

# THE RELATIONSHIP BETWEEN ACCIDENT CULPABILITY AND THE PRESENCE OF DRUGS IN BLOOD SAMPLES TAKEN FROM PEOPLE INJURED IN MOTOR VEHICLE COLLISIONS

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## INTRODUCTION

Is a driver who is injured in a collision and has drugs detected in a blood sample taken, more likely to have been responsible for the collision when compared with drivers who are drug free?

For many years attention has been focused on alcohol and its role in accident causation. Escalating drug use in Australia has meant that attention needs to be given to the risk associated with driving under the influence of drugs other than alcohol. There has been limited research into the risk of non-fatal collision associated with these drugs. Data pooled from coronial investigations has shed light on the relative risk of fatal collision[1-4] This project is a collaboration between Victoria Police and Swinburne University to document the relationship between collision causation and the presence of drugs in injured drivers in Victoria.

## METHODS

Any person over 15 years of age who is taken to hospital as a result of a road collision in Victoria is required to furnish a blood sample for analysis (Road Safety Act Victoria 1986). There are three samples taken— one given to the patient, one used as a 'screening sample' and the third is subject to evidential continuity in the event of prosecution. The 'screening sample' was previously processed only for the presence or absence of alcohol. Since July 2009, it is also analysed for the presence of proscribed drugs (Methamphetamine, MDMA and cannabis). For this project, the sample is also analysed for a range of substances that are known to impair driving including opiates, benzodiazepines, antidepressants, antipsychotics, sleeping tablets and other drugs that cause sedation. The toxicology results are then linked to the police traffic database to extract the characteristics of the collision. All identifying personal information is then removed.

Collision analysis using the method developed by Terhune (USA) and Drummer (Australia) provides a rating of the driver's relative responsibility. Using drug and alcohol free drivers as the control group, an odds ratio gives an estimate of the relative risk associated with the drugs identified in collisions.[5, 6]

## RESULTS AND DISCUSSION

Preliminary data was presented at the 2009 conference demonstrating that the presence of drugs in blood samples from injured drivers can be linked to accident causation. This paper updates that information and extends the analysis to 837 cases.

The study began in December 2008 to clarify the role of licit and illicit drugs and alcohol in non-fatal collisions. This paper analyses the data from July 2009 to June 2010.

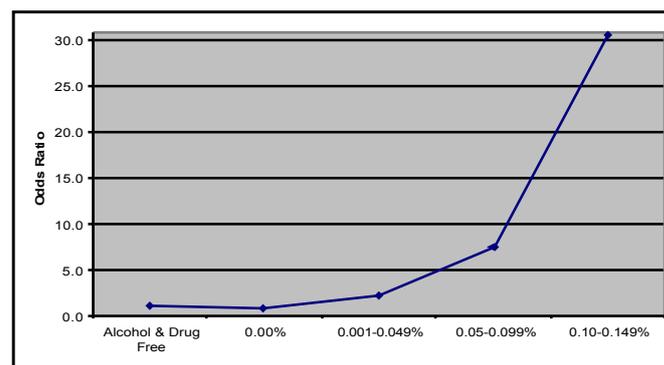
In 1990, when the focus of enforcement was on alcohol, police negotiated a code of practice with emergency physicians that permitted the use of preliminary breath testing to select patients who were alcohol positive and required to provide blood samples.

The State Coroner still required them to obtain samples from drivers in serious collisions and clinical practice meant that patients who appeared drug affected were also subject to blood

sampling. This practice meant that drivers taken to hospital from minor collisions who were not obviously impaired were not subject to blood sampling. It was estimated that 40% of drivers involved in injury collisions did not furnish a sample.

Since the preliminary data was released in 2009, hospital practitioners have been asked to ensure that all drivers have blood taken after collisions. This has increased sampling of the alcohol and drug free control group and improved the validity of the conclusions. Release of this paper to the community will provide some feedback and encourage further commitment by the profession to blood sampling after collision.

Alcohol remains the most frequently encountered drug. At the beginning of the project with the selection of alcohol positive patients for testing, 57% of samples were alcohol positive. This proportion has fallen to 34% as a result of the cooperation of emergency doctors with the request for more complete sampling. The average blood alcohol concentration (BAC) in the alcohol positive group was 0.149% (SD 0.081%, range 0.002% to 0.363%). There is a predictable exponential relationship between the measured BAC and the odds ratio.



There were 25 collisions with a blood alcohol concentration between 0.001% and 0.049%. 20 of these drivers (80%) contributed to or were responsible for the collision. This is a higher ratio than the alcohol free drivers (48%). It may be partly explained by the inclusion of high risk drivers (under 20 and over 80 years old). There were even learner drivers with low positive blood alcohol concentrations theoretically driving under supervision.

The average BAC of the drivers not responsible for the collision was 0.047% compared with 0.149% in the group of responsible drivers. The project has yet to identify a driver with a BAC above 0.05% who is not responsible for the collision.

51% of drivers with a positive BAC also had another substance in their blood, most commonly a benzodiazepine or cannabis. 14% of samples screen positive for cannabinoids; 7.3% had levels of  $\Delta$ -9-tetrahydrocannabinol (THC) indicating recent use. The metabolism and distribution of THC is complex, as is the correlation between measured levels and impairment.

It is possible to estimate the time of smoking from the measured level of THC. [7-10] The majority of the THC levels indicate smoking in the 2-3 hours before the blood was taken, implying that smoking occurred in the hour before driving. Laboratory studies and simulated driving indicate that this is the time of greatest impairment. [11-14]

14% of samples contained a benzodiazepine, most commonly diazepam. It would be tempting to consider the benzodiazepines as a group, but to do so would be quite misleading. The individual members of the group have distinctly different metabolism. For instance midazolam has a half-life of 2 hours compared with diazepam 24 to 72 hours. They also have different uses in therapeutics and different abuse potential.

Overall the odds ratio for collision was increased (OR=10.4) when diazepam was detected with a clear relationship between blood level and likelihood of being responsible for collision. Considering how commonly these drugs are prescribed, further analysis with larger numbers of subjects is required to clarify the risk when the drugs are taken in common clinical doses.

Alprazolam stood out in this family of drugs. All drivers who had alprazolam detected were responsible for the collision (n=23). Alprazolam has limited place in the treatment of panic disorder. Unfortunately it has become popular as a recreational drug and is taken in quantities in excess of the recommended dose. This is reflected in levels far above the expected therapeutic level. The average level detected was 0.138 mg/L which is in toxic range.

7% of samples contained an amphetamine-type stimulant (ephedrine, amphetamine, methamphetamine, methylene-dioxy-methamphetamine, MDMA). When a stimulant alone was present at 'therapeutic levels', there was no increase in responsibility for collision. When in combination, particularly with alcohol, responsibility for collision increased dramatically.

21.6% of samples contained an opiate, mostly morphine or codeine. The majority of the morphine was in therapeutic concentration and is likely to have come from ambulance or hospital treatment prior to the blood sample being drawn.

In 10 cases morphine and codeine were located together and it was concluded that heroin was the likely source of both substances. In 7 of these cases the driver was responsible. (6-mono-acetyl-morphine is a unique marker of heroin use, but is not currently being assayed.)

Substances detected in numbers that do not yet allow analysis include zopiclone and zolpidem, sedating antihistamines, antidepressants, antiepileptic drugs and antipsychotics.

Drug combinations are worthy of further study. When one or two substances were present, 73% of drivers were responsible for the collision. When a third substance was present 92% were responsible and if four or more substances were detected, then every driver was responsible.

## CONCLUSIONS

This study has established the methodology for performing responsibility analysis of non-fatal collisions utilising the same technique used extensively for fatal collisions. These early results confirm the risks associated with alcohol and cannabis. The benzodiazepines are of particular concern, especially alprazolam

which was mostly detected in high concentration with universal association with responsibility for collision.

This study produces a rich data set which has yet to be explored to see which substances are associated with particular sorts of collisions and explore differences in drug detection in particular demographic groups.

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