (0)
TOTAL	$1168^{*}$	501 (20)	107 (20)	560 (87)

In one case, sex of driver could not be determined.

#### DISCUSSION

Using a subset of cases from the present study, Donelson et al. (5) compared results to those of the previous study in Ontario (3-4). The interstudy comparison produced two noteworthy findings. Firstly, the frequency of cannabis use among 14-24 year-old driver fatalities was higher. In 1982-1984, 59 of 346 cases (17%) were THC-positive compared to 14 of 169 cases (8%) in 1978-1979. Secondly, a substantial (albeit smaller) increase in the percentage of THC-positive cases was also found for driver fatalities aged 25 years or older. In 1982-1984, 28 of 486 cases (6%) were THC-positive compared to 1 of 228 cases (0.4%) in 1978-1979. This latter finding indicates that cannabis-using cohorts are aging and are now appearing in older age groups.

Differences in the incidence of THC may be partly due to differences in toxicologic methods employed in the two studies. Some adjustments were made to enhance the comparability of the two sets of data. Had the same methods been available and used in 1978-1979, percentages of THC-positive cases would likely have been somewhat higher. Nonetheless, the results of the present study indicate that cannabis use among traffic fatalities in Ontario has increased since 1979.

## ACKNOWLEDGEMENTS

This study was conducted by the Traffic Injury Research Foundation of Canada and two agencies of the Ontario Ministry of the Solicitor General -the Office of the Chief Coroner for Ontario and the Centre of Forensic Sciences. The study was funded in part by the Department of National Health and Welfare, Bureau of Tobacco Control and Biometrics. Complete reports based on the study (5,7) may be ordered from the author of this paper.

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