INVOLVEMENT OF DRUGS IN ACCIDENT CAUSATION

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ABSTRACT: Responsibility analysis has been used to assess the contribution of drugs in traffic accidents involving fatally injured drivers in Australia in 1995 and 1996. These results have been compared with those of a similar study conducted in drivers killed from 1990–1993. The prevalence of drugs in drivers killed in 1995–1996 averaged at 27%, an increase of 5% from 1990–93. The prevalence in individual states across Australia ranged from 11 to over 41%. The most prevalent drug was cannabis, which increased in prevalence from 11% to 13% in this period. There were lesser changes for the other major drug groups: opioids, benzodiazepines and amphetamine-like stimulants. The incidence of alcohol (BAC ≥ 0.01%) averaged 32% in 1995 – 96 cases, a decrease of 4% from 1990–1993. Risk analysis showed no significant increase in risk for drivers positive for cannabis and opioids alone, but when combined with other psychoactive drugs, a significant increase in risk occurs (3.5-fold). Drivers positive for alcohol over 0.05% gave an increase in risk of 9-fold over drug-free drivers. Users of amphetamines and related stimulants and benzodiazepines show a trend to a higher risk, but this was not significant. Of interest was the significant increase in risk for users of psychotropic drugs (Odds Ratio = 3.4). THC positive culpable drivers had an average blood concentration of 15 ng/ml compared to 3.5 ng/ml in non-culpable drivers. These data suggest that campaigns to reduce drug use are best targeted to users of drivers likely to drive shortly after consuming cannabis, using non-prescribed doses of drugs, those who mix psychoactive drugs, and those combining drugs with alcohol.

KEY WORDS: Drugs and driving; DUI; Post-mortem material.

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INTRODUCTION

There is still considerable debate concerning the involvement of drugs other than alcohol on road trauma. Psychotropic drugs other than alcohol have been detected in drivers killed in motor vehicle accidents. Such drugs include the amphetamines and related stimulants, the benzodiazepines and other tranquilliser drugs, cannabis and opioid-like drugs such as morphine, codeine and methadone. Overseas studies show an incidence of psychotropic drugs in drivers of 10% or greater [1, 2, 4, 5, 6, 8, 9, 10, 11].

In a review of 1045 drivers killed in Western Australia, New South Wales and Victoria during the period 1990 to early 1993, psychotropic drugs were found in 22% of drivers. Cannabis was most prevalent at 11%, followed by stimulants (3.7%),

benzodiazepines (3.1%), opioids (2.7%) and miscellaneous drugs (5.6%). Alcohol was found in 36%, of which 33% were over the legal limit of 0.05% [3].

With support of the Australian transport ministers, funding was provided to repeat this study in all mainland states. This and related studies in this series have been conducted with the cooperation of the relevant Coroners and State Government Departments and the financial support of Vic Roads.

This paper provides a summary of the incidence of drugs found in fatally-injured drivers in Victoria, New South Wales, Western Australia, South Australia and Queensland during 1995 and 1996, and shows some preliminary data on the relative risk of a fatality involving psychotropic drugs.

SUBJECTS AND METHODS

Information on drivers killed in motor vehicle accidents between January 1995 and December 1996 were obtained from records kept at the respective coroners' or Department of Justice facilities in the capital cities. Identification of driver fatalities was obtained from the toxicology databases of the respective laboratories (Victoria, QLD, WA) or from coroners/Department of Justice databases (SA, NSW).

Cases were only included in the study if toxicology testing included a broad range of drugs and drug classes including the drugs of abuse and common psychotropic prescription drugs. In cases of death following hospitalisation, cases were excluded unless antemortem specimens were analysed. Data were rounded to two significant figures. Cannabis use was confirmed by the presence of Δ^9-tetrahydrocannabinol (THC) in blood, 11-carboxy-Δ^9-THC, or collective cannabinoids in blood or urine.

Data from a previous report was used as source of information for fatalities in the period 1990–1993 [3]. Data from a previous report was used as source of information for fatalities in the period 1990–1993 [3]. Drivers were scored for responsibility as described by Robertson and Drummer [7]. Cases in which there were insufficient information to allow an assessment of responsibility, were omitted from the analysis. Scores from 8 to 12 were recorded as "culpable", scores between 13 and 15 were recorded as "contributory", whilst scores of 16 or greater were recorded as "non culpable". Toxicology data relating to drivers scored for responsibility were included last. All data pertaining to these studies were kept on Access database files.

Statistics were calculated by Odd's ratio analysis using either chi-square or Fisher's Exact tests.

RESULTS

The incidences of drugs in fatally-injured drivers are summarised in Table I for all mainland Australian states. The number of cases used varied from state to state and

depended on the absolute number of drivers killed in each state and the number of cases in which toxicology testing was conducted. Victoria and WA had the highest incidence of useable cases since all driver deaths are investigated with a full toxicological work-up. In NSW only Sydney metropolitan cases were included because of the difficulties in obtaining information from regional areas. In Queensland, few drivers who could be scored for responsibility had a full toxicological examination, and in SA only selective testing for nominated drugs was conducted in most cases.

TABLE I. STATE-BY-STATE BREAKDOWN OF DRUG INCIDENCES IN DRIVERS KILLED IN MVAS – 1995 AND 1996[1]

Parameter/state	Vic	NSW	WA	SA[2]	Qld[2]
Number of cases	590	143	188	139	34
Proportion useable cases	94%	27%	94%	97%	7.5%
Drug and/or alcohol positive	45%	51%	54%	38%	68%
Alcohol positive < 0.05%	3.5%	4.2%	3.2%	0.7%	2.9%
Alcohol positive ≥ 0.05%	23.1%	29.4%	35.6%	30.2%	41.2%
Drug positive	27.6%	23.8%	216.5%	10.8%	41.2%
Cannabis	12.2%	14.6%	6.0%	7.9%	23.5%
Stimulants	3.8%	2.1%	2.1%	2.9%	8.8%
Benzodiazepines	4.4%	2.1%	3.2%	0.7%	2.9%
Opioids	4.4%	4.9%	2.1%	2.2%	2.9%
Other drugs	12.3%	6.3%	7.4%	0%	14.7%

[1]In many cases more than one drug was detected.
[2]These two states have selective drug testing policies leading to a biased prevalence.

Significant differences in the incidences of alcohol and drugs occur in Australian mainland states. The alcohol positivity rate (BAC ≥0.05%) was highest in QLD and WA (over 35%), while Victoria had the lowest rate at 23%. Less than 5% of all drivers were positive for alcohol less than 0.05% (Table I).

Drugs were found in variable rates from 11 to 41%, however the rates in Victoria, NSW and WA are likely to best reflect the true incidence of drugs. These three states show an incidence of 24–28%. Cannabis was the most prevalent drug, ranging from 12 to 16% in these three states with the highest prevalence in WA and the lowest in Victoria. Stimulants were found in 2.1 to 3.8% with the highest rate detected in Victoria and the equal lowest rate in NSW and WA (Table I).

Benzodiazepines were detected in 2.1% to 4.4% of all drivers in these three states with the highest rate detected in Victoria and the lowest rate detected in NSW. Opioids were detected in 2.1% to 4.9%, with the highest rate detected in NSW and the lowest rate in WA. Other drugs were detected in 6.3% to 12.3%, with the highest rate detected in Victoria and the lowest rate in NSW (Table I).

The miscellaneous drugs included a large range of prescription and over-the-counter drugs including the analgesics (mainly paracetamol, but also aspirin, anti-histamines, anti-depressants and anticonvulsant drugs).

The incidence of drugs in three Australian states (Victoria, NSW and WA) increased from 22 to 27% in the period 1990–1992 to 1995–1996 (Table II). This increase was largely due to greater cannabis use (2%) and miscellaneous drugs (5%), although there were small increases in the incidence of benzodiazepines and opioids. Stimulant use decreased since the earlier study. In contrast, alcohol was detected in 32% of all cases surveyed in Victoria, NSW and WA, which was 4% less than for the period 1990 to 1992. A feature of a significant number of cases is the presence of more than one psychoactive drug. Significant differences in the incidences of alcohol and drugs do occur in Australian mainland states. However, the profiles in SA and Queensland are substantially skewed due to targeted or limited drug screening practices.

TABLE II. PREVALENCE OF ALCOHOL AND DRUGS IN FATALLY-INJURED DRIVERS IN TWO NATIONWIDE STUDIES

Drug group/Study	First study* (1990–1992)	Second study* (1995–1996)
No of cases	1045	921
Alcohol (≥ 0.01%)	36%	32%
Drugs	22%	27%
Cannabis	11%	13%
Stimulants	3.7%	3.2%
Opioids	2.7%	4.0%
Benzodiazepines	3.1%	3.8%
Miscellaneous drugs	5.6%	10%

* Only data for Victoria, WA and NSW are included here.

Preliminary data on relative risk (assessed by Odd's ratio analysis) shows a significant risk for drivers consuming alcohol, alcohol and any drug, other psychoactive drugs (sedating anti-depressants, sedating anti-histamines, anti-convulsants etc.) and any combination of two or more psychoactive drugs (Table III). There was no significant increase in rate of responsibility for cannabis positive drivers, although the risk did increase slightly for drivers with high concentrations of carboxy-THC or those in whom THC was detected. Of the 10 drivers positive for THC (and no other drug or alcohol), eight were culpable, and two were non-culpable. The odd's ratio to control drivers was calculated as 1.3 and 2.7 if THC concentrations below 5 ng/ml were ignored. The average THC blood concentrations in culpable drivers was 15 ± 14 ng/ml, whereas the average THC concentration in non-culpable drivers was 3.5 ng/ml.

DISCUSSION

Alcohol was detected in 32% of all cases surveyed in Victoria, NSW and WA, which was 4% less than for the period 1990 to 1992 [10]. On the other hand, drug use increased from 22 to 27% in this period. This increase was largely due to greater cannabis use (2%) and miscellaneous drugs (5%), although there were small increases in the incidence of benzodiazepines and opioids. Stimulant use has apparently decreased since the earlier study (Table II). A feature of a significant number of cases is the presence of more than one psychoactive drug.

These data also demonstrate the differing policies of states in regard to forensic drug testing. While a full toxicological analysis may be costly and may not always be justifiable, the information obtained on the presence of drugs in fatally injured drivers can provide very useful public health information.

Risk analysis shows some interesting trends with users of cannabis and opioids showing collectively no increase in risk, but when combined with other psychoactive drugs, a significant increase in risk occurs. Users of amphetamines and related stimulants and benzodiazepines show a trend to a higher risk, but this is not significant. Of interest is the significant increase in risk for users of psychotropic drugs, other than the main four groups discussed earlier. These are largely users of sedating anti-histamines, tricyclic anti-depressants and sedating anti-convulsants. While these drugs can affect psychomotor skills it is entirely possible that the medical profile (clinical and psychological) of the individual is a significant factor in the increased risk of being involved in a fatal collision.

TABLE III. ODD'S RATIO ANALYSIS OF DRIVERS POSITIVE FOR SELECTED DRUG GROUPS

Drug group	Total	Odds ratio
Drug negative cases	1106	1.0
Alcohol only ≥ 0.01%	522	5.5**
≥ 0.05%	471	9.1**
≥ 0.15%	335	21**
Drugs plus alcohol	205	11**
All psychotropic drugs (no alcohol)	289	1.5**
Cannabis – only (all types)	110	0.94
Cannabis – THC only	10	1.3
Stimulants – only	29	1.4
Benzodiazepines – only	24	2.3
Opioids – only	33	0.9
Other psychoactive. Drugs – only[b]	33	3.4*
Psychotropic drug combinations – only	60	4.6**

*P = 0.05, ** P < 0.01.

THC positive culpable drivers in whom no other drugs were detected had an average blood concentration higher than non-culpable drivers. The odd's ratio for THC-positive drivers was not significantly different from drug-free drivers, although it tended to be higher when THC concentrations below 5 ng/ml were ignored. These data suggest a higher accident involvement for cannabis users driving a motor vehicle shortly after consuming the drug. More cases are needed to confirm this trend.

An estimate of the drug involvement accidents can be calculated based on the assumption that all psychotropic drugs increase risk by 50%. Since the incidence of psychotropic drugs or drug combinations is 13%, a possible contribution of drugs to the road toll is 6.5%. In addition, a further 9% of drivers involve alcohol and drug combinations.

These data therefore show trends in alcohol and drug incidence in fatal accidents that suggest an increasing involvement of drugs in fatal accidents. These data also provide more evidence that drivers using psychoactive drugs are over-represented in fatal motor vehicle accidents. These data suggest that campaigns to reduce drug use are best targeted to users of drivers likely to drive shortly after consuming cannabis, using non-prescribed doses of drugs, those who mix psychoactive drugs, and those combining drugs with alcohol.

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