The Effects of Drugs (Other than Alcohol) on Road Safety

First Report

Incorporating Collected Papers

May 1995
In 1993 a fully loaded semi-trailer ran off the Hume Highway, through a guard railing and then drove over an embankment and landed on a railway line 9 metres below. Shortly after a freight train collided with the crashed semi-trailer. The driver, aged 19 years, was killed.

This occurred in the early hours of the morning and the night was clear and the road dry.

The Coroner's investigation revealed pseudoephedrine (a stimulant) in the blood of the deceased and containers of amphetamines and methylamphetamines (also stimulants) were found in the cabin of the semi-trailer. The Coroner also found that the probable cause of the accident was the deceased falling asleep, there being evidence of him looking very tired the day before.

The photograph on the front cover shows the upturned trailer, the freight train, an axle from the prime mover and part of the load. The top photograph on the back cover is an aerial view of the scene. The path of the semi-trailer after it ran off the highway is clearly evident. The bottom photograph shows the result of the collision between the prime mover and the locomotive.
INQUIRY INTO THE EFFECTS OF DRUGS (OTHER THAN ALCOHOL) ON ROAD SAFETY IN VICTORIA

Incorporating Collected Papers

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Membership

Mr John I. Richardson, MP
Mr David J. Cunningham, MP
The Hon. Ronald A. Best, MLC
The Hon. Burwyn E. Davidson, MLC
Mr. F. Peter McLellan, MP
The Hon. Brian W. Mier, MLC
The Hon. E. Graeme Stoney, MLC
The Hon. Douglas T. Walpole, MLC
The Hon. Sue deC. Wilding, MLC

Chairman
Deputy Chairman

Staff

Mr Geoffrey H. Westcott, Executive Officer
Mr Graeme J. Both, Senior Research Officer
Mrs Lois J. Grogan, Office Manager

The Committee's address is:
Parliament House
Spring Street
Melbourne Victoria 3002
Australia

Telephone: (03) 655 6644
Facsimile: (03) 655 6858

From 1 June 1995:
Telephone: (03) 9655 6644
Facsimile: (03) 9655 6858

International Telephone: 61 3 655 6644
International Facsimile: 61 3 655 6858

From 1 June 1995:
International Telephone: 61 3 9655 6644
International Facsimile: 61 3 9655 6858

E Mail Address: parlrc@vicnet.net.au
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety
# Table of Contents

<table>
<thead>
<tr>
<th>Membership</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table of Contents</td>
<td>iii</td>
</tr>
<tr>
<td>Committee Functions</td>
<td>v</td>
</tr>
<tr>
<td>Terms of Reference</td>
<td>vii</td>
</tr>
<tr>
<td>Committee Report</td>
<td>ix</td>
</tr>
<tr>
<td>Preface</td>
<td>xiii</td>
</tr>
<tr>
<td>Acknowledgments</td>
<td>xiv</td>
</tr>
</tbody>
</table>

## COLLECTED PAPERS

### BACKGROUND AND CONTEXT

1. *A review of the contribution of drugs in drivers to road accidents*  
   by Professor O.H. Drummer ................................................................. 1

2. *A clinician’s prospective*  
   by Dr M. McDonough ............................................................................... 29

3. *Accident Investigation Section contribution*  
   by the Victoria Police ............................................................................. 43

4. *State Highway Task Force contribution*  
   by the Victoria Police ............................................................................... 55

5. *Cannabis and road safety: An outline of the research studies to examine the effects of cannabis on driving skills and actual driving performance*  
   by Dr G.B. Chesher ..................................................................................... 67

### LAW ENFORCEMENT ASPECTS

6. *Drug law enforcement and legislation in New South Wales*  
   by Dr J. Perl ................................................................................................ 97
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety

7. The Drug Recognition Expert response
   by Sergeant T.E. Page, Los Angeles Police...............................................121

VARIous VIEWPOINTS

8. The day-to-day realities of long-distance driving and the influences which encourage illicit drug-taking
   by Mr K. Wilkie............................................................................................149

9. A prevention program: The Road Transport Forum Team 200 Project
   by Mr D. Stewart..........................................................................................157

10. Drugs and driving: The issues from the motorists' perspective
    by Ms K.D. McIntyre ..................................................................................171

11. Drug driving and drink driving: The similarities and the differences
    by Dr J. Hendtlass ......................................................................................189

12. The road transport operators' viewpoint
    by The Victorian Road Transport Association......................................205

ECONOMIC ASPECTS

13. Economic aspects of drug taking and road safety
    by Professor D.J. Collins and Ms H.M. Lapsley ....................................211

Notes on Contributors.....................................................................................231

Appendix 1: Background Information for Overseas Readers..................239
Appendix 2: Description of Organisations................................................253
Appendix 3: Recent Australian Publications............................................257
Appendix 4: Guide for Making a Submission to the Inquiry....................261
The functions of the Road Safety Committee are to inquire into, consider and report to the Parliament on any proposal, matter or thing concerned with road trauma or safety on roads and related matters, if the Committee is required or permitted so to do by or under this Act.
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety
Terms of Reference

Parliamentary Road Safety Committee

INQUIRY INTO THE EFFECTS OF DRUGS (OTHER THAN ALCOHOL) ON ROAD SAFETY IN VICTORIA

Pursuant to Section 4F(1) of the Parliamentary Committees Act 1968, His Excellency the Governor in Council refers the following matter to the Parliamentary Road Safety Committee:

To inquire into and make recommendations upon the risks associated with driving after consumption of drugs (other than alcohol), having regard to road safety, social and economic issues, and in particular to –


2. Report on the health, social and economic costs of such drug use in relation to road safety.

3. Report on methods of detection and measurement of drug (other than alcohol) use by drivers.

4. Report on methods for measuring driving impairment and crash risk of drivers who have consumed drugs (other than alcohol).

5. Report on evidence which could be admissible in determining legal sanctions against drivers who have consumed drugs (other than alcohol).

6. Report on the status and effectiveness of drug driving countermeasures, including legislation, operating in other States of Australia and other comparable overseas jurisdictions.

7. Report on ways to reduce crash risk associated with driving which is impaired by the consumption of drugs (other than alcohol) in Victoria, including the roles of research, information campaigns, public education and legislation.

Dated: 25 October 1994

Responsible Minister
W. R. BAXTER
MINISTER FOR ROADS AND PORTS

Clerk of the Executive Council
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety
APPRAOCH TO THE INQUIRY

The Inquiry was referred to the Committee by the Governor in Council because of concerns within Government, road safety agencies and the Police of the incidence of drugs in a significant number of road users involved in casualty crashes.

The subject of drugs and road safety is complex and often controversial. Whilst the use of illicit drugs features most in the community's perception (and is usually linked to the long distance transport sector), use of legal drugs and the resultant impairment of drivers is often not so well understood. Nor is the impact of mixing drugs or mixing drugs and alcohol.

The Inquiry will examine legal and illicit drugs, drug usage and the mixing of drugs and alcohol.

The community's response is usually focussed after accidents involving significant road trauma and property damage. Media attention often highlights the illegal drug taking of a driver involved in such an incident.

Some commentators conclude that draconian legislation and enforcement is required to stamp out this drug abuse. Others argue that such legislation would be ineffectual and an over-reaction to a problem that can best be treated through public education and information campaigns.

The Committee's task is to examine the issue and to consider how significant is the problem of drugs and road safety and make recommendations to the Parliament.

The Committee has resolved to publish the attached collected papers in accordance with its policy of encouraging public participation.
The collected papers have been prepared using contributions of eminent persons and practitioners from a variety of backgrounds who are in day to day contact with the issues raised by the Inquiry. The purpose is to form a focus, stimulus and catalyst for public and professional participation.

The emphasis is on:

- Raising interest and issues;
- Stimulating discussion;
- Encouraging thoughtful submissions and evidence/knowledge; and
- Encouraging development of policy options, their advantages, disadvantages and other consequences.

The Committee recommends that all those interested in making submissions should first read the collected papers.

It should be understood that this publication is not intended to be exhaustive or conclusive and that the contributions of the authors are not necessarily the view of the Committee.

Committee Room
3 April 1995
PREFACE

The contributors to the collected papers come from a variety of backgrounds and professions and this provides an illustration of the many perspectives from which people may debate matters raised by the Inquiry.

In establishing the panel of contributors the Committee has been aware that it is not possible to cover all aspects of the inquiry or all viewpoints. Those members of the public who feel there are significant omissions or an unfair balance in the overall effect will, of course, have the opportunity to rectify the matter by making a submission to the Inquiry. At the forefront of the Committee's consideration has been the practical problem of putting together a range of information and views in a succinct and publicly useful document, while allowing the contributors freedom to provide a worthwhile and stimulating contribution.

To further assist those making a submission a list of recent Australian publications on the topic is published toward the end of this report, as are some notes which may help persons presenting submissions.

The deadline for receipt of submissions to the Inquiry is 31 July 1995.

Submissions addressing the terms of reference should be forwarded to:

The Executive Officer,
Road Safety Committee,
Parliament House,
Spring Street,
Australia.

The Committee plans to table an interim report in the Victorian Parliament either late in the Spring sitting this year or early in the Autumn sitting in 1996. There will be an opportunity for public comment on the findings of the interim report prior to tabling of the final report in Parliament.
Acknowledgments

The Committee gratefully acknowledges the helpfulness and enthusiasm of the authors of the collected papers. As regards the maps contained in the Report, the Committee acknowledges the assistance of the State Data Centre, Ballarat, and Mr Gary Swinton, Cartographer at Monash University.
A REVIEW OF THE CONTRIBUTION OF DRUGS IN DRIVERS TO ROAD ACCIDENTS

Associate Professor O.H. Drummer
Assistant Director (Scientific Services)
Victorian Institute of Forensic Pathology
and
Department of Forensic Medicine, Monash University

Professor Drummer looks at the pharmacology of selected drugs; the prevalence of drugs in dead (and other) drivers; does drug impairment contribute to accidents? legal aspects of driving under the influence of drugs; and difficulties with legal measurements of drug use.

Professor Drummer's paper is not meant to be exhaustive or necessarily conclusive but rather seeks to provide information to readers which he believes is relevant to the general discussion on the role of drugs in driving. His contribution does not necessarily reflect the views of the Victorian Institute of Forensic Pathology or Monash University.

Contents:

1. Introduction

2. Type of impairing drugs

3. Pharmacology of selected drugs
   3.1 Central nervous system stimulants
   3.2 Central nervous system depressants
   3.3 Narcotic analgesics
   3.4 Cannabis

4. Alcohol and accidents

5. Drugs and accidents
   5.1 Prevalence in fatally injured drivers
   5.2 Prevalence in other drivers
6. Does impairment actually cause accidents?

7. Truck drivers
   7.1 Surveys of truck use
   7.2 Prevalence of drugs in fatally-injured truck drivers
   7.3 Selective case reports for Australian truck accidents

8. Forensic aspects of drug usage

9. Legal measurements of drug use
   9.1 Marijuana
   9.2 Other drugs

10. Conclusions

   Appendix 1:
   Effect on the standard deviation of lateral position of drivers taking marijuana compared with alcohol

   Appendix 2:
   Basic pharmacokinetic parameters for selected drugs
1. INTRODUCTION

There are numerous drugs available either over-the-counter, at a pharmacy, by prescription from a medical practitioner, or through illegal means. These are capable of adversely affecting brain functions to the point where they may cause impairment of driving skills. The main drugs in this category include the tranquillisers, sleeping pills, many of the analgesics including codeine, slimming tablets and the related stimulants including the ephedrines and the amphetamines. Marijuana is also capable of impairing driving skills.

While many drugs are capable of causing impairment, it is not correct to assume because a drug is taken or found in a person's blood that it necessarily has caused measurable impairment. In most cases, where therapeutic drugs are taken according to directions, significant impairment is unlikely. Impairment is usually only likely when a drug is used to excess or when more than one drug is taken together. The use of multiple drugs, particularly combinations such as alcohol and marijuana, multiple tranquillisers, or analgesics with other drugs will invariably cause significant impairment, increasing substantially the probability of an accident.

This discussion will focus on a description of the main drugs found in drivers and the extent they may cause impairment. Difficulties in assessing drug effects in drivers will also be discussed.

2. TYPE OF IMPAIRING DRUGS

The principal drugs of concern are those drugs which can affect parts of the brain involved in controlling our ability to react to external stimuli and which decrease the level of our skills in driving motor vehicles.

The principal drugs of concern can be divided into the following categories:

Central nervous system (CNS) depressants

1 Ethanol: All alcoholic beverages

2 Anti-depressants:
Tryptanol, Sinequan, Prothiaden etc.

3 Anti-histamines: 
   Sedating types eg. Avil, Fabahistin, Phenergan, Polaramine, Vallergan etc.

4 Benzodiazepines: 
   Valium, Ducene etc. (diazepam)
   Rohypnol (flunitrazepam)
   Normison, Euhypnos etc. (temazepam)
   Serepax etc. (oxazepam)

5 Barbiturates: 
   Amytal, Neuramyl, Amylobarbitone

6 Major Tranquillisers: 
   Anti-psychotics eg. Largactil, Melleril etc.

Narcotic analgesics

7 Opiates: 
   Heroin
   Morphine (Mophalgin etc)
   Codeine (Panadeine, Codral forte etc)
   Methadone (Physeptone)
   Pethidine
   Propoxyphene (Doloxene, Digesic, Capadex)

Cannabis

8 Marijuana: 
   Various forms of Cannabis

Central nervous system stimulants

9 Amphetamines: 
   'Speed' (methamphetamine)
   'Ecstasy'(methylenedioxy-methamphetamine)
A Review of the Contribution of Drugs in Drivers to Road Accidents

10. Other Stimulants:

Ephedrine
Pseudoephedrine (Sudafed etc)
Phentermine (Duromine)
Cocaine

Inhalants

11. Inhalants:  

Petrol, solvents, propane (LPG), butane lighter fluid

Other Drugs

12. Hallucinogens:  

LSD, Ecstasy (a designer amphetamine)

13. Phencyclidine:  

Usually abbreviated as PCP

3. PHARMACOLOGY OF SELECTED DRUGS

The pharmacological effects of some classes of these drugs are briefly described below.

3.1 Central nervous system stimulants

Stimulants such as the amphetamines, the ephedrines and the 'slimming pills' increase wakefulness and alertness when first used. Their effects are similar to that of adrenalin, which is released by the body when faced with fright or for example when about to sit for an examination or take part in an athletic event.

The stimulant nature of these drugs is also associated with elevations in heart rate, blood pressure and general metabolic rate. Mood swings from depression to nervousness and agitation are not uncommon. Hyperactivity, nervousness and disinhibited behaviour are part of this profile and are generally the observed signs of impairment. Unpredictable and often bizarre behaviour and paranoid psychoses can also occur, particularly with repeated use.
Repeated use causes fatigue even though these drugs act initially to reduce fatigue. Fatigue is also accentuated when stimulants reach low concentrations in blood since they are no longer able to reverse the effects of sleeplessness. Chronic lack of sleep in this group of drivers further worsens the severity of fatigue.

Because of this 'withdrawal effect' of stimulants, the blood concentration of a drug cannot necessarily be used to predict a likely drug effect since low concentrations may be as dangerous as high concentrations. For this reason blood measurements cannot be interpreted without examination of the individual concerned.

Designer amphetamines such as methylenedioxy-methamphetamine (MDMA or Ecstasy), para-methoxy-amphetamine (PMA), dimethoxy-amphetamine (DMA) are more potent, requiring less drug for an effect. They also can cause hallucinations and convulsions which further increase the dangers when driving under the influence of these drugs.

Cocaine is often placed into this category since it also acts as a stimulant. While cocaine has a slightly different profile of action to the amphetamine-based stimulants, its mechanism of action is also related to prolonging the action of adrenalin and related sympathomimetics at nerve endings. Its duration of action is usually quite short (1–2 hours) and because cocaine is not widely used in Australia it is therefore not often seen in the blood of drivers.

More recently the natural product, Khat, has been shown to be used by some groups. The active principle of this substance, cathinone, is closely related to the amphetamines and produces qualitatively similar effects to amphetamines.

### 3.2 Central nervous system depressants

This list includes a large number of drugs including alcohol, the minor tranquillisers (benzodiazepines) and major tranquillisers (anti-psychotics), anti-depressant, anti-convulsant and anti-histamine drug classes. Barbiturates are also included in this category, although their availability and use in Australia are uncommon.

These drugs slow the action of the brain by sedating and impairing coordination and reaction times. Slow reflexes and slurred speech are also
expected. When a person is affected by a CNS depressant the effects are usually indistinguishable from those observed for alcohol, the so-called 'drunken' look.

Impairment is often associated with horizontal and vertical gaze nystagmus in the eyes. 16

3.3 Narcotic analgesics

These drugs include heroin, morphine, codeine, propoxyphene, oxycodone, pethidine and methadone as well as a number of other opioids all of which have pharmacological properties similar to morphine. 17

All are powerful pain relievers and act to sedate the user resulting in sleepiness, slow reflexes and changeable moods. Recreational users may also experience psychological problems if regularly used and usually develop a dependence to the drug. Withdrawal symptoms can result in a very unstable personality including physical discomfort and irritability.

Many of these drugs are widely available as either over-the-counter medications, (eg. codeine in Panadeine) or through prescription for minor to major pain, (eg. codeine in Panadeine forte, oxycodone and propoxyphene).

3.4 Cannabis

Cannabis (or marijuana) contains tetrahydrocannabinol (THC) as the main active ingredient.

The effects of THC when smoked is to provide a sense of euphoria and relaxation. High doses may depress the central nervous system similar to CNS depressants by impairing co-ordination, reaction time, sense of time and other intellectual functions. Effects on the mind may also occur causing distortions in the person's perception of time and alterations in their perception of their whereabouts.

The effects of marijuana usually last only for a few hours, however repeated or regular use may cause the effects to persist for much longer. The dose of THC received by the body is variable and depends on the manner of inhalation (through cigarette, bong etc), the amount inhaled and the strength of marijuana. Cannabis plant (leaves and flower heads) may contain from 0.5 to 5% THC, with some varieties having a THC content in
excess of 15%. Hashish or hash oil, a resin or oil obtained from the plant may contain much larger amounts of THC. Consequently the amount taken in by the body can be substantially different depending on the form used.

4. **ALCOHOL AND ACCIDENTS**

Alcohol is recognised as a leading contributor to serious road traffic accidents throughout the world. This is due to the strong impairing potential of alcohol on psychomotor and cognitive skills and the high level of excessive use of alcohol in the driving community.

Recent data from the Victorian Institute of Forensic Pathology show that 32% of fatally injured drivers in Victoria have a blood alcohol concentration (BAC) over 0.05% with an average BAC of 0.16%, some 3 times the legal limit! Drivers with BACs over 0.10% have been shown to have accident rates over 10-times higher than alcohol-free drivers. 19 20

The involvement of alcohol at these rates is not unique to Australia. Recent data in the USA (1993) from almost 2 000 driver deaths across seven States show that 52% of all fatalities involved alcohol. 21

Drugs other than alcohol are also important factors in some accidents.

5. **DRUGS AND ACCIDENTS**

The role drugs (other than alcohol) play in serious traffic accidents is not as well defined as alcohol.

5.1 **Prevalence of drugs in fatally injured drivers**

A recent study conducted in Victoria but involving a survey of drivers killed in traffic accidents in Victoria, New South Wales and Western Australia over the period 1990-1993 showed that the most commonly detected drugs were marijuana, the amphetamines and related stimulants, the benzodiazepines, and opiate-like drugs such as morphine, codeine and methadone 22 This study conducted by the Victorian Institute of Forensic Pathology showed that 49% of 1 045 fatally-injured drivers had at least one drug including alcohol detected. Drugs other than alcohol were detected in 22% of these drivers with the most frequently detected drug being cannabis which was found in 11% of these drivers.

These data are shown in Table 1.
A Review of the Contribution of Drugs in Drivers to Road Accidents

Table 1. Prevalence of Drugs in 1045 Dead Drivers *

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Number</th>
<th>% of Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol (&gt;0.01%)</td>
<td>382</td>
<td>36%</td>
</tr>
<tr>
<td>Alcohol (&gt;0.05%)</td>
<td>345</td>
<td>33%</td>
</tr>
<tr>
<td>Drugs:</td>
<td>234</td>
<td>22%</td>
</tr>
<tr>
<td>Cannabis</td>
<td>112</td>
<td>11%</td>
</tr>
<tr>
<td>Stimulants</td>
<td>39</td>
<td>3.9%</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>32</td>
<td>3.1%</td>
</tr>
<tr>
<td>Opiates</td>
<td>28</td>
<td>2.7%</td>
</tr>
<tr>
<td>Other Drugs</td>
<td>59</td>
<td>5.6%</td>
</tr>
</tbody>
</table>

(* Some cases had 2 or more drugs detected hence totals exceed 100%)

Amphetamines and related stimulants were detected in 3.9% of the cases. Four cases involved phentermine, 13 involved methamphetamine or amphetamine, 12 cases involved pseudoephedrine, 13 involved ephedrine and 1 involved methylenedioxy-methamphetamine.

Benzodiazepines were detected in 32 cases or 3.1% of the cases. The benzodiazepines detected were diazepam (17 cases), flunitrazepam (6 cases), nitrazepam (2 cases), oxazepam (9 cases), temazepam (2 cases) and clonazepam (1 case).

Opiates were detected in 28 cases or 2.7% of the dead drivers. The opiates represented were codeine (17 cases), methadone (7 cases), morphine (9 cases) and pethidine (1 case). Four cases possibly involved the use of heroin.

Other drugs were detected in 59 cases or 5.6% of the dead drivers. Thirty drugs were represented in these cases. The most common drugs were analgesics (21 cases), anti-depressants (11 cases), anti-convulsant drugs (7 cases) and the non steroidal anti-inflammatory drugs such as naproxen and ibuprofen (7 cases). One case involved cocaine.
5.2 Prevalence of drugs in other drivers

The prevalence of drugs other than alcohol in non-fatally injured drivers is less well known, since random surveys of the driving population are much more difficult to perform. Drivers apprehended by police at random breath testing stations, or following an accident or following an interception usually involve a suspicion by police of drug use due to the driver's 'unusual' behaviour or poor driving skills. Consequently these cases do not represent a reflection of the overall driving population. The number of drug impaired persons fitting this category is difficult to estimate since it depends on the ability to 'detect' these drivers. In New South Wales recent data (1992) suggest that approximately 300 drivers are booked each year for drug driving offences. The actual number may be significantly higher if police are trained to recognise drug impairment.

For example, drug recognition programs (DRP) in the USA commonly show one or more psychotropic drugs (ie. mind-altering drugs) in approximately 90% of apprehended drivers thought to be drug impaired. Statistics from the USA show the prevalence of drugs in drivers similar to that detected in fatally injured drivers (Table 2). These data derive from 1842 drug impairment evaluations on drivers over 5 States. It is important to realise from these studies that all of these drugs are not only known to cause impairment but that the drivers also exhibited visible impairment to police officers trained to recognise drug impairment.

Table 2. Prevalence of Drugs in Impaired Drivers in the USA

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Number</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannabis</td>
<td>857</td>
<td>37.8%</td>
</tr>
<tr>
<td>CNS stimulants</td>
<td>546</td>
<td>24.1%</td>
</tr>
<tr>
<td>CNS depressants</td>
<td>431</td>
<td>19.0%</td>
</tr>
<tr>
<td>Narcotic analgesics</td>
<td>285</td>
<td>12.6%</td>
</tr>
<tr>
<td>PCP</td>
<td>109</td>
<td>4.8%</td>
</tr>
<tr>
<td>Inhalants</td>
<td>26</td>
<td>1.1%</td>
</tr>
<tr>
<td>Hallucinogens</td>
<td>14</td>
<td>0.6%</td>
</tr>
</tbody>
</table>
While inhalants were detected, their frequency was relatively low. The same can be said of the hallucinogens and PCP. These 3 drug types are probably even less represented in Australia given their low general availability on the streets. 27

6. DOES IMPAIRMENT BY DRUGS ACTUALLY CAUSE ACCIDENTS?

While drugs have the potential to adversely affect skills and are represented in drivers assessed to be visibly impaired by specially trained police officers or clinical forensic physicians, it is not clear if this necessarily translates to an increased accident risk. 28

Any link between drug usage and an increased road accident risk leading to hospitalisation is equivocal. While one study has shown that people who used minor tranquillisers in the past 3 months had a 5-times higher risk of being involved in a serious road traffic accident and being hospitalised, two other studies have shown no increase in accident risk with the use of benzodiazepines or sedatives. 29 30

In Australia a procedure has been developed to examine the role of drugs in driving. 31 This analysis involves an examination of 8 factors known to be important in determining contribution to a road accident. These factors include driving and weather conditions, roadworthiness of the vehicle, obeyance of road laws, driver fatigue etc. This study involved examining over 1 000 cases of drivers killed in road accidents throughout Victoria, New South Wales and Western Australia.

These 8 factors were examined in each case and mitigated the driver from full responsibility if the factor contributed to the accident. This approach was used to compare the incidence of drugs in drivers deemed to be responsible from those deemed to be not responsible for the accident. With this approach, it was expected that if drugs contributed to road accident rates (or risk) then the drugs would be more prevalent in 'responsible drivers'. 32

As expected, alcohol exhibited a big increase in the responsibility rate (Table 3). These drivers were almost 7-times more likely to be responsible for the accident than drug-free drivers. Drivers with drugs in their blood (other than alcohol) showed a much smaller increase than seen with alcohol.
Table 3. Relative Accident Risks of Dead Drivers

<table>
<thead>
<tr>
<th>Drug Group</th>
<th>Number of Drivers</th>
<th>Accident Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug-free</td>
<td>532</td>
<td>1.0</td>
</tr>
<tr>
<td>Alcohol</td>
<td>286</td>
<td>6.8</td>
</tr>
<tr>
<td>Opiates</td>
<td>12</td>
<td>2.4</td>
</tr>
<tr>
<td>Stimulants</td>
<td>16</td>
<td>1.4</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>10</td>
<td>1.0</td>
</tr>
<tr>
<td>Cannabis</td>
<td>41</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Opiates showed a more than doubling in risk and stimulants showed a 40% increase, although neither were statistically significant. Drivers with benzodiazepines (minor tranquillisers) in their blood showed no increase in responsibility rate while drivers using marijuana actually showed a reduction in responsibility rate!

These results should be treated with some caution since the actual number of drivers in the various drug groups were quite small. For example there were only 12 drivers in over 1000 fatalities who only had an opiate-like drug in their blood at the time of the accident. Consequently the relative accident risk is subject to considerable statistical error. The author is continuing these analyses to obtain larger numbers.

There were in fact more drivers with drugs of the groups shown above, but most of these involved more than one drug which made analysis of the effects of one drug type very difficult.

It was of considerable interest that multiple drug cases were invariably responsible for the road accident. For example, of the 26 drivers in whom more than one psychoactive drug was detected (alcohol excluded), 22 were deemed responsible, 2 were partly responsible and only 2 were not responsible. The most frequent combination was a stimulant and an opiate (6 cases) and more than one tranquilliser (4 cases). A summary of these results is shown in Table 4.
Table 4  Responsibility Rate in Multiple Drug Cases

<table>
<thead>
<tr>
<th>Drug Combination</th>
<th>Number of Drivers</th>
<th>Responsibility Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug-free drivers</td>
<td>532</td>
<td>70% responsible</td>
</tr>
<tr>
<td>Alcohol-only drivers</td>
<td>286</td>
<td>94% responsible</td>
</tr>
<tr>
<td>Cannabis plus another drug</td>
<td>6</td>
<td>4 responsible (67%)</td>
</tr>
<tr>
<td>Stimulant plus another drug</td>
<td>9</td>
<td>All responsible (100%)</td>
</tr>
<tr>
<td>Opiate plus another drug</td>
<td>13</td>
<td>12 responsible (92%)</td>
</tr>
<tr>
<td>Benzodiazepine plus another drug</td>
<td>11</td>
<td>10 responsible (91%)</td>
</tr>
<tr>
<td>Other drug combinations</td>
<td>5</td>
<td>4 responsible (80%)</td>
</tr>
</tbody>
</table>

The responsibility rate for drivers with a combination of drugs in their blood was similar to alcohol positive drivers and to drivers with alcohol and another drug. Drivers with alcohol and another psychoactive drug in their blood are shown below in Table 5.

These results confirm the dangers of multiple drug use. While alcohol is still a predominant factor, multiple use of psychoactive drugs is probably as dangerous as alcohol itself.

It was of some interest that cannabis showed a negative effect on relative risk suggesting that cannabis use actually reduced the responsibility rate. This may suggest either that cannabis is protective and actually increases driving ability or, more likely, that drivers taking cannabis over-compensate for any loss of driving skills. Over compensation may be caused simply by slowing down and avoiding adverse driving situations. This phenomenon has also been seen elsewhere in similar studies conducted in the USA.
Table 5 Responsibility Rate in Dead Drivers With Alcohol and Another Drug

<table>
<thead>
<tr>
<th>Drug Combination</th>
<th>Number of Drivers</th>
<th>Responsibility Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug-free drivers</td>
<td>532</td>
<td>70% Responsible</td>
</tr>
<tr>
<td>Alcohol-only drivers</td>
<td>286</td>
<td>94% responsible</td>
</tr>
<tr>
<td>Alcohol plus cannabis</td>
<td>63</td>
<td>56 responsible (89%)</td>
</tr>
<tr>
<td>Alcohol plus stimulant</td>
<td>10</td>
<td>All responsible (100%)</td>
</tr>
<tr>
<td>Alcohol plus opiate</td>
<td>4</td>
<td>3 responsible (75%)</td>
</tr>
<tr>
<td>Alcohol plus benzodiazepine</td>
<td>11</td>
<td>All responsible (100%)</td>
</tr>
</tbody>
</table>

These observations with cannabis raise some important issues about the connection between drug use and impairment and how this translates to road accident risk. Observations with cannabis suggest that an impairing drug actually reduces accident rates. A number of anecdotal reports suggest that cannabis-using drivers actually drive more slowly and take fewer risks. Of course it is likely that police only pick up drivers who are likely to be substantially impaired and who may either be using large amounts of the drug or who have recently used the drug and are still experiencing the acute adverse effects of cannabis. Most casual users of cannabis not showing signs of impairment (usually because their driving is apparently normal or have not been involved in an accident) are probably not detected by police officers.

Cannabis use in the general community has been widespread for many years both here and overseas and is the most commonly used illicit drug in Australia and the USA. The usage of cannabis among high school students in the USA declined from 60% in 1980 to 37% in 1991. Surveys show that 15% of males and 6.5% of females are weekly users of cannabis. Data in Victoria suggest that 29% of the population have used cannabis with the rate being 45% in the 18–24 year-old group. In comparison, persons who have used amphetamine and heroin rate at 6.9% and 1.9%, respectively.
Studies in instrumented cars in The Netherlands under controlled driving conditions on open highways also show that drivers who have smoked cannabis tend to drive more slowly although their ability to keep the car in the lane is impaired. 39

These authors show that common doses of smoked cannabis produce similar effects to alcohol at a BAC of 0.05% on the ability to maintain lane control (lateral deviation movement test) and that these effects increase with the amount of cannabis consumed (see Appendix I). However studies in urban traffic show that low doses of cannabis (100 µg THC) do not impair driving ability to the same extent as alcohol at a BAC of 0.04% and a high dose of cannabis (300 µg THC) produces a road tracking impairment less that seen with a BAC of 0.08%. 40

Furthermore these authors concluded that 'drivers under the influence of cannabis tend to over-estimate the adverse effects of the drug on their driving quality and compensate when they can', while 'drivers under the influence of alcohol tend to under-estimate the adverse effects of the drug on their driving quality and do not invest compensatory effort'.

More work in this area is required, particularly differences in driving ability during the time course of cannabis consumption as well as the effect of combining alcohol with cannabis use.

The Australian collaborative study also showed that the relative risk of drivers depends on the age and sex of the driver, the type of motor vehicle driven and the type of drug found in the blood of the driver (Table 6).

This study shows that drivers under 25 have higher responsibility rates than drivers in the older groups. Male and female drivers had very similar responsibility rates. Truck drivers had the lowest responsibility rate while drivers of motor cars had the greatest responsibility rate. Motorcyclists exhibited a responsibility rate between that of truck drivers and drivers of motor cars.

7. TRUCK DRIVERS

Truck drivers represent an important sub-class of driver since they are a group who drive for a living.
Table 6  Responsibility Rates in Drug-free Drivers

<table>
<thead>
<tr>
<th>Group</th>
<th>Accident Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 25 years</td>
<td>1.0*</td>
</tr>
<tr>
<td>26 – 35 years</td>
<td>0.6</td>
</tr>
<tr>
<td>36 – 59 years</td>
<td>0.6</td>
</tr>
<tr>
<td>Over 60 years</td>
<td>0.7</td>
</tr>
<tr>
<td>All males</td>
<td>1.0*</td>
</tr>
<tr>
<td>All females</td>
<td>1.1</td>
</tr>
<tr>
<td>All motor cars</td>
<td>1.0*</td>
</tr>
<tr>
<td>All motor cyclists</td>
<td>0.7</td>
</tr>
<tr>
<td>All truck drivers</td>
<td>0.4</td>
</tr>
</tbody>
</table>

(* Reference group rate of 1.0.)

7.1  Surveys of Drug Use

Two surveys in Australia show that the use of drugs by truck drivers to stay awake varies from approximately 25% to approximately 50%. Random surveys in the USA at truck weighing stations have shown that 29% of truck drivers had drugs in their blood or urine. Stimulant use occurred at approximately 17%, with cannabis at 15% and alcohol at 1%. Since over 10% of the drivers declined to be surveyed the true rates are likely to be higher.

The type of drugs detected in these surveys included:

- Methamphetamine and amphetamine;
- Ecstasy (a designer amphetamine);
- Phentermine and other slimming tablets;
The effects of these drugs have been discussed earlier. Caffeine, while a component of tea, coffee and chocolate can also be obtained as tablets over-the-counter in pharmacies (e.g. 'No Doz'). Caffeine is also a stimulant if taken in sufficient amounts and consequently may have adverse impairing effects.

### 7.2 Prevalence of drugs in fatally-injured truck drivers

A study of 168 fatally-injured truck drivers in the USA showed evidence of drugs in 67% of these drivers of which half had psychoactive drugs or alcohol in their blood or urine. Stimulants were present in 11.3% whereas cannabis and cocaine had a prevalence of 12.5% and 8.3% respectively. This is described in Table 7.

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>12</td>
</tr>
<tr>
<td>Stimulants</td>
<td>11.3</td>
</tr>
<tr>
<td>Amphetamines</td>
<td>7.1</td>
</tr>
<tr>
<td>Other stimulants</td>
<td>7.1</td>
</tr>
<tr>
<td>Cocaine</td>
<td>8.3</td>
</tr>
<tr>
<td>Cannabis</td>
<td>12.5</td>
</tr>
<tr>
<td>Other psychoactive drugs</td>
<td>1.8</td>
</tr>
<tr>
<td>Non psychoactive drugs</td>
<td>7.7</td>
</tr>
</tbody>
</table>

In the Australian collaborative study truck drivers represented 47 of the cases (or 4.5% of the study population of 1045 dead drivers). Amphetamines and related stimulants were detected in 10 cases or 21%. These included ephedrine (5 cases), methylamphetamine (2 cases),...
pseudoephedrine (3 cases) and phentermine (2 cases). Two drivers had 2 stimulants detected. Five drivers were using the 'legal' stimulants pseudoephedrine and phentermine.

Alcohol was detected in 19% with an average BAC of 0.08% (range 0.01 – 0.21%). Cannabis was detected in 2 drivers.

7.3 Selected case reports for Australian truck accidents

As an example of drug involvement in truck related casualty crashes, the following are three cases drawn from the Victorian Coroner's records.

Case 1:

This 29-year-old male was driving his Mack semi-trailer loaded with cattle north along the Hume highway. The deceased left the road on a straight section for no apparent reason and struck a tree in the middle of a median strip. The accident occurred in the early hours of the morning. A number of legally available stimulant drugs were detected in the truck including Duromine (phentermine) and Sudafed (pseudoephedrine). Toxicological analysis of his blood confirmed the excessive use of these drugs.

The cause of the accident can be attributed to excessive fatigue caused by excessive driving hours and contributed to by the excessive use of stimulant drugs.

Case 2:

This 29-year-old male driver of a heavy truck hit the rear of a stationary truck on a major highway leading towards Melbourne causing a fire in both trucks. The stationary truck was parked hard against the left lane with his lights on. Toxicology showed excessive concentrations of the legally available stimulant Sudafed in his blood.

This accident reinforces the problems of drivers who have either fallen asleep at the wheel or who have lost the ability to properly perceive and respond to changing driving conditions.
Case 3:

This 19-year-old driver of a semi-trailer ran off the Hume highway in the early hours of the morning, over turned and ran down a railway embankment on to the interstate railway tracks. The driver was killed and the prospect of a train ploughing in to the truck causing a possible major loss of life was narrowly avoided by luck rather than design. The driver was found to be driving excessive hours and had stimulants present in his blood.

This case represents another case of truck drivers falling asleep as a result of excessive driving hours. The use of stimulants increases the prospects of fatigue and sleepiness when their effects wear off.

8. FORENSIC ASPECTS OF DRUG USAGE

The detection of drug-using drivers by police in Australia is much more difficult. While the data presented thus far provide an overall picture of drug use in drivers, a concept fundamental to any proof of impairment is that:

*The presence of a drug in the driver's blood (or urine) does not prove the driver was necessarily impaired at the time of the accident or interception by police.*

While a drug may belong to a drug group known pharmacologically to be capable of impairing driving skills, its use by a person or its presence in a bodily fluid does not mean the drug actually caused impairment.

The best example of this concept is alcohol. Most people suffer little or no detectable impairment by alcohol when consumed in small amounts, eg. one or two social drinks. In fact the studies described earlier confirm this lack of significant impairment with relatively low amounts of alcohol. Our laws also recognise this and allow a person to have up to 0.05% alcohol in their blood before impairment is assumed (and likely in most persons). 47

The use of prescribed amounts of the minor tranquilliser Valium (eg. 5 mg) is unlikely to cause significant impairment in most people. Similar considerations apply for most of the prescribed medications known to be capable of causing impairment. While some persons are more affected than others, many of the adverse effects decline with repeated usage. Persons
using more than the prescribed amounts or persons on very high prescribed doses are likely to show impairment.

Most of the overseas studies suggest that 'impaired drivers' are those persons using (or abusing) drugs for recreational reasons rather than the average citizen taking their prescribed medications.

Unfortunately there are only very poor correlations between the dose of most drugs and blood concentrations. Except in extreme cases, it is very difficult to predict from blood concentrations a likely dose used, and therefore, if impairment was likely. Urine drug concentrations are even more difficult to correlate to a dose.

For these reasons it is inappropriate for blood tests to be performed unless there is a measure of likely impairment taken at the time the blood sample is withdrawn. This measure of impairment serves two important functions in that it:

a) provides the police officer a reasonable cause for a blood (or urine) sample to be taken, and

b) provides a quantitative pharmacological measure of impairment which can be linked to a blood test for an impairing drug.

Without this measure of impairment it is my view that a conviction based solely on a forensic bodily fluids test is invalid. Of course this presumes that the police officer (or court) has to prove impairment existed at the time of the interception or accident! However without such proof of impairment, many persons would be unjustly convicted even if they were using illegal drugs.

Injury to offending drivers often prevents assessment. In those cases observations by witnesses of the driving behaviour prior to an interception by police or an accident can be very helpful in assessing whether impairment was likely.

9. FORENSIC MEASUREMENTS OF DRUG USE

9.1 Cannabis

Proof by laboratories of cannabis use normally occurs by the measurement of the cannabis metabolite, carboxy-THC in urine or blood. Since this
metabolite may persist in blood for several days and in urine for weeks following cannabis use, the presence of carboxy-THC in blood or urine cannot prove that the person was necessarily impaired at the time of the accident. For this reason it may be advisable for laboratories to measure psychoactive THC in blood rather than the inactive carboxy-THC.

The advantage of measuring THC in blood is that, when present, THC concentrations in excess of 5 ng/mL indicate recent use of cannabis as distinct from past use. Urinary carboxy-THC may be detected in urine for 2–6 weeks following cannabis use while THC is present in blood for several hours. Impairment by cannabis therefore more closely correlates with blood THC than any other cannabinoid.

Although measurement of psychoactive cannabis in blood may provide a more reliable assessment of recent cannabis use, it is still not possible to use blood concentrations of THC to predict likely driver impairment.

Further research is required to investigate the relationship between blood concentrations of THC and other cannabinoids with degree of impairment.

### 9.2 Other drugs

Similar considerations apply for all other drugs, although it is usual to measure the actual amount of the parent drug (rather than a metabolite).

Appendix II summarises the common lowest doses used, the likely blood concentrations achievable following these doses and estimates of the rate of removal of drug by human metabolism.

Blood concentrations are only a guide since they vary depending on the person, time since last dose and method of administration (eg. oral, injection, smoking etc).

The ability of laboratories to detect drugs in blood varies from one laboratory to another since this is dependent on the techniques used and the quality of the blood sample. (Since discussion on such techniques is very technical I have omitted this area from this paper.)

Urinary drug concentrations will be detectable for longer periods than for blood concentrations, however drugs may more likely be present in urine when no impairment is observable to a trained eye. Blood is therefore the preferred specimen in impairment testing, although urine offers advantages
since it requires no special training to collect and contains drugs in higher concentrations than blood (and therefore drugs are more easily detectable by laboratories).

10. CONCLUSIONS

- The most common drugs (other than alcohol) detected in drivers killed in Australian accidents are in decreasing prevalence – cannabis, stimulants, opiates and the minor tranquillisers.

- All of these drugs have the capability to impair driving skills particularly when misused.

- The prevalence of psychotropic drugs in dead drivers in Australia is approximately 20%, although the number of drivers actually impaired by these drugs is unclear and is likely to be substantially less than 20%.

- The most common drugs detected in drivers assessed as being 'impaired' by drug recognition experts in the USA are also cannabis, stimulants, opiates and the minor tranquillisers.

- The ability of these drugs to actually increase the risk of a road accident in the Australian collaborative study is variable. Some, such as the opiates and stimulants increase risk while cannabis may actually reduce risk when used in a social setting. Benzodiazepines have not been shown to affect the risk.

- Truck drivers have a higher use of stimulant drugs compared to drivers of motor cars, and are unlikely to use drugs which cause drowsiness and accentuate fatigue such as alcohol, cannabis, minor tranquillisers and opiates.

- The risk associated with drug use in truck drivers is less clear due to the relatively small numbers of fatally-injured drivers, although the stimulants may have the largest effect on increasing risk.

- For comparison, alcohol use is still the major drug factor contributing to crashes on Australian and overseas roads, with approximately 30% of dead drivers over 0.05% BAC.

- Impairment cannot be established solely by the presence of an impairing drug in blood. Rather, the presence of a drug in a biological
specimen must be compatible with some positive visual assessment of impairment.

• A standardised approach for assessment of impairment is required which is then linked to the result of a blood test showing the presence of an impairing drug.

• Multiple drug use is common and generally leads to significant impairment.
Appendix I

Figure showing the effect on the Standard Deviation of Lateral Position (SDLP) on drivers taking marijuana (As doses of THC) compared with the effects seen with known blood alcohol concentrations. After Robbe et al. 49
Appendix II

Basic Pharmacokinetic Parameters for Selected Drugs

<table>
<thead>
<tr>
<th>Drug</th>
<th>Dose</th>
<th>Blood Levels</th>
<th>Half-life</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol</td>
<td>25-40 g</td>
<td>0.05%</td>
<td>0.01-0.02%/h</td>
</tr>
<tr>
<td><strong>CNS Stimulants</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methamphetamine</td>
<td>20 mg</td>
<td>0-0.2 µg/ml</td>
<td>2-6 h</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>20 mg</td>
<td>0-0.2 µg/ml</td>
<td>4-6 h</td>
</tr>
<tr>
<td>Pseudoephedrine</td>
<td>100 mg</td>
<td>0-1.0 µg/ml</td>
<td>4-6 h</td>
</tr>
<tr>
<td>Cocaine</td>
<td>20 mg</td>
<td>0-0.2 µg/ml</td>
<td>1 h</td>
</tr>
<tr>
<td><strong>Cannabis</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tetrahydrocannabinol (THC)</td>
<td>200 µg</td>
<td>0-25 ng/ml</td>
<td>0.5 h</td>
</tr>
<tr>
<td>Carboxy-THC</td>
<td>-</td>
<td>0-50 ng/ml</td>
<td>24-72 h</td>
</tr>
<tr>
<td><strong>Opiates</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morphine (heroin)</td>
<td>20 mg</td>
<td>0-0.1 µg/ml</td>
<td>2-4 h</td>
</tr>
<tr>
<td>Methadone</td>
<td>30 mg</td>
<td>0-0.1 µg/ml</td>
<td>12-36 h</td>
</tr>
<tr>
<td>Codeine</td>
<td>30 mg</td>
<td>0-0.2 µg/ml</td>
<td>2-4 h</td>
</tr>
<tr>
<td><strong>Benzodiazepines</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diazepam</td>
<td>5 mg</td>
<td>0-0.5 µg/ml</td>
<td>12-36 h</td>
</tr>
<tr>
<td>Flunitrazepam</td>
<td>2 mg</td>
<td>0-0.02 µg/ml</td>
<td>12-24 h</td>
</tr>
<tr>
<td>Oxazepam</td>
<td>15 mg</td>
<td>0-0.5 µg/ml</td>
<td>5-6 h</td>
</tr>
<tr>
<td>PCP</td>
<td>2 mg</td>
<td>0-0.2 µg/ml</td>
<td>10-48 h</td>
</tr>
</tbody>
</table>

µg/ml = Micrograms per millilitre
mg = milligrams
g = gram
Impairment is defined here to mean a state whereby the person's coordination and reactions have been adversely affected.

CNS stands for Central Nervous System, the part of the brain controlling the functioning of our nerves.

Common alcohol available in numerous forms from light beer (1-2.5%), full strength beer (~5%), wine (8-12%) and spirits (20-40%).

Current legal blood limit in Victoria and other Australian States is 0.05% (for probationary drivers and drivers of heavy vehicles and buses it is 'zero'), whilst most States in the USA have driving limits of 0.10%.

A number of anti-depressants fit into this category, all of which can sedate and thereby affect driving skills, although the effects may often dissipate with repeated use.

These only include the sedating anti-histamines chlorpheniramine, doxylamine, pheniramine, promethazine and diphenhydramine found commonly in cough syrups and cold medications which are available over-the-counter. The new non-sedating anti-histamines such as Claratyne, Hismanal, Zadine, Tavegal and Teldane produce little or no impairment.

These drugs are prescribed as hypnotics (sleeping pills), minor tranquillisers to reduce anxiety, as muscle relaxants and as anti-epileptic drugs and include some 13 different drugs within this group, all of which are capable of impairing driving skills.

These drugs are usually prescribed to persons with psychoses, schizophrenia and other mental disorders. The adverse effects on driving skills often dissipate with repeated use but sedation is a frequent side-effect.

These drugs include the 'Schedule 8' drugs of addiction, the opioids methadone, pethidine, morphine and heroin as well as weaker analgesics such as codeine which are available in numerous over-the-counter and prescription medications as well as propoxyphene (Digesic and Doloxene etc).

The active chemical in this plant is Δ9-tetrahydrocannabinol (THC) and a number of other 'cannabinoids'.

Amphetamines include designer variations as well as the ephedrine-type stimulants used in common cold preparations and the slimming tablets (anorectics) which include phentermine but also include dexfenfluramine, fenfluramine, mazindol and diethylpropion.

Inhalants, while strictly speaking not drugs, are used by the younger generation and is recognised as a potential hazard. These volatile substances are most commonly inhaled into the lungs.

There are a number of potential hallucinogens including these substances as well as chemicals that derive from certain species of mushrooms and from a number of members of the Solanaceae family including 'angels trumpets'.

PCP is a type of hallucinogen, but is not currently available in Australia.

Sympathomimetics are drugs which mimic the action of adrenalin by stimulating the sympathetic nervous system.

Proceedings of the meeting of the Society of Forensic Toxicologists and International Association of Forensic Toxicologists held at Tampa, Florida, October 31-November 6, 1994, abstracts 20 and 79.

Nystagmus is a condition associated with the uncontrollable movement of the pupils at the extremes of their movements.


Data derives from drivers killed in Victoria in 1993 and 1994 (O.H. Drummer, personal communication).

A Review of the Contribution of Drugs in Drivers to Road Accidents

22 Victorian Institute of Forensic Pathology; Collaborative study involving Victoria, NSW and WA covering the years 1990-1993, Report No. 0594.
23 Taken from Dr Moynham's presentation, Drugs in Drivers Proceedings of the Workshop held in Melbourne, June 3, 1993 - VIFP Report No 0694.
24 Programs run by State or County police forces to recognise drug impaired drivers.
25 Proceedings of the meetings of the Society of Forensic Toxicologists and International Association of Forensic Toxicologists held at Tampa, Florida, October 31-November 6, 1994.
27 Case work experience by author and results of a report by the Australian Bureau of Criminal Intelligence, Australian Drug Intelligence Assessment, 1993.
28 Previously known as police surgeons these medical practitioners are specially trained to medically examine persons for the police.
31 Robertson M.D. & Drummer O.H., A methodology to study the effect of drugs in driving, Accident Analysis and Prevention, 1994; 26: 243-247.
32 Victorian Institute of Forensic Pathology, Collaborative studies involving Victoria, NSW and WA covering the years 1990-1993, Report Nos. 0293, 0393, 0494 and 0594.
33 See also VIFP Report 0594. Only drivers were used in which one of the target drugs were detected in their blood. Risk based on Odd's ratio analysis in which the risk of a drug-free driver was given the value of 1.0. Statistical evaluation based on smoothed Department of Social and Preventative Medicine, Monash University.
34 Some drivers appear in more than one category, hence totals add up to more than 30 drivers.
38 Patterns of cannabis use in Australia, National Drug Strategy monograph series no. 27.
42 Derived from the Study by O.H. Drummer, VIFP Report No 0594. Culpability ratios determined from the number of drivers deemed culpable over those deemed not-
culpable following an assessment of the responsibility of 1045 drivers killed in accidents in Victoria, NSW and WA over 1990-1993.

Reference group given rate of 1.0.


With the exception of probationary drivers and certain other driver groups.


Jones R.T., Drug of abuse profile: Cannabis, Clinical Chemistry, 1984; 33: 72B-81B.


Pharmacokinetics refers to the science of describing the time-course and distribution of drugs in human tissues.

Time taken to halve blood concentration. This parameter does not apply to blood alcohol concentrations which is better expressed as a rate per hour.
A CLINICIAN'S PROSPECTIVE

Dr M. McDonough

Director, Drug Services Unit
Box Hill Hospital, Victoria

Dr McDonough describes his experiences with drug affected patients both in the emergency department of a large hospital and with its drug clinic.

Contents:

1. Introduction
2. The emergency department
3. The Drug and Alcohol Unit
4. Bethesda Hospital
5. Summary
1. INTRODUCTION

We already know that alcohol intoxication contributes significantly to road accidents; is it not then logical to conclude that intoxication with other drugs poses a similar hazard to road safety in some dose dependent relationship?

Available pharmaceuticals are human tested before approved for marketing and therefore manufacturers and subsequently prescribers, are obliged to inform consumers of certain medications' potential to impair psycho-motor performance.

Tolerance among individuals will vary considerably for various drugs as it does in fact for alcohol. Nonetheless, we know that the majority of alcohol intoxicated individuals are at risk when driving a motor vehicle at blood alcohol levels in excess of .05 grams per cent.

I believe that any medication with mind-altering properties should be restricted to prescription only so that at least three levels of warning are given to the consumer: firstly, by the prescribing doctor, secondly, by the dispensing pharmacist and thirdly by the manufacturer (eg. product carries appropriate warning label). If the prescriber suspects that with any particular patient a significant level of impairment may result from the prescription (eg. an elderly patient, a patient with sleep apnoea syndrome or with significant day time somnolence etc.), such patients ought to be actively discouraged from driving until they have been medically reviewed while taking the medication. If the prescription is of short duration, the patient may be persuaded to abstain from driving during this period. If the prescription is of an ongoing nature, the patient could be observed until deemed unimpaired and where doubt still exists, referral for formal driver assessment could be made.

Drug tolerance is a complex process whereby an individual begins to show resistance to the intoxicating effects of the substance over a progressive period of time. However, tolerance is not comprehensive of all the drug's effects, for example, regular opiate users do not become tolerant to the constipating effects of the drug and marijuana users do not become resistant to the heart rate enhancing effects (increased pulse rate) of that drug.

Among alcohol dependent individuals who possess high grades of tolerance, many are able to display minimal psycho-motor impairment to
high blood alcohol levels. Despite this tolerance, they are still more prone to accident for a number of reasons: they are not tolerant to all of the intoxicating effects and they often misperceive the 'slowing of reflexes' and/or they may misinterpret normal situations suddenly presented to them during the course of driving (eg. someone running across the road in front of them). For similar reasons, where there is any doubt about a patient's tolerance to the prescription of chronic intoxicating medications (benzodiazepines, opiates, anti-histamines etc.), then after medical assessment the driver should be reviewed by driving simulator assessment.

In considering these issues, medical practitioners have an important community and professional responsibility to ensure a detailed knowledge of potentially intoxicating medications and to exercise reasonable caution when prescribing. Furthermore, when any medical practitioner sees a patient impaired by intoxicating drugs, they have the immediate responsibility of attempting to dissuade the patient from driving and subsequently to consider reporting to VicRoads (confidentiality must be assured as doctors will be unlikely to report if not), or even to consider a police notification if the situation is one of an acute risk to the intending driver and other road users (eg. an overtly intoxicated individual expressly intending to drive).

In my general experience as a specialist medical practitioner both within the drug and alcohol field and at a general teaching hospital, many of the aforementioned issues are not well addressed by most doctors. This is because most doctors do not wish to be in a position of having to report their patients, ie. have a policing role. This duty is not good for business and it is perceived to jeopardise the doctor/patient trust relationship.

There is a need for public education regarding safety issues concerning the use of sedating medications which in part, at least, should be provided by medical practitioners for their patients. This information could be reinforced by legislation for the mandatory reporting by doctors of potentially or actively drug impaired drivers. In such a manner, patients who need such medication would be provided with information about possible impairment and driving, and also about the existence of mandatory reporting requiring that an individual pay particular heed to the medical practitioner's advice about driving and the need for further medical review. Failure to comply would necessitate mandatory reporting procedures.
Finally, pharmaceutical manufacturers are similarly obliged to provide reasonable information for prescribers which can be utilised by the prescriber along with the prescriber's own knowledge of that particular patient, to make a reasonable clinical judgement about driving safety.

2. THE EMERGENCY DEPARTMENT

What has been most obvious over the past decade is the dramatic fall in road trauma. Factors such as the recession, a maintained reduction in per capita alcohol consumption and introduction of random breathalyser testing are a few of the most likely contributors to this decline in road accident fatalities. It is still however apparent that a significant number of road trauma and less serious accident victims are alcohol intoxicated at the time of presentation to the hospital's emergency department.

Recent changes to the blood alcohol testing legislation require emergency department doctors to blood test only those victims whom they have reason to believe may be under the influence of alcohol intoxication. This also means firstly, that some patients who present late to the emergency department may not manifest signs of intoxication and therefore go undetected and secondly, whether or not a patient will be tested will be determined by an individual doctor's judgement and this may vary considerably.

In particular, it has already been well demonstrated that medical practitioners under-report substance abuse and there are many reasons for this. Firstly, I have already mentioned the reticence doctors have about reporting their patients. Secondly there is also the issue of not being able to identify a substance abuser (eg. the patient may not fit the stereotype) and thirdly, screening for substance abuse would not be seen as an important priority by the doctor when considering more immediate emergency medical decisions.

Drug screening may also not be perceived as cost effective in an emergency department setting and some emergency department doctors may not perceive that there are a significant number of accidents where drug intoxication was contributory. In our hospital's Emergency Department, doctors appear to recall only a few instances where road accident victims appear to be under the influence of an intoxicating drug. Mostly, this appeared to be due to cannabis and here it should be pointed out that
cannabis intoxication is fairly obvious to an experienced observer (appearing 'stoned' with reddened eyes and an increased pulse rate).

Other drug intoxications are not as readily, clinically identifiable particularly in a patient who might be already distressed, shocked and/or concussed. Indeed, the acute anxiety state precipitated by the experience of an accident or the varied effects of head injury on individuals could be expected to significantly impact upon a clinician's decision as to whether a patient may be under the influence of an intoxicating drug. Even if drug screening was performed on all road accident cases routinely, in many cases it would be unlikely to prove helpful in deciding if the patient was impaired at the time of the accident. For example, the presence of cannabis metabolites in the urine may persist for weeks, especially in chronic users, and therefore such a result would not help determine whether the individual was intoxicated at the time of accident and the test may be reflecting the use of cannabis a week or more ago.

It is already well known that substance abusers are disproportionately represented among accident statistics of all kinds and the adoption of a drug screening policy in emergency departments may not tell us any more than we already know. On the other hand, if screening was performed routinely, this information could be given to the patient's regular doctor in such a way as to raise in the mind of the doctor the possibility of drug impairment and future risk for driving.

This then might lead to a thorough re-evaluation of that patient's current and ongoing medication together with an assessment for the possibility of substance abuse. In regards to the latter, a further drug urine screen, if positive again, might reasonably lead to the conclusion that such a patient has a substance abuse problem, especially when illicit substances are detected.

While the original test taken in the emergency department would not have been helpful in determining the level of impairment at the time of the accident, the later identification of the person having a substance abuse problem would certainly be of assistance. Again, substance abusers experience more accidents than the general population and death by accident (accidents of all kinds including road trauma) is one of the commonest causes of mortality amongst this group.
Regular substance abusers do not generally like emergency departments and hospitals because of a perceived association with the 'authorities including the police'. A recent survey in Sydney into heroin users' experience of overdose revealed a general reluctance among users, particularly males, to call an ambulance and seek medical attention. For these sorts of reasons, substance abusers frequently do not wish to stay in observation in emergency departments despite medical advice and they are more likely to be unco-operative with certain forms of assessment eg. inquiring into the substance use history and requests for body fluid testing. Substance abusers therefore are not only seen as unpopular patients but also as patients who are difficult to assess adding perhaps another barrier to the likelihood of a doctor finding and reporting on drug related impairment.

Emergency departments are also places where potent narcotic medications are administered to patients who will later be discharged. For example, a patient may present with a broken bone or a kidney stone, both acutely painful situations often requiring a narcotic analgesic (eg. pethidine or morphine) sometimes even with light anaesthesia (so as to reduce a joint dislocation or re-align fractured bone ends) and the combination of these drugs together means that the patient would be unfit to drive a motor vehicle home. Emergency department doctors need to be and generally are quite astute with warning patients about driving after they have administered potent psycho-trophic drugs.

What may be needed is some form of standard documentation – a copy of which is given to the patient, containing explicit information advising not to drive over a certain time period. Failure to comply with such explicit advice could be made an offence and could add grounds for litigation against such a driver by other parties sustaining injury or property damage as the result of a motor vehicle accident. It is certainly in the doctor's best interest to provide appropriate advice to a driver about driving after receiving sedating medication in an emergency department setting, the same way as it is for providing advice against driving while still alcohol intoxicated.

Some medico-legal research in the United States has shown that lawyers would be less likely to litigate against doctors who had recently attended an intoxicated patient who subsequently drove and was involved in an accident provided the doctor detected the intoxication, used reasonable effort to discourage the patient from driving and had documented such.
In summary, emergency departments have witnessed a very significant decline in road trauma over the last decade. The observation that alcohol still contributes to a significant percentage of current road accidents is still being made. The contribution of drugs, other than alcohol, to road accidents is not clearly apparent in the emergency department setting but this does not mean that drug intoxication is an insignificant contributor to accidents. This is because levels of drug intoxication may not be easily identified, are often masked by other acute conditions and it is hard to justify a drug screening program in an emergency department setting. Warnings about driving under the influence of medication provided by the emergency department are generally given but whether or not this is heeded by the individual patient is anyone's guess. Disregarding such advice could become an offence which, if well publicised, might be a deterrent against driving after a medical warning not to do so.

3. THE DRUG AND ALCOHOL UNIT

I have already mentioned the known association between substance abuse and accident risk but from the perspective of a clinician working in the field, one invariably finds that the majority of patients have experienced one or more accidents prior to their attendance at a drug and alcohol clinic.

While there is little doubt that drug abuse itself contributes to accident risk, at least in the under 25 age group, there is evidence to suggest that drug abusers are more likely to engage in risk taking behaviour. While this may add a difficult variable to the assessment of an individual drug user's road accident risk, in general, drug abuse itself could serve as a practical marker of risk.

Of all forms of drug abuse, the poly substance abuser (ie. multiple substance abuser) poses perhaps the greatest risk to himself/herself and other road users. For various reasons, this pattern of substance abuse is being seen more frequently within our community. Individuals concerned are generally more impulsive and less discriminative in their drug use, commonly taking very large (ie. intoxicating) doses in a somewhat episodic fashion. Some individuals are dependent on one primary substance (ie. daily heavy use of the drug and withdrawal symptoms are experienced if the dose if significantly reduced or the drug is abruptly discontinued).
A regular 'alcoholic' or patient on a methadone maintenance program may be concurrently abusing tranquillisers, hallucinogens and/or other substances. In whatever scenario, both episodic high dose substance abuse and the interaction between combined substances poses significant likelihood of intoxication and impairment. In the single drug dependent state, a person may acquire significant degrees of tolerance to the central intoxicating effects of the substance. For example, it has been shown that patients once stabilised on a methadone maintenance program are not at an increased risk of a collision. 4 It is most likely that chronic dependent users of other sedating medications, such as benzodiazepines (Valium, Mogadon, Rohypnol etc) are similarly less likely to be as impaired by the effects of chronic intoxication as they would if they were only occasional or intermittent users of the same medication. Of particular concern over recent years is the increasing number of 'alcoholic' patients who are abusing tranquillisers and/or other medication.

There is now good evidence for the efficacy of methadone treatment (in particular long-term methadone maintenance treatment) in terms of reducing illicit opiate usage and reducing mortality among drug users under such treatment. 5 Furthermore, the process of the methadone program requires that a patient is seen regularly by the medical practitioner who monitors the general health of the individual, is alerted by signs of unexpected levels of intoxication and performs urine drug screening to further detect ongoing substance abuse.

For some patients in the methadone program, other forms of substance abuse may continue leading to varying degrees of intoxication and impairment. When this occurs, the treating doctor is obliged to remind the patient that they are unfit to drive a motor vehicle. If the intention to drive is immediate, then every effort would be taken to prohibit that person from driving. If the clinical impression leads one to conclude that such a patient is continuing to abuse substances and very likely therefore to exercise poor judgement and be impulsive, a decision to report that driver confidentially to the Medical Review Section of VicRoads must be made. This is done because of concern both for the patient and other road users.

In short, methadone treatment is effective and often leads to a reduction, stabilisation and sometimes cessation of substance abuse. When it doesn't, at least the patient in treatment can be monitored and if necessary, reported to the licensing authority as a person at significant risk. In our clinic, most
patients on the methadone program improve in terms of their physical, psychological and social health with time on the program. The majority of these patients also drive motor vehicles and the occurrence of road accidents amongst stable patients appears to be quite rare. Among those patients who are less stable, a large percentage do not possess a licence (many have lost such already) and others have had their licences withdrawn following a medical report by the clinic doctor.

Some similar comments can be made about other drug abusers attending rehabilitation programs. Both from the research and my own clinical perspective, drug abusers engaged in treatment and extended follow-up are less likely to be frequently intoxicated and are more likely to be detected if impaired by infrequent intoxication with appropriate action implemented.

For many people, the nature of substance abuse is chronic and often relapsing and therefore, those of us working in the field do not believe in the accuracy of prognostic assessments made over a limited time. In treating substance abuse, the primary therapeutic aim is to reduce the harm associated with drug use among individual users and secondarily, to aim, where possible, for remission. To do such usually requires surveillance over a protracted period of time, ie. at least twelve months or more. What needs to be also understood is that the majority of substance abusers do not present for treatment and many of these will change their pattern of use or proceed towards natural remission without treatment over a certain period of time. Of those patients who do present for treatment, many will attend the clinic once or twice but fail to engage in longer term follow-ups. Many of these individuals do not appear to have regular general practitioners and they therefore tend to use health and the welfare services on an intermittent basis, eg. in a crisis situation.

Also, most people who do attend the Drug and Alcohol Clinic have already experienced some form of drug related harm (including accidents) such that treatment services have limited if any scope for primary prevention (eg. before the drug related accident or other harm has occurred), but it does provide a venue for secondary prevention (eg. identifies at an earlier stage and implements preventive strategies). For these sorts of reasons, drug and alcohol clinics are unlikely to make a significant impact across the board among the greater majority of substance abusers.
What is needed is a community wide, early identification system which detects substance abuse at the earliest possible stage and implements effective behaviour change strategies. It has already been well established that early intervention strategies for heavy alcohol consumers are effective and that relatively brief interventions are probably also effective for the most potent addiction of them all, cigarette smoking. Because approximately eighty per cent of the Australian population access a doctor in any one year, general practitioners are therefore in an ideal position to deliver an early identification and intervention program.

Along with this there needs to be community wide education about drugs and accident risk with special targeting of 'at risk' groups. An increase in teenage binge drinking is being observed and also an increase in psychostimulant (eg. amphetamines) and hallucinogen (eg. LSD, MDMA etc.) use among certain night club and dance party patrons which suggest that both groups are important to target. Both these groups tend to be occasional users or sometimes referred to as 'recreational' users and therefore their drug use on that occasion is often specifically intended to produce intoxication. It makes very good sense therefore to be targeting not only the teenagers who engage in binge drinking behaviour but also those young people attending nightclubs, dance parties and other similar venues.

To reiterate, in the under-twenty-five age group in particular, there is a greater risk posed by harm from an accident related to drug abuse than from the drug abuse itself.

4. BETHESDA HOSPITAL

As a Drug and Alcohol Consultant for Bethesda Hospital, a major rehabilitation centre for road accident victims in Melbourne, there has been a general impression of an increased number of drug abusers being represented amongst patients. For instance, a couple of years ago I was formally invited by the hospital to address clinical staff about handling drug and alcohol problems that have arisen among patients. I was also subsequently appointed to provide ongoing consultation and liaison work with ward staff.

What is not certain however is whether or not there has been a real or just a perceived increase in the identification of drug problems amongst accident victims at the hospital. This hospital, like Box Hill Hospital's Emergency
Department, has also seen a dramatic fall in road trauma cases over the past decade. Maybe with a reduced case load, drug abuse characteristics are more obvious to identify. It could also be that drug problems have become more visible because there has been a real increase in the number of drug related motor vehicle accidents. Again, from a clinician's perspective, drug and alcohol management problems are far more likely to be identified when there are a group of drug abusers together in the same ward. Like most people who share any common life experience therein lies a basis for the beginnings of communication, the development of friendships and even a re-exploration of the shared past experiences.

It would be of interest to retrospectively survey patients admitted to Bethesda over a certain time period, eg. from five to ten years ago and compare this with a current sample of patients taken over a similar time period. This sort of research could lead to a clearer picture of the prevalence of substance abusers among road accident rehabilitation patients at Bethesda Hospital. This hospital, along with other road accident rehabilitation centres, provides an excellent venue for identification and possible earlier treatment for some drug abusers.

A difficulty faced as a clinician in this setting and the same is true in the Drug and Alcohol Unit setting, is in persuading the drug abuser who has already had a road accident (or other type of accident) that their drug abuse has been a likely contributor to their risk of accident. This is partly because the association between drug use and road accident has not met the public consciousness to the same degree as the well known association between drinking and driving. Preventive and rehabilitative work would be much easier if supported by a public education campaign which acknowledges both alcohol and other drugs as contributors to accidents.

5. SUMMARY

There can be little doubt that drugs, other than alcohol, contribute to road accidents. The perception of the extent to which this is so appears fairly minimal (probably for various reasons) in the emergency department setting. From the Drug Services Unit view, most substance abusers appear already to have experienced accidents of all kinds, including road accidents. Accidents are one of the commonest causes of death among drug abusers. Poly-substance abuse and 'bingeing' behaviours are currently on the increase which would suggest a possible greater risk among some drug users for
accident. There is a need for greater medical surveillance, reporting under appropriate legislation (confidential but mandatory reporting) and continuing education.
Footnotes

4 Edward Ogden, *Drugs and Driving*, Proceedings of the Autumn School of Studies on Alcohol and Drugs (St. Vincent's Hospital, Melbourne) 1992, pp. 15-20.
6 *Minimal Interventions*, Proceedings of the Autumn School of Studies on Alcohol and Drugs (St. Vincent's Hospital, Melbourne), 1991, pp. 175-227.
This paper provides information on the subject derived from the experience of the Accident Investigation Section. It includes the topic of drug use in the transport industry as well as the tragic consequences of prescription drug misuse.

Contents:

1. Introduction
2. Blood tests
3. Drugs and surviving drivers
4. Alcohol and other drugs
5. Drug cocktail
6. Prescribed drugs
7. Drug use in the transport industry
8. Conclusion

Appendix A:
Pie chart of 1993 Victorian drug test results

Appendix B:
Profile of the Accident Investigation Section
1. INTRODUCTION

While it is accepted in law enforcement that drugs, other than alcohol, contribute to the number and severity of collisions on our roads, it is not known to what extent. This question can only be answered by effective legislation and a commitment to tackle the problem.

The strategies adopted by police in this state, to combat driver impairment from drug use, have been compared to the period prior to the introduction of the breathalyser in 1960. There is no mandatory requirement upon drivers suspected of driving under the influence of a drug to provide a sample of their blood for analysis. Police officers are dependent on their observations and admissions of drug use by the suspect. This cannot be relied upon as an effective countermeasure, as it depends on the cooperation of the suspect and the ability of the untrained police officer.

Many police do not have the skills to recognise and record the effects of impairment from drugs. The problem is magnified when the suspect has been involved in a collision because to the untrained observer, impairment of the suspect can be attributed to a visible injury or an intangible condition such as shock.

2. BLOOD TESTS

A driver who goes (or is taken) to a hospital (designated place) for treatment following a collision, may be required to allow a doctor to take a sample of blood for analysis. Since 1991 legislation has allowed this blood to be tested for drugs other than alcohol. In some circumstances a doctor may elect not to take blood under these provisions.

A knowledge of certain detection and prosecution, in many instances, will dictate that the drug affected driver will not volunteer a blood sample which they know will incriminate them, especially in cases where they face serious criminal charges, such as causing death by culpable driving.

Therefore the only drivers tested for drugs as a matter of procedure are those that are killed in collisions, and some of those that suffer injury and who require medical treatment. If a suspect is not injured there remains a strong possibility that the presence of drugs will go undetected.
3. **DRUGS AND SURVIVING DRIVERS**

Presently the number of major collisions which occur involving drug impaired drivers in Victoria is not known. From 1 January 1993 to 31 December 1993 the Victoria Police Accident Investigation Section attended 457 motor vehicle collisions involving death or life threatening injuries. As a result, 122 blood samples were taken from surviving drivers and submitted for analysis. (See Appendix A).

4. **ALCOHOL OR OTHER DRUGS**

In recent years the drinking driver has been targeted in line with a very successful statewide road safety strategy. The aim of this strategy has been to change driver behaviour in a number of areas, including the sphere of drink driving. Certain successes are evident, particularly in the reduction of detected drink drivers and the reduction in the presence of alcohol as a causation factor in major collisions. Nevertheless evidence is emerging that indicates that some younger drivers are turning to drugs as an alcohol alternative.

When asked about alcohol consumption they indicate an awareness of the dangers and consequences of drink/driving and limit their consumption accordingly, however this is not so with other drugs which do not have an arbitrary limit. A common answer when asked what effect a drug has on the user's ability to drive is, 'It just relaxes me'. Such a response is predictable. Examples are able to be given that clearly indicate that these drivers are responsible for causing another's death by virtue of their unexplained recalcitrant driving.

The signs of drug intoxication can be subtle and differ in many respects to the alcohol induced individual but in terms of driver impairment and potential harm, there appears to be little difference. Cannabis is said to relax inhibitions and alter mood, perception, and thought processes.

*For example; an experienced long distance truck driver, who, on the open highway, approached a vehicle from behind, which was intending to turn right at a 'T' intersection. The driver of the truck failed to perceive that the vehicle in front of him was about to turn right and attempted to overtake it. In doing so the truck was driven to the right across double white lines. A collision*
subsequently occurred whereby the occupants in the turning vehicle were killed.

A blood sample was obtained from the driver of the truck and cannabis was found in his blood. It could not be proved that the active ingredient of cannabis was present at the time of driving but the gross error in perception and thought process is consistent with the effects of cannabis.

Obviously trained drug recognition experts were needed in this instance, in conjunction with effective and workable legislation, to hold accountable a driver who may be criminally culpable for causing the death of others.

5. **DRUG COCKTAIL**

The combination of alcohol and other drugs is lethal in terms of driver impairment. The Accident Investigation Section has experienced several salient examples where drivers, involved in major collisions, have consumed both alcohol and drugs. Extreme difficulties have been encountered by investigators in attempting to determine driver impairment, and thereby ultimate culpability. Irresponsible drivers have exhibited a variety of behavioural traits, some almost unbelievable, and others more subtle. A common thread is that the drug cocktail is becoming more commonplace, while the difficulties of proving actual impairment that contributed to a collision (and often the death or major injury to another) remain very difficult to detect. Experience suggests that without trained drug recognition investigators or forensic physicians coupled with adequate powers to obtain body samples to test for drugs, and a requirement for suspects to undergo testing, successful prosecution will remain almost impossible.

6. **PRESCRIBED DRUGS**

The problem which the community faces with prescribed drugs is reflected in the death of a 30 year old female recently. She died when the motor car she was driving collided with a tree in suburban Melbourne. She was one of the many people to die in single vehicle collisions during 1993, but her death was significant for a number of reasons.
She was married with an 18 week old son. She had overcome an addiction to heroin, but from 1989 was prone to binges on drugs such as Valium and Serepax. On the day leading up to her death, she drove her husband to work and then visited a local doctor whom she had been seeing on an irregular basis since 1990. The doctor was aware of her heroin difficulties, but believed that she was participating in a methadone program to combat her addiction.

On this occasion, she requested drugs to assist her heroin withdrawal. This was not the first occasion that she had made this request and Serepax, as in the past, was prescribed in the form of twenty-five, 30 mg. tablets. She declined to accept other more benign medication which had been prescribed for her.

Around lunch time she visited a friend and, after a short time, fell asleep and was put to bed. She slept for three to four hours. She also displayed other obvious signs of impairment. At the time, she was accompanied by her child.

After leaving this address she was observed searching her vehicle, whilst the baby screamed in a child restraint. She then appeared to become agitated and struck the baby capsule with some force. At this point an observer intervened. The driver was observed to be distressed and unsteady on her feet and stated she was searching for money to purchase petrol. The witness then opened the rear door of the vehicle and attempted to calm the baby while the woman continued to search her vehicle.

Eventually the witness invited her into her home where the baby was fed and settled. The woman remained for some hours, during which time she visited her vehicle on a number of occasions.

On one occasion when she came back inside she could hardly stand or walk and was obviously affected by something other than alcohol. Upon leaving, she was observed to have difficulty in reversing her car from the driveway. Fortunately, she left her child at the address. A few hours later, she lost her life when she...
Drug Use in the Transport Industry

collided with the tree. It was found that ten of the Serepax tablets dispensed earlier in the day were missing.

A post mortem examination later found that she had died from multiple injuries sustained in the collision. A number of drugs were found in her blood, including amphetamine, benzodiazepine, and oxazepam (Serepax), at levels which would impair driving ability.

While this young mother clearly displayed signs of impairment to the casual observer, it is incongruous that had she killed another, and remained unharmed herself, then investigating police would have had no power to request a blood sample to determine whether her behaviour was attributable to prescribed or illicit drugs. Accordingly a prosecution for causing death by culpable driving would, in the absence of other evidence, fail.

7. **DRUG USE IN THE TRANSPORT INDUSTRY**

There is an abundance of anecdotal evidence of illicit drug use in the long distance transport industry where drivers are required to drive and work excessive hours. The anecdotal evidence is supported by other evidence which is sometimes found at collision scenes. Accident investigators frequently find drugs such as amphetamine and cannabis in the wreckage of heavy vehicles. Post mortem blood samples often support this contention.

8. **CONCLUSION**

At the present time the measures available to control and prevent the use of drugs by drivers is ineffective. Detection is dependent upon a driver being involved in a collision, injured, and taken to a hospital where a blood sample can be taken. Without these preconditions a blood sample for drug analysis cannot be obtained. Legislation is essential to enable mandatory blood testing of all drivers suspected of drug impairment.

There must be a commitment from medical and scientific services to provide ancillary services, including:

(i) Mandatory collection of blood samples from suspect drivers;

(ii) Research into the effects of drugs on driving ability;
(iii) Efficient analysis of samples; and

(iv) Police training in relation to the identification of drug impairment.

These measures focus on detection and in terms of overall prevention will not be sufficient. There must also be countermeasures to educate all road users on responsible use of drugs whilst using the roads, coupled with increased awareness of the growing drug problem in the community.
INQUIRY INTO THE EFFECTS OF DRUGS (OTHER THAN ALCOHOL) ON ROAD SAFETY IN VICTORIA

**Graph:**
- **ALCOHOL:** 28%
- **CANNABIS & ALCOHOL:** 12%
- **PAIN KILLING DRUGS:** 8%
- **OTHER DRUGS:** 5%
- **ALCOHOL & OTHER DRUGS:** 2%
- **NEGATIVE RESULT:** 34%

**Percentages represent the proportion of positive drug tests in road safety incidents.**
Appendix B

Profile of the Accident Investigation Section

The Accident Investigation Section was established within the Victoria Police Force in 1957 to assume responsibility for the investigation of major and fatal motor vehicle collisions where criminal negligence was apparent.

Since that time the Accident Investigation Section has investigated thousands of collisions and has been responsible for the prosecution of drivers who have caused the death of others in circumstances that are tantamount to criminal negligence.

Since the late 1980s, the Section has been required to assume the responsibility for the investigation of all collisions where:

(i) three or more individuals lose their lives;

(ii) any driver fails to stop (or absconds) when fatal or life threatening injuries are suffered by any party;

(iii) where fatal or life threatening injuries are suffered by any party if –

   (a) there is evidence of criminal negligence by a surviving driver;

   (b) a member of the Police Force (on or off duty) was driving a vehicle involved in the collision;

   (c) an on-duty member of the Police Force, or a police vehicle, was involved in the collision;

(iv) any other collision that is likely to bring discredit upon the Police Force.

In recent times, the Accident Investigation Section has adopted a pro-active policy in the investigation of some forms of major collisions. Specific collisions have been targeted in an endeavour to establish common factors in the particular class of collision being probed. Classes of collisions exclusively investigated have included heavy and articulated vehicle involved crashes, drug involved collisions and collisions caused following the heart attack of the responsible driver.
The Accident Investigation Section is dedicated to achieving best practice in collision investigation and the identification of causal factors in the ongoing program to reduce road trauma.
STATE HIGHWAY TASK FORCE

VICTORIA POLICE

This paper provides information on the subject from the experience of the State Highway Task Force. It includes details of four case studies as well as the results of Operation 'Tall Poppies' aimed at creating an audit trail linking driving activities to employers, both prime contractors and subcontractors.

Contents:

1. Introduction

2. Case Studies
   Case study 1
   Case study 2
   Case study 3
   Case study 4

3. Operation 'Tall Poppies'

4. Conclusions

5. Recommendations

   Appendix A:
   Profile of the State Highway Task Force

   Appendix B:
   Industry Liaison
1. INTRODUCTION

This paper is submitted and is based on the activities of the State Highway Task Force of the Victoria Police and their experiences in the enforcement of legislation surrounding the use of heavy commercial vehicles. The contents of this paper are drawn from case histories, offences detected and anecdotal evidence from the industry.

The State Highway Task Force is a traffic unit operating to enforce traffic law and encourage road safety. Police have always been aware of stimulant use by long distance drivers and the impact that has on road trauma in Victoria. As there is no definitive testing method, other than the analysis of body samples, the detection of drivers affected by drugs is reliant on the location of substances and the evaluation of the driver.

The road transport industry in Australia suffers from the tyranny of distance and competition for the transport dollar creates a very competitive environment. Evidence of both an anecdotal nature and admissions by offending drivers causes law enforcement agencies in this State serious concerns relating to the distances driven and the excessive hours worked to achieve profit.

Previously, pseudo-ephedrine and ephedrine were the major stimulants used (mainly under the brand name of Fedrine) but in recent years amphetamine and methyl amphetamine have become popular in the transport industry and it is believed that amphetamine is now the most widely used stimulant. Little research has been conducted into the effects and/or impairment suffered by users of these illegal substances.

Members involved in enforcement find the users of stimulants display various symptoms such as aggression, hyperactivity and paranoia. Drivers who, through use of stimulants are unable to sleep, often smoke cannabis to counteract the effects of the stimulants.

There are many reasons put forward for the use of stimulants, the majority relate to the competitiveness of the industry. Many sub-contractors are forced to work hours well in excess of their legal entitlement and hours that do not allow for proper sleep patterns.

The State Highway Task Force has developed networks within the transport industry encompassing all facets from unions to company directors. The
Task Force has come to realise that the prosecution of the driver only will not address the drug problem in the heavy commercial vehicle industry. Investigations and enquires have identified:

(i) Poor work practices by some employers;
(ii) Disregard of legislation by some employers;
(iii) Excessive and extreme hours of driving;
(iv) Fatigue of drivers; and
(v) Traffic of drugs by employees within the industry.

Investigations conducted to date have reaffirmed that there is ample reason for concern and the requirement for greater accountability particularly in regard to companies, sub-contractors and owner operators. Contacts from numerous companies within the long distance transport industry portray similar accounts of the unsuitable work practices and pressures placed upon drivers. These problems are widespread.

There is acceptance by drivers of participation in these work practices, either as a result of personal greed or under duress from the employer.

In attempting to identify the problems that exist within the industry, it is necessary to itemise the reasons influencing the problems. Some of those are:

(i) The highly competitive nature of the industry;
(ii) Operators being prepared to cut corners;
(iii) Freight forwarders making unrealistic demands;
(iv) Lack of accountability across the spectrum of the industry; and
(v) Insufficient enforcement of legislative restrictions.

The Victoria Police Force have endeavoured to enforce current legislation and make companies, sub-contractors and owner-operators accountable for the driving activities of their employed drivers. With strict accountability and enforcement, unrealistic and impossible schedule times will be reduced enabling drivers to perform their task within legislative restraints. This
will have the 'flow-on' effect of reducing fatigue and the current high incidence of drug/stimulant use. This is the direction that should be taken to prevent road trauma and improve the occupational, health and safety of all concerned within the industry.

It is important that enforcement continues and suitable powers are available to fulfil the policing task. Companies, sub-contractors and owner-operators must be accountable for their activities and operate within the legislation. At present, some companies purport to be conducting operations which comply with legislative requirements. However recent investigations suggest that they are engaged in the types of activity sought to be eradicated from the industry.

Statistical information suggests that drugs other than alcohol contribute to the number, nature and severity of collisions involving commercial heavy vehicles. Although unable to determine to what extent the use of drugs has been a contributing factor to collisions, Professor Olaf Drummer of the Victorian Institute of Forensic Pathology has analysed the blood samples of deceased drivers of heavy commercial vehicles since 1990 and 36% of the samples were found to contain drugs other than alcohol.

Alcohol consumption and driving is now socially unacceptable within our community but within the confines of the long distance truck driving community, stimulants are seen as a tool to be taken to complete a job. Put simply, drivers affected by alcohol are considered unacceptable whilst the taking of stimulants is acceptable as an alternative to fatigue.

Recent examples are documented in the following case studies:

2. **CASE STUDIES**

**Case Study 1**

A 28 year old driver with a willingness to break the law started with a three-truck operator from a small country town in Victoria. He was to be paid 14 cents per kilometre. With only a 38 tonne permit in Victoria and New South Wales and a 72 tonne road train permit in Queensland, he regularly drove over 72 tonnes with one trailer. The heaviest he loaded was 142 tonnes over 2 trailers travelling Melbourne to Cairns. He used amphetamine, liquid methyl amphetamine, phentermine and
diethylpropion. After 18 months of constant driving and living in the vehicle, his weight was down to 52 kg from excessive drugs use, poor diet and sleep deprivation. He eventually drove the vehicle from North Queensland to Melbourne and left the vehicle on the side of the highway. The last week he was without sleep for 6 days and when he raised issue with his employer, he was told to 'get out of the truck and he would get a real bloke to drive it'. He was owed $16,000 in wages and fines and putting in an average of 120 – 150 hours a week. At the time of his departure, he was 48 kg and could not hold a drink without spilling three-quarters of it. He now has a job with a more responsible company driving a B Double.

Although the company he now works for has a reputation for being one of the better transport companies, most of the drivers exceed their hours of driving everyday, some completing runs involving 18 – 20 hours and the company is aware of it. His current employer runs over 200 trucks and some 400 sub-contractors involving interstate operations.

The driver has indicated a willingness to appear and give evidence before the committee if asked, being fully aware of the consequences to his career in the transport area.

Case Study 2

In the early hours of an October morning in 1994, a six axle articulated vehicle was observed as it travelled along the South Eastern Arterial at Glen Iris. This vehicle is owned by a Melbourne based small operator with about 6 vehicles. The vehicle was stopped. It was returning from Sydney with the driver on only his first trip since being employed the previous Thursday. The last entry in his log book was several hours earlier. When questioned about the hours of driving in the last 24, it was found that he had driven 16 hours with some loading on top of that. He was searched and 6.6 grams of amphetamine was found in his wallet. He admitted that after he picked the vehicle up on Thursday, he drove to a nearby truck stop to purchase chrome brite and other similar accessories for the vehicle. He was seen by other drivers and advised that if he was
going to drive for this company, then he had better buy some 'speed' as the boss is well known for working the drivers into the ground. He obtained the located powder for $250.00.

Case Study 3

In Melbourne a commercial heavy motor vehicle was intercepted. The driver was searched and 21 grams of amphetamine was located on this person. A plastic bag containing marijuana was also located. This driver was not pushed by the company to achieve unmanitainable schedules, but was taking advantage of the lucrative trade in amphetamine sales to truck drivers by conducting drug sales in the course of his driving between Melbourne and Sydney.

Case Study 4

A driver who is employed by a major employer in the area of refrigerated transport was stopped at a weighbridge on a major highway. He produced his authorised log book which had expired 12 days earlier. He also produced a note pad on which he had been recording his entries since then. His completed log book and the pad disclosed that he had driven for some part of every day for the last 112 days. A search of his vehicle located a plastic bag containing approximately 1.5 grams of amphetamine and a bottle containing 40 mg Duromine capsules (phentermine). This 50-year-old man was a physical and mental wreck and was crying while being interviewed.

3. OPERATION 'TALL POPPIES'

Concerns regarding the alleged work practices within the transport industry led to an operation the aim of which was to create an audit trail linking driving activities to employers being both sub-contractors and prime contractors. This operation was aimed at enforcing existing log book (duplicate pages) legislation that had not been substantially enforced in recent years. The operation was also to impress on the companies that they have responsibilities under the legislation and from now on these statutes will be enforced. It became apparent that some transport companies did not even keep duplicate log book pages, let alone check the activities and hours worked by their employees. Many companies claimed ignorance of the
requirements of the legislation. It should be a legislative requirement for pay records on which drivers claim hours worked be inspected and compared to log book entries.

**Table 1 Results From Operation 'Tall Poppies'**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL PREMISES VISITED</td>
<td>401</td>
</tr>
<tr>
<td>TOTAL COMPANIES CHARGED</td>
<td>47</td>
</tr>
<tr>
<td>TOTAL DRIVERS CHARGED</td>
<td>128</td>
</tr>
<tr>
<td>TOTAL CHARGES</td>
<td>728</td>
</tr>
<tr>
<td>TOTAL WARNINGS</td>
<td>366</td>
</tr>
<tr>
<td>TOTAL POLICE INVOLVED</td>
<td>71</td>
</tr>
</tbody>
</table>

During this operation, Police did not visit every transport company within the state. With approximately 10% of the companies visited being charged with a number of offences it can be speculated that non-compliance with the legislation was substantial. All offences detected relate to the legislation in regard to duplicate log book pages.

4. CONCLUSIONS

Apprehensions made by members of the State Highway Task Force and other evidence obtained from the transport industry indicates that the use of stimulants is prevalent and growing. Enforcement aimed solely at drivers is not the answer and to reduce fatigue leading to drug use, the transport industry must be accountable for the behaviour of their staff whether employee or contractor.

Freight forwarders must also be discouraged from imposing impossible delivery schedules (9 hours Melbourne to Sydney; 16 hours Melbourne to Brisbane; 36 hours Melbourne to Perth and 42 hours Sydney to Perth) on transport companies.
5. RECOMMENDATIONS

The following issues need to be considered:

- Legislation to enable blood and urine samples to be taken for analysis as part of a prosecution process.

- Commitment from the transport industry and freight forwarders towards realistic delivery schedules to reduce fatigue and eliminate the use of stimulants. This may require legislative change.

- Programs be introduced to educate drivers in the long term effects of using stimulants and the dangers they pose to all road users.

- Accountabilities imposed on the transport industry to ensure compliance with legislation relating to hours of driving and rest periods.
Appendix A

Profile of the State Highway Task Force

During the mid 1980s the profile of the long distance commercial vehicle industry was increasingly deteriorating. Public exposure to and experience with the problems associated with heavy vehicles speeding, collisions, tailgating and the industry's unwillingness to respond to complaints generated demands from both Government and the public for action to be taken by the Victoria Police.

Highway terrorism, harassing and intimidatory driving were the more emotional terms levelled at the transport industry particularly on the major interstate arterial - the Hume Highway.

In an endeavour to modify this behaviour, it was determined that a group of experienced Traffic personnel from the Victoria Police would be selected to perform duties initially on the Hume Highway. The group was formed on 9 September 1985, and given the title the 'Hume Highway Task Force'. This unit now has permanent status as the State Highway Task Force.

The strategy developed was to provide intensive and concentrated enforcement aimed at eradicating the 'cowboy' element who were generally responsible for the increasing problems.

This enforcement took the form of simple line patrol of the Hume Highway, covering the entire length from Melbourne to Wodonga. Speeding, log book offences, over-dimensional and over-weight loads were the target. These early operations had an immediate impact and the counter measures were so successful that the section was permanently established by Victoria Police Command.

The acquisition of equipment to identify and locate radar detectors and the use of CB radios frustrated the defensive tactics employed by commercial carriers who were themselves using radar detectors and the CB network to avoid apprehension.
Appendix B

Industry Liaison

A valuable benefit of targeting heavy vehicles was an insight into the structure of the transport industry. A number of individual Task Force members consider themselves to be as much a part of the industry as any other segment. A genuine desire to promote safe and best practice in this industry is held by these officers.

Networking has occurred between Police and industry representatives which has assisted in formulating new strategies to effectively modify and improve heavy vehicle road user and industry behaviour.

The emphasis is now more on education and co-operation, although when needed combined enforcement activities with interstate police and other enforcement agencies are still utilised.
CANNABIS AND ROAD SAFETY:
AN OUTLINE OF THE RESEARCH STUDIES TO EXAMINE THE EFFECTS OF CANNABIS ON DRIVING SKILLS AND ON ACTUAL DRIVING PERFORMANCE

Dr G.B. Chesher

Department of Pharmacology
University of Sydney
and
National Drug and Alcohol Research Centre
University of New South Wales.

Dr Chesher provides an extensive coverage of the latest Australian and overseas research on the impairing effects on driving of cannabis, particularly relative to those of alcohol.

Contents:

1. Executive summary

2. Introduction
   2.1 Pharmacology and pharmacokinetics
   2.2 Behavioural pharmacology and psychology

3. Studies using the techniques of epidemiology
   3.1 Pharmacology and pharmacokinetics
   3.2 Pharmacokinetics

4. A comparison of the effects of alcohol and cannabis on skill performance and driving skills
   4.1 Laboratory tests
   4.2 Duration of cannabis-induced impairment in laboratory tests
   4.3 The effect on laboratory tasks of alcohol and cannabis in combination
   4.4 Driving simulators
   4.5 On-road driving
5. Epidemiology

5.1 Questionnaire based surveys
5.2 Incidence of drug detection in crash involved drivers
5.3 Attempts to assess whether or not the driver who has detectable drugs in the bloodstream was culpable in the accident

6. The use of 'Responsibility Analysis' or estimation of 'culpability' to determine the role of drugs in crashes

7. Alcohol and cannabis in epidemiological studies

8. Summary (of the evidence presented above)
1. **EXECUTIVE SUMMARY**

There is no doubt that cannabis, smoked or taken by mouth produces a dose-related deficit in tests of performance skills as conducted in a laboratory.

Using driving simulators and on-road real vehicles, cannabis has been shown to affect driving performance. However, the effects are less severe than would be anticipated from the evidence obtained from the laboratory studies of individual tests of skills performance.

A description is given of epidemiological studies to determine the role of cannabis in road crashes. The pharmacological problems associated with these studies are described. The results of studies within the last 10 years have failed to present clear evidence for a role of cannabis in road crashes. The role of alcohol in all studies has proved to be dominant.

The evidence indicates that there is a clear difference in the mode of action of cannabis and alcohol, both pharmacological and behavioural and this is presented and the implications described.

The most recent of studies of cannabis and driving (Robbe & O’Hanlon, 1993), which was sponsored by the U.S. National Highway Safety Traffic Administration included a review of the literature. The authors’ comments in summary of their literature review and of their own results include the following:

*The foremost impression one gains from reviewing the literature is that no clear relationship has ever been demonstrated between marijuana smoking and either seriously impaired driving performance or the risk of accident involvement. The epidemiological evidence, as limited as it is, shows that the combination of THC and alcohol is over-represented in injured and dead drivers and more so in those who actually caused the accidents to occur. Yet there is little if any evidence to indicate that drivers who have used marijuana alone are any more likely to cause serious accidents than drug free drivers.*

*Of the many psychotropic drugs, licit and illicit, that are available and used by people who subsequently drive, marijuana may well be among the least harmful. Campaigns to discourage the use of marijuana by drivers are certainly warranted. But concentrating a campaign on marijuana alone may not be in proportion to the safety problem it causes.*
2. **INTRODUCTION**

In this paper I will examine briefly the studies which have sought an understanding of the effect of cannabis and of alcohol on driving skills and their role in road crashes. This information has been based upon scientific data which have been collected from several scientific disciplines. I have outlined these in earlier papers and will only mention them briefly here.  

The major purpose of this paper is to compare the two drugs, alcohol and cannabis and the status of the evidence as to their role in road crashes.

The determination of the legal limit for alcohol has been achieved in a scientific manner. There are pharmacological reasons why it has not been possible to follow these same techniques with drugs other than alcohol, including cannabis. This paper will draw attention to these problems.

First, we might briefly outline the nature of the evidence which has been generated to examine the effects of cannabis on driving skills and as a causative factor in road crashes. This information has been derived from the employment of three scientific disciplines:

2.1 **Pharmacology and pharmacokinetics**

Pharmacology is the study of the way a drug exerts its action in the body. This involves an understanding of the sites and the body systems where the drug acts and the consequences of this drug-system interaction. Information obtained from these studies can help to formulate an hypothesis as to how the drug may influence driving behaviour.

The pharmacological discipline known as pharmacokinetics studies the fate of the drug after it has been taken. It provides information as to the rate of absorption from the site of administration; the manner of its distribution in the body up to the delivery to its site of action (e.g., the brain). Pharmacokinetics also studies the way the body eliminates the drug from the body and includes the understanding of the metabolism and excretion of the drug.

2.2 **Behavioural pharmacology and psychology**

These involve studies of the effects of the drug on human behaviour. The behaviour of relevance to this discussion concerns those skills which are (or
are related to) those necessary for the safe control of a motor vehicle or other items of machinery. Psychological studies also involve the effects of the drug on mood and cognition.  

The three classifications of these studies are:

(i) Those performed on specific tests of behaviour or psychological functioning (for example, tests of reaction times of various degrees of complexity; tracking; divided attention or vigilance);

(ii) Those performed in a driving simulator; and

(iii) Those performed in a real car, either in a closed course or in real traffic.

3. STUDIES USING THE TECHNIQUES OF EPIDEMIOLOGY

These studies aim to determine whether or not a causal relationship between drug use and a motor vehicle crash exists.

I shall look at each of the above factors and will compare the two drugs alcohol and cannabis in the light of current evidence. In interests of time and space I have in this summary referred to reviews of the literature and have made only a brief description of the studies themselves. A fuller description of these can of course be sourced from the original literature of the cited reviews.

3.1 Pharmacology

First, the drugs themselves. With the increase in pharmacological knowledge it is known that most drugs act upon specific receptors. A receptor is a specific site in tissues, frequently on the cell membrane, which has a specific structural affinity (shape) for a naturally occurring molecule. The interaction between receptor and the endogenous molecule is part of the body's normal, physiological functioning. Most drugs exert their activity by acting upon these receptors. Examples of such drug-receptor interactions are the opioids (morphine etc) and the opioid receptors; the antihistamines and the histamine receptors and the benzodiazepines which act on the benzodiazepine receptors. The endogenous substances that physiologically act on these receptors are, respectively, the endorphins and enkephalins on the opioid receptors; histamine on the histamine receptors;
however the identification of the physiological substance for the benzodiazepine receptor has yet to be identified.

Research within the last five years has revealed that the cannabinoids, such as delta-9-tetrahydrocannabinol (THC) from the cannabis plant exert their effects on specific receptors known as the cannabinoid receptors. To date two cannabinoid receptors have been described and an endogenous (physiological) substance has been identified. This has been given the name 'anandamide'. It is very likely that in the near future more cannabinoid receptors will be described and more endogenous substances that act on these receptors will be identified. An historical overview of these findings has recently been published. 7

In contrast, the evidence strongly indicates that the drug alcohol does not act on a specific receptor, but acts more widely in a non-specific manner on the cell membranes themselves. This understanding is supported by the evidence that alcohol exerts effects on most of the tissues of the body and in excess is toxic to most tissues. The reader is referred to a recent review on this subject by Dufor and Caces. 8

Drugs which act upon a specific receptor produce their effects in doses measured usually as nanograms or micrograms per kilogram of body weight. Alcohol doses are measured in grams per kilogram – many hundreds of thousands times greater than those of most other drugs. Alcohol is a very non-specific drug.

Another important factor is that receptor-specific drugs exert their activity only on those cells which bear the specific receptor. In the case of the cannabinoids these receptors are found only in the brain in the basal ganglia, the cerebellum, the brain stem, thalamic nuclei, hypothalamus and corpus callosum. On the other hand alcohol affects all nerve cells to which it is delivered by the circulating blood.

Consequently it is not surprising that differences in the action of alcohol and the cannabinoids have been described in their effects on mood and behaviour. These will be discussed below.

3.2 Pharmacokinetics

The pharmacokinetics of alcohol and the cannabinoids could hardly be more different. 9
The apparent volume of distribution of alcohol (the volume of fluid in which the drug seems to be dissolved throughout the body) is quite low, consisting of the 41 litres of body water, providing a value of about 0.59 litres/kg. Cannabinoids, on the other hand, are very fat soluble and have a high volume of distribution which has been estimated to be about 10 litres/kg.

The meaning of these values is that the concentration of alcohol in the blood provides a reliable estimate of the concentration of the drug in the brain. This in turn provides a reliable estimate of the degree of impairment of the drinker. In addition to this, alcohol is excreted via the lungs to the breath and the blood : breath ratio is such that the determination of the alcohol in breath provides a reliable estimate of the blood alcohol concentration. It is because of these pharmacokinetic properties of alcohol that it has been possible to accumulate the epidemiological data upon which our drink-driving laws have been based. 10

Cannabinoids, on the other hand are lipophilic (fat loving) and are distributed in the fatty tissues of the body. When smoked, which is the most common route of administration, the cannabinoids are rapidly absorbed from the lungs into the bloodstream. Being so fat soluble the cannabinoids readily cross membranes, leave the circulation and are rapidly 'dumped' into various tissues of the body, including the brain. In this way the concentration of cannabinoid in the blood declines very rapidly as indicated in Fig 1.

As indicated in the Figure, we can describe the concentration of cannabinoid across time in the blood in the three phases: absorption, re-distribution and elimination. The steep upward curve of THC represents the inhaled THC being absorbed into the blood through the lungs; the equally sudden drop in the concentration of THC represents the drug being 'dumped' from the bloodstream into fatty tissues. This redistribution phase 'flattens' out as the 'dumped' THC re-enters the blood and is then metabolised in the liver—the elimination phase. It is important to note that the sudden decline in the concentration of THC (the psychologically active cannabinoid) in the blood does not represent drug metabolism but rather the rapid re-distribution of the drug from the blood into other tissues. The metabolism of the cannabinoids takes place when these 'dumped' cannabinoids are released back into the bloodstream whence they pass through the liver and are very rapidly metabolised and subsequently excreted.
Figure 1. The blood concentration of THC (squares) and its inactive metabolite, carboxy THC (THC Acid; diamonds) after the smoking of a marijuana cigarette. Each point is the mean of results from six volunteers, all of whom were free from cannabinoids before smoking the drug. The 925±7mg refers to the average weight of the cigarettes and the 1.32% refers to the dry weight concentration of THC.

Figure 1 also shows the blood picture of the inactive metabolite, carboxy THC (or THC acid). It is important to note several points about the pharmacokinetics of this substance. First, in the study indicated here (Fig 1) all of the volunteers had no cannabinoids in their blood before they began smoking. Second, the THC acid is formed in the liver from the metabolism of THC, therefore its appearance in blood follows that of the parent, THC. Third, the THC acid concentration then increases and surpasses that of the parent molecule in the blood. At a time when the parent THC is in the blood at only a very low concentration, that of the metabolite is higher and exists in the blood for a longer time. Therefore, should the smoker smoke again before the parent molecule and its metabolite have been eliminated, the ratio of the concentrations of THC and of the THC acid will be different from that shown in Figure 1. This is because there will exist a higher concentration of the metabolite than of the THC in blood at the time when the next dose of cannabis is smoked.
For this reason, analytical data that provides a value only for the metabolite can only be validly interpreted as indicating recent consumption of cannabis; however the time of this consumption could be a matter of hours or days. For this reason the quantitative determination of only the metabolite is of no value to determine possible impairment.

To assess possible impairment the analyst must provide data for the active molecule, THC. And when this occurs, the only interpretation possible on present knowledge is to infer the recent consumption of the drug by smoking. To date no meaningful correlation between blood concentration of THC and impairment in laboratory tasks has been established. This point will be clarified when the results of the recent epidemiological studies are discussed below.

Yet another problem arises in the interpretation of blood concentrations of cannabinoids. The pharmacokinetics of the cannabinoids are quite different when the drug is taken by mouth. Space in this discussion precludes further discussion of the pharmacokinetics after oral administration, but suffice to say the absorption of cannabinoids taken orally is slow and erratic. The absorbed THC passes through the liver and is rapidly metabolised. This results in a different proportion of THC to the metabolite, THC acid than encountered after smoking. There is a greater amount of entero-hepatic ‘recycling’ as some of the cannabinoids are stored in the bile in the gall bladder. These cannabinoids can later be ‘recycled’ and reabsorbed into the bloodstream when the gall bladder empties. In this country, most who use cannabis, smoke it.

It is also important to note that the detection of cannabinoids in a urine sample provide evidence only that the donor of that urine has been exposed to cannabis at some time in the past. It gives no indication at all of impairment or of intoxication. A frequent, heavy cannabis user may be excreting cannabinoids in urine for some weeks or in some cases, for more than a month. Those who take the drug by mouth also will be excreting the drug for a longer period.
4. A COMPARISON OF THE EFFECTS OF ALCOHOL AND CANNABIS ON SKILLS PERFORMANCE AND DRIVING SKILLS

4.1 Laboratory tests

Laboratory tests isolate specific psychological functions and determine the skill of the test subject on that function. Most studies test each volunteer on each test before and after taking the drug. For testing alcohol and cannabis, the choice of these tests rests upon an assessment of their relationship to the task of driving a motor vehicle. However, the fact is that no battery of separate tests comprehensively defines the actual task of driving. In fact, Joscelyn and others (Joscelyn et al., 1980) examined the plethora of methods employed in these studies and commented:

... many tests routinely employed have limited validity or no demonstrable relation to real-world driving. Measuring the 'same' behaviors often differ, raising questions about the comparability of experimental findings. 12

Laboratory tests, nevertheless do provide a 'screening' of the potential for drugs to impair specific behaviours. However, results from such laboratory testing should not form the sole basis for any judgement of the potential of a drug to impair actual driving skills or to increase the probability of an accident. For this reason, evidence for the traffic hazard associated with any drug should be confirmed by studies of actual driving (either using driving simulators or a real car) and by studies using epidemiological methods.

The data from laboratory testing of alcohol has been reviewed by Moskowitz and Austin 13 and of the effects of cannabis by Klonoff, 14 Moskowitz, 15 and by Chesher. 16 It is clear that both alcohol and cannabis cause dose-dependent deficits in the performance of specific laboratory tasks.

It is to be noted that the doses of cannabinoids in these tests are lower than those in use by many smokers of cannabis today. However, they may have been appropriate to the cannabis experience of the volunteers when these studies were conducted. In many of these studies, the volunteers were asked to rate the effect of the dose given with that of their general experience with the drug. In many (but not all) cases the doses given produced subjective effects which were as great as those generally experienced by the volunteers in their social use of the drug.
Cannabis and Road Safety

Looking at the Australian studies across time, from the 1970s to the 1990s these observations are in accord with the results expressed in a recent publication concerning the patterns of cannabis use in Australia. The earlier studies produced deficits in testing which were greater than those in the later studies. The data presented by Donnelly and Hall (1994) indicate that:

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The prevalence of cannabis use seems to have been very low by contemporary standards in the early 1970s. It increased substantially throughout the 1970s and 1980s, levelled off in the late 1980s, and has probably shown a small increase in the early 1990s. 18
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The phenomenon of tolerance to cannabis is well established and this in turn is a serious confounding variable in the studies with this drug. Tolerance develops with the regular and frequent use. This in turn depends upon the pattern of use of those in the study sample. The correlation of performance : dose : and tolerance requires further study. There is very little information available as to the change in doses used across the years since the 1970s as most data refer only to frequency of use. Studies involving high doses of cannabis should be undertaken, but with due consideration given to the degree of tolerance of the volunteers to be studied.

The Australian data presented by Donnelly and Hall indicate that:

```
Most cannabis use is infrequent and intermittent, with about three-quarters of adult women and two-thirds of adult men having discontinued their use, or continued to use less often than weekly. The proportion of users who are weekly users is highest in the younger age groups. Rates of weekly and lifetime use are highest among those aged 20 to 24 years, and decline markedly with increasing age. 19
```

### 4.2 Duration of cannabis-induced impairment in laboratory tests.

Most studies have reported a duration of cannabis-induced impairment of the order of 4 hours. On the other hand there have been three studies which have reported a longer duration of cannabis effects of between 10 to 24 hours. However, these reports have been questioned for methodological or reasons of interpretation. That of Yesavage et al. did not include a control group. Subsequently the study was repeated by Leirer et al. in an attempt to replicate this effect using a control group but was only able to show an effect up to four hours after smoking (ie. that described in the many other studies of this effect). A third study, also with a control group, did demonstrate an effect at 24 hours after smoking. The statistical
significance of the effect required a statistical procedure (one tail 't' test) which is of questionable validity when there was no previous statistical proof that the effect was expected. This means that the effect was at best, only marginally significant. The study by Moskowitz et al., as described in Moskowitz's 1985 review (Moskowitz, 1985) was of a:

.... compensatory tracking task performed while simultaneously executing a visual search task as well as a critical tracking task. Performance was significantly impaired on the compensatory tracking task for more than 2 hours and upon the critical tracking task for up to 10 hours, albeit, intermittently during the period from 4 hours on. [emphasis added] 25

At present I think it is fair to conclude that the evidence for the long duration of cannabis induced impairment requires more study to confirm its validity. Furthermore, both tasks in which it was described are very difficult tasks. It has been argued that the use of cannabis by pilots in the 24 hours preceding flying may be more an indicator of poor judgement rather than a cause for concern about the residual psychomotor effects of cannabis. 26

4.3 The effect on laboratory tasks of alcohol and cannabis in combination

The effect of this drug combination has been reviewed and only an outline will be given here. 27

There is very clear evidence from numerous studies of the effect of alcohol and of cannabis on the performance of specific tasks in the laboratory. Both drugs produce a dose related impairment on these tasks and the effect of the drugs when given in combination is essentially additive. Although of more academic than practical interest is the evidence as to the nature of this additivity. Several studies have observed a trend that the effect of cannabis plus alcohol is less than additive, meaning that 1 + 1 is less than 2. In the most recent study, Dauncey et al. reported this effect, found to be statistically significant, and termed it to be a 'de-intensification'. 28 In the light of the present knowledge of the quite different mode of action of cannabis and alcohol such an interaction is not necessarily surprising.

What is quite surprising and important however, is the result of a study by Perez-Reyes. 29 For pharmacological reasons the researchers studying the alcohol-cannabis interaction administered the drugs such that the peak of blood concentration of both drugs occurred as near as possible at the same time. Such is the thinking of the pharmacologist! Indeed Perez-Reyes and
his colleagues had reported such a study showing an additive decremental effect of the drug combination. Interestingly, in their later study they had the volunteers smoke marijuana (placebo; 1.7% and 3.58% THC) before they commenced drinking alcohol (0.85g/kg) over a period of 30 mins. This would have produced a BAC of the order of 0.1g%. Their results showed a dose-dependent effect for cannabis and the characteristic effects expected for the one dose of alcohol. However, no significant interaction between the two drugs was recorded. The authors concluded:

The lack of interactive effects, particularly on psychomotor performance, highlights the influence that the order of administration of the companion drug has on its interaction with the reference drug.

4.4 Driving simulators

A driving simulator is also a laboratory based apparatus. It is important to realise that it is only a simulation of real life driving and driving simulators vary greatly in the degree to which they can simulate the real event. It is fair to say that all but the most sophisticated and extremely expensive simulators are to the test subject, still a laboratory piece of equipment. They lack realism both in the dynamics of car driving and in the visual presentation of the road and other traffic. Nevertheless they are able to present simulated dangerous presentations to which the driver must respond. The effects of cannabis on performance in a driving simulator have been reviewed and a summary only is given here. 31

The early driving simulator studies, for the driver, were not interactive with the 'driving scenery' which was generally a film of the road to be covered and the driver had little or no control over the presented imagery. 32 These studies showed no significant effects of marijuana on car control. However marijuana did produce the following effects, namely:

(a) An increase in decision latency before starting, stopping or overtaking;
(b) Impaired monitoring of a speedometer; and
(c) Reduced risk-taking behaviour in tasks requiring a decision to overtake a vehicle in the presence of an oncoming car.

Later simulator studies with apparatus with a more realistic driving dynamics and an interaction between 'scenery' and the driving manoeuvres
did show marijuana effects on car control. The study by Smiley et al. found that cannabis increased lateral position variability, headway variability, and caused the 'driver' to miss more signs that indicated the need to follow another route. On the other hand, cannabis caused the subjects to drive in a more conservative manner inasmuch as they maintained a longer headway when car following, refused more opportunities to overtake a vehicle in front and when they accepted this opportunity, they began to do so at a greater distance from the approaching vehicle. The effects of alcohol (at about 0.08g% BAC) in this study were surprisingly small.

Another and very similar study by Stein et al. showed alcohol effects were as one would expect and significantly affected practically every performance parameter. Alcohol (at about 0.1g% BAC) was associated with significantly increased 'accidents' (hitting obstacles or exceeding road edges by a full car width) and 'traffic tickets' (exceeding speed limit by 32 'radar checks'). Alcohol was also associated with increased lane deviations, speed variability, response times to signs, and errors in sign recognition. In contrast, cannabis was associated with few changes. The mean speed travelled was lower and two measures of steering control changed significantly. Alcohol and cannabis in combination were associated with more adverse reactions than alcohol alone. Alcohol was consumed first and the performance testing was begun 15 minutes after the end of cannabis smoking.

### 4.5 On-road driving

Driving studies with a real car, conducted in an open field, of course present a more realistic experience of a motor vehicle than do simulators. However they usually require the driver to undertake manoeuvres that are not necessarily part of normal driving—such as weaving between cones. Those studies undertaken in on-road traffic naturally require great care on the part of the experimenter to avoid dangerous driving. Therefore these studies are restricted in the measures that can be realistically taken. They are somewhat akin, for both the experimenter and the test driver, to a driver undertaking a test for a driving licence. Indeed, experimental studies of the effects of drugs using in-car performance have been described by Smiley as being really a simulation of real driving.
On-road driving studies vary considerably in their experimental design and in the tests of driving employed. In this paper, only the broadest outline of the results is given in the interests of brevity. Reviews of these studies have been presented and published. The reader is referred to the original studies or to the cited reviews for more information.

There have been to date, seven on-road studies to examine the effects of cannabis on driving performance. Each of these is outlined below:

1. Klonoff studied volunteers in a closed course as well as in-traffic on a city road. The closed course study comprised eight tests and the response scores rested essentially on the number of cones struck. Testing was conducted in 4 blocks, each of 5 trials. The first three were taken as practice and the fourth, after drug treatment, were the test trials. The anticipated scores in the fourth block were determined by regression analysis on the assumption that the rate of learning or performance would continue at the same rate. Using this technique the author concluded that there was an impairment under cannabis. While the mean of the impairment was not large, the trend was clear.

The city traffic study was conducted rather in the manner of a driving test by a driving examiner. The subjects drove for about 45 minutes on a course of 16.8 miles after being given their dose of cannabis. A strong trend towards impaired performance was indicated by the lower scores given by the examiner on judgement and concentration after the higher dose of cannabis.

2. Hansteen et al. conducted a closed course study in which subjects were required to drive six times around a 1.1 mile course set out on an airfield. The course was set out with cones and poles and the number of these hit were counted. The course involved curves and straight sections and drivers were required to undertake various manoeuvres. The mean number of struck objects per lap increased from a mean of 13.2 in the placebo condition, 13.4 in the low cannabis dose, 16.8 for the high cannabis and 17.4 for the alcohol dose (BAC 0.07g%). The effects for the high cannabis dose and the alcohol dose achieved significance.

3. Casswell conducted a closed course study in which the behaviours sampled were more typical of those for real driving, than for the
studies outlined above. Driving behaviours recorded included overtaking, responding to road signs, making a hairpin turn and driving through a narrow gap. A subsidiary reaction time task was also included to monitor attention. Driving behaviour under cannabis, alcohol and the combination was tested. After alcohol, and alcohol plus cannabis, the subjects showed poorer tracking performance and drove at increased speed over various segments of the course, including the hairpin bend, and the straight section. Under alcohol alone, the speed through the narrow gap was also increased.

On the other hand, marijuana alone was not accompanied by steering or tracking errors. The mean speed dropped significantly after cannabis, both on the hairpin bend and on the straight section of the course.

Casswell suggested that drivers under the influence of cannabis appeared to compensate for what they perceived as being an adverse effect on driving. Compensation was exhibited by driving more slowly. This contrasted with the effects of alcohol. The increased reaction times to the subsidiary task under cannabis suggests an effect on attention. The extent of this effect was of the same order as that measured by the author in another study after 8 hours of continuous driving. 40

4. Attwood conducted a study on a closed course constructed on an airfield and, like Casswell, used measures appropriate to real driving including acceleration, following a lead car which varied its speed and responding to 'traffic signals'. The drug effects (alcohol, and two doses of cannabis alone and together with alcohol) recorded were not particularly robust, even with a complicated multivariate analysis which did distinguish the treatment conditions from each other. 41

5. The study by Peck and colleagues (Peck et al., 1986) from the California Department of Motor Vehicles, is best summarised by the authors' own summary.

Approximately 80 volunteer male marijuana and alcohol users received one of four experimental treatments: (1) marijuana, (2) alcohol, (3) marijuana and alcohol, or (4) double placebo.
After consumption, each subject drove a vehicle over a test course which simulated a number of real-world driving conditions.

Four post-drug runs were involved, separated by one hour intervals. The subject's performance was rated by an in-car examiner, outside observers, and computerised vehicle measurements.

Blood and urine specimens were extracted after each run to establish levels of tetrahydrocannabinol (THC), serum carboxy, and alcohol. A variety of multivariate statistical techniques were applied in evaluating treatment effects.

Both marijuana and alcohol had significant effects on driving performance, and the effects were particularly detrimental under the both-drugs treatment. The effects of marijuana were more rapid than those of alcohol and somewhat less severe for most tasks.

In this study cannabis was smoked after the consumption of the alcohol dose. In discussing their results and comparing them with other studies, they had this to say:

There is a vast amount of empirical evidence documenting the effects of marijuana on a wide array of human performance measures—cognitive, psychomotor and affective. Although the literature has clearly established that marijuana affects all three domains and results in detriments in the ability to perform many psychomotor and cognitive tasks, the evidence is somewhat more equivocal on the question of actual driving skill and even more equivocal on the question of those aspects of driving skill that are related to safety and accident avoidance. [Emphasis that of Peck et al.]

6. Smiley et al. tested the effects of cannabis (placebo and two doses) and alcohol (placebo and BAC of 0.05 g%) in combination and the effect of alcohol alone (BAC 0.08g%) on driving in a closed course study using an instrumented car.

The high dose of cannabis significantly increased headway and headway variability (ie distance from a car in front). Alcohol alone at the BAC 0.05g% produced an increase in speed, both in the straight sections of the road and in curves. In her review of her own study, and those of others, Smiley (Smiley, 1986) concluded:

In conclusion, marijuana does appear to impair driving behaviour. However, this impairment is mediated in that subjects under marijuana treatment appear to perceive that they are indeed impaired. When they can compensate, they do, for example, by not overtaking, by slowing down and by focussing their attention when they know a response will be required. Unfortunately, such compensation is not possible where events are unexpected or where continuous attention is required. Effects on driving behaviour are present shortly after smoking but do not continue for extended periods. [emphasis added]
7. The most recent and most comprehensive study of the effect of cannabis on driving on city roads and a public highway is that conducted in The Netherlands and was sponsored by the U.S. National Highway Safety Traffic Administration. 

An intelligent departure in methodology in this study from the others reviewed here is that the dose of cannabis used was determined in a pilot study using the volunteers who were to take part in the main study. The aim was to estimate the dose these volunteers generally use on a social occasion. Accordingly socially appropriate doses (for these subjects) were chosen for the driving study. Three driving studies were then performed. The first was conducted on a closed section of a public highway with no traffic; the second on a highway with traffic and the third in city traffic. The measure they have found to be of significance is the standard deviation of lateral position on the roadway (SDLP). It is a measure of the 'automatic' function of information processing in the driving task. Cannabis, in all tests produced a dose-related increase in the SDLP. Mean speed was somewhat reduced under cannabis as was the headway distance from the lead vehicle in the test in highway traffic.

The test under city driving conditions was conducted under one dose of cannabis and as a comparison, subjects were also tested under alcohol at a BAC of 0.04g%. Results in this test showed that this modest dose of alcohol, but not cannabis, produced a significant impairment of driving performance relative to placebo. Alcohol impaired driving performance but subjects did not perceive it. Cannabis did not impair driving performance yet the subjects thought it had. After alcohol, there was a tendency towards faster driving and after cannabis, slower.

This research group has conducted many studies with the same methodology and has accumulated much data on the effects of other drugs. They therefore were able to indicate the extent of the impairment on the measure of SDLP. The greatest effects of cannabis in this study were 3.7 and 2.9cm. In other studies drugs, for example diazepam (Valium), or lorazepam (Ativan), produced increases of 7 and 10cm respectively. The authors commented:

_In so far as its effects on SDLP are concerned THC was just another moderately impairing drug._
Cannabis and Road Safety

The authors go on to say that the effects of cannabis differ qualitatively from those of other depressant drugs, especially alcohol:

Very importantly our city driving study showed that drivers who drank alcohol overestimated their performance quality whereas those who smoked marijuana underestimated it. Perhaps as a consequence, the former invested no special effort for accomplishing the task whereas the latter did, and successfully. This evidence strongly suggests that alcohol encourages risky driving whereas THC encourages greater caution, at least in experiments.

Finally, Robbe contrasted the effects of cannabis when measured with laboratory based, individual tests in the laboratory, with those conducted in an on-road vehicle:

The results of these studies corroborate those of previous driving simulator and closed-course tests by indicating that THC in single inhaled doses up to 300 μg/kg has significant, yet not dramatic, dose-related impairing effects on driving performance. They contrast with results from many laboratory tests, reviewed by Moskowitz (1985), which show that even low doses of THC impair skills deemed to be important for driving, such as perception, coordination, tracking and vigilance. The present studies also demonstrated that marijuana can have greater effects in laboratory than driving tests. The last study, for example showed a highly significant effect of THC on hand unsteadiness but not on driving in urban traffic.

5. **Epidemiology**

The studies outlined above indicate that cannabis does cause dose-dependent effects on laboratory based tests of human skills. Furthermore, studies utilising driving simulators and on-road driving also indicate a degree of cannabis induced impairment of driving skills. However in these cases the extent of the impairment indicated from laboratory studies is not replicated in the simulator or in-car studies.

The effects of alcohol on the other hand can be demonstrated both in laboratory studies and in simulated or on-road driving at very much the same dose levels. Explanations for these differences between alcohol and cannabis have been suggested and rest essentially upon the difference in the awareness by the drug taker of the presence of drug impairment. This in turn may be explained by the present understanding of the quite different ways alcohol and cannabis are known to act on the brain.

Also mentioned above and in other publications our present laws on alcohol and driving have been based upon the scientific principles outlined here and in particular on the results of epidemiological studies. It is
pertinent therefore to discuss briefly the nature of the epidemiological studies undertaken to date with cannabis and road crashes.

Epidemiological studies with alcohol are greatly facilitated by the pharmacokinetics of that drug. Alcohol is excreted in the breath and the ratio of the concentration on the breath and in the blood is relatively constant. Therefore the determination of the concentration of alcohol in the breath (by a 'breathalyser') provides a reasonably and acceptably accurate indication of the blood concentration. It is unfortunate therefore that cannabinoids are not excreted on the breath and the concentration of cannabinoids that can be detected on breath represent only that contained in the 'dead-space air' in the upper respiratory tract. The cannabinoids so detected do not correlate in any way with the blood concentration. In addition to this the blood concentration of cannabinoids do not show any useful relationship to the degree of impairment or the degree of subjective effects of the drug. The blood concentration of alcohol on the other hand does exhibit a reasonable correlation with the degree of impairment.

These properties of cannabis mean that the determination of the role of cannabis in road crashes by the same techniques of the case-control study as used for alcohol, is not an easy task. The pharmacokinetics of cannabis make this an exceedingly difficult task. The difficulty is not only related to the poor correlation between blood concentration and impairment, but also because it requires the collection of a blood sample—from both the crash case and the controls. The collection of the latter sample is likely to involve a high refusal rate, and this alone would almost certainly invalidate the study. One does not know the reason for the refusal!

The studies that have been undertaken to date can be described within three groups and these are:

(i) Questionnaire based surveys;
(ii) Incidence of drug detection in accident involved drivers; and
(iii) Attempts to assess whether or not the driver who has detectable drug in bloodstream was culpable in the accident.

Studies along the lines outlined above have been reviewed by Simpson. 48
5.1 Questionnaire based surveys

Questionnaire based surveys by definition depend upon self report data and their reliability is questionable. Furthermore, the incidence of cannabis use and the likelihood of a driver admitting to such use is likely to change across time. 49

5.2 Incidence of drug detection in crash involved drivers

This technique involves the analysis of blood or urine samples taken from crash involved drivers. The detection of cannabinoids in urine provides information only that the drug has been consumed within the last day or even month. It provides no indication at all of impairment. Therefore only the analysis of a blood sample is likely to be helpful. However, the detection of cannabis in a blood sample does not itself prove impairment or crash culpability. This fact has been well expressed by Compton as follows:

Knowing only the frequency with which crash-involved drivers use drugs does not allow one to know the danger posed by the drugs. It may simply reflect the general drug usage pattern in the driving public at large. For example, finding that 30% of crash-involved drivers have nicotine in their blood does not imply that nicotine was involved in the occurrence of their crashes. It may be that 30% of the general driving population smokes cigarettes and the smoking of cigarettes is unrelated to crash occurrence. Finding that a drug was overrepresented in crash-involved drivers (as compared to non-crash involved drivers) would strongly suggest it played a role in increasing crash risk. However, this approach requires knowing the drug usage rate of the general driving public, something we do not know and can not easily determine. 50

Furthermore, any comparisons of the incidence of cannabis detections in crash-involved drivers with those of non-crash involved drivers should be collected from a comparable population and at the same time. The patterns of cannabis use vary not only across time but also across populations.

Therefore studies reporting the incidence of drugs in the blood of crash-involved drivers is essentially meaningless without some control of the incidence of drug use in non-crash involved drivers. Nevertheless, such studies have been reported and are reviewed by Simpson who summarised that:

- Marijuana users are certainly among drivers who are injured in road crashes (suggested by the presence of cannabinoids in urine);
• More importantly, recent use, as indexed by the presence of THC in blood, is evident in perhaps less than 10% of injured drivers; and
• When cannabis is detected, there is an 80% chance that alcohol will also be found. 51

5.3 **Attempts to assess whether or not the driver who has detectable drugs in the bloodstream was culpable in the accident**

Of the first attempts to assess culpability has been an ongoing series of data collected by McBay of fatal, single vehicle crashes. 52 Culpability in single vehicle crashes is assumed to be that of the driver (assuming no mechanical fault can be found) and the choice of fatal crashes assumes that death occurred shortly after the accident; meaning that drug metabolism ceased at death and therefore the blood sample from the dead body will represent the blood picture at the time of the crash. Cannabis was detected in 7.8% of 600 such cases, but 88% of these also contained alcohol in concentrations which of themselves could have accounted for the crash.

### 6. **THE USE OF 'RESPONSIBILITY ANALYSIS' OR ESTIMATION OF 'CULPABILITY' TO DETERMINE THE ROLE OF DRUGS IN CRASHES**

In the absence of a separate control group (as used in the assessment of crash probability with alcohol as described above) an alternative of a 'culpability index' is currently being employed in drug studies. The basic construct is first to formulate a means of determining the responsibility or culpability of a driver involved in a crash. There have been several means of constructing this 'culpability index' and this must be done with each of the accident cases by observers who have no information as to the drug status of each driver. 53 The responsibility (or culpability) ratio is then determined as the proportion of drug-bearing drivers who were determined to be culpable, to the non-drug bearing drivers who were deemed to be culpable. The null hypothesis predicts a culpability ratio of 1.00 (ie, the drug has had no causal relationship with crashes).

To date there have been six studies employing this technique (two of which have involved the re-analysis of earlier generated data). These are briefly outlined below:
1. Warren and others re-analysed the data of Cimbura and found a culpability index for cannabis of 1.7, the same as that found for alcohol. However, the original data comprised a total of 484 drivers and pedestrians, 3.7% of whom were positive for cannabis. However, 88% of these people were also positive for alcohol. This left a very small number from which to assess a culpability ratio for cannabis alone.

2. Terhune also has previously collected data independently re-analysed to estimate a culpability ratio. All BACs over 0.10% were judged significantly more culpable than the drug-free group. The cannabis group also had a higher culpability ratio than the drug-free group, but this was only marginally significant (58.8% vs 34.4%). This estimation was also compromised by the small sample size for cannabis only (n=17). The cannabis plus alcohol group was analysed separately.

3. Donelson began a very ambitious project but was unfortunately thwarted by funding problems which precluded the complete analysis of the collected data. However, a random sample of 415 cases was analysed. The results cautiously suggested a finding consistent with those of Warren et al. and Terhune above.

4. Williams et al. in a study involving 440 cases, demonstrated as in the above studies that alcohol had a higher culpability ratio compared with culpable drug-free drivers (92% vs 71%). However, those drivers in whom only cannabis was detected were less likely to be responsible for the crashes (53% vs 71%).

5. Terhune et al. reported a very comprehensive study involving 1882 cases. They found that alcohol was the dominant drug in fatal crashes, although the basic focus of their research was to describe the effect of drugs other than alcohol. They reported that fully 40% of the drivers had only alcohol in their systems and another 11% had alcohol combined with drugs. Among the drivers with BACs at or above 0.10% (n=625) their responsibility rate:

\[ ... \textit{was an extraordinary 94\%, well above that found for any other single substance}. \]

Of cannabis, the authors stated that while cannabinoids were detected in 7% of the drivers, the psychoactive agent THC was found in only
4%. Of the drivers with only one substance in their system, only 1.1% had cannabis alone, either as the THC the psychoactive compound or had the inactive metabolite carboxy THC. The presence of the inactive metabolite and the absence of detectable THC infers less recent ingestion of cannabis—assuming an efficient analysis.

The THC only drivers had a responsibility rate below that of the drug-free drivers—i.e. as with the study by Williams et al. (1985) they were considered to be less likely to have been a cause of the crash than the drug-free drivers.

The report also indicated the range of THC concentrations found in the blood. There were 109 cases of THC alone; of these, 22.9% contained what the authors called a 'trace' i.e. 1 to 2 nanograms THC per millilitre of blood (ng/ml); 69.7% contained 'low' concentrations between 3 to 19 ng/ml; and 7.3% contained a 'high' concentration of equal to or greater than 20 ng/ml.

6. Drummer reported a study of 1 045 fatalities in New South Wales, Victoria and Western Australia and used the technique of responsibility analysis (culpability index). 62

As with other studies, the dominant drug was alcohol, being found overall in 36% of all driver fatalities, 33% of which were over the legal limit of 0.05g%. Cannabis was found in 11% of cases of which 56% (n= 63) also contained alcohol (mean BAC 0.16 g% ± 0.08g%). There was no significant difference in the BAC of the alcohol only drivers and those with alcohol plus cannabis.

Assessment of the culpability ratio by Drummer provided the same result as those of Williams et al. and Terhune et al; there was a trend to a decrease in relative risk when either THC or the metabolite carboxy THC was measured in blood or urine. 63 64 The relative risk was 0.6 relative to drug-free drivers, although this was not significant statistically.

7. **ALCOHOL AND CANNABIS IN EPIDEMIOLOGICAL STUDIES**

The relative risk for drivers with alcohol plus cannabis was also greater than that for the control group, but this culpability ratio was no different from the alcohol only group. 65 Also in this study (as indicated above), there was no
significant difference in the BAC of the alcohol-only drivers and those with alcohol plus cannabis.

The same finding was reported by Terhune who also suggested that the high levels of alcohol are primarily responsible for the increased crash risk. Therefore the effects of alcohol in road crashes are really profound. The studies reviewed here using the method of 'responsibility analysis' have confirmed the information already established by the case-control methods—that alcohol is the dominant drug associated with risky and dangerous driving and road crashes.

There have been suggestions throughout the studies reviewed here that the crash responsibility rates associated with the low BAC plus other drug, might be higher than in the low alcohol-only groups. The interaction of other drugs and alcohol (including cannabis) require further study using epidemiological techniques. One must remember the description by Perez-Reyes of the effect of the order of administration of alcohol and cannabis in these interaction studies.

8. SUMMARY (OF THE EVIDENCE PRESENTED ABOVE)

The most recent of the reports of studies of the effects of cannabis on actual driving performance included a summary of the published literature on marijuana and driving. They concluded this review with the following paragraph:

The foremost impression one gains from reviewing the literature is that no clear relationship has ever been demonstrated between marijuana smoking and either seriously impaired driving performance or the risk of accident involvement. The epidemiological evidence, as limited as it is, shows that the combination of THC and alcohol is over-represented in injured and dead drivers and more so in those who actually caused the accidents to occur. Yet there is little if any evidence to indicate that drivers who have used marijuana alone are any more likely to cause serious accidents than drug free drivers. To a large extent, the results from driving simulator and closed-course tests corroborate the epidemiological findings by indicating that THC in single inhaled doses up to 250 μg/kg has relatively minor effects on driving performance, certainly less than BACs in the range of 0.08 - 0.10g%.

Apart from the above, a very important finding in the reviewed studies is the difference in the drug users' awareness of the effect of the drugs alcohol and cannabis. Alcohol use is accompanied by increased confidence, an
impairment of judgement to the extent that driving behaviour becomes more risky, with faster speeds and a greater willingness to take risks. Cannabis use on the other hand, is accompanied by compensatory driving behaviour, including a reduced willingness to take risks and slower driving speeds. Indeed the compensation was described by Robbe and O'Hanlon in the following manner:

Very importantly our city driving study showed that drivers who drank alcohol overestimated their performance quality whereas those who smoked marijuana underestimated it. Perhaps as a consequence, the former invested no special effort for accomplishing the task whereas the latter did, and successfully. This evidence strongly suggests that alcohol encourages risky driving whereas THC encourages greater caution, at least in experiments.

The task of driving has been described as a 'self-paced' task. That is, drivers choose their own levels of task difficulty. There is a difference therefore between a driver's skills performance, as measured in individual laboratory tasks and driver behaviour. Driver performance, or skills performance is what a driver *can* do. Driver behaviour is what a driver *actually does*. Driving skills (or driver skills performance) differ very widely within a community. Some of us may be extremely cautious and others much less so. The correlation between driver skills and crash probability is not as great as many may imagine. For example, it is held by many that superior driver skills lead to reduced crashes and this led to the concept of 'advanced driver training'. Indeed, an editor of a road magazine claimed: 'I have for many years claimed that the licensed racer is far safer than ordinary chaps, on the grounds of practised skills, mental ability, cognisance of hazards in driving, keen interest in driving as well, and so on.'

In order to examine the possibility that unusually skilled drivers really did have different on-the-road driving records from the average driver, a comparison was made of the on-the-road driving records of a group of licensed racing drivers with those of other drivers matched for such characteristics as sex and age, etc. What they found was that in all measures of traffic violations including crashes, speeding violations, other moving violations as well as non-moving violations, the rates for the racing drivers exceed those of the comparison drivers, in most cases by a considerable margin.

In the light of the above, Terhune *et al.* asked the following questions:
A nagging question which qualifies conclusions from epidemiological studies of drugs in crashes is: if certain drugs are linked to elevated crash risks, how much of the elevation is due to characteristics of the people who use these drugs? 73

For example, Terhune in a literature review remarked that research revealed a striking similarity between the personal correlates of marijuana use and the correlates of crash involvement. 74 Rebellious, deviant, youthful males were prominent among marijuana users and among those in crashes. Jessor et al. also addresses these issues. 75

A general conclusion made by Robbe and O'Hanlon when discussing the results of their study and of their review of the literature is worth citing here as a general conclusion to this review:

In summary, this program of research has shown that marijuana, when taken alone, produces a moderate degree of driving impairment which is related to the consumed THC dose.

The impairment manifests itself mainly in the ability to maintain a steady lateral position on the road, but its magnitude is not exceptional in comparison with changes produced by many medicinal drugs and alcohol.

Drivers under the influence of marijuana retain insight in their performance and will compensate where they can, for example, by slowing down or increasing effort. As a consequence THC's adverse effects on driving performance appear relatively small. Still we can easily imagine situations where the influence of marijuana smoking might have an exceedingly dangerous effect i.e. emergency situations which put high demands on the driver's information processing capacity, prolonged monotonous driving, and after THC has been taken with other drugs especially alcohol.

We therefore agree with Moskowitz's conclusion that 'any situation in which safety both for self and others depends on alertness and capability of control of man-machine interaction precludes the use of marijuana'.

However, the magnitude of marijuana's relative to many other drugs' effects also justify Geringer's (1988) conclusion that 'marijuana impairment presents a real, but secondary, safety risk; and that alcohol is the leading drug-related risk factor'. Of the many psychotropic drugs, licit and illicit, that are available and used by people who subsequently drive, marijuana may well be among the least harmful.

Campaigns to discourage the use of marijuana by drivers are certainly warranted. But concentrating a campaign on marijuana alone may not be in proportion to the safety problem it causes. 76
Footnotes

2. Ibid., p. 107.
4. Ibid.
5. Cognition means knowing or perceiving.
6. Endogenous – produced normally by the body.
10. Ibid.
18. Ibid.
19. Ibid.
23. Yesavage et al., 1985, op. cit.


30 Ibid.

31 Moskowitz (1985), *op cit.*


40 Smiley *et al.* (1981), *op cit.*

41 Stein *et al.* (1983), *op cit.*

42 Moskowitz (1985); Robbe & O’Hanlon (1993); Smiley (1986), *op cit.*


49 Smiley (1986), *op cit.*

50 Robbe & O’Hanlon (1993), *op cit.*


Drummer, O. (1994), *Drugs and drivers killed in Australian Road traffic accidents*. The use of responsibility analysis to investigate the contribution of drugs to fatal accidents, Victorian Institute of Forensic Pathology, Monash University.


Terhune et al. (1992), *Drugs in fatally injured young male drivers*, Public Health Reports, 100, pp. 19-25.


Ibid.


Terhune et al. (1992), *Drug-related traffic accidents: A report to the US Department of Transportation*, DOT HS 807 261.

Ibid.

Ibid.

Road Safety Committee
DRUG LAW ENFORCEMENT AND LEGISLATION
IN NEW SOUTH WALES

Dr J. Perl
Clinical Forensic Medicine Unit
New South Wales Police

Dr Perl describes in considerable detail the operation of drug driving legislation and enforcement procedures in New South Wales, the State which has the most stringent drug driving measures operating in any Australian jurisdiction. The paper includes the results of blood and urine tests on drivers suspected of being under the influence of drugs.

Contents

1. Introduction
   1.1 Alcohol
   1.2 Drugs (other than alcohol)

2. Driving under the influence of a drug - the legislation in New South Wales

3. Discussion

Appendix 1:

Blood and urine testing procedure for persons suspected of driving under the influence of a drug in New South Wales

Appendix 2:

Guide for use on police in cases of suspected drug and drink/driving offences

Appendix 3:

New South Wales Schedule of substances prescribed as drugs
1. INTRODUCTION - DRUGS AND DRIVING

For many thousands of years mankind has been using drugs derived from nature to treat ailments. Unfortunately, many useful drugs have dangerous or damaging effects on the body if used indiscriminately.

The drugs which are most often abused, are generally those that affect the nervous system so as to alter a person's perception of the real world or his/her subjective sensations. These drugs can have one of three effects: stimulation, sedation or hallucination.

Many people believe these drugs are all of the prohibited type eg. heroin, amphetamine or cannabis. But, many medications prescribed by the family doctor are drugs which are frequently abused by some individuals eg. Valium, Serepax, even some antihistamines and weight control drugs.

Each year more than 25 500 Australians die from causes related to the use of drugs. Alcohol, and to a lesser extent other drugs, contribute significantly to road fatalities. Alcohol is present in the blood of about a third to a half of all people killed in motor vehicle crashes and is a factor in about a third of collisions resulting in injury.

Driving a motor vehicle is a task which involves the reception and integration of a number of sensory inputs, decision-making and execution of manoeuvres of varying complexity. Alcohol and many other drugs may alter any or all of these processes.

To protect individuals from using potentially harmful substances, society can implement legislation to restrict supply of the drug or punish the individual for using such substances. The problem with legal restriction is that successful control of one substance often leads to the emergence of another.

Alternatively, society can implement education programmes to inform the general public about potential hazards of drug use and to develop attitudes to make correct decisions about drug use.

1.1 Alcohol

There is little doubt that the single most important drug when considering traffic safety is alcohol. Decades of research has demonstrated the
relationship between the blood alcohol concentration, impairment of driving ability and increased crash risk.

Alcohol is a unique drug in that it can be measured by breath analysis. The introduction of breath analysis in New South Wales in 1968 to determine blood alcohol concentration increased the effectiveness in detecting the intoxicated driver.

Despite the widespread use of breath analysis in New South Wales and harsh penalties for driving under the influence of alcohol, the most dramatic change in drink-driving behaviour since the introduction of breath testing in 1968 occurred with the introduction of random breath testing (RBT) in 1982.

Initially, RBT was conducted at stationary set-ups. To further enhance the deterrence aspect of RBT, and to make the motorist more aware that he/she could be stopped anywhere, anytime for RBT, mobile RBT was introduced in 1988. In addition to random breath testing in New South Wales, compulsory breath testing of drivers/riders of motor vehicles occurs following a traffic offence or involvement in a motor vehicle collision. Evidential breath analysis must be carried out within two hours of the incident.

Furthermore, compulsory blood samples are taken from any driver, rider or pedestrian who is injured and attends a hospital (Section 4G, Traffic Act). The collection of these samples must be carried out within 12 hours of the incident resulting in injury.

1.2 Drugs (other than alcohol)

There has been a tendency to separate alcohol from other impairing drugs because of the numerous difficulties encountered in drug-driving research.

Compared to alcohol (which can be detected by breath analysis), detection of the large number of prescription, over-the-counter and illicit drugs is time consuming, expensive and body-fluid samples are necessary.

In addition, unlike alcohol which is used recreationally by drivers who are generally in good health, most drug users take drugs because of health problems and the question arises - 'Is the driver safer taking medication than driving with an uncontrolled, untreated health problem?'
Most drugs appear, by themselves, to have no obvious effect on driving performance, but some of those that are expected to impair performance do so. However, no simple relationship exists between impaired performance and the concentration of the drug in the blood.

While the full impact of drug use (other than alcohol) in traffic safety is unknown, epidemiological and human performance studies suggest the problem is serious enough to warrant a new look at the law enforcement of driving under the influence of a drug.

Epidemiological studies on the incidence of drugs in the driving population vary from about 5% to 40%, depending on the population under investigation and the extent of drug analysis.

The presence of a drug in accident-involved drivers doesn't necessarily mean that the drug(s) caused the accident. In fact, very few studies include an appropriate non-accident control group for comparison and studies attempting to determine if the drug was a causative factor are very rare.

2. DRIVING UNDER THE INFLUENCE OF A DRUG – THE LEGISLATION IN NEW SOUTH WALES

Driving under the influence (DUI) of a variety of specified drugs has been an offence in New South Wales for many years. Proof of the charge however depended upon two criteria being satisfied - firstly, the admissions of the driver/rider and secondly, the observations of behaviour made by the Police. Police commonly reported the driver driving erratically or weaving and displaying 'slurred speech, bloodshot eyes and staggering gait'. These symptoms are commonly associated with alcohol-intoxicated persons but are not unexpected in drug-intoxicated persons since the majority of abused drugs are central nervous system depressants (affecting brain function), like alcohol.

In New South Wales if a driver did not make admissions about a particular drug the Police were obliged to release him despite obvious impairment. Often an admission made to Police was retracted by the driver when the matter came to Court.

Obviously, the difficulties faced by the Police in proving the DUI charge made that particular section of the Traffic Act virtually redundant.
The recognition that drug-impaired drivers do exist, prompted the New South Wales Government to amend the DUI legislation on the recommendation of the Joint Parliamentary Standing Committee on Road Safety, STAYSAFE.

The amendment to the Traffic Act came into force on 1 December, 1987 and this required compulsory blood and urine samples to be taken from drivers suspected by Police to be affected by a drug (Section 5AA of the Traffic Act of 1909).

Certain procedures must be adopted before the driver is submitted to drug testing (Appendix 1). Police must initially have evidence of impaired behaviour and the driver must then be subjected to a breath test for alcohol. Only if the breath test indicates that the driver is below the legal alcohol limit can the urine and blood testing for drugs be undertaken.

When the legislation was first introduced, the procedure required the Police Officer to witness the manner of driving or the way in which the driver was occupying the driving seat and attempting to put the vehicle in motion. Following a negative screening breath test, an on-the-spot assessment of sobriety was required to be carried out by the Police Officer.

There is no formal assessment of sobriety procedure used in New South Wales, such as the field sobriety testing procedure or drug recognition experts programme used in California, USA. Assessment is at the discretion of the Police Officer although a blue card is issued to all Police, a 'Guide for use of Police in cases of Suspected Drug and Drink/Driving Offences' (Appendix 2). Police are encouraged during training to use the guide.

Once the Police Officer has assessed the driver and is of reasonable belief that a driver/rider is under the influence of a drug, the driver can be arrested under Section 5AA and taken to a hospital for the purpose of providing a 10 ml blood and a 100 ml urine sample. The samples, taken by a medical practitioner or registered nurse, are divided into two - one each for the driver and the Police.

The samples obtained under Section 5AA must be obtained within two hours from the event which led to the assessment of sobriety.
It is an offence to refuse to undergo an assessment, or to refuse or fail to provide a sample of blood or urine or both. Once the samples have been provided the driver is free to go but is advised not to drive at that time.

A report by the arresting Police about the circumstances leading to the arrest and the sobriety assessment must be submitted to the Blood Sample Unit of the New South Wales Police Service, together with the certificate filled out by the Police Officer and the doctor/nurse responsible for seeing that the samples of blood and urine are collected. The samples are analysed by the Department of Health (Division of Analytical Laboratories). Urine, being a clean sample, is used for screening (qualitative analysis) purposes while a quantitative analysis is carried out on the blood.

If no drugs are found the arresting Police are advised and they, in turn, advise the driver. If a drug is detected in the urine, evidentiary analysis of the blood is carried out and a certificate is prepared by an analyst at the Laboratories.

The blood certificate, manuscript report and analyst's certificate are then forwarded by the Police Blood Sample Unit to the Clinical Forensic Medicine Unit of the New South Wales Police Service where a report is prepared by a forensic pharmacologist giving an expert opinion as to the likelihood of driving impairment due to the drug(s) found. Finally, advice is forwarded to the arresting Police relating to the results and the course of the action to be adopted. The Police Officer then advises the driver and provides the driver with a copy of the analyst's certificate.

Since the manner of driving had to be witnessed by Police, many accident-involved drivers were not subjected to blood/urine samples. In 1989, the procedure was amended to include accident-involved drivers where Police had reasonable belief that the person was under the influence of a drug by the way in which the person drove, or the manner in which the driver/rider occupied the seat and attempted to put the vehicle in motion.

A further amendment to the Traffic Act in 1990 allowed the testing for drugs in blood samples taken from injured drivers conveyed to hospital and who had not undergone a breath test or been subjected to an assessment of sobriety. These compulsory blood (only) samples are taken under Section 4G of the Traffic Act and are analysed for alcohol only, unless a request is made by Police for drug analysis. For the sample to be tested for drugs,
Police must produce a report including evidence of justifiable grounds to suspect that at the time of the accident the driver/rider was under the influence of a drug other than alcohol. Such evidence may include things such as drugs or implements found in the vehicle.

As with any new legislation and analytical procedure, teething problems arose. As already indicated above, when the legislation was first enacted accident-involved drivers were not subjected to drug testing. This issue was resolved with further amendments.

Secondly, some drugs which are abused were not covered by the definition of 'drug'.

'Drugs' for the purposes of the Traffic Act are defined as alcohol, those included in the Drug Misuse and Trafficking Act (mainly illicit drugs), drugs listed in Schedule 8 of the Poisons Act and those drugs listed in Schedule N of the Motor Traffic Regulations.

Initially samples were only screened for a small range of drugs including alcohol, cannabis, opiates (heroin, morphine etc.), cocaine, amphetamines ('speed'), barbiturates and benzodiazepines (eg. Valium, Serepax, Mogadon etc). The spectrum of drugs has been increasing as changing patterns of drug misuse have been identified. Appendix 3 shows the current Schedule N of the Motor Traffic Regulations.

In view of the study of stimulant abuse by heavy vehicle drivers reported by Nix-James in 1979, it was suggested (by the author) that perhaps ephedrine, phentamine and diethylpropion (drugs with stimulant actions) should also be included in Schedule N of the Motor Traffic Regulations since these drugs were frequently found to be used by heavy vehicle drivers. Although this proposal was put forward in 1988, no amendment to Schedule N was implemented until 1991.

Moves to amend Schedule N finally came about as a result of the tragic Grafton bus and truck crash which took so many lives. The truck driver was found at the coronial inquest to be at fault. His blood ephedrine level of 8 milligrams per litre was much higher than the blood levels expected in chronic users of this substance.

Although there are many drugs (including legally prescribed medications) which may impair driving ability, in reviewing epidemiological studies it
becomes apparent that the selected list of drugs for the purposes of the legislation appears to be surprisingly comprehensive.

A Committee involving representatives from the Roads and Traffic Authority, New South Wales Police Service, the Poisons Advisory Committee, the Department of Health and on occasions other interested parties, was formed in 1989 to review Schedule N as the need arises.

Potential hazards to traffic safety may become evident with new drugs or changing 'recreational' use (abuse) of prescription drugs. Amendments to the list of proscribed substances will regularly need to be made to deal with the problem.

One major difficulty with this process is the delay between identification of a 'problem' drug and the implementation of an amended Schedule N. One solution would be a much broader definition of the term 'drug' within the Traffic Act. Perhaps consideration should be given to the Californian definition which states:

"The term 'drug' means any substance or combination of substances, other than alcohol, which could so affect the nervous system, brain or muscles of a person as to impair, to an appreciable degree, his ability to drive a vehicle in a manner that an ordinarily prudent man, in full possession of his faculties, using reasonable care, would drive a similar vehicle under like conditions."

3. DISCUSSION

The DUI legislation is not aimed at the legitimate drug user but is aimed at further improving road safety by removing drug abusers from New South Wales roads.

Prior to the inclusion of injured accident-involved drivers in 1991, 90% of drivers suspected of being under the influence of a drug (other than alcohol) were in actual fact drug-positive as determined by blood analysis (TABLE 1). This indicates the procedures adopted in New South Wales result in a low incidence of persons being unnecessarily subjected to blood/urine analysis. When it is further considered that not all potentially impairing drugs are looked for in the samples, the 'negative' percentage is readily acceptable.

Since 1991, the testing of blood samples taken from injured accident-involved drivers suspected of driving under the influence of a drug has
resulted in a greater percentage of drug-negative (although not necessarily alcohol-negative) drivers (TABLE 1).

Table 2 shows the total samples taken under Section 5AA of the Traffic Act between 1987 and 1990 and the number of drivers who were charged with the offence of 'driving under the influence of a drug' (DUID). From this Table it can be seen that as Police became more familiar with the requirements of the legislation in obtaining samples, fewer drivers subjected to testing were subsequently found to be drug-negative.

These findings would strongly suggest good procedures and good training of Police is desirable to avoid unnecessarily subjecting a driver to testing.

Overall, cannabis was by far the most frequently detected drug in drivers suspected of DUID. Table 3 indicates the number of drivers in each of the drug categories tested for; these totals are obtained from the total number of reports submitted to the forensic pharmacologist and may include some cases which were subsequently not prosecuted due to some requirement not having been fulfilled (eg. driver not breath-tested, sample being taken outside the two hour limit etc). Barbiturates and cocaine do not appear to be as prominent in New South Wales as they are in many reported studies from overseas.

Table 4 shows the drug-positive drivers in 1990 by age group and drug category. Young drivers were clearly more likely to be using cannabis than drivers over 25 years of age. Unfortunately, these data are at present incomplete since the age of many of the drivers was not reported to the pharmacologist; the data is currently being reviewed.

Drug-positive drivers arrested in 1990 are shown by sex and drug category in Table 5. In accordance with other drink-driving data in New South Wales, males constituted the majority of arrests.

Since a great deal of attention was focussed on the Grafton truck and bus collision (at the time, the most serious motor vehicle collision to have occurred in New South Wales history), attention has been focussed by the STAYSAFE committee, the Roads and Traffic Authority and the Police on heavy vehicle drivers. Tables 6 and 7 show the reason for coming to Police notice and incidence of drugs detected in heavy vehicle drivers suspected of DUID between 1990 and 1992. Erratic manner of driving was the most
common reason cited by Police for stopping these drivers and stimulant drugs were by far the most prevalent drugs detected.

The above results indicate the procedures adopted in New South Wales for obtaining blood samples from drivers suspected of being under the influence of a drug are clearly successful in detecting the drug-positive drivers. Further, the vast majority of these drug-positive drivers plead guilty at Court.

Nevertheless, the entire procedure is under constant evaluation and review. To further enhance the procedure of detecting drug-impaired drivers, it has been proposed the Californian system of field sobriety testing and drug recognition experts be assessed.

Field sobriety testing involves up to three days of police training and includes measures of performance such as: stability on standing, time perception, ability to balance on one foot, ability to walk in a straight line and a coordination task (ability to touch one's nose with eyes closed). The scores given for these tests may be compared to give a crude indication as to the degree of impairment. This level of training is given to all Police involved in apprehension of drivers for suspected driving under the influence of a drug/alcohol.

The drug recognition expert program (DRE) was developed by the Los Angeles Police Department. This program involves a very high level of training, over several months, to accurately recognise physiological signs and symptoms of drug influence.

Unlike New South Wales, Californian legislation does not allow the taking of blood and urine samples from drivers suspected of being drug-impaired without a comprehensive assessment process. The purpose of the DRE assessment provides 'an articulable basis for requesting a suspect to supply the blood (or urine) sample'.

In New South Wales the legislation is clear. It requires a driver/rider to submit to a blood/urine test if a Police Officer has reasonable belief that the driver/rider may be under the influence of a drug, although a certain procedure must be followed by Police. The use of field sobriety tests may assist the Courts as a guide to the degree of affectation and may reduce subjectivity on the part of the Police Officer when making the assessment.
Finally, it is recognised that little is known about the effect of drug concentrations on driving behaviour to the extent that establishing a statutory concentration is, at present, impossible. This has not stopped the analysis of blood and urine samples in New South Wales from being a success in the enforcement of the DUI legislation, since it is now possible to confirm drug usage by blood and urine analysis, which are used to support the observations by the police of impaired driver behaviour.

REFERENCES

APPENDIX 1
BLOOD AND URINE TESTING PROCEDURE FOR PERSONS SUSPECTED OF DRIVING UNDER THE INFLUENCE OF A DRUG IN NEW SOUTH WALES

Non-Injury Accidents

Person Submitted To Breath Test - Negative Result

Police Observe Manner Of Driving

Police Believe Person To Be Under The Influence Of Drug - Assessment Of Sobriety

Person Arrested And Conveyed To Hospital

Blood And Urine Taken Within Two Hours Of Incident

Blood Sample And Police Report To Blood Sample Unit

No Drug

Positive Sample

Blood Result And Police Report Sent To Pharmacologist For Opinion

Blood Sample Unit To Advise Police Of Action

Evidence To Suggest Drug Abuse

Report To Blood Sample Unit Requesting 4G Sample To Be Tested For Drugs

Person Injured - Blood Sample Taken At Hospital For Alcohol Analysis (Section 4G)

Samples Sent To Division Of Analytical Laboratories

Police Manuscript Report Of Incidence And Observations
APPENDIX 2

GUIDE FOR USE OF POLICE IN CASES OF SUSPECTED DRUG AND DRINK/DRIVING OFFENCES

The information supplied as a result of the questions set out hereunder is considered essential in drink/driving offences. Every effort should be made to explore and clarify answers given. The questions suggested hereunder are intended to be only the most essential and investigating Police should fully explore each individual case bearing in mind individual circumstances which will exist.

1. Who was the driver of this vehicle at the time of the collision?
2. What time did the collision occur?
3. How did you determine the time?
4. How did the collision occur?
5. I can smell intoxicating liquor on your breath. What have you been drinking?
   (i) First Drink
   (ii) Last Drink
   (iii) Drink since collision
   (iv) Type of Drink
   (v) Quantity of Drink
   (vi) Size of Drink
6. Where did you consume these drinks?
7. With whom did you consume these drinks?
8. Are you suffering from any illness or injury? (explore each)
9. Are you taking any tablets, drugs, insulin or medicine? (explore in answer yes)
10. Have you received any medical or dental treatment recently?
11. When did you have your last meal/what did you have?

OBSERVATIONS

Breath: Smell of intoxicating liquor.
Colour of Face: Flushed pale or other signs.
Skin: Pale, needle-marks, ulcers, abscesses, excessive perspiration.
Clothing: Orderly, soiled, disarranged.
Attitude: (points to look for)
  co-operative  talkative  anxious
  excited  dreamy  relaxed
  indifferent  hallucinating  sedated
  antagonistic/hostile  irritable  depressed
  cocky/overconfident  unable to follow instructions.
Actions: Swearing, hiccupping, belching, vomiting, fighting, drooling, restless, loss of emotional control, runny nose, itching/constant scratching.
Eyes: Describe in detail: (points to look for) Watery, glazed, bloodshot, eyelids drooping etc. Pupils enlarged or pin-point.
Breathing: Describe in detail: (points to look for) Normal, short, jerky, rapid, shallow, slow.

Speech: Describe in detail: (points to look for) Incoherent, clear, slurred, confused, fast, slow.

Balance: Describe in detail: (points to look for) Unsteady, swaying, sagging, falling, staggering.

Movement: Describe in detail: (points to look for) Manner of walking, need of support, performance of actions (eg. lighting cigarette) clumsy, sluggish, jerky, tremor.

ANY OTHER SIGNS:

Opinion: Based on observations as to insobriety: (slightly, moderately, well-affected, drunk due to liquor and/or drug).
APPENDIX 3

TRAFFIC ACT 1909 - REGULATION

(Expanding the range of pharmaceutical substances prescribed as 'drugs' for the purposes of the Act)

HIS Excellency the Governor, with the advice of the Executive Council, and in pursuance of the Traffic Act 1909, has been pleased to make the Regulation set forth hereunder.

Minister for Roads.

Commencement

1. This Regulation commences on 1 September 1991.

Amendment

2. The Motor Traffic Regulations 1935 are amended by omitting Schedule N and by inserting instead the following Schedule:

SCHEDULE N - SUBSTANCES PRESCRIBED AS DRUGS

(Reg. 130B)

ALPRAZOLAM
AMYLOBARBITONE
AZATADINE
BARBITURIC ACID DERIVATIVES not otherwise specified in this Schedule
BENZODIAZEPINE DERIVATIVES not otherwise specified in this Schedule
BROMAZEPAM
BROMPHENIRAMINE
BUCLIZINE
BUPRENORPHINE
BUTOBABITONE
CHLORAL HYDRATE
CHLORDIAZEPoxide
CHLORMETHIAZOLE
CHLORPHENIRAMINE
CHLORPHENTERMINE
CHLORPHENTERMINE
CLEMASTINE
CLOBAZAM
CLONAZEPAM
CLORAZEPATE
CODEINE
CYCLIZINE
Cyclobarbitone
Cyproheptadine
Dexchlorpheniramine
Dextropropoxyphene
diazepam
diethylpropion
dihydrocodeine
dimexhydrinate
dimethindine
diphenhydramine
diphenylpryzaline
doxylamine
ephedrine (excluding pseudoephedrine)
ethylmorphine
fenfluramine
flunitrazepam
flurazepam
glutethimide
hydroxyzine
lorazepam
mazindol
mebhydrolin
meclozine
medazepam
meprobamiate
mepyramine
methdilazine
methylphenobarbitone
midazolam
nalbuhine
nitrazepam
oxazepam
pentazocine
pentoobarbitone
pheniramine
phenobarbitione
phentermine
phenyltoloxamine
pizotifen
prazepam
promethazine
propylhexedrine
quinalbarbitone
secbutoobarbitone
temazepam
thenyldiamine
triazolam
trimeprazine
triprolidine

Road Safety Committee
TABLE 1

TOTAL SAMPLES RECEIVED IN NEW SOUTH WALES UNDER SECTION 5AA OF THE TRAFFIC ACT - DRUG POSITIVE AND DRUG NEGATIVE MOTORISTS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Drug positive</td>
<td>75 (58%)</td>
<td>151  (77%)</td>
<td>235  (90%)</td>
<td>284  (74%)</td>
<td>340  (84%)</td>
</tr>
<tr>
<td>Drug negative</td>
<td>55 (42%)</td>
<td>44  (23%)</td>
<td>25   (10%)</td>
<td>99   (26%)</td>
<td>67   (16%)</td>
</tr>
<tr>
<td>TOTAL SAMPLES</td>
<td>130 (100%)</td>
<td>195  (100%)</td>
<td>260  (100%)</td>
<td>383  (100%)</td>
<td>407  (100%)</td>
</tr>
</tbody>
</table>
## TABLE 2

**TOTAL SAMPLES RECEIVED IN NEW SOUTH WALES UNDER SECTION 5AA OF THE TRAFFIC ACT - ACTION TAKEN AGAINST THE MOTORIST**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Samples</th>
<th>Traffic Sample</th>
<th>Action Taken Against Motorist</th>
<th>No Action Taken</th>
<th>Nil Drugs</th>
<th>Total Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec 1987 - Dec 1988</td>
<td>130 (100%)</td>
<td>195 (100%)</td>
<td>185 (71%)</td>
<td>50 (19%)</td>
<td>25 (10%)</td>
<td></td>
</tr>
<tr>
<td>1989</td>
<td>195 (100%)</td>
<td>57 (44%)</td>
<td>123 (63%)</td>
<td>28 (14%)</td>
<td>44 (23%)</td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>260 (100%)</td>
<td></td>
<td>185 (71%)</td>
<td>50 (19%)</td>
<td>25 (10%)</td>
<td></td>
</tr>
</tbody>
</table>

Road Safety Committee
## TABLE 3

**TOTAL DRUG POSITIVE SAMPLES**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N (%total)</td>
<td>N (%total)</td>
<td>N (%total)</td>
</tr>
<tr>
<td>Total positive</td>
<td>64 (100%)</td>
<td>141 (100%)</td>
<td>237 (100%)</td>
</tr>
<tr>
<td>Stimulants</td>
<td>11 (17%)</td>
<td>19 (13%)</td>
<td>51 (22%)</td>
</tr>
<tr>
<td>Cannabis</td>
<td>18 (28%)</td>
<td>76 (54%)</td>
<td>162 (68%)</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>26 (41%)</td>
<td>48 (34%)</td>
<td>67 (28%)</td>
</tr>
<tr>
<td>Barbiturates</td>
<td>2 (3%)</td>
<td>2 (1%)</td>
<td>7 (3%)</td>
</tr>
<tr>
<td>Narcotics</td>
<td>28 (44%)</td>
<td>41 (29%)</td>
<td>76 (32%)</td>
</tr>
<tr>
<td>Cocaine</td>
<td>-</td>
<td>7 (5%)</td>
<td>1 (1%)</td>
</tr>
<tr>
<td>Other drugs*</td>
<td>3 (5%)</td>
<td>10 (7%)</td>
<td>44 (19%)</td>
</tr>
</tbody>
</table>

* This group includes primarily, alcohol and methadone
TABLE 4

DRUG-POSITIVE DRIVERS - 1990

(n = 237)

drug category -v- age of driver

<table>
<thead>
<tr>
<th>Drug category</th>
<th>Up to 25</th>
<th>26-35</th>
<th>Over 35</th>
<th>Unknown</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulants</td>
<td>12</td>
<td>17</td>
<td>8</td>
<td>14</td>
<td>51</td>
</tr>
<tr>
<td>Amphetamine type</td>
<td>8</td>
<td>4</td>
<td>4</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td>-</td>
<td>6</td>
<td>1</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Cannabis</td>
<td>57</td>
<td>22</td>
<td>9</td>
<td>74</td>
<td>162</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>16</td>
<td>16</td>
<td>7</td>
<td>28</td>
<td>67</td>
</tr>
<tr>
<td>Barbiturates</td>
<td>-</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Narcotics</td>
<td>13</td>
<td>15</td>
<td>13</td>
<td>35</td>
<td>76</td>
</tr>
<tr>
<td>Cocaine</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Other drugs*</td>
<td>8</td>
<td>17</td>
<td>3</td>
<td>16</td>
<td>44</td>
</tr>
<tr>
<td>TOTAL</td>
<td>106</td>
<td>88</td>
<td>43</td>
<td>171</td>
<td>408</td>
</tr>
</tbody>
</table>

* Includes 18 alcohol positives and 21 methadone positives.
TABLE 5

DRUG-POSITIVE DRIVERS - 1990

(n = 237)

drug category -v- sex of driver

<table>
<thead>
<tr>
<th>Drug Category</th>
<th>Male</th>
<th>(%T)</th>
<th>Female</th>
<th>(%T)</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stimulants</td>
<td>47</td>
<td>(92)</td>
<td>4</td>
<td>(8)</td>
<td>51</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>20</td>
<td>(91)</td>
<td>2</td>
<td>(9)</td>
<td>22</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>18</td>
<td>(90)</td>
<td>2</td>
<td>(10)</td>
<td>20</td>
</tr>
<tr>
<td>Other</td>
<td>9</td>
<td>(100)</td>
<td>-</td>
<td>-</td>
<td>9</td>
</tr>
<tr>
<td>Cannabis</td>
<td>146</td>
<td>(90)</td>
<td>16</td>
<td>(10)</td>
<td>162</td>
</tr>
<tr>
<td>Benzodiazepines</td>
<td>47</td>
<td>(70)</td>
<td>20</td>
<td>(30)</td>
<td>67</td>
</tr>
<tr>
<td>Barbiturates</td>
<td>2</td>
<td>(29)</td>
<td>5</td>
<td>(71)</td>
<td>7</td>
</tr>
<tr>
<td>Narcotics</td>
<td>58</td>
<td>(76)</td>
<td>18</td>
<td>(24)</td>
<td>76</td>
</tr>
<tr>
<td>Cocaine</td>
<td>1</td>
<td>(100)</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Other Drugs</td>
<td>32</td>
<td>(73)</td>
<td>12</td>
<td>(27)</td>
<td>44</td>
</tr>
</tbody>
</table>
TABLE 6

HEAVY VEHICLE DRIVERS
1990 - 1992
REASON FOR COMING TO POLICE NOTICE

<table>
<thead>
<tr>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Erratic manner of driving</td>
<td>12</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Traffic offence</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Single vehicle collision (eg. left the road)</td>
<td>4</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Other collisions</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Speeding</td>
<td>3</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Other reasons</td>
<td>2</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>
### TABLE 7

HEAVY VEHICLE DRIVERS  
1990 - 1992  
DRUG CATEGORIES USED

<table>
<thead>
<tr>
<th>Drug Category</th>
<th>Number of Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1990</td>
</tr>
<tr>
<td>Stimulants</td>
<td>26</td>
</tr>
<tr>
<td>Amphetamine</td>
<td>2</td>
</tr>
<tr>
<td>Ephedrine</td>
<td>12</td>
</tr>
<tr>
<td>Pseudoephedrine</td>
<td>3</td>
</tr>
<tr>
<td>Diethylporpion</td>
<td>2</td>
</tr>
<tr>
<td>Phentermine</td>
<td>4</td>
</tr>
<tr>
<td>Phenylpropanolamine</td>
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THE DRUG RECOGNITION EXPERT RESPONSE

Sergeant T.E. Page
Officer-in-Charge, Drug Recognition Expert Unit
Los Angeles Police Department
California, United States of America

Sergeant Page describes the background to the Los Angeles Police Drug Recognition Expert process which subsequently developed into a national drug expert accreditation scheme adopted by more than half the American States. The 12 step process is described, as is the training process and court acceptance of evidence.

Contents:

1. The dark ages
2. Out of the dark
3. Drug categorization: Based on patterns of signs and symptoms
4. Laboratory and field evaluation of the DRE program
5. Curriculum development and institutionalization of DRE
6. The three determinations of a DRE
7. The twelve step DRE procedure
8. The drugs of abuse: An overview
   8.1 Central nervous system depressants
   8.2 Inhalants
   8.3 Phencyclidine
   8.4 Cannabis
   8.5 Central nervous system stimulants
   8.6 Hallucinogens
   8.7 Narcotic analgesics
   8.8 Poly-drug use
9. DRE training and certification
10. Court acceptance

Road Safety Committee 121
1. **THE DARK AGES**

In the 1970s, before the dawn of the Drug Recognition Expert (DRE), the following scenario was regularly played out on the streets of cities like Los Angeles:

A police officer's attention would be drawn to an automobile. The officer's attention may have been diverted by a traffic violation, such as speeding, an improper turn, or the host of other violations. In fact, the officer's attention may have been diverted not because of a traffic violation, but because of some other form of erratic driving such as weaving within a traffic lane or stopping inappropriately. Whatever the reason, the officer would initiate a traffic investigation by stopping the driver. This officer would then approach the driver on foot, always, of course, being alert for officer safety considerations. The officer would inform the driver of the reason for the stop, and request the person's driver's license and vehicle registration. The officer would mentally catalogue any evidence that indicated that the driver was under the influence of alcohol and/or drugs. If the officer developed sufficient suspicion that the driver was possibly under the influence of alcohol or drugs, the officer would administer roadside sobriety testing to gain additional reasons to suspect alcohol or drug influence.

During the 'dark ages', these roadside tests were not standardised. Each officer would develop his or her own procedures for determining if the individual was under the influence of alcohol and/or drugs. Junior officers would model their procedures after those used by senior officers and would often add their own nuances to the procedures. These roadside sobriety tests would frequently include variations of 'counting exercises', alphabet tests, coin pick-ups and questioning techniques. Officers developed their own tests to determine if a suspect was able to divide his or her attention. For example, an officer may first direct the driver to produce a driver's license. As the driver was producing the license, the officer would ask the driver the year and model of his vehicle. Officers learned that the under the influence driver was easily distracted. The driver would frequently 'forget' the directions to produce a driver's license, and would now 'concentrate' on answering the officer's questions about the vehicle's year and model. Based on everything the officer had observed, the individual's driving, the observations at the time of personal contact, and the driver's performance on the roadside sobriety tests, the officer would decide to arrest the person
for driving under the influence. After being arrested the driver would be taken to a police station. At the police station, and after the officer informed the arrestee of his rights and obligations under the law, the arrestee would typically be administered an alcohol breath test. The officer would then receive a written record of the person’s alcohol level. If the arrestee’s level reached a certain statutory level, such as .10% BAC (blood alcohol concentration), the individual would be booked into the jail. The case would then be presented to the prosecuting attorney for review and prosecution.

During the 1960s and 1970s, many individuals were producing breath test results that were below the statutory level even though they seemed to be extremely intoxicated. In these increasingly common instances, the officer had a number of options, all of them unsatisfactory. The officer may simply have released the person advising the person not to drive. In many of these cases, the arrestee had some alcohol in their system, although they seemed to be more intoxicated than would be expected. The officer may have believed that the person was simply an intolerant drinker, one that would become overly intoxicated after a small amount of alcohol.

Another option was to obtain a psychiatric evaluation of the driver. In effect, the officer would suspect that the individual’s erratic behaviour was caused by a psychological condition. A third option for the officer who had arrested the so-called ‘low blow’ driver was to request an evaluation for drug influence by medical personnel assigned to the jail dispensary. (Los Angeles as well as many other jurisdictions have medical personnel on-duty around the clock at their larger jail facilities.) This option had its pitfalls. Even to this day, most medical personnel, including physicians and nurses, have little comprehensive knowledge about the drugs of abuse, particularly in the quantities of drugs that drug abusers use, the methods of administration, and importantly, the predilection of drug users to use multiple substances either serially or concomitantly. These professionals simply did not have the knowledge about drugs that trained officers have. More importantly, however, and most relevant to how drug users ingest drugs, the medical professionals were seeing the arrestee after a good deal of time had elapsed since the person had been observed by the arresting officer. By the time of the medical assessment the arrestee may no longer display any of the signs and symptoms that the arresting officer had seen. The individual may not even be under the influence any more. Frequently,
however, and owing to the prevalence of poly–drug or multiple drug use, the individual would exhibit nearly the opposite of the effects the officer had seen. While being investigated by the arresting officer, the individual would frequently be agitated, nervous, trembling, have dilated pupils and so forth. By the time the physician encountered the suspect, the suspect would often be sedated in appearance and demeanour. The suspect may in fact display nearly the opposite of the effects detected by the arresting officer. For all of these and more reasons, a medical evaluation was not a viable solution to detecting drug influence. A procedure was needed that officers could employ to be able to detect, apprehend, document, assess and prove in a court of law that the individual was under the influence of drug(s). The need for DRE was incubating.

2. OUT OF THE DARK

Much has not changed over the years from the above scenario. Officers are still taught three phases of DUI detection, these being: (1) vehicle in motion, (2) personal contact, and (3) pre-arrest screening. Each of these phases requires decision making on the officer's part. In phase one, vehicle in motion, the officer's decision is whether or not to stop the vehicle. Phase two's decision is whether or not the driver should be instructed to exit the vehicle. Phase three's decision is simply whether or not to arrest the person. The development, refinement, and validation of standardised procedures for phase three commenced at the same time that the need for procedures to detect the drug-impaired driver was growing. The resulting development of the standardised field sobriety test (SFST), which was largely through the efforts and research of Marcelline Burns, Ph.D. of the Southern California Research Institute, was a critical step toward the development of DRE.

Without repeating the extensive volumes of research conducted by Dr. Burns and her associates, the outcome was a systematic and standardised procedure that officers could use to determine at roadside if an individual was under the influence of alcohol. Dr. Burns evaluated the assortment of tests that officers through trial and error had developed throughout the United States. In laboratory settings, and then again in the field, Dr. Burns evaluated these various tests. The three tests found to be the most reliable predictor of a .10% BAC are: (1) the horizontal gaze nystagmus test; (2) a walk and turn test; and (3) a one-leg stand test. When these tests were administered by a trained officer as a battery of examinations, officers could
reliably determine if an individual's BAC was at or above the legal level at the time—0.10%. Importantly, these tests included an assessment of not only the individual's balance and coordination, but also assessed the ability to pay attention, follow simple instructions, and most importantly, whether the individual was able to divide his or her attention between multiple tasks. This important concept, now termed divided attention, has direct association with the multiple tasks involved in operating a motor vehicle during which many tasks are being done simultaneously. According to a study by researchers at the Johns Hopkins University, there are approximately 1500 separate tasks involved in motor vehicle operation, many of which are done simultaneously. The SFST includes an assessment of an individual's ability to divide his or her attention. For example, during the walk-and-turn test, the suspect is instructed to stand on a real or imaginary line with one foot in front of the other. While the suspect stands in this position, the administering officer gives verbal instructions while at the same time demonstrating how the test is to be performed. Often, a suspect who is under the influence, will 'forget' to maintain the initial position, and will either begin to do the walking portion of the test before being told to do so, or will step out of the initial (instructional) position. During the walking phase, the individual who is unable to divide his or her attention will frequently forget part of the instructions, such as counting out loud, touching heel to toe, etc. With support by the United States Department of Transportation, the battery of tests, known as the SFST, became the curriculum to train officers in DUI detection nationwide.

Concurrently with the development of the SFST, drug use, and its effect on highway fatalities and injuries continued its steady incline. Traffic enforcement officers from the Los Angeles Police Department (LAPD) began to develop their own expertise on the effects of the non-alcohol drugs. These officers consulted and worked with officers from the LAPD's Narcotics Division. Over time, the traffic enforcement officers combined the knowledge that narcotics officers had developed with accepted medical knowledge about the effects of drugs, and developed a step-by-step procedure to enable them to determine drug influence. These innovative LAPD officers did not 'invent' new knowledge about the effects of drugs, as the effects of most drugs have been known for thousands of years. The writer Aldous Huxley has been quoted as saying that 'Pharmacology antedated agriculture'. Simply, this means that people were learning about the effects of drugs before they learned to plant and harvest crops. Probably
through the observation of animals, humans very early on learned of the pharmacological, mood and mind altering effects of certain drugs.

3. **DRUG CATEGORIZATION: BASED ON PATTERNS OF SIGNS AND SYMPTOMS**

Borrowing extensively from medicine, psychiatry, physiology, toxicology and associated fields, a drug categorization scheme was developed that placed the primary drugs of abuse into seven categories. These categories are not based on shared chemical structures, nor on their legality, nor on the user's subjective experience. Rather, this categorization system is based on the premise that each drug within a category produces a pattern of effects known as signs and symptoms.

A 'sign' is detectable by an observer. Signs include bloodshot eyes, horizontal gaze nystagmus, pulse rate, impaired coordination, etc. A 'symptom' on the other hand is by nature subjective. It is experienced by the individual, and may be reported to the observer. For example, a feeling of nausea is a symptom. Hallucinations are symptoms, although they may elicit a behavioural response. It is the pattern of effects, rather than a specific effect, that is unique to the category.

This scheme is analogous to a handwritten signature, not a non-changing fingerprint. Each time a signature is written it will be slightly different. The signature will still however be recognisable as identifying a specific individual. The same is true with the categorization system developed by DREs. Fingerprints, on the other hand, do not change. Practically, this means that although there are numerous drugs within each of the seven categories, the overall pattern of effects within the category at hand is the same. The effects can and do vary from drug to drug, primarily in terms of intensity and duration. This also means that the DRE is not able to distinguish between the specific drugs in a category by detecting effects.

It should also be clear that when I discuss the effects of the various drugs I am speaking of intoxicating effects and generally not therapeutic effects, if any. Drug abusers use drugs for effects on the central nervous system (CNS), primarily the brain. If a drug does not affect the brain then it will not be abused (although, of course, it may be misused). The seven categories will be discussed later in this paper. To preview, however, the seven drug categories used by DREs are: CNS depressants (including alcohol),
Sergeant T.E. Page, Los Angeles Police

inhalants, phencyclidine, cannabis, CNS stimulants, hallucinogens, and narcotic analgesics.

Not only did the LAPD officers borrow extensively from existing bodies of knowledge to develop their drug categorization method, they also borrowed from the medical field to develop procedures to evaluate individuals for suspected drug influence. For example, it has been established for years that an individual's state of health, or intoxication for that matter, can be assessed by taking the person's vital signs (blood pressure, pulse and temperature in the case of the DRE). Likewise, the eye examinations, the balance and coordination tests, as well as the other parts of a DRE evaluation have an historically accepted role in medicine. The primary role of these assessment devices has been in the history and physical examination that is performed by physicians to aid in arriving at a diagnosis of illness, injury or disease. In fact, physicians have discerned similarities between each step in the DRE procedure to this history and physical examination. As the New York Court (Quinn case) stated in its decision regarding the scientific acceptance of DRE procedures, DRE is simply a compilation of the 'tried and true'.

To summarise, the initial DREs simply applied accepted medical techniques to detecting the accepted effects of the drugs of abuse. What was new however, was the development of a step-by-step procedure that non-medical people, ie. law enforcement officers, could use. A step-by-step checklist procedure is standard within law enforcement. Following a checklist ensures that nothing is left out and aids in the presentation of evidence in a court of law. Although the procedure was not nearly as standardised as it is today, DRE officers were increasingly able to testify and articulate in Los Angeles Courts their expertise on the effects of drugs. And the courts began to routinely recognise the officers as experts, which meant that these officers could render opinions, unlike the non-expert who could only relate facts. As a result, Los Angeles prosecutors increasingly relied upon DREs to obtain convictions of defendants who drove while under the influence of drugs. Over a relatively short period of time, the actual rate of filing and subsequent conviction of DUI – drug drivers exceeded that of alcohol alone (approximately 95%). The testimony of DREs was usually not (and is still not) the only evidence that would be introduced into Court in DUI – drug cases. Usually, the prosecutor was able to present scientific evidence of use of drugs through urinalysis or blood analysis by
toxicologists. There was a shift in the role, however, of toxicologists. Their role increasingly became not to determine if the individual was under the influence of drugs, but rather to scientifically confirm use of a specific drug. The DRE's role became further defined as determining whether or not the individual was actually impaired, that is, was under the influence of the drug based on the presenting signs and symptoms.

4. LABORATORY AND FIELD EVALUATION OF THE DRE PROGRAM

The Drug Recognition Expert was becoming institutionalised within the LAPD and within the Los Angeles Courts. The U.S. Government's National Highway Traffic Safety Administration (NHTSA), an agency within the Department of Transportation, began to receive requests from various sources to study the validity and reliability of the DRE procedure. In response, NHTSA, in cooperation with the National Institute on Drug Abuse, undertook a laboratory evaluation of DRE in 1984 at the Johns Hopkins University. Four LAPD DREs travelled to Johns Hopkins University. An experimental protocol was designed to test the accuracy of the DREs. Each of the officers was isolated and independently conducted an assessment of 80 volunteer drug users. In a double-blind format, each of the volunteers had received either marijuana (2 dose levels), diazepam (2 dose levels), amphetamine (2 dose levels), secobarbital (1 dose level) or a placebo. Upon completing a 15 minute assessment, each of the officers was required to determine if the volunteer was impaired, and if so, the type of drug that was causing the observed impairment. The results of this study were reported as extremely encouraging to DRE. In this controlled study, DREs were over 90% accurate in determining impairment, and in correctly identifying the type of drug causing the impairment.

As a follow-up, in 1985 NHTSA conducted a field validation study of the LAPD DRE program. This study which is also commonly known as the 173 Case Study, involved a much larger group of Los Angeles DREs and involved individuals actually arrested for suspicion of driving under the influence of drugs. NHTSA contracted with an independent laboratory to conduct blood analyses of samples obtained from the arrestees. The opinion of the DREs was then compared to the results of the laboratory's analysis for drugs. The results were very similar to the Johns Hopkins Study. Ninety-four percent of the time (162 suspects) a drug other than alcohol was found
when the DREs said that the suspect was impaired by drugs. The drug
determination was complicated by the fact that over 70% of the suspects
yielded detectable levels of more than one drug. Overall the DREs were
totally correct in their judgements on 49% of the suspects, ie., all the drugs
were identified, and partially correct and they identified at least one of the
drugs in an additional 38% of the cases. They were wrong on only twenty-
three subjects (13%) in that the correct drug class was not identified. Only in
one case was no drug or alcohol found.

To summarise, the NHTSA findings were that:

1. When the DREs claimed drugs other than alcohol were present, they
were almost always detected in the blood (94%);

2. Multiple drug use was common: 72% used two or more drugs
including alcohol. 45% used three or more drugs including alcohol;

3. All of the drugs were identified in almost 50% of the subjects;

4. Eighty-seven per cent of the time the DREs correctly identified at least
one drug other than alcohol; and

5. Only 3.7% of the suspects who had used drugs had BACs equal to or
greater than 0.10%. It is likely that most, if not all, of the remainder
would have been released to possibly drive again if the drug
symptoms had not been recognized by the DREs.

The overall conclusion of the two studies was:

The LAPD drug recognition procedure provides the trained police officer
with the ability to accurately recognise the symptoms of many types of drugs
used by drivers.

5. CURRICULUM DEVELOPMENT AND INSTITUTIONALIZATION
OF DRE

Although these studies demonstrated the ability of Los Angeles DREs to
form accurate and corroborated opinions, there was no true standardised
curriculum to ensure the consistency of DRE training. In recognition of the
need to develop a curriculum, 16 senior DREs were selected to develop and
present the DRE curriculum. A DRE school was conducted in 1986 in Los
Angeles utilizing this initial cadre of instructors. The NHTSA and other
The Drug Recognition Expert Response

agencies monitored this school with the goal of standardising the curriculum, and developing a comprehensive curricula package for administrators, instructors, and students. In 1987, NHTSA completed the development of these lesson plans. NHTSA also conducted an instructor development school in Los Angeles to prepare DREs to present the curriculum. A successful DRE school was then held in Los Angeles using this new standardised curriculum.

The next step in the development and expansion of DRE was the selection of four states to pilot the expansion of DRE outside of Los Angeles. The states of New York, Arizona, Colorado and Virginia were selected. Initially, officers from these jurisdictions travelled to Los Angeles to receive the classroom portion of DRE training. Upon completing the classroom training, Los Angeles DREs travelled to these other states to supervise field application and certification of these student DREs. After these students had attained certification as DREs, DRE instructor schools were held to develop some of these new DREs as instructors. Subsequent DRE schools, conducted primarily by these new instructors were then held in these additional states. This basic format of DRE expansion through the development of an initial cadre of DREs, followed by an instructor school, has continued to this day.

In 1988, the United States Government passed the Omnibus Drug Bill. This legislation funded a large scale expansion of DRE. Due in large measure to this bill, law enforcement agencies in 28 states (out of 50) have adopted the DRE program. Currently, there are approximately 4,000 DREs nationwide, including approximately 400 DRE instructors. DRE certification records are now maintained by the International Association of Chiefs of Police. The NHTSA has maintained its role in the DRE program by sponsoring curriculum update conferences, coordinating DRE courses nationwide, developing and issuing training materials and generally providing administrative support of DRE. The DRE Program is now formally titled the Drug Evaluation and Classification Program (DECP).

6. THE THREE DETERMINATIONS OF A DRE

Although DREs may initiate their own arrests for DUI – drugs, the usual case is for a different officer, the arresting officer, to request the expertise and assistance of the DRE after making a DUI arrest. The DRE should be requested to conduct an evaluation for drug influence when the arrestee's signs and symptoms are not consistent with the arrestee's BAC. Simply, the
arrestee may appear more intoxicated than the alcohol level alone would account for. Some agencies such as the LAPD, mandate a drug influence evaluation by a DRE whenever an individual is arrested for DUI and produces a BAC below the statutory level (.08% in California). In addition, an evaluation is mandated whenever the arrestee's degree and/or type of intoxication is not consistent with the arrestee's BAC.

A DRE is responsible for making three determinations which are:

(1) That the arrestee's impairment is not consistent with the BAC;

(2) That the individual is under the influence of drugs and not suffering from a medical condition that requires immediate attention; and

(3) That the individual is under the influence of a specific category (or categories) of drugs.

Step two, the ruling in or out of medical conditions is a critical determination. There are many medical conditions such as stroke, epilepsy, multiple sclerosis, uncontrolled diabetes and others that produce effects that mimic drug intoxication. The DRE needs to be able to quickly and accurately assess the arrestee for the presence of these conditions. It is a frequent occurrence for DREs to determine that the arrestee, who was appropriately arrested, is actually in need of urgent medical care and is not under the influence of drugs. Only after ruling out these medical conditions does a DRE proceed with an evaluation to determine what type of drug the person is under the influence of.

7. THE TWELVE STEP DRE PROCEDURE

In order to reach the three determinations DREs utilise a 12 step, systematic and standardised process. It is standardised in that all DREs, regardless of agency, utilise the same procedure, in the same order, on all suspects. It is systematic in that it logically proceeds from a BAC, through an assessment of both clinical and psycho-physical signs of impairment, to toxicological analysis for the presence of drugs.

The Twelve Steps are:

Step One: The blood (or breath) alcohol concentration

Step Two: Interview of the arresting officer
Step Three: Preliminary examination (includes the first of three pulses)

Step Four: Eye examinations

Step Five: Divided attention tests

Step Six: Vital signs examinations (includes the second of three pulses)

Step Seven: Darkroom examinations of pupil size (includes an examination of the nasal and oral cavities)

Step Eight: Muscle tone

Step Nine: Examination of injection sites

Step Ten: Statements, interrogation

Step Eleven: Opinion

Step Twelve: Toxicological examination

* * * * *

Step One: Blood alcohol concentration

This step precedes the involvement of the DRE. If the arresting officer has determined that the BAC is consistent with both the type and degree of impairment no DRE is called. On the other hand, if the BAC is not consistent with the degree and/or type of impairment a DRE should be requested.

Step Two: Interview of the arresting officer

Based on the results in Step One, the arresting officer requests the assistance of a DRE. The DRE will discuss the circumstances of the arrest and will inquire as to the arrestee's condition at the time of the arrest, whether the arrestee had been involved in a traffic collision, any statements the arrestee had made, whether or not the arrestee had drugs in his or her possession and any other relevant matters. This step is analogous to the interview an emergency room physician conducts when an unconscious individual is brought by ambulance to the hospital. The physician will of course inquire of the ambulance attendants as to how long the person has been in that state, if the person has come in and out of consciousness and so forth.
Step Three: Preliminary examination

This step is commonly referred to as a 'fork in the road'. The purpose of this step is to determine if there is sufficient reason to suspect drug influence. As I mentioned earlier, there are often serious medical conditions that may mimic drug influence. Therefore, an extremely important part of this step is the determination that it is in fact drugs rather than a medical condition that is inducing the observed impairment. In order to make this critical determination the DRE will make general observations of the arrestee's condition, inquire of the arrestee as to any health problems, and conduct a pupil size and eye tracking examination.

Pupils of different size and/or differences in the tracking movements of the eyes often provide evidence of serious life-threatening medical conditions. In addition the DRE takes the first of three pulses in this step. Based on what the DRE detects in this phase a number of outcomes are possible. The DRE may find no signs of drug influence and may return the arrestee to the arresting officer for routine processing. The DRE may see evidence of a medical condition and may obtain a medical assessment. Or the DRE may proceed with a full DRE evaluation. Even though the DRE may have decided to proceed with the drug evaluation, if the DRE at any time finds evidence of a serious medical condition the DRE will cease the evaluation and obtain the medical assessment.

Step Four: Eye examination

During this step the DRE conducts three separate eye movement examinations. They are: horizontal gaze nystagmus, vertical gaze nystagmus, and an eye convergence examination. (Simply, nystagmus refers to an involuntary, but visible jerking of the eye balls. Horizontal gaze nystagmus refers to the visible jerking of the eyeballs as the eyes move back and forth while gazing at an object.)

The SFST research found that horizontal gaze nystagmus (HGN) was the best predictor of an individual's alcohol level. Although there are many different types of nystagmus, some of which are caused by pathology, the HGN examined for by DREs is rarely confused with nystagmus caused by other than alcohol or drugs. The DRE uses a pencil or pen held in front of the arrestee's eyes and moves the object horizontally in front of the individual, while the individual moves his or her eyes attempting to follow
the object. Alcohol and certain other drugs of abuse induce this visible jerking.

During the vertical gaze nystagmus (VGN) examination the arrestee is directed to follow an object that is moved up and down. Importantly, any drug that induces HGN may also cause, if the dose is sufficient, VGN. There are no drugs however that may cause VGN without first causing HGN. Certain medical conditions, such as brain stem damage may however cause VGN but not HGN.

During the convergence examination, the DRE, again using a pencil or pen, directs the arrestee to look at the object while the DRE places the object at the bridge of the arrestee’s nose. The arrestee will attempt to 'cross' his or her eyes while looking at the object. Certain drugs impair the ability of the individual to converge (or cross) the eyes.

Step Five: Divided attention testing

To a degree, this step repeats some of the tests that were given to the suspect at the time of the arrest. The setting now however is a controlled environment, a police station, rather than on the side of a roadway. The DRE administers the following tests in the following order: Romberg Balance Test; a walk and turn test; the one-leg stand test and a finger-to-nose test. These tests are divided attention tests in that they require the individual to not only balance and coordinate body movements, but to remember instructions and to perform more than one task at once. Frequently, the individual's performance on these tests during the DRE evaluation will be markedly different from the arrestee's performance in the field. There are many explanations for this variance: the drug(s) may have worn off during the intermittent time period; the individual may have used multiple drugs and a different drug may now be dominant and so forth. The officer will document the performance of the arrestee, and will then continue to Step Six.

Step Six: Vital signs examination

The DRE takes three vital signs. First, blood pressure using a sphygmomanometer and stethoscope; second, body temperature utilizing an oral thermometer; and third, pulse rate. This is the second of three pulses, the first having been taken in the preliminary examination. Of
course, if the arrestee's vital signs are dangerously high or low the DRE will immediately obtain a medical assessment. DREs are trained to accurately take these vital signs and to compare the results with medically-accepted normal ranges. Certain drugs elevate specific vital signs, other drugs depress the vitals and other drugs may not affect certain vital signs.

Step Seven: Darkroom examination

The eyes have been called 'the window to the soul'. They are certainly a 'window' to the inner body. The pupils enlarge in response to darkness, certain drugs as well as fear and excitement. They also constrict in response to bright light as well as in response to certain drugs. The DRE uses a pupillometer to estimate the arrestee's pupil sizes in four different light levels: room light, near total darkness, indirect artificial light and direct light. The DRE also examines the individual's nasal and oral cavities for evidence of drug use. As with the prior steps the DRE documents the results of this examination, but does not reach a final opinion until the entire evaluation is completed.

Step Eight: Muscle tone

Certain drugs cause the skeletal muscles to become rigid whereas other types of drugs, such as alcohol, cause muscle flaccidity. The arrestee's muscle tone is evaluated throughout the examination through observations of the arrestee's movements. During this step however, the DRE gently moves the arrestee's arms to determine muscle tone. This examination has its roots, as does most of the DRE evaluation, in standard medical procedures.

Step Nine: Injection sites examinations

Many drug users inject drugs intravenously. Rarely however, do medical procedures involve injecting drugs into an artery or vein. For example, insulin-dependent diabetics do not inject into blood vessels. During this step, the DRE examines the arrestee's arms, possibly ankles and possibly other body areas for injection sites. Importantly, the presence of injections, even recent ones, is an indicator of use rather than drug influence. Their presence however, may provide evidence of frequency of use and the type of drug used. A third pulse is also taken.
Step Ten: Statements and interrogation

The DRE now conducts a structured interview of the arrestee. Within the constitutional and procedural rights of the arrestee the DRE will question the person about the use of drugs. Frequently, the arrestee will make self-serving denials of drug use but may admit or even confess to the DRE. Arrestees often state that they were using a prescribed drug. The DRE may ask the arrestee about any warnings given to the arrestee by the prescribing physician or pharmacist regarding operating a motor vehicle while taking the drug.

Step Eleven: Opinion

Based on the totality of everything the DRE has observed up to this point, including the statements provided by the arresting officer, the DRE forms an opinion as to drug influence, and then as to the type of drug causing the impairment. This opinion is not a guess or a hunch. The legal standard for an expert opinion is to a 'reasonable degree of certainty'. The DRE's opinion is not based on an absolute belief that the DRE is without error. If in fact DREs were always 100% correct there would be no need for toxicology. The DRE opinion is however based on certainty. It is a primary dictum of DRE training that when in doubt, the DRE shall always find 'in favour of freedom' of the arrestee. As written, a typical DRE opinion is: 'In my opinion, the arrestee is under the influence of a central nervous system stimulant and cannot safely operate a motor vehicle'. This opinion also has its analogy in the physician's history and physical examination in which a provisional diagnosis is made.

Step Twelve: Toxicological examination

The fact that this step is the twelfth or last should not be construed to mean that it is the least important part of the evaluation. In fact, toxicological corroboration of drug use is often necessary for successful prosecution. During this step the DRE obtains a urine or blood specimen from the arrestee, which is then analysed for the presence of certain drugs by a toxicological laboratory. Under the implied consent laws that DRE states have, an individual is required to provide blood or urine to the police when requested. This blood or urine sample is required even though the arrestee may have already provided a breath test.
Typically, a week or more will elapse until the laboratory reports their results. The decision to prosecute the individual will usually be delayed until these results have been obtained.

It's important however to again reiterate the laboratory's role in a non-alcohol drug case. In a drug influence case, the laboratory's role is usually not to determine if the individual was impaired, but is to determine use of a specific substance. For example, the DRE has determined the arrestee is under the influence of a central nervous system stimulant. The laboratory analyses for specific drugs such as cocaine, amphetamines and others. The laboratory report, assuming it corroborates the opinion of the DRE, will identify a specific stimulant the person used. In Court the consistency between the DRE's opinion and the laboratory analysis is critical in demonstrating the accuracy of the DRE.

8. THE DRUGS OF ABUSE: AN OVERVIEW

The DRE drug categories are based on the premise that the drugs in each category produced a shared pattern of effects that is unique to the category. The analogy was made to a signature, and not a never-changing fingerprint. The effects of any drug depend upon many factors. These factors include obviously the dose as generally the effects of any drug are dose-dependent. More of the drug, such as alcohol, will generally produce more pronounced effects. The effects also depend on the user's tolerance to the drug, how the drug was administered, the drug's purity, the user's expectations and the presence of other drugs. Also, individuals vary in their response to the same drug. As Zenon Zuk, M.D., an advisor to the DRE program, has said, 'We are as different on the inside as we are on the outside'. The effects of a drug also vary in the same individual. Given these caveats however, there is still a general pattern of effects of the abused drugs. In this next section I will outline the seven drug classifications, the common substances within each category and provide some general characterisations of the expected effects. I will then discuss the complicating role of poly-drug use.

8.1 Central nervous system depressants

This category includes the most widely abused drug, alcohol. In addition, the category consists of barbiturates, non-barbiturates that have barbiturate like effects, anti-anxiety tranquillisers, anti-psychotic tranquillisers, certain anti-depressants and certain pharmaceutical combinations that contain
more than one type of CNS depressant. The benzodiazepines, chloral hydrate, methaqualone, lithium, phenobarbital and many other substances are included in this category. Commonly referred to as 'downers' and also as sedative-hypnotics, the effects of these drugs at intoxicating doses mirror the effects of alcohol. Importantly however, they are not detected by an alcohol breath test and do not produce an alcohol odour.

Unlike the case with alcohol, there are generally no consistent correlations between the levels of these drugs ingested and the degree of intoxication. These drugs produce relaxation, drowsiness, impaired balance and coordination, slurred speech, a lowering of inhibitions and increased risk taking. They also produce nystagmus, do not generally affect pupil size and typically depress the vital signs. The non-alcohol CNS depressants are extremely dangerous when taken with alcohol. Pharmaceutical preparations of these drugs usually contain warnings advising the user not to drink alcohol at the same time and to be cognisant that they may impair driving.

8.2 Inhalants

The drugs in this category are usually inhaled. Three sub-categories comprise the inhalants: volatile solvents, aerosols, and anaesthetic gases. The typical user of these drugs is poor, young, and as a result does not have ready access to more preferred drugs. Included are solvents such as paint thinner, gasoline, toluene, turpentine and paint. Nitrous oxide, freon, ether and many other substances are also included. Common indicators of the use of these drugs are the presence of chemical odours on the user and residue of the substance on the user's face, clothing and hands. Intoxicated individuals may look and act similar to one under the influence of alcohol. They may display impaired gait, slurred speech, bloodshot eyes and a blank stare. Since these substances displace oxygen the heart generally will accelerate resulting in an increased pulse rate. Depending on the specific substance, blood pressure can be elevated or depressed. As with the CNS depressants these drugs generally produce nystagmus but do not usually affect pupil size.

8.3 Phencyclidine

This drug is usually known as PCP which represents its longer chemical name of phenyl cyclohexyl piperidine. Although frequently classified as a
hallucinogen, and sometimes as a depressant, a stimulant, or an analgesic, PCP is appropriately termed a dissociative anaesthetic. The drug Ketamine is also included in this category.

The typical effects of PCP are elevated vital signs accompanied by both horizontal and vertical gaze nystagmus. In addition, rigid skeletal muscles, a blank stare, an absence of pain, hallucinations and many other effects may be evident. PCP users may become suddenly violent and pose an extreme danger to police officers. Many non-lethal control devices such as 'taser' dart guns have been developed in order to subdue the PCP user.

8.4 Cannabis

This category, which includes marijuana, hash, hash oil and the synthetic drug dronabinol is the most widely abused illicit drug. Although it has a popular reputation as a relatively benign drug it is extremely impairing, affecting judgement, depth perception, ability to maintain attention, as well as having effects on the cardiovascular system. Cannabis causes blood shot eyes, dilated pupils, accelerated heart rate (tachycardia), muscle tremors, forgetfulness and many other effects. Unlike the first three categories (CNS depressants, inhalants and PCP) this category does not produce nystagmus. Users of cannabis frequently also use alcohol as well as the other drugs concomitantly.

8.5 Central nervous system stimulants

This category includes the ubiquitous cocaine in all its various forms, amphetamine, methamphetamine, certain diet pills and other related substances. Commonly known as the 'uppers', the effects of these drugs mimic the body's 'fight or flight' response – the autonomic nervous system's response to perceived danger. Their effects include dilated pupils, elevated vital signs, hyper-alertness, rapid and agitated body movements, extreme weight loss accompanied by deteriorating health and hygiene, and a deterioration of the individual's ability to 'filter' environmental stimuli, such as noises and movement. CNS stimulants do not produce nystagmus. The user may overreact to seemingly minor events and may view minor inconveniences as elaborate plots. As the effects wear off the user may physiologically 'crash' and may appear nearly the opposite of when he or she was under the influence of the drug. The user may sleep for long periods, may wake voraciously hungry and may be extremely dysphoric.
8.6 Hallucinogens

Hallucinogens are used for their distorted sensory perceptions known as hallucinations. In many respects, they are closely related to the CNS stimulants as is evidenced by the fact that they also cause dilated pupils and elevated vital signs. The user may experience a mixing of the senses called synaesthesia, in which the user may 'hear' visual stimuli such as colours, and may 'see' sounds such as music. LSD, psilocybin, mescaline, peyote, bufotenine, morning glory seeds, jimson weed and the psychedelic amphetamines are some of the drugs in this category. The psychedelic amphetamines include MDMA, or methylene dioxy methamphetamine which is known in the vernacular as 'Ecstasy', and many other related preparations. Very popular in the 1960s, these drugs have experienced a resurgence of use.

8.7 Narcotic analgesics

This final category includes the opiates such as morphine, codeine, heroin, meperidine, percodan, methadone, fentanyl and numerous others. These drugs relieve pain but also produce sedation. The specific effects include constricted pupils, depressed vital signs, slow and deliberate movements and forgetfulness. These drugs do not produce nystagmus. Although these drugs are frequently injected, more users, because of the concern over the spread of infectious disease through the sharing of hypodermic needles are inhaling drugs such as heroin. These drugs are known for their physically addictive qualities as well as for the extremely unpleasant, though not life-threatening, withdrawal syndrome.

8.8 Poly-drug use

Poly-drug use is the norm for today's drug user. Poly-drug use, also termed poly-pharmacy and multi-habituation simply means that the drug user is using more than one category of drug simultaneously or serially. Often, the drugs have nearly opposite effects. For example, an extremely common drug combination in many parts of the United States is the 'speed ball'. This slang term refers to combining a narcotic analgesic, typically heroin with a CNS stimulant, usually cocaine. In many respects these drugs have opposite effects. For example, cocaine dilates the pupils and elevates the vital signs, whereas heroin constricts the pupils and depresses the vitals. Contrary to what defense attorneys attempt to coax the DRE to say, neither
drug 'cures' the effects of the other. What typically occurs is that the user displays a mixture of signs and symptoms, such as dilated pupils with depressed vials, that can best be explained by poly-drug use.

DREs apply four concepts to interpret poly-drug signs and symptoms: additive, antagonistic, overlapping and null.

'Additive' means that each of the drugs used produce the same effect. Each of the drugs reinforces a specific effect of the other. For example, CNS stimulants and cannabis independently elevate pulse rate. Taken together the user's pulse will be elevated, probably to a greater degree than either drug would separately. Each drug is reinforcing an effect of the other.

'Antagonistic' means that each of the drugs produces an opposite effect. Cocaine dilates the pupils while heroin constricts them. When taken together the user's pupils may be dilated, may be constricted, or may be within the normal range (3.0mm to 6.5mm diameter). The effects displayed are dependent on the dose of each of the drugs, the user's tolerance to each of the drugs and importantly, the point in time that the user is evaluated by the DRE. Cocaine, a short-acting drug may 'wear off' quickly and the effects of the heroin may then dominate.

An 'overlapping' effect refers to the case in which one of the drugs produces the effect, but the other drug is neither additive nor antagonistic to it. For example, alcohol produces nystagmus. If alcohol is taken with cocaine, a drug that does not cause nystagmus, the user will display nystagmus—again, due to the alcohol. There is no drug that is antagonistic to nystagmus.

'Null' effect refers to a combination of drugs in which neither of the drugs used produces the effect. For example, cocaine does not produce nystagmus; neither does heroin. Taken together, the user will not have nystagmus since neither of the drugs produces nystagmus. To paraphrase an old rock 'n roll song, "Nothin' and nothin' means nothin'".

During the opinion step of the DRE process, the DRE will systematically review the documented signs and symptoms and explain poly-drug effects using these four concepts.
9. DRE TRAINING AND CERTIFICATION

Just as there are twelve steps in the DRE procedure, there are twelve steps in the DRE's training and eventual certification.

The steps are:

1. Standardised field sobriety test training and DRE preliminary training
2. DRE school
3. DRE school examination
4. Minimum number of evaluations
5. Minimum number of drug categories observed
6. Toxicological corroboration
7. 'Rolling' log reviewed
8. Resume reviewed
9. Certification final examination
10. Endorsement by an instructor
11. Endorsement by a second instructor
12. Certification by the International Association of Chiefs of Police.

Step One: SFST training and DRE preliminary training

Although there are a number of formats for this first phase of DRE training, the usual format consists of two days training in the proper administration and interpretation of the standardised field sobriety test (SFST) battery. This segment is primarily skill-oriented. Students practice administering the SFST on volunteers who consume alcohol. In order to complete this phase, students must successfully pass both a written examination and a proficiency test. SFST training is a 'stand-alone' course in that most officers who complete SFST training never continue into DRE training. Following the SFST training officers who will continue with DRE training must successfully complete a two day DRE preliminary training course. This course expands upon the officers' SFST skills, provides an overview of the DRE procedures and provides an overview of the effects of the drugs of abuse. In this segment officers are also taught to properly administer the
vital signs examinations. Some agencies combine these two courses, SFST and DRE preliminary training, into one four-day course. The LAPD also conducts an accelerated ten-day format that includes SFST training, DRE Preliminary Training and the DRE course itself into one training event.

**Step Two: DRE school**

This segment of the training consists of seven classroom days of intensive training. There are 31 separate segments to the course. Some of the specific segments are: the physiology of the drugs of abuse; the development and effectiveness of the DRE procedures; vital signs examinations; eye examinations; courtroom testimony and drug combinations. Each of the seven categories of drugs are covered in depth. Students view video-tapes of individuals under the influence of the various categories and participate in interpretative exercises. Students also practice the administration of the DRE procedure while under the direct supervision of DRE instructors. Students are tested throughout this phase. Under the guidelines established for DRE training by the International Association of Chiefs of Police, students cannot ‘test-out’ of any of the segments of the course and must make-up any missed classes.

**Step Three: DRE school examination**

Near the end of the DRE school students take a comprehensive written examination. Eighty per cent is the minimum passing score. Approximately 10% of the students fail to achieve a passing score.

**Step Four: Minimum number of evaluations**

Step four begins the certification phase of DRE training. Much like an internship, the student must demonstrate his or her proficiency in properly conducting and interpreting DRE evaluations that are given to actual suspects. The minimum national standards require the DRE student to conduct 12 full drug evaluations. Many agencies, including the LAPD require 15 evaluations. Some of the required evaluations may include medical rule-outs and evaluations in which no drug influence was determined by the DRE student. All of the evaluations during this phase must be conducted under the direct supervision of a DRE instructor.
Step Five: Minimum number of drug categories observed

Student DREs must evaluate individuals who are under the influence of at least three of the seven categories of drugs. (The LAPD and many other agencies require four drug categories.) The student DRE must correctly conduct the evaluations and must reach appropriate conclusions.

Step Six: Toxicological corroboration

During certification, student DREs must submit a minimum of nine physical specimens (blood or urine) to a laboratory for analysis. The laboratory analysis is compared to the student DRE's opinion as to the type of drug influencing the individual. The student must achieve a 75% laboratory confirmation rate. This means that at least 75% of the samples submitted to the laboratory must result in the laboratory finding a drug belonging to the category the student DRE identified. This standard was recommended by an advisory board of toxicologists selected by the NHTSA. A 75% standard does not mean that the student can be wrong 25% of the time. A student's opinion must always be supported by the individual's presenting signs and symptoms. It does allow however for those instances in which the laboratory is not able to detect the type of drug the student DRE had identified.

Step Seven: 'Rolling' log reviewed

All DREs must maintain a log of all the evaluations (including toxicological results) they have conducted. This log is then submitted to a DRE instructor for review. This log is critical in establishing the DRE's expertise in Court.

Step Eight: Resume reviewed

All DREs must maintain an up-to-date resume. This resume should list the training the DRE has received, additional readings, Court qualifications, formal education, publications and other relevant experiences. As is the case with the 'rolling' log, the primary purpose of the resume is to enhance the credibility and consistency of the DRE when testifying in Court. This resume must be presented for review by a DRE instructor. A copy of the resume is maintained by an agency's DRE coordinator.
Step Nine: Certification final examination

This comprehensive written examination is given when the student DRE is approaching the conclusion of certification training. This examination, which typically takes from between three and six hours, requires the student DRE to articulate the signs and symptoms of the various drugs, including numerous drug combinations. The examination is scored on a pass-fail basis by a DRE instructor. This examination is similar in concept to examinations given in graduate school that require the student to demonstrate knowledge of all aspects of drug effects.

Step Ten: Endorsement by an instructor

The student DRE is required to secure in writing the recommendation of a DRE instructor stating that the student should be awarded certification. Only DRE instructors who have actually supervised the student DRE may endorse the student.

Step Eleven: Endorsement by a second instructor

This step requires the written endorsement of a second DRE instructor.

Step Twelve: Certification by the International Association of Chiefs of Police

Once steps one through eleven have been completed, the student DRE submits all the required documentation to the agency's DRE coordinator. After reviewing the completed package, the agency coordinator approves and submits certification documents to the International Association of Chiefs of Police (IACP) through a state coordinator. A tracking number is assigned to the DRE and certificates are issued to the new DRE by the IACP.

The IACP has also adopted continuing education requirements for both DREs and DRE instructors.

10. COURT ACCEPTANCE

The scientific reliability and validity of the DRE program and procedures have been challenged numerous times by defense attorneys. The defense typically argues that DRE testimony should not be accepted in Court stating that it is new or novel science. Defense attorneys also frequently argue that
the DRE procedure is an ersatz medical procedure that police officers are not capable of properly administering and interpreting.

After extensive hearings, Courts throughout the United States have accepted DRE testimony as expert evidence. The Courts have cited the fact that scientific studies have supported the reliability of the DRE procedures, commenting that the level of accuracy of DREs is persuasive. The Courts have also recognized the fact that DRE is not new, novel, nor controversial. As a Minnesota Court wrote, the sign and symptom matrix of drug effects used by DREs is accepted by the scientific community.

In cities like Los Angeles, DRE testimony is increasingly critical to our efforts to combat the hazards created by the drug-impaired driver. The Drug Expert Program is now law enforcement's primary tool in identifying the drug-impaired individual.
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety
THE DAY-TO-DAY REALITIES OF LONG-DISTANCE DRIVING AND THE INFLUENCES WHICH ENCOURAGE ILLICIT DRUG-TAKING

Ken Wilkie

(with input by Tony Koot)

Mr Wilkie is an owner driver of a semi-trailer and discusses the pressures on truck drivers to meet delivery schedules and the use of stimulants to combat fatigue, particularly that associated with the unnatural activity of driving at night.
MAP OF QUEENSLAND
One of the first comments that needs to be made in regard to the use of illicit drugs by long-distance drivers is that drugs sought after by long-distance drivers to maintain alertness are frequently only illicit because they have not been prescribed with that use in mind. There are at least two drugs which are used as stimulants that I am aware of, which are available on prescription to people to use as an aid to lose weight. Drivers find these supplements are useful in maintaining their mental functions.

Frequently people criticising drivers for taking stimulants do so in the belief that these drivers are simply greedy – looking to increase their time on the road to allow for higher pay packets. It has to be said that easy access to stimulants could lead to a problem in this area. However no other industry has a problem with people working too hard. Other industries can self-regulate the hours its members work – why should road transport be different?

In any case, greed is not the major problem. Nor is thrill seeking or 'getting high' a major factor causing long distance drivers to take drugs.

The first reason, which is largely unrecognised by people who are not shift workers, is the basic human characteristic of being diurnal. ¹ The human body is simply not created to work at night. Since I have become interested in this subject I have spoken to numerous shift workers. I haven’t yet spoken to one who could manage the task without some cost to his/her well-being. Probably the first shift worker I spoke to specifically on the subject related how he had an ideal situation. When he got home from work his wife had gone to her day job and his children had gone to school. His bedroom was air-conditioned and the neighbourhood was quiet. However, he further related to me, by Friday when his shift was finished he was totally fatigued.

Just recently I spoke to a person who drove for a now defunct coachline. His role was to take over driving a north-bound coach at Bundaberg in Queensland and take it through to Bowen in North Queensland. At Bowen he would hand over to another driver. This first driver would spend the day at a motel in Bowen and bring the coach south from Bowen the following night. When asked how he managed driving through the small hours of the morning he replied that he had difficulty. The company

¹ Diurnal means "in or of the daytime".
coaches were fitted with UHF radio transmitters and he used these to talk to other drivers – or stopped on the highway if he got very tired and walked around the coach. He told me he would often wake up shortly after getting to bed in the motel and not be able to sleep for the rest of the day. These comments underline my experiences.

Some years ago I was involved in an overnight transport run from Brisbane to Townsville, and then on to Cairns the next day after a night’s rest in Townsville. [See map on page 158] The run from Brisbane to Cairns and return to Brisbane started at 6.00pm Brisbane – if the load was ready. Most often departure took place around 8.00pm. My employment condition required that I be in Townsville by 4.00pm the following day (a run of some 1300 km) and involved eight deliveries at least before I was free to finish my day’s work in Townsville.

From Townsville to Cairns and back to Brisbane was more relaxed – unless some of the company’s customers required tight delivery schedules on the return leg. In any case, I would be at my home in Brisbane at least by Sunday morning.

I had only one near-new prime mover to service and the refrigerated trailer had been supplied by the company that I was working for and consequently my workload once at home was light. I had time to be able to rest on Tuesday afternoon but very rarely was I able to sleep and the most sleep I ever achieved at one time was about an hour.

At some point I’ve read that it is not possible to build up a reserve of freshness – by that I mean that we in the human race in general only sleep when we are tired and are not able to ‘presleep’ tiredness or fatigue onset.

The situation I invariably found myself in was that I was forced to take stimulants as early as 10.00pm or fail to fulfil the commitments to the company that I was towing for. The transport company in turn had undertaken to transport food to multinational fast food outlets. My failure to meet deadlines would have resulted in my losing the position I had and causing severe disruption to the outlets being supplied.

Only today I spoke to a sub-contractor employed with a subsidiary of a multinational company which is currently gaining applause for its results on the share market. This company is demanding that its sub-contractors ‘overnight’ (ie, drive all night to arrive at the load destination) so that the
The day to day realities of long distance driving and the influences which encourage illicit drug taking

driver is able to off-load as soon as the transport company customers' staff arrive at start of work the following morning – irrespective of whether the freight is required urgently or not. The reasoning behind this is to ensure that the company's equipment is free to be reloaded as early as possible that day and irrespective of whether the driver was required to assist in placing the load on the trailer the day before. Interestingly, the company drivers employed in this case are not required to load/unload and are summoned by telephone when 'their load' is ready to get underway. This is a case where drivers are being used in a way which has not regard for their well-being and this situation should be deplored to the highest degree. This is a case where the greed of a company can, has and does promote the taking of stimulants by drivers.

So we have some drivers who are being abused by employers and these drivers obviously feel their interests are better protected by taking stimulants than they are by taking the employer to task. There is an interesting quotation which advocates that one should not argue from a point of weakness. This nation should hang its head in shame because so many people have prospered at the gross expense of subcontractors and employee drivers and very little has been done to correct the injustices.

Having said that I know that provision of the best remuneration - the best trucks - the best roads will not stop the need for stimulants.

I go back to the word 'DIURNAL'

In front of me is a publication called Well Being at Work - Shiftwork in the 1990's. The booklet was produced by the division of the Workplace Health and Safety Authority. Some quotes from this paper:

*Most people also seem to have reserve capacity to go through one night without sleep and still perform up to normal standards in most ways.*

*If we do not get enough sleep the main consequence is that we tend to get sleepy more easily, particularly when doing something monotonous. Physically or mentally active tasks are not upset as much as passive tasks - sitting watching a dial or driving along a motorway.*

*Human contact is one of the most important ways of both watching for sleepiness and counteracting it. NO WORKER SHOULD BE ALONE AT NIGHT.*
To me, the last sentence screams a siren of alarm. Should those complacent souls in authority consider road safety a simple matter of stamping out stimulants and enforcing limited hours behind the wheel – then they themselves should be condemned to breaking the news of an accident to loved ones.

So why not just pull over and rest. I’ve already explained some reasons causing drivers to ‘soldier on’ – namely loss of work – and when one believes his/her house and means of providing an income are at stake, that is strong enough incentive to do the extra mile. Some employers will not tolerate any late arrival at the load destination - others are more lenient, but in any case persistent late arrival will cause a driver to be removed from that position.

It has often been stated that drivers using stimulants can be faced with sudden loss of alertness when the effects of the stimulants are wearing off. My experience is that that is not any more the case with stimulants than it is from being free from drugs. The progression to natural sleep is very often unmarked by warning signs. Consequently, a driver might embark onto a stretch of road feeling secure with the level of his body’s alertness to achieve the next rest point. These are very often - usually in fact - too far from the last. However the onset of fatigue can be unpredictable and the provision to pull-over safely is not available and this is a recipe for another fatigue-related accident. The provision of rest areas is very much worse in wet weather because of poor or nil advance warning of the whereabouts of a rest point. Even where drivers do know the existence of a rest point, they can very often be hard to locate in wet weather and also not be suitable for heavy transports because they often become boggy.

As I have reported, it has been strongly suggested that shift workers should not be on their own at night. The shift working truck driver is not only alone but alone in a warm, peaceful, sedentary environment doing anything up to 100 km/h (hopefully no more). They operate in an environment where they pass often at a distance of a couple of feet with combined legal weights of in excess of eighty tonnes and even in the case of New South Wales a collision speed of 180 km/h is possible. Is it any wonder that some drivers use a crutch to maintain alertness?

Some governments promote the use of stimulants by drivers. Queensland, in its driver reviver programme advocates the use of caffeine to stimulate
drivers on long runs. That is why coffee and chocolate biscuits are offered free to drivers so that their alertness is maintained. Of course there is the prime design of having a change of activity but none the less refreshments provided are ones containing higher levels of stimulating chemicals than are present in other foods that could be provided.

I feel that there is a good deal society can do to reduce the risk to shift worker drivers through use of fatigue management programs. However, owing to the diurnal nature of man and the time sensitive nature of a lot of freight (farm produce being a prime example), I feel it is dishonest and irresponsible to remove drugs that can be monitored and prescribed by a doctor but not have some realistic method by which a night driver can ensure his/her alertness.

In my opinion because society has removed the relatively safe stimulants from the market, drivers who have a need to ensure their alertness are forced to go underground to purchase material that is inconsistent in strength and purity. Not only is the quality of the illicit drugs presently being used sub-standard but it also can cause behavioural changes in people and can also be addictive.

It is also my opinion that because of the stigma placed on the use of stimulants by drivers, the medical profession is now fearful of making an honest assessment of the need to supply a substance which might save a driver's life, or that of a coach load of tourists or some other innocent oncoming driver for fear of being ostracised and deregistered.

A graph of accident rates in Queensland shows an alarming rise in accident rates peaking at the early pre-dawn hours. I feel it prudent for society to look at the time of these accidents in view of the rhythm of the human body being at low ebb at that point. It has also been pointed out that it is extremely difficult and verges on impossible to readjust the 'bodyclock' - especially under conditions available to long-distance drivers.

In summary, it is my experience and that of others that owing to the natural cycle of the human body and the present inability to modify that cycle using a system that could be put to use by long-distance transport drivers, these people often feel they need to have access to stimulants to maintain their own safety and that of other road users. These people are not irresponsible but rather cogs in society's transport requirements and are currently being
persecuted because that same society has failed to understand the special difficulties encountered in meeting those requirements.
A PREVENTION PROGRAM:
THE ROAD TRANSPORT FORUM TEAM 200 PROJECT

Mr D. Stewart
Sedgwick Risk Services
Melbourne, Victoria

Mr Stewart approaches the subject of drug use by some truck drivers from the point of view of occupational health and safety in the workplace. He describes an innovative world first fatigue management program which is involving a group of truck operators (Team 200) in a workplace and driver health cultural change process.

Contents:

1. Foreword
2. Background
3. Industry profile
4. Road Transport Forum
5. The problem
6. Driver medicals
7. Health promotion and training
8. Industry promotion
9. Driver community and partners
10. Fatigue management
11. Conclusion
1. **FOREWORD**

This paper details the innovative process conducted by the Road Transport Forum (RTF) in trying to improve the health, safety and performance of truck drivers in Australia. Whilst not dealing exclusively with the issue of drugs and alcohol, it certainly does recognise the need for adequate controls.

Our research, and research conducted here in Australia and overseas recognises that there is quite a sizeable health and drug problem with car and truck drivers. The RTF and the trucking industry in early 1993 recognised and accepted that a problem did exist, and at the RTF 1993 Conference resolved to establish better standards in this area.

The question for the RTF and the Team 200 Project is not how bad is the problem, but how can the problem be rectified and performance standards raised. In eighteen short months, what seemed like an impossible ideal has become reality for 240 trucking operators trialing standards in driver health, management, maintenance and training.

The RTF understands that those drivers who take drugs do so in the main as an outcome of their circumstances. What these circumstances are that lead them to taking drugs are many and varied, including:

- Work practices;
- Driver health and lifestyle;
- Road & weather conditions;
- Vehicle issues;
- Schedules; and
- Other.

The Team 200 Project is focusing on how these circumstances/risks can be controlled to help reduce the likelihood of drivers taking drugs. Given that drivers are consuming non-recreational amphetamines, (if given a choice, drivers would prefer not to take amphetamines), but feel they have to in order to avoid an accident or fulfil their customer requirements.
The RTF Team 200 Project is all about focusing on improving the performance standards of the industry including driver health. For too long driver health has been ignored. Now it is recognised as an essential key result area. The Team 200 Project is the start of a journey into the future. Future truck operators will be efficient, safe and competitive. The commitment to the project by operators, police and government agencies demonstrates the importance the industry places on improving driver health.

This paper details the process and achievements to date and the opportunity to present it is greatly appreciated.

2. BACKGROUND

The road transport industry's self regulation program grew out of the industry's recognition and acceptance during the late 1980s of the need to improve its management of safety and operational efficiency. This followed two major accidents in northern New South Wales in 1989. Considerable pressure from governments threatening stringent regulations followed media attention and community demands to improve safety performance.

The industry responded by conducting a number of summits, national tours and industry meetings commencing in 1990. Key deficiencies inhibiting the development of industry safety standards were identified. Driver health, vehicle maintenance, driver training and management practices required standards to be developed.

In October 1992 the Road Transport Forum implemented a Self Regulation Pilot Project to develop draft industry standards in these areas. This led in October 1993 to the Team 200 Project trialing draft standards in the above four key safety areas. This involved over 200 road transport companies and approximately 5,000 drivers and other staff.

The ultimate goal is to improve levels of safety management and professionalism in the road transport industry while maintaining its position as one of the most efficient transport industries in the world. A consequence is the improvement of road safety for all road users.
3. INDUSTRY PROFILE

The road transport industry is a national industry operating across state and territory boundaries and servicing all other Australian industries. Eighty percent of goods moved throughout Australia travel by road transport. The industry employs 100,000 people and indirectly generates another 400,000 jobs in other industries. Businesses range from divisions of large multinational companies to thousands of single truck owner operators.

The industry is intensely competitive. This culture results in operators readily accepting offered prices and undercutting competitors to receive available work.

According to research conducted by Worksafe Australia, the transport and storage industry has an absenteeism rate 7.6% higher than any other industry and the fourth highest rate of occupational injuries.

The industry is seen by Corporate Australia as the lifeline between efficient supply and demand systems between the providers of goods and their customers. Poor transport efficiencies means poor and unreliable delivery results.

4. ROAD TRANSPORT FORUM

The Road Transport Forum is the peak national body of the Australian road transport industry. It consists of fifteen member organisations and two owner operator representatives. Member organisations represent particular states or sectors of the industry, companies such as Mayne Nickless, Finemores, Boral, Scott Corporation, and the Transport Workers Union. Owner operators represent single truck operators and operators who drive a vehicle and run a fleet of up to five trucks.

5. THE PROBLEM

The RTF activity which is placing most emphasis in supporting and improving the performance of drivers is the driver health project. The objectives of the activity are:

- To improve industry management of driver health and safety; and
• To enable operators to perform their job safely with adequate employer support.

The aim is to improve the well-being of drivers in both their working environments and personal lives. This is seen as an alternative to instituting strict medical requirements which may exclude drivers from participating in the industry. It is achieved by providing operators with the support necessary to deal with job stresses. The project has involved two stages to date:

**Stage 1: Pilot Project (January - May 1993)**

The aim of the Self Regulation Pilot Project was to:

• Develop industry ownership of the health issue;
• Develop realistic industry standards which addressed the problems facing operators in their day to day activities; and
• Empower industry groups and individual operators to develop and implement solutions to identified health issues.

The process to date has involved:

• Research to identify current knowledge in the area;
• Surveys of industry and drivers to identify current practices and needs;
• Interaction between experts and industry operators to develop standards and procedures;
• Industry trialing and reviewing processes to ensure practical application of standard; and
• Seminars and workshops to introduce the standards to industry operators.

A health consultancy developed a health profile of the industry following a survey of drivers. The main concerns of drivers related to avoiding accidents, minimising and coping with fatigue and the avoidance of muscle and body injuries. These findings were used to institute a program aimed at assisting drivers and managers to address these concerns. There has been significant support from managers for these proposals as a source of savings as well as injury prevention.
Stage 2: Team 200 (October 1993 to Present)

The aim of Team 200 is to trial and evaluate the draft industry standards developed under the pilot project in the four target areas. The health program involves a number of key elements. These are:

- To trial policies in all areas of driver health;
- To research and appoint a medical officer for each operation;
- To have drivers undergo medical screening and counselling by a health professional;
- To implement education and health promotion initiatives in each operation;
- To research and measure the impact of health initiatives; and
- To implement fatigue management strategies.

Vehicle maintenance standards aim to assist operators to develop maintenance systems that ensure vehicles are safe and roadworthy. They are based on written work schedules, detailed vehicle records, driver fault reporting and clearly assigned responsibilities. Training standards are based on national competencies registered with the National Training Board. Management standards reflect the need to clearly document responsibilities and procedures in the safety critical areas of training, driver health and maintenance. Operators are developing basic quality manuals and adopting procedures covering these issues.

6. DRIVER MEDICALS

It was deemed that an essential component of the Driver Medical strategy was to ensure drivers were regularly undergoing health appraisals with medical practitioners attuned to their needs. It was recommended in the form of a policy that all drivers undergo a medical examination at least every three years, regardless of age. This has been accepted by all Team 200 operators with indeed the vast majority opting for annual medicals as a policy principle.

Medical standards were implemented following the standards put in place by the National Road Transport Commission and the Federal Office of Road Safety. These were designed by the Australasian Faculty of Occupational Medicine. The process for drivers participating in their medical screening were as follows:
1. Operators to appoint designated medical practitioner(s).

2. Once appointed, appointed medical practitioners were placed on a central registry and had sent to them an outline of the process, a copy of current research findings, performance and medical standards and a detailed briefing on fatigue.

3. Drivers had to participate in the screening process in two stages:
   a) Complete driver health survey that contained the following sections:
      i. driver health and safety
      ii. physical activity
      iii. family history
      iv. medical history
      v. current symptoms
      vi. smoking status
      vii. occupational health
      viii. diet and lifestyle and alcohol
      ix. driver fatigue
      x. Epworth sleepiness scale.
   b) Complete a 30 minute medical consultation and counselling session. Forms and handouts were contained in the doctor's kit.

   The consultation and counselling session included:
      i. review of survey
      ii. medical data
         - body mass index (BMI)
         - sleep disorder
         - eyesight
         - cardiovascular assessment
         - heaving
         - neurological and locomotor function
         - signs of drug abuse
         - recommendations
         - review date

4. Each participating doctor had to complete a certificate which was given to the operator/driver indicating that they were fit to drive a
heavy vehicle and whether they required any further ongoing reviews.

All medical results were kept confidential and have been loaded onto electronic data for analysis. Drivers have been very positive to the process and have found that going to the doctor was worthwhile. Doctors have felt that drivers did open up to them on some of the more critical issues, and felt that ongoing monitoring of drivers in poor health has been very beneficial to the drivers.

Recently a group of drivers have participated in their second round of health screening (12 months after their initial screening), and the results and improvements have been staggering, particularly in blood pressure and BMI.

Over 1 000 drivers have been screened to date, with all Team 200 operators committing to a 1 March 1995 timeline for all drivers to meet driver health standards, with clearly visible on-road behavioural changes being witnessed, such as improved diets and fatigue management systems.

Many drivers are writing to the project office stating how they have lost weight, and now for the first time they are no longer taking drugs and feel positive and confident about themselves. The most pleasing aspect has been how suspicious and sceptical drivers have embraced the program, and now regard their doctors as an invaluable resource, not just someone in charge of a pass/fail test.

7. HEALTH PROMOTION AND TRAINING

It soon became evident that operators were requiring urgent assistance in helping deal with all the health and lifestyle issues affecting drivers. The focus operators required was how to help drivers balance the conflict between driving, personal needs and home responsibilities. The major resource operators needed was where do you go to get help? Whilst doctors are the primary resource in this areas, a secondary means of assistance was needed.

A driver health resource kit was designed to list a directory of health promoters, specialists and information providers in all aspects of health.

This included:
• Health promoters;
• Drug information;
• Occupational health and safety providers;
• Financial managers and counsellors;
• Trauma advisers;
• Crisis hotlines;
• Community health contacts;
• Support groups;
• Information guidelines; and
• Self help numbers.

The aim of the kit is to help operators act as a facilitator of assistance to those in need.

The resource kit is applicable on both a local and national level. For instance, the network of Team 200 doctors is recorded so if a driver falls ill anywhere in Australia they can contact the closest Team 200 doctor for assistance.

The kit also acts as a catalyst for providers of health services to design more industry specific initiatives. This will help produce a better quality service and training.

8. INDUSTRY PROMOTION

It was deemed a pointless exercise to promote driver health and fatigue management principles if the broader industry did not reward, recognise, embrace and support the essence of the process. A promotional plan was put in place to motivate key industry players to promote some health initiatives, and the various state and federal government departments and jurisdictions were approached and educated to gain their support.

Each state government is supporting the thrust of the program as evidenced by their 'Alternate Compliance' strategies being co-ordinated by the National Road Transport Commission.

BP Truck stops are currently performing a critical review of their food menus and are aiming to promote healthy food choices and health messages to drivers.
In general, the truck drivers in 1995 will be putting in place an accreditation process for truck stops, rating them in regards to certain health and service standards which are being developed. This has already occurred in Western Australia.

National Transport Insurance (NTI) has put in place a risk management strategy that not only will produce clear claims management systems for operators, it will then help implement risk management strategies to reduce the incidence or likelihood of claims occurring. They are also implementing a reward/incentive strategy for those operators who do initiate risk management strategies in line with their claims records.

Truck designs are continually improving and being reviewed. Volvo is currently trialing some new features aiming to reduce fatigue and injury risks specific to Australian conditions.

These are only a few of the initiatives that are starting to come forward since the inception of the RTF Team 200 Project. Other initiatives include skill and attribute testing driver competency standards prior to commencing long distance driving. Drivers are being trialed as well. Couple these with the innovations in on-board computers which monitor driver and vehicle performance are all are helping to raise the standard of driving performance and driver feedback mechanisms.

9. DRIVER COMMUNITY AND PARTNERS

Clearly drivers cannot improve their own health standards alone. It requires the support and input of their peers, managers, families and personal friends.

In order for their community to understand their requirements and needs they must first of all understand the issues. Consequently an important aspect of the program has been to run seminars, workshops and awareness sessions throughout the country to people who will impact on the status of driver health.

These have included:

- Police;
- Regulatory authorities;
- Management and supervisors;
• Wives;
• Doctors;
• Trade press; and
• Regional road safety groups.

The project team have co-ordinated regional forums for partners to attend, spoken at industry association conferences and addressed countless management teams. Each presentation has reinforced the needs and challenged those in attendance to get involved in some way.

As a result many initiatives have taken place, mainly at a local level, focusing on self help and support initiatives. These are too numerous to mention but have created some excellent networking. Some have involved local regional doctors and hospitals conducting monthly training for drivers to attend including fatigue and drugs, whilst others have established local taskforces to address health issues.

10. FATIGUE MANAGEMENT

It is an unfortunate reality that the current system of managing fatigue (via log books) is ineffective. Fatigue is an outcome, in particular of driver health and work practices. The work practices which contribute to driver fatigue are currently being assessed. Each Team 200 organisation will have in place by 1 September 1995 a Fatigue Management Program.

A trial program is being conducted in Queensland which will be used as the pilot for further fatigue management initiatives. The program model looks at all aspects of the causes of fatigue and how they can be effectively controlled.

The Team 200 Project has already uncovered many elements of the industry which, when combined, significantly contribute to driver fatigue. These have included issues such as loading and unloading methods, scheduling, driver recruitment standards and the like.

Fatigue management is an absolutely essential element in the Team 200 Project in which to establish clear standards. Ultimately, if fatigue is not effectively controlled, then the entire project has been a waste of time.

Fatigue management has been identified as a management process that monitors and controls the fatigue of drivers, and hence reduces the
likelihood of fatigue related accidents. In the past six months there have been huge gains in this area, with a joint venture about to commence with Queensland Transport involving five operators.

11. CONCLUSION

The improvement in driver health is not a health promotion program but a cultural change program. Performance improvement in this area ultimately means the reduction in the incidence of drivers needing to consume drugs to drive effectively. The Team 200 Project is all about delivering results in a more efficient and safer environment.

The Team 200 Project has started a process. It has acted as a catalyst for change, and focused and motivated the industry to make some long needed reforms and reviews of the status quo.

There is ultimately no excuse for drivers to consume drugs to drive safely, however, the issue is who is responsible? Management, drivers, jurisdictions, governments and freight forwarders all must accept responsibility for the current unacceptable standards. Team 200 is all about taking a bold look forward to explore how standards can be raised and what is possible.

In a society that is over-medicated and under-educated in the area of health the RTF Team 200 Project demonstrates that an industry can take on board some hard issues and at least address them. Preventative health is really a behavioural/culture change program and cannot be treated in isolation. It must be all embracing and most importantly its effects must be identifiable and measurable.

Team 200 is currently preparing for interim accreditation and report back, before it moves forward to the wider industry in mid 1995. An industry that can help reduce the need for drivers to consume drugs to avoid accidents, is an industry totally focused on world best practices. Nowhere else in the world is the transport industry taking on board prevention measures at all levels to improve driver health standards and ultimately industry efficiencies.
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety
MS K.D. McIntyre
Manager Road Safety and Education
Royal Automobile Club of Victoria Ltd

Ms McIntyre takes a broad approach to the topic, mentioning lifestyle situations of young people, the possible over-dependency on medication of older people, the need for a diverse and innovative range of drug countermeasures and the need for further research.

Contents:

1. Introduction

2. Finding solutions
   2.1 The difficulties
   2.2 Positive solution searching

3. Drugs and driving
   3.1 Effects of prescribed drugs
   3.2 Illicit drugs
   3.3 Older drivers and medication

4. Enforcement

5. Research

6. Summary

7. Bibliography
1. INTRODUCTION

The Royal Automobile Club of Victoria (RACV) has over 1.5 million memberships and one of its prime roles is to ensure the safety of Victorians on our roads. Over the years it has supported many road safety initiatives and has been pleased to witness the consequent reduction in the road toll. To maintain this downward trend, it is vital that the community review initiatives where there is scope for further improvements. Drugs and driving is one of these areas. Very little has been done to date, and research is indicating that drug-taking is a problem in road crashes. Thus, there could be potential for further reductions in road fatalities and injuries if countermeasures can be developed and implemented which would reduce crashes involving drivers taking legal or illicit drugs.

This paper focuses on issues which affect motorists and provides ideas for which future countermeasures need to be considered. This paper complements other papers being written by experts in areas such as medicine and enforcement.

2. FINDING SOLUTIONS

2.1 The Difficulties

The implementation of drink-drive countermeasures has led to a reduction in road crashes involving alcohol. It would be hoped that drug-driving countermeasures could be as successful. However, it will be a more difficult challenge because less is known about the drug problem, and difficulties in measuring drugs makes research and enforcement more complex.

Drinking is a legal activity that can be readily observed making it easy to determine where and when it happens, how frequently and who it involves. This means that it has been relatively easy to carry out research into drink-drive patterns and to subsequently develop campaigns which could specifically target certain behaviour. This is more difficult with drugs. For illicit drugs, it is difficult to determine the patterns of drug-taking because people will be unwilling to reveal information too readily about an illegal activity. For legal drugs, it is also difficult to find out information because doctors cannot reveal this confidential information and patients will be reluctant to divulge these personal details.
The second difference is that alcohol can be easily measured in the breath which has made it possible to estimate the level of crash risk associated with different blood alcohol concentrations. The Grand Rapids Study was able to estimate crash risk by comparing the blood alcohol levels of accident-involved drivers with a similar sample from the normal driving population. This required breath testing of a sample of drivers.

This type of research has not been conducted to study drugs and driving because there is no screening test and it would be difficult to get the average driver to agree to a blood test after being randomly selected for research purposes. This has meant that most research has relied on blood samples of those killed in road crashes.

Not only is research very difficult because of the difficulty of measurement, but enforcement and consequent prosecution is also difficult. No accurate physical device is available at this stage for screening of drugs. There has been some work on saliva-testing but to date this has not been very successful. Thus, unlike random breath testing for alcohol it is not possible to undertake random checking of drug levels. Instead there needs to be sufficient evidence to require the person to undertake a blood test.

### 2.2 Positive solution searching

Given the problems described above, it is not an easy task to overcome the drug-driving problem. The community needs to use the information we now have to begin developing solutions and we need to think of innovative ways to learn more about the problem.

First of all, it is not one simple problem but it can be categorised into several types of problem groups. These include:

- Drivers on medication;
- Drivers and illicit drugs;
- Older drivers and medication; and
- Truck drivers and stimulants.

Different solutions will be required for these different problem groups. When developing countermeasures, problem areas must be kept separate
because different countermeasures may be required for different target groups.

Research will be needed to build a better picture of the magnitude of each of these problem groups, why they are occurring, and the characteristics of the target group so that countermeasures can be developed to respond to the problem.

Development of countermeasures may need to involve policy makers from areas other than road safety such as health, education, youth workers and aged care.

Countermeasures may need to be very different from past countermeasures and therefore should be trialed and evaluated before full implementation.

This paper raises issues that may be relevant in developing countermeasures for prescription drugs, medication for older drivers and illicit drugs. Issues that will be addressed will include those that must be addressed by the community and government as well as those that affect individuals. The issues related to truck drivers and stimulants is covered by another author in this report.

3. DRUGS AND DRIVING

3.1 Effects of prescribed drugs

When discussing the effects of prescribed drugs on driving ability it is important to consider that for many drivers the benefits of the drug may improve driving ability such that the benefits outweigh the disadvantages of side-effects. Nevertheless, it is important to minimise the problems associated with driving and medication.

For all medications the exact effects on driving ability and risk of involvement in a road crash are not well known. However, laboratory studies combined with studies of people who have been killed in road crashes with drugs in their blood provide an indication. One of the most difficult problems is determining the level of impairment at different dosages.

Some information about the effects of prescribed drugs which needs to be communicated to drivers is:
Benzodiazepines:

These drugs are prescribed to reduce anxiety and help people sleep. The most common side effects of the benzodiazepines are unwanted sedation and sleepiness, uncoordination of muscle movement and disturbances of memory and intellect. While symptoms are usually mild, they increase the effect of other depressants on the central nervous system including alcohol.

Antidepressants:

Depressed patients show impaired information processes, learning, memory and tracking skills. It is not known whether by relieving the depression driver safety is improved or whether the antidepressant adds to the impaired performance already shown by the depressed driver.

Anti-psychotics:

The effects of anti-psychotic drugs, although providing relief for patients, may reduce vigilance and otherwise impair driving ability. Also, some patients treated with this group of drugs develop tremors and associated conditions that could also cause problems in driving.

Antihistamines:

Antihistamines are useful to treat the symptoms of allergies, such as hay fever because they inhibit histamine-induced rash, itching, sneezing and running nose. Some antihistamines have sedative effects on tasks related to driving. However antihistamines are now available which have markedly reduced sedative effects.

Non-narcotic analgesics:

Analgesics are intended to relieve pain. Non-narcotic analgesics include aspirin and the non-steroidal anti-inflammatory drugs (NSAID) used for the treatment of arthritis and other inflammatory conditions causing pain. While many people use these drugs they do not appear to be associated with increased crash risk.
Narcotic analgesics:

Those narcotics derived from opium include morphine, codeine and other related compounds. Narcotic drugs which are produced entirely synthetically include pethidine, methadone and pentazocine. Therapeutically, opioid narcotics reduce pain but the major reason for their illicit use is their effect on mood. They depress respiration, which is why overdosage can be fatal.

As can be seen from the brief list above, drugs which are prescribed by doctors and even some that are available over-the-counter can have side-effects which impair driving performance.

In the case of antihistamines, more doctors would now be prescribing those with the least tendency for drowsy side-effects. The public also needs to know about the availability of these drugs so that they can ask their doctor for them. It is not known how often doctors are prescribing antihistamines with drowsy side-effects. Research may be needed in this area to determine whether further promotion to doctors and the public is required.

For other types of drugs doctors may not have much choice as to which type to choose. However, when a drug is prescribed which has effects on driving, the patient needs to know. Does the patient know sufficient detail currently or is there a need for further information to be available?

If the patient requires further information, how can the community improve the level of information? This could be achieved by:

- The doctor informing the patient about the effects on driving at the time of issuing the prescription and advise the patient about when they should drive;
- Pharmacists warning the patient when they provide the medication;
- Making it mandatory for all medications which affect driving to have clearly visible warning labels on the bottle. This would provide a reminder each time the medication is used. The National Road Safety Strategy has included the need for warnings on pharmaceuticals;
• Educational material in the form of brochures or posters or via the media such as newspapers or television; and

• A campaign assisting drivers to become aware of questions to ask their doctor and pharmacist.

3.2 Illicit Drugs

Much of the research indicates that illicit drug use is starting at a very early age. For this reason it is important to determine what the pattern of drug use is in schools and determine ways in which we can influence this age group as early as possible. This, therefore, is not simply a road safety issue but a lifestyle issue for young adults.

Drug use by young people

Comparison of a survey of secondary school students in Victoria in 1992 with a similar survey in 1989 found:

• About 30 per cent of Year 11 students reported having tried marijuana;

• A steady increase in the weekly use of pain relievers by all students; and

• A slight increase in the use of stimulants and hallucinogens.

A Queensland study investigated drug use patterns in Mackay, Logan City and Cairns. The study found 22 per cent of the sample used marijuana and amphetamine and LSD was used by about 5 per cent in Logan City but not in Mackay or Cairns. It was also disturbing to find that students also experimented with chemical agents such as hair sprays, deodorants, fire extinguisher retardants, cellophane and liquid paper.

Drug education in schools

Given that some students are taking drugs in their teens, drug education in schools is vital. In Victoria guidelines for drug education are provided to schools in the Personal Development Framework and in the new Curriculum Standards Framework. In August 1994 the Victorian Government launched the Drug Education Strategic Plan 1994 - 1999. This plan recommends directions for effective planning, co-ordination and
support for school-based drug education and drug-related student welfare for the next five years.

A specific project, known as Drug Education Support for Schools began in 1992, and is co-ordinated and managed by the Directorate of School Education with funding from the Drug Research and Rehabilitation Fund and the National Campaign Against Drug Abuse. The project includes professional development training for teachers and a school resource package is being developed as part of the project.

While the need for parental involvement is known, most schools are yet to develop programs that actively promote parent participation in drug education. The information could include the role parents play in influencing attitudes and behaviours, advice on how to deal with children abusing drugs and where to obtain assistance in dealing with such problems.

A lack of trained teachers in drug education is a major constraint to schools teaching drug education.

There is also a Life Education Program which visits primary schools and is provided by the Department of Health and Community Services. The program discusses the human body, peer pressure and how to say 'no' to drugs. There may be a need for more curriculum materials at the primary school level.

**Education for young people**

It is important for the community to also consider how to reach young people after they leave school.

Most young people gain their learner's permit at the age of 16 and apply for their probationary licence at 18. Currently the Victorian Traffic Handbook includes information on alcohol and crashes, how alcohol affects driving skills, the legal limit and how much alcohol takes you to a blood alcohol concentration of 0.05%. There is only one section on mixing drugs. It reads as follows:

_The drug that causes the greatest problem is alcohol, but a number of other drugs also increase your crash risk. They can slow down your reaction time, affect concentration and vision, and make you drowsy._

_The most serious problem of all comes from taking alcohol with other drugs. For example, whilst marijuana makes your driving worse by itself, marijuana combined with alcohol is much worse._
Any drug that calms you down or makes you drowsy, will affect your driving and may have other dangerous effects when combined with alcohol.

Even medicine prescribed by your doctor can have an effect on you. Always ask your doctor or chemist if you can drive with any medication you have been given. [Page 11]

The learner driver phase would seem to be an ideal opportunity to provide more information to young people about the risks associated with taking drugs. Would it be appropriate for further information to be included in the Victorian Traffic Handbook, and questions on the subject to be included in the learner permit and probationary licence tests?

Other areas

Research may be needed to find out more about patterns of drug-taking and driving so that the most appropriate messages can be developed. It is not going to be as simple as telling young people that taking drugs increases their chances of a car crash. For example, evaluations of road safety benefits from Transport Accident Commission advertisements have shown that the advertisements were only effective when complemented with an enforcement program.

Television may not be the best avenue to reach young people. Research may be required to find out the most cost-effective way of getting the message to young people. Some innovative thinking may be required in developing a program to influence people’s taking of illicit drugs.

3.3 Older drivers and medication

While the issue of medication and driving is an issue for all motorists, the older driver has particular problems when it comes to medication.

In 1993 the Autumn School of Studies on Alcohol and Drugs focused on the problems associated with older drivers and medication. The conference reported:

Surveys have shown that over the age of 75, some 80% of the population are on regular drug treatment. About one third of this group are taking multiple drugs, three to four at any one time. These drugs usually include analgesics, psychotropic drugs and drugs used to treat cardiac failure.
The Macedon Ranges and District Road Safety Council recently expressed its concern about older people and medication. Their president, who is employed by Gisborne Shire Council in the Home Help Scheme, is becoming increasingly alarmed at the number of elderly people taking a daily cocktail of prescription drugs.

The Autumn School also reported a study which found that the mean number of drugs taken by older patients was 4.5, but there were three patients who were taking 13 drugs. While not all drugs may have effects on driving, some would, and the combination of drugs often increases the effects. Benzodiazepines were prescribed in 15 per cent of the population.

While a combination of drugs may be necessary depending on the person's condition, it was suggested that drug treatment in all patients should be regularly reviewed to see whether some drugs could be stopped.

Another common problem for older people is that their sleeping patterns alter and this often leads to them taking sleeping tablets.

There are several differences between the sleep of young adults and the sleep of the older people and these are:

- Older people wake up more during the night;
- They have less deep sleep;
- The total sleep time in the elderly is less; and
- Even though they are sleeping less, they are spending more time in bed.

TRANX (Tranquilliser Recovery and New Existence) believes that the evidence is clear that elderly people are being prescribed a disproportionately high number of benzodiazepines. Benzodiazepines are the most frequently dispensed group of drugs under the Pensioner Category of the Pharmaceutical Benefits Scheme.

TRANX also states that the effects of benzodiazepines contribute to the risk of road crashes. Because of the physical dynamics associated with the ageing process, elderly people are more sensitive to the effects of drugs and have a prolonged sedation. A New South Wales study found that 54 per cent of
those people receiving benzodiazepines were prescribed them because of sleeping problems.

In terms of prevention, the message is simple:

*Prescribers need to encourage older people to use non-drug alternatives to assist sleep problems and to prescribe benzodiazepines in low doses for a few days only, ensuring that the patient understands the effects of the drugs.*

Those older people already dependent on benzodiazepines should be given the opportunity to withdraw from the drug.

In this Inquiry on drugs and driving it is important that older drivers are considered but not only from a road safety perspective. From the evidence above it would appear that there is a need for reducing the number of drugs taken by older people. Medical professionals may be able to provide ways in which this can be achieved. In regard to benzodiazepines, how can people become more aware that there are other options to sleep problems besides taking drugs?

The following means of communication could be considered including:

- More training or educational material for doctors in regard to medication for older people, particularly sleep medication;

- Information presented to older people through talks to groups;

- Brochures and articles in newspapers to educate older people directly; and

- Information through material that can be directly distributed to older people, eg. via pension information brochures.

### 4. ENFORCEMENT

While the intention of education is to reduce the level of drivers taking drugs before driving, other road safety initiatives have usually found that education on its own is not sufficient to change behaviour. It is also necessary to have enforcement so that drivers know if they commit the offence there is a high chance that they will be detected and consequently penalised for their behaviour.
As described earlier in this paper, enforcement for this particular road safety problem is difficult. The only way to determine the type of drug taken by a driver and its concentration is by analysing a driver's blood sample.

The issue of random blood sample taking must be addressed because it is likely to be seen as an infringement of civil liberties.

Since 1987 New South Wales drivers are required to give a blood and urine sample if police have reasonable cause to suspect that ability to drive is impaired. If police observe driving behaviour which they suspect is influenced by drugs they first request that the driver undertake a breath test to determine whether the person is affected by alcohol. If the person has a blood alcohol concentration above 0.05% they would be prosecuted for the appropriate drink-drive offence. If the blood alcohol concentration is lower than 0.05% the police use a sobriety test to decide whether they believe the person is likely to be affected by drugs. (Full details of this scheme are provided elsewhere in this report.)

If this requirement for body fluid analysis was introduced in Victoria, motorists would need to be confident that police could accurately determine which people are reasonably likely to be impaired due to taking drugs.

How accurate is the sobriety test used in New South Wales? What percentage of drivers who fail the sobriety test are found to have drugs in their system when the blood test is taken? If the New South Wales system is accurate their tests could be employed. However, all options should be considered.

There are also systems employed in the United States, most based on the Los Angeles Police Department’s procedures. Are these better or worse than the system employed in New South Wales? Are there elements of different tests that could be brought together to develop a test that is accurate and suited the Victorian situation?

Victorian motorists need to be confident of the accuracy of screening tests before accepting legislation requiring blood and urine testing. For the legislation to be acceptable, motorists would need to be assured that there would be no unnecessary blood tests.

It would also be necessary for funding to be available to establish an effective system and train relevant staff. Police officers would need to be trained in
implementing the screening test and medical staff would need to be available for taking body fluid analyses at suitable locations and times.

It is also important to consider how drivers would be prosecuted. In New South Wales Dr Judy Perl is an expert witness and presents to Court information on the driver's level of impairment. Could a similar system be employed in Victoria?

5. RESEARCH

It is important to recognise that more information is still needed in the area of drugs and driving and funds must continue to be available for research purposes. Much of the knowledge available on the effects of drugs on driving has been obtained through laboratory studies. It is only recently that an Australian study has investigated the likely involvement of drugs in fatal crashes.

Further research is needed on the effects of drugs on driving. In particular, more information is needed on dosage and driving impairment.

For education purposes it will be important that we are able to provide motorists with accurate information about the effects of certain drugs.

As discussed earlier in this paper, market research will be required to determine the most appropriate method for reaching the different target audiences, i.e. the young, the sick and the older person.

6. SUMMARY

This paper has raised issues that need to be considered by government, the community and by individuals in order to address the drug-driving problem. The solutions are unlikely to be straightforward and it is certainly not possible to directly copy drink-drive countermeasures.

While this paper discusses both illicit and prescribed drugs the issues are very different. For illicit drugs, people take them for recreational purposes and in most instances they are harmful to the person's health. It is the effects on the nervous system which attracts people to taking these drugs but it is also these effects which slow reaction times, cause drowsiness and reduce attention. The preventative solution lies in finding a way to discourage these people from taking illicit drugs. This may be education.
and enforcement, but it may also be greater access to rehabilitation or social interventions which reduce people's need and desire to take drugs.

How can the problem of medication and driving be minimised? The answer may be through educating people more about how prescribed drugs affect driving. It will be important to consider what information needs to be imparted and how to get it to the patient. Should doctors, pharmacists or pharmaceutical manufacturers be involved? What can others in the community do to improve communication about the effects of drugs on driving?

For prescription drugs it must be kept in mind that drugs may be necessary for the health and quality of life of a person. The solution cannot be to stop people taking all drugs. The solution must be to find the optimum way in which we can ensure that people are only taking those drugs necessary for their improved health and that they minimise their driving when the effects of the drug mean that it is unsafe for them to drive. The issue is how this decision is made and how is sufficient information provided to the decision maker.

For older drivers the problem appears to be that many of them are taking a combination of drugs. A further problem is the extent to which benzodiazepines are used. Older people need to be aware of how to reduce their risks. The community, including medical professionals, will need to think of the most appropriate ways of reducing the risks. If education of the older people is important, the most effective means of communication needs to be determined.

Research has indicated that illicit drug-taking can start when a person is in their early teens. The education system offers one avenue for reaching young people in relation to drugs. There must be other ways in which we can communicate messages about illicit drugs and these messages may not always be directly related to road safety. It would appear that more research is needed about the messages that need to be given and how they can be imparted to people.

If enforcement is introduced how can the system be made fair and reasonable for the motorist? Blood taking without any screening beforehand is likely to be considered an infringement of civil liberties. The challenge is to develop a screening procedure which is relatively accurate,
but is not of major concern to the driver. The community would require an efficient system without undue delays. Best practice needs to be employed in this area of enforcement.

This paper has addressed issues which affect both the community as a whole and individual motorists. These are summarised below according to government, community and individual issues:

**Government issues**

- What information needs to be taught regarding drugs?
- What avenues are available for teaching drug education? eg, schools, universities, colleges of further education, driver licensing system, media.
- What form of law enforcement procedure can be implemented which is practical and does not invade people's civil liberties? and
- Funding for further research.

**Community issues**

- How much advice should doctors give their patients and their families?
- How can doctors and patients be best educated so that a decision can be made as to whether it is safe to drive or not?
- How much advice needs to be provided on medication packaging? and
- How does the community ensure that older people are not taking too many drugs or drugs that are unnecessary?

**Individual issues**

- How do individuals find out the risk level of driving with a certain drug?
- How do people change their lifestyle to minimise driving when affected by medication?
Drugs and Driving: The Issues from the Motorists' Perspective

• Should people drive at all when taking certain drugs?

• What happens when apprehended for driving under the influence of a drug? and

• If help is needed where is it available?

It is hoped that the Parliamentary Road Safety Committee Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety in Victoria will address these issues.
7. **BIBLIOGRAPHY**


DRUG DRIVING AND DRINK DRIVING:
THE SIMILARITIES AND THE DIFFERENCES

Dr J. Hendtlass
Barrister and Solicitor of the Supreme Court of Victoria

Dr Hendtlass uses the analogy between drink driving and drug driving to demonstrate some of the issues which could arise when implementing drug driving countermeasures. She advocates a focus on community and professional education.

Contents:

1. Background
2. Drugs which increase crash risk
3. Defining the maximum legal level of drug use
   3.1 Driving-related skills
   3.2 Drug levels
4. Accurate analysis
5. Social research
6. Conclusion
1. **BACKGROUND**

A drug is a substance which is used to change the way you feel or function. Drugs are available over-the-counter from pharmacies, supermarkets and health food stores, on prescription from medical officers, or through illegal drug networks. Availability and use of most drugs is controlled by extensive legislation passed by Commonwealth and State parliaments and enforced by health and criminal law enforcement bodies.

Australians are heavy users of all types of drugs. Surveys indicate that over 70% of the community has used medication in the last two weeks and nearly 50% of Year 11 students in Victoria have used illegal drugs such as marijuana. 1 2

Police and ambulance officers who regularly attend accident scenes will always be able to tell you a true story like this one to explain why they think drugs are dangerous:

Bob Simon 3 was aged about fifty, the manager of a big company and lived in the eastern suburbs of Melbourne. Bob’s doctor prescribed a commonly prescribed tranquilliser, oxazepam, 4 to treat his severe anxiety state. ‘Just take one tablet a day as it will say on the label’, he told Bob, ‘But for goodness sake, don’t drive after you take the first dose. Wait a while because you may feel a bit drowsy for the first couple of days on these tablets’. Bob’s pharmacist repeated these warnings as he handed over the packet.

Unfortunately Bob was too anxious to heed the warnings of both these professional advisers; he took his first tablet immediately he left the pharmacy, then began to drive home. Little of the next few hours remains in Bob’s memory, but he has been shown the remains of the five parked cars which he ploughed into when he lost control of his vehicle. Bob could easily have killed someone in one of these cars and he was also very lucky not to be badly injured himself.

Experienced road safety experts often extend their individual experiences with drivers like Bob Simon to argue that the crash risk of drivers is increased by drug use to such a degree that the Victorian Parliament should pass drug-driving legislation which is analogous to existing drink driving laws.

The argument which links drugs to increased crash risk tends to assert that drugs are analogous to alcohol, according to logic which goes like this:
1. We know that alcohol is associated with increased likelihood that drivers will be involved in road crashes. An authoritative controlled study, published by Professor Bob Borkenstein and his colleagues thirty years ago, demonstrated that, on average, blood alcohol levels of 0.05g/100mls are associated with statistically significant increases in crash risk compared with blood alcohol levels of zero. This research has been repeated in Australia and elsewhere.

2. We also know that drinking drivers are more likely than non-drinking drivers to be responsible for the crash in which they were injured or killed. Therefore, alcohol probably contributes to the cause of crashes in which it is involved.

3. Alcohol has been shown in laboratory and off-road experiments to reduce individuals' reaction times, peripheral vision, co-ordination and ability to undertake complex mental tasks and it increases their propensity to take risks. This research provides an explanation of the way in which alcohol contributes to increased crash risk.

4. Some drugs also affect drivers' reaction times, peripheral vision, co-ordination and ability to undertake complex mental tasks. Most Australians are aware of the drowsiness that can accompany use of some medications which reduce hay-fever and other allergies. Other drugs which are known to affect some or all of these driving related skills include sedatives and tranquillisers (some of these can still slow you down in the morning after you have used them to sleep), antidepressants, anticonvulsants, some antiarthritis, some minor pain relievers, some cardiovascular drugs and some illegal drugs such as marijuana. Therefore, logically, if alcohol contributes to crash risk, it is likely that these drugs are also associated with reduced safety.

5. Government expenditure saved by reducing the number and severity of road crashes is greater than the cost of enforcement and prosecution of current drink driving legislation which allows police to detect offenders following crashes, and at random breath test stations using relatively simple blood alcohol analyses and breath testing instruments, ensures prosecution by narrowing Courts' ability to admit expert evidence which could challenge the blood alcohol reading and imposes severe mandatory penalties. Therefore, similar road safety policies against use of drugs which are likely to increase...
drivers' crash risk should also be cost effective in reducing road crashes and reducing their burden on the economy.

This thesis, that drug driving is similar to drink driving, provides a useful basis for discussing some of the factors which may contribute to assessment of drug-related risk and design of drug-driving policies in the context of existing knowledge about drink-driving countermeasures.

However, analogous drug driving legislation will require the Government to:

- Nominate those drugs which increase crash risk; and
- Define the maximum legal level of impairment; and
- Provide facilities for their accurate analysis; and
- Consider the social and medical implications of selecting some substances for legislative prohibition in this way.

This paper will discuss some of the ways in which drugs differ from alcohol so that cost effective road safety policies which seek to minimise the influence of drugs other than alcohol need to differ from current drink driving countermeasures. They should rely on professional and community education programmes rather than legislation.

2. **DRUGS WHICH INCREASE CRASH RISK**

There are now many tens of thousands of drugs available to the community ranging from illegal and prescription medicines to alcohol, tobacco, caffeine through to herbal remedies which may be recommended by naturopaths and grandmothers or sold in supermarkets. In assessing crash risk, each drug must be treated individually because it has specific clinical effects and pharmacological characteristics.

Research into drug use among drivers involved in road crashes varies in the frequency with which drugs are detected but most of this range can be explained by differences in the methods of analysis used and the drugs included in each study. Some of these issues will be discussed later in this paper.
Objective assessment of the risk associated with drug use will require blood and urine from driver victims and drivers not involved in collisions to be analysed using identical sampling and analytical procedures. None of these controlled studies have been undertaken.

However, road users who use drugs do not generally have greater liability than non-users for the crashes in which they were killed and no increase in liability has been demonstrated for cannabis, amphetamine or sedative, tranquilliser and hypnotic users involved in crashes.\textsuperscript{12,13} Further, the frequency of victims' use of particular substances such as aspirin (about 10\%) and cannabis (about 20\%) seems to be generally consistent between studies and with patterns of use among members of the general community with the same sex and age characteristics.\textsuperscript{14} These data suggest that, even if some drugs under some circumstances contribute to the crashes in which they are involved, these are individual incidents and, in the absence of alcohol, there is no need for generalised alarm about the effect of drugs on the road toll.

3. **DEFINING THE MAXIMUM LEGAL LEVEL OF DRUG USE**

If some drugs are identified as increasing the likelihood of drivers' crash involvement, determination of the maximum level of impairment which would be tolerated under drug driving legislation will be an essential task of policy makers who seek to rely on the criminal law to implement road crash countermeasures. They will need to determine which driving-related skills are associated with crash risk and/or what levels of each drug in the body are associated with unacceptable impairment of performance of these tasks.

3.1 **Driving-related skills**

For several reasons, the assumption that alcohol's effect on drivers' reaction times, co-ordination, peripheral vision and ability to undertake complex mental tasks contributes to its associated crash risk becomes unhelpful in more complicated circumstances relating to drug impairment.

This is because:

1. Analysis of the literature has not revealed any research which demonstrates a link between crash risk and drivers' natural reaction times, coordination, peripheral vision or ability to undertake complex mental tasks. Without this objective demonstration, society has
chosen not to require licensed drivers to meet minimum standards for these measures of skilled performance although drivers are required to demonstrate adequate long distance vision.

2. Although cannabis impairs reaction time, coordination and ability to undertake complex mental tasks, research has consistently shown that it is not associated with drivers' increased liability for crashes in which it is involved. This suggests that these skills are not crucial in determining crash risk. Consequently, performance of some psychomotor skills could be wrongly used to assess crash risk, as in the Los Angeles Police Department Drug Recognition Programme and tests used to demonstrate driving under the influence by Victoria Police, or to identify which drugs to target in drug driving legislation.

3. The crucial factor in determining drugs' effect on crash risk could be their effects on drivers' risk taking behaviour which increases with alcohol use and decreases with cannabis use. Other drugs, such as some stimulants, which improve drivers' reaction times, co-ordination and ability to undertake complex mental tasks but may, under some circumstances, be associated with increased crash risk are also known to increase risk taking behaviour.

3.2 Drug levels

Even if reaction time, co-ordination, peripheral vision and ability to undertake complex mental tasks are important vectors in the effect of alcohol on crash risk, the effect of particular doses or blood alcohol levels is related to alcohol tolerance, that is, the frequency and quantity of alcohol consumption.

Although crash risk doubles for drivers with blood alcohol levels exceeding 0.05g/100ml when measured over the whole driving population, the risk of drivers who say they drink daily and drivers aged over 25 years does not increase significantly until blood alcohol levels exceed 0.08g/100ml. This means that current drink driving legislation imposes alcohol restrictions on most drivers when their driving skills and crash risk are not necessarily significantly impaired.

The same factors become even more important in determining the levels of drugs which should be tolerated by legislative drug driving
countermeasures. This is because most drugs have an alternative legitimate medical role which could be compromised if inappropriate maximum levels are imposed. As for alcohol and in the example of Bob Simon's oxazepam experience, impairment of skilled performance is usually related to the frequency, quantity and length of time that the drug has been used. It seems likely that increased risk is associated with intolerance to the drug, at least at low or clinical doses, and there is still no consistent demonstrable relationship between performance impairment and measurable blood or urine drug levels.

Further, given that about 40% of both fatalities and surviving drivers in fatal crashes felt unwell, agitated or worried before they began to drive, there remains considerable debate about whether drivers are better to drive feeling ill or anxious or to drive under the influence of medication. It is quite possible that individuals who require drug therapy perform better when medicated than they would without treatment. Obvious examples of this are clinically depressed, anxious, diabetic or epileptic patients.

Therefore, if drug driving countermeasures continue to follow the drink driving model, the maximum legal level of each drug should probably be determined from clinical and toxicological data which relates blood and urine levels to medical effectiveness and death respectively. In order to avoid jeopardising legitimate use of these substances, these levels will have to be set high enough to allow for tolerance and for medically authorised use of the drug. Drivers who demonstrate the levels of impairment associated with these high drug doses are now subject to prosecution under the Driving Under the Influence provisions of the Road Safety Act 1986 or the Culpable Driving provisions of the Crimes Act 1958.

4. ACCURATE ANALYSIS

Studies of drug use in road accident victims which rely on toxicological analyses of blood and/or urine give consistently higher results than those which use surveys or analysis of police reports. Therefore, chemical analysis has become the accepted method of determining the presence and levels of drugs in road users for research and legal purposes.

Alcohol analyses are simple, specific and accurate because the active component of alcoholic beverages, ethyl alcohol, is a small, simple molecule which is soluble in water. Therefore, results are admissible in Court and
acceptable for research purposes. However, chemical analyses will always underestimate the frequency of other more complex drugs to a degree which depends on the body fluid analysed and on the sensitivities of the procedures used to detect and measure each particular substance. In some cases, drugs present in the body may not be detected at all if, for example:

- The detection procedure used does not detect the drugs; or
- The methods used to extract the drugs from body fluids are inefficient before analysis; or
- The sensitivity of the screening procedure to the drugs is low; or
- The body fluid which is being analysed contains very low concentrations of the drugs relative to their concentrations in other fluids.

An example of this issue came to notice in 1984 when the Los Angeles Police Department was able to identify drugs in the blood or urine of about half of the drivers with blood alcohol levels below 0.05g/100ml who had failed sobriety tests. This anomaly could be partly explained by the procedures used by their forensic scientists which only screened for about six groups of chemically related substances. These analyses would have failed to detect many substances at levels which could impair the psychomotor skills assessed in their sobriety testing procedures. Other reasons for the low prosecution rate could include the high levels of some individual drugs required for detection by the analyses, low levels of some drugs in urine under some conditions or the failure of sobriety tests to discriminate between drug impairment and naturally low performance.

Further, even when drugs are found in blood or urine, they may be wrongly identified or the error inherent in quantifying the drug may be very large. The accuracy of these analyses increases with the experience of the analytical chemist, the cost of the equipment he or she requires and the time available for analysis. Although research projects can rely on less expensive analyses because the data is pooled and can be interpreted within the errors inherent in the methods used, analysis of drugs for the purpose of prosecuting individual drivers requires specific identification using mass spectrometry and quantification against known concentrations of the drug throughout the analysis. The errors incurred in determining the concentration this way remain large, of the order of ± 5%-50% depending on the extraction.
procedures used. The detection limits of these accurate analyses are also increased.

Therefore, it will be difficult and extremely expensive to enforce drug legislation which specifies maximum blood or urine levels for particular drugs. The decision to follow the enforcement pattern of drink driving legislation will need to be taken in the light of the cost, the burden on analytical resources and the likely road safety benefit.

5. SOCIAL RESEARCH

The personal, social and driving characteristics of drivers are important factors in determining their crash risk. For example, most driving in urban areas is associated with travel to and from work and, accordingly, most road accidents occur between about 7 a.m. and 9 a.m. and 4 p.m. and 8 p.m. In contrast, most drink driving occurs at night as drivers return home from social or recreational pursuits. This higher frequency of drink driving is associated with a peak in alcohol related road crashes between about 8 p.m. and 4 a.m. particularly on weekends. At these times, the frequency of drink driving appears to be related to the level of alcohol consumption in the community. Drink-driving offenders are often young or deviant in their other drinking and driving behaviour and in the rest of their lives. The rest of us are at home with our families!

Heavy vehicle drivers are different. They drive further than other drivers, their fatal accident rate is higher than other drivers and we know that several of their other characteristics, such as the times at which they work and the way in which driving is work rather than recreation, distinguish them from other drivers. Although workers in the transport and communications industries in Australia have the highest frequency of unsafe alcohol consumption of any occupational group, alcohol consumption by the truck driver is involved in less than 3% of truck accidents. No relationship between alcohol consumption and crash risk among truck drivers has been demonstrated. These inconsistencies can be explained by the previous activities of truck drivers who are involved in crashes. About 60% have been or still are working and 20% have just left home.

These social and personal factors may also relate to differences in drivers' drug use. In general, the characteristics of drug using drivers surveyed at
night and among road user fatalities reflect the characteristics of drug users in the community as measured from surveys and prescription records. In any two week period, 35% of Australians use pain killers, 12% use cough or cold remedies, 11% use fluid, heart or blood pressure medication, 6% use antihistamine drugs and 5% use sedatives. The frequency of use of most medicines is greater among women and the elderly. In contrast, in Victoria 35% of men and 23% of women have used cannabis. These figures include 45% of Victorians aged 18 to 24 years, 42% aged 25 to 44 years and 8% of over-45-year-olds. These groups are also more likely to be identified using the same drugs before driving in research into drug use of road crash victims.

Further, over 40% of long-distance truck drivers admit using stimulant drugs and there is a strong association between fatigue, alcohol and drug use and on-road failure. In a special report, the State Coroner determined that 9% of car drivers were fatigued compared with 5% of drivers of articulated vehicles and 2% of drivers of rigid trucks. Other estimates assert that 21% of car drivers were fatigued compared with 10% of articulated vehicle drivers and 3% of rigid truck drivers and another study found that 42% of truck drivers involved in accidents were fatigued compared with 31% of all accident involved drivers. These data indicate that fatigue is an important component of long distance truck driving and that stimulant use is probably a side effect of this fatigue.

These examples of personal, social and driving characteristics which are associated with drivers' alcohol and drug use and alcohol related crashes indicate that, even if there is a causal relationship between road crashes and alcohol or some drugs, the characteristics of their users and the frequency with which they drive after use are important factors to take into account when designing road safety measures.

6. CONCLUSION

Existing laws provide for prosecution of drivers who are demonstrably impaired by high levels of alcohol and other drugs. This paper has used the analogy between drink driving and drug driving as a vehicle to demonstrate some of the issues which could arise when determining and implementing a legislative drug driving programme. This programme would be directed at crashes which may be caused by the relatively low doses of drugs usually used in clinical or recreational settings.
Issues include:

1. Drug driving legislation assumes that drug use is related to crash risk but there is no direct relationship between blood drug levels and reduction of driving related skills. Some drugs may even improve driving related skills and increased risk may be associated with their absence.

2. Drug driving legislation assumes that particular drugs which increase crash risk can be identified. However the effects of alcohol which cause increased crash risk have not been adequately defined so that it is difficult to identify the other drugs which should be targeted in drug-driving policies.

3. Drug driving legislation assumes that the levels of drugs associated with increased risk can be defined but chronic drug users demonstrate less impairment of driving related skills at particular doses of drugs.

4. Drug driving legislation assumes that drug use can be objectively measured but drug analysis for research and prosecution purposes is expensive, labour intensive, complicated and subject to error.

5. Drug driving legislation assumes that drugs have no beneficial influence on road safety but most drug use is associated with treatment of medical conditions which, of themselves, could affect driving.

6. Drug driving legislation assumes that the drivers who use drugs most often are those involved in road crashes but, with the exception of cannabis, drug users are more likely to be women or aged over 65 years. These drivers have relatively low crash risk.

These distinctions between alcohol and other drugs will make it difficult to draft or enforce effective legislation which proscribes use of particular drugs and relies on chemical analyses for prosecution. Rather, road safety measures may need to:

- Firstly, establish that drivers' use of drugs other than alcohol increases the number and severity of crashes sufficiently to justify specific drug-driving countermeasures; and
• Secondly, focus on community and professional education about the possible effects of drugs on driving, particularly when users are beginning a new course of medication or changing their dose or combining them with alcohol.
Footnotes

3. His name has been changed for obvious reasons.
4. Oxazepam is marketed as Serepax and is an active breakdown product of other benzodiazepine sedatives and tranquillisers such as diazepam (Valium) and nitrazepam (Mogadon).
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Drug Driving and Drink Driving: the Similarities and Differences


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THE ROAD TRANSPORT OPERATORS' VIEWPOINT

The Victorian Road Transport Association

This paper by the Long Distance Division of the Association provides facts about the industry, describes the difference between employee and sub-contractor drivers and mentions the involvement of the association with the Victorian Enforcement Liaison Group to improve road safety in the industry.

Contents

1. Introduction
2. Statement
3. Market size
4. Drivers
   4.1 Employees
   4.2 Sub-contractors
5. Safety
6. Recommendations
1. INTRODUCTION

On behalf of the Victorian Road Transport Association (VRTA), the Long Distance Division has been asked to make a comment regarding the use of drugs in transport. Unfortunately, there is a perception in the community that drug taking in long haul road transport operations is commonplace. This is unfortunate, as the reality is that drivers have become more professional and are endeavouring to prove to the community that they are responsible and have respect for the current road laws. It is our view that drug taking is not as prolific as it once was... this means that the problem still exists and must be addressed.

2. STATEMENT

The VRTA comprises professional transport companies and uppermost is the belief that its members obey the law. Currently the law does not permit the taking of drugs and the industry does not condone the use of same. We also state that we are not the competent authority to determine the medical merits of various drugs.

We are approached from time to time that controlled and limited use of prescribed drugs may actually create a safer environment on the roads. We also are advised by others that no drugs are necessary for this to be achieved. This paper's objective is therefore to inform the reader of:

- Facts about our industry;
- Long distance drivers and the difference between employees and sub contractors;
- The ongoing improvement in pursuit of safety on the highway; and
- Recommendations.

The members of the VRTA are committed to the pursuit of a safe working environment – one which will ensure that all road users share the roads with confidence that all has been done to make travelling safe.
3. MARKET SIZE

Some facts on road freight:

Gross Domestic Product:
- The road freight transport sector contributes a value added output of 7.5% of Australia's gross domestic product.

Tonnages:
- 96% of all freight moves within the State of origin.
- 4% of all freight moves interstate.

Vehicles:
- There are approximately 680,000 trucks in use in Australia.
- There are approximately 27,000 trucks rated 34 tonnes or more in Australia.

Operators:
- There are over 110,000 operators with only one truck.
- There are over 43,000 operators of between 2 and 50 trucks.
- There are approximately 200 operators of 40 or more vehicles.

4. DRIVERS

Interstate drivers can be categorised into two areas:

(a) Employees; and

(b) Sub-contractors.

4.1 Employees

Over the past 5 years, there has been an increasing awareness by transport operators to change their image. The employee driver is now much closer to management than ever before. He or she is trained, uniformed and participates in quality assurance programs. Many companies recognise their obligations under the relevant regulations and Acts to ensure drivers are
competent to complete the task assigned each day. This includes the national road laws as well as occupational health and safety.

Companies recognise that the driver is in control of a substantial asset and down-time must be minimised.

It is a general view that drug taking by employee drivers is now 'rare' and generally occurs within companies who do not subscribe to employer associations.

4.2 Sub-contractors

Sub-contractors may work solely for one company, or may work permanently as freelance operators. Either way they are able to make a choice regarding employment. Currently there is a strong market for sub-contractors. Therefore, a good driver is generally welcomed by reputable companies. Sub-contractors generally have large financial commitments and their immediate goal is to make the monthly truck payment, then cover other expenses. It is always tempting for sub-contractors to take an extra job because they will know they only have to cover variable costs to be cash positive for the month. (This may be economically incorrect, however, many sub-contractors think this way.)

Sub-contractors are therefore more likely to take drugs as they can see a short term financial gain. It is not practicable for a transport company to check the log book of a sub-contractor, as the operator is not aware of the driver's previous journeys for other companies. However, it is the opinion of the VRTA Long Distance Division that drug taking is not common among drivers who work predominantly for one company. We do not have data to make an accurate assessment on freelance operators.

5. SAFETY

The VRTA has been a supporter of national safety – and not just in words. Two years ago, in conjunction with the Victoria Police, the VRTA established the Victorian Enforcement Liaison Group (VELG). This group comprises representatives from different industry associations, Occupational Health and Safety Authority, VicRoads, Victoria Police, Transport Workers Union, industry, Municipal Association of Victoria and the Environment Protection Authority. It has been highly successful and other States have been encouraged to follow our lead. Through the VELG,
there is constant communication between the authorities and drivers on the highways through the 'Meet the Truckie' nights. These are scheduled every quarter and are held overnight on the highways. The issue of drug taking has been raised by the authorities as a serious issue. No conclusion on the best solution has yet been made.

6. RECOMMENDATIONS

1. The VRTA strongly recommends that the enforcement authorities be allowed to advise a transport operator when a driver (either an employee or sub-contractor) has been charged with a drug related offence.

The transport operator is in the best position to counsel and train the driver to modify his/her behaviour.

Action taken by the company may involve:

• Special drug and alcohol training;
• Financial planning (budgeting);
• Vehicle management (ie. fuel, tyre management, etc); and
• Monitoring ongoing behaviour.

2. An appropriate medical authority be commissioned to study the effects of various drugs on the 'on-road' behaviour of long distance drivers.
ECONOMIC ASPECTS OF DRUG TAKING AND ROAD SAFETY

Professor D.J. Collins
Associate Professor in Economics
Macquarie University

Ms H.M. Lapsley
Senior Lecturer in Health Economics
University of New South Wales

Professor Collins and Ms Lapsley's paper covers the types of costs relevant to consideration of the effects of drug use on road safety, the sources of data for Australian cost estimates and the theoretical and methodological problems of cost estimation. The paper also mentions some evidence of a possible relationship between tobacco users and road safety.

Contents:

1. Introduction – The uses of economics

2. The links between drug taking and road safety
   2.1 Tobacco
   2.2 Legally prescribed and purchased drugs
   2.3 Illegal drugs
   2.4 Alcohol and other drugs

3. Types of costs relevant to consideration of the effects of drug use on road safety

4. Sources of data for economic studies of drug taking and traffic accidents
   4.1 Epidemiological data
   4.2 Health costs
   4.3 Traffic data

5. Theoretical and methodological problems in cost estimation
   5.1 Valuation of production losses
   5.2 The concept of cost
   5.3 Problems of double counting
   5.4 Treatment and measurement of intangible costs
5.5 Valuation of loss of life
5.6 Treatment of research, education and law enforcement costs
5.7 Estimation of avoidable costs

6. Types of programs and policies
7. Conclusions
1. INTRODUCTION - THE USES OF ECONOMICS

A major issue in the determination of appropriate policies to deal with the effects of drug use on road safety is the question of what is the appropriate level of public resources which should be devoted to these policies. An associated, but equally important question is how these resources should be allocated between competing programs and policies. To answer these questions it is necessary to apply economic analysis. Without the analysis supplied by other disciplines, economic analysis is likely to be of limited value. Equally, however, without the application of economic analysis the interpretation of the output of other disciplines becomes for policy purposes, virtually meaningless. Interdisciplinary studies, which make use of the expertise of economists and other scientists, are essential for the formulation of rational and effective public policy.

No meaningful decisions can be made about the level of resources appropriately devoted to public policies without some knowledge of the costs which the impact of drug taking imposes upon the community as a whole through its effects on road safety. The greater the economic costs, the greater the level of resources which might appropriately be devoted to the problem. If the problem is a small one in terms of economic costs, there would be no justification for the application of large scale resources to its solution. The resources would be better used elsewhere where they could yield greater benefit to the community.

If the costs of a particular activity (for example, drug-taking by drivers) is high, the issue arises as to the extent it is possible to reduce these costs. In other words, to what extent are these costs avoidable if subjected to appropriate public policies? It would normally be expected that some proportion of social costs would, in practice, not be avoidable by any socially practicable public policies. For example, in looking at the social effects of smoking it must be accepted that it is simply not possible to reduce tobacco consumption to zero and so it is not possible to reduce the social costs of smoking to zero. Some proportion of these costs will be unavoidable.

Even when the avoidable social costs of the problem are high, the question still remains as to the selection of programs or policies to which the public resources should be devoted. In other words, it is necessary to make some estimate of the relative rates of return which will result from the use of
resources in particular programs or policies. Resources available to tackle any given problem are always limited since the resources available to society as a whole are limited. There will be competition amongst alternative users for access to scarce resources. If these resources are to be used as efficiently as possible, they should be directed to those uses which produce the highest rate of return. It is important therefore to subject policy proposals to the discipline of benefit-cost analysis (BCA).

BCA does however have both theoretical and practical deficiencies. Some costs and benefits are difficult to estimate. In particular, intangible benefits such as pain, suffering and loss of life are difficult to evaluate and yet, in many cases, are an important component of total benefits. Another serious problem is the choice of an appropriate discount rate by which to reduce benefits and costs to values measured at a common period of time in order to make them comparable. There are both theoretical and practical difficulties in the choice of the appropriate discount rate. The problems of BCA suggest that it should be used as one of a set of decision-making considerations, rather than as the sole decision instrument.

The difficulties with BCA that are discussed above often lead policy makers to decide that a particular policy objective should be implemented (for example, a given reduction in the rate of motor vehicle fatalities), leaving the decision to be made as to the most cost-effective way of achieving that objective. This approach requires cost-effectiveness analysis (CEA) which is simpler than BCA because it requires evaluation only of costs, not of benefits.

Whatever technique is adopted, it is clear that the most efficient use of limited public resources requires economic analysis. Table 1 below summarises the types of economic information which need to be produced before public policies towards drug use and its relationship to road safety can be sensibly formulated, and the uses to which each type of information can be put.

Another category of information related to the impact of drug abuse (for example, on motor vehicle accidents) is the budgetary impact of drug abuse (in relation to alcohol, the taxes paid by drinkers compared with the budgetary outlays attributable to alcohol). In the way that this information is usually presented it deals with the question of whether drug abuse reduces budget deficits. This is of minor importance relative to the real
question which should be 'Do abusers pay taxes sufficient to cover the external costs which they impose upon the rest of the community?' Since not all external costs are reflected in increased government expenditures (examples of such externalities being third party damage in drug-related vehicle accidents and loss of earnings related to these accidents) it would be desirable that drug tax revenue should exceed drug-related public expenditures.

Table 1

<table>
<thead>
<tr>
<th>TYPE OF ESTIMATE</th>
<th>INTERPRETATION OF RESULTS</th>
<th>EXAMPLE OF POLICY USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate (total) costs</td>
<td>Total costs of abuse compared with alternative situation of zero abuse</td>
<td>Indication of size of drug abuse problem</td>
</tr>
<tr>
<td>Total avoidable costs</td>
<td>Potential economic benefits from harm minimisation strategies</td>
<td>Appropriate level of resources for harm minimisation strategies (cost-effectiveness)</td>
</tr>
<tr>
<td>Disaggregated costs</td>
<td>Returns to specific programs eg. road accident costs</td>
<td>Economic evaluation of early intervention alcohol programs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Economic evaluation of random breath tests</td>
</tr>
</tbody>
</table>

The danger with estimates of budgetary costs is that they are open to substantial misinterpretation. They are often taken to answer the question 'Do drug abusers pay their way?', when they really can only be used to answer the question 'Do drug abusers reduce budget deficits?'

2. THE LINKS BETWEEN DRUG TAKING AND ROAD SAFETY

Alcohol is the most frequently abused drug in relation to road safety. It is therefore only too easy to dismiss the economic aspects of other drugs, the use of which may have implications for road safety. These can be divided into the three major categories of:
- Tobacco;
- Legally prescribed and obtained drugs; and
- Illegal drugs.

The economic implications of each category will be discussed in turn. Those categories are not necessarily discrete, as any or all can be used in conjunction with each other and/or with alcohol.

Road safety costs can be incurred directly by drivers, passengers, cyclists and pedestrians. In practice, a substantial proportion of these costs is likely to be borne indirectly by the rest of the community, particularly through health costs and production losses.

2.1 Tobacco

Smokers have a significantly greater rate of motor vehicle accidents than non-smoking drivers (see R. Christie, 1991, re North American studies) and, therefore create significantly greater costs on the road than non-smoking drivers. There are a range of explanations for this, including physically-based, physiologically-based and psychologically-based.

The evidence from a number of studies is sufficiently strong to indicate that smokers who drive may well have more traffic accidents, independently of whether their smoking is also associated with alcohol consumption. Smoking itself appears to be a possible risk factor.

Studies of smoking and drinking drivers suggest that the physical and physiological consequences of smoking which impair driving are exacerbated when alcohol consumption is combined with smoking and driving. Explanations for this include the propensity towards high risk-taking, personality factors, membership of a 'multiple lifestyle hazard group' (Bradstock et al, 1987) and lower seat belt wearing rates of smokers.

2.2 Legally prescribed and purchased drugs

The circumstances under which road accidents, including pedestrian accidents, can be associated with prescribed drugs can be described as to whether:
The prescribed drugs are used appropriately but with side-effects leading to accidents;

- The prescribed drugs are used without reference to recommended compliance warnings or in greater quantities than prescribed, leading to accidents; and

- The prescribed drugs interact with other drugs and so lead to accidents.

All of these aspects of drug taking have inevitable economic consequences.

### 2.3 Illegal drugs

Illegal drugs, which can have psychological and physiological effects altering moods, concentration, speed of reaction and other responses, can all cause or be associated with road accidents. The existence of these drugs is often not identified in the course of normal accident investigation processes and their illegal status has made research difficult and infrequent. Nevertheless, it appears that road traffic accidents related to illegal drugs are likely to be under-reported and their extent and impact underestimated.

### 2.4 Alcohol and other drugs

While the association between tobacco and alcohol as a cause of accidents has already been discussed, there are also connections between alcohol and other abused drugs with 'risky-lifestyle' associations. This connection is one reason why much of the research which has been conducted on alcohol and traffic accident involvement has relevance to the relationship between traffic accidents and other drugs. The economic aspects of such studies can be appropriately compared.

### 3. TYPES OF COSTS RELEVANT TO CONSIDERATION OF THE EFFECTS OF DRUGS ON ROAD SAFETY

Consideration of the costs of drug-taking's impact on road safety is a two-stage process. The first stage is to identify the nature of all possible costs and any offsetting benefits in a notional listing. The second stage is to quantify each of these costs and benefits. In practice, many costs and benefits are likely to be unquantifiable as a result of the unavailability of appropriate data, and for others the estimation techniques are less than totally
satisfactory. It is, nevertheless, important to understand the nature of the various types of costs even though it is not possible to place a dollar value on many of them.

The listing below distinguishes between tangible and intangible costs. Tangible costs, when reduced, release productive resources for investment or consumption elsewhere. For example if the number of motor accident injuries are reduced, labour and other resources will be released for use elsewhere in the health system or in the wider community. Intangible costs, when reduced, do not release resources for use elsewhere. The reduced pain and suffering resulting from fewer road accidents (while being an important benefit) do not release resources for alternative uses.

The *tangible* road safety costs and benefits of drug taking are as follows:

(i) Morbidity of accident victims:
   (a) Health care costs;
   (b) Productivity losses; and
   (c) Welfare costs of victims, dependants and carers (primarily a budgetary, rather than a resource cost).

(ii) Mortality of accident victims:
   (a) Health care benefits (resulting from premature death);
   (b) Productivity losses;
   (c) Welfare costs of dependants (primarily a budgetary cost); and
   (d) Welfare benefits (resulting from premature deaths, primarily a budgetary cost).

(iii) Other costs of accidents:
   (a) Police;
   (b) Judicial;
   (c) Penal;
   (d) Property;
(e) Research; and
(f) Prevention.

(iv) Costs of consumed drugs.

The intangible costs can be identified as follows:

(i) Morbidity of accident victims:
   (a) Pain and suffering of victims; and
   (b) Suffering imposed on rest of community.

(ii) Mortality of accident victims:
   (a) Value of loss of life to deceased;
   (b) Consumption forgone by deceased; and
   (c) Suffering imposed on rest of community.

It will be observed that of the tangible costs listed above, some are the inevitable result of the effects of drug-taking on road safety. Others (those under the heading of 'Other costs of accidents') are the costs of policy responses to the problems. They are discretionary in the sense that they are determined by public policy. Increases in these types of costs would be expected to reduce the size of other categories of costs. For example, an increase in policing would probably lead to a reduction in road accident costs. Thus, the costs considered here would appear on both sides of the cost-benefit ledger, with the reduction in some costs being treated as a benefit.

4. SOURCES OF DATA FOR ECONOMIC STUDIES OF DRUG TAKING AND TRAFFIC ACCIDENTS

Studies of the economics of road traffic accidents are dependent to a considerable extent on the availability and reliability of data from which the appropriate calculations and estimates can be derived. Such data include epidemiological data, data on costs incurred within the health care system and detailed information regarding the drug status of the members of the population who are involved in accidents. The collection of these data
enable economic estimates to be made of both the present costs and the economic effects of alternative policies.

4.1 Epidemiological data

Epidemiological data provide information on rates of illness and death in the population, referred to as morbidity and mortality rates. Road traffic accident rates can be analysed to determine the relative proportions of accidents which are caused by or associated with alcohol and other drugs. The numbers of deaths and road injuries can then be calculated on an age-specific basis, to determine the value of years of life lost in the case of death, or years of disability in the case of permanent injury and disability. For accidents from which victims recover completely, the period of absence from work during treatment and recovery can be estimated.

Aetiological fractions for drug-related accidents could be calculated in the same way as has been done for alcohol if the necessary data were available. (An aetiological fraction indicates the proportion of a particular mortality or morbidity which can be attributed to a particular action. For example, Holman and Armstrong (1990) have estimated that the aetiological fraction relating road injuries to alcohol consumption for Australian males aged 20-24 is 0.34. That is, 34% of all road injuries suffered by males aged 20-24 can be attributed to the consumption of alcohol).

4.2 Health costs

The costs to the health care system of road accidents which are caused by alcohol has been compiled (see Collins and Lapsley, 1991) but cost estimates of road accidents caused by drugs other than alcohol have not been undertaken in Australia.

The costs to the health care system of road accidents associated with drug use include:

- Costs within accident and emergency departments;
- Costs of acute hospital bed days;
- Costs of pharmaceuticals;
- Costs of rehabilitation programs; and
• Costs of counselling.

Such costs can be incurred for the treatment of persons who themselves are affected by drugs, or for the treatment of other people involved in accidents caused by persons affected by drugs.

4.3 Traffic data

Data collection, analysis and estimation of causality are essential to determine the economic burden of traffic accidents caused by drug taking. It is also necessary to include pedestrian data in such analysis, as both alcohol and other drugs can be associated with accidents involving pedestrians.

Accident-generated activities, including drug-testing, investigation and assessment, are also economic costs which require resources which otherwise could have been utilised in some other way. Costs of accidents include loss and repair of motor vehicles and cycles, traffic delays, costs of third party property damage, legal and court costs and insurance administration.

5. THEORETICAL AND METHODOLOGICAL PROBLEMS IN COST ESTIMATION

Having identified the nature of the costs to be considered (in Section 3) and the data sources (in Section 4), it is now necessary to consider the methods and problems of estimating particular types of costs. This is an important exercise since, in many of these types of estimates which tend to be reported uncritically in the media, the methodology tends to be suspect, the data sources dubious and/or unclear and the interpretation of the results highly methodological. We proceed to consider the major theoretical and methodological problems of cost estimation.

5.1 Valuation of production losses

Two broad approaches have been adopted to the valuation of production losses resulting from road accidents - the human capital approach and the demographic approach. Both relate to the valuation of the loss of production arising from the abuse-related deaths or injuries of otherwise productive members of society. Both approaches compare abuse costs in the actual situation with those in a hypothetical alternative situation which would have existed had there been no past or present substance abuse. The
difference between the two approaches relates to the way in which the production costs of premature mortality are treated.

The human capital approach is to estimate the value of the worker's future production stream, brought back to present day values by the use of an appropriate discount rate. A thousand dollars received this year is worth more than a thousand dollars received next year (even if there is no inflation) because this year's resources become available for investment purposes a year earlier and so produce interest receipts or profits a year earlier. The use of a discount rate acknowledges this fact and adjusts for the difference between present and future values. Two major problems arise in the human capital approach – how to forecast future production levels and how to choose the appropriate discount rate.

The demographic approach compares the actual population size and structure in a given year with the size and structure of the hypothetical alternative no-abuse population. From this comparison the actual and hypothetical outputs are compared to yield the production costs in that year of past and present substance abuse. The major problem in this approach is the estimation of the alternative population structure.

The essential difference between the two approaches can be summarised in the following way. The human capital approach calculates the present and future production costs of abuse-induced deaths and injuries which occur in the present year. The demographic approach calculates the present production costs of abuse-induced deaths and injuries which have occurred in past and present years. Which approach should be adopted depends therefore upon which type of information is needed. The two approaches are complementary rather than competitive.

5.2 The concept of cost

The economist's definition of tangible cost is based on the concept of an alternative use for scarce resources known as opportunity cost. The measure of opportunity cost is the benefit which would be derived from the best alternative use of a particular resource. For example, the alternative use of land which is currently used for growing tobacco is the next most valuable crop which could be produced on that land.

It is generally recognised that the costs of drug use include private costs and social costs, about which Markandya and Pearce say:
To the extent that the costs are knowingly and freely borne, they are referred to as private costs, but to the extent that they are not so borne but fall on the rest of society they are referred to as social costs.

If the costs of drug production and use are knowingly and freely borne by producer or consumer as the result of a rational decision-making process they should be classified as private costs. It can be assumed that, in these circumstances, there exist private benefits of production or consumption which at least equal the private costs.

There are three circumstances under which the consumer will not have rationally, knowingly and freely borne the full costs of the drug use. These are:

- There may not be available full information as to the costs which drug use imposes on the user;
- The consumer may not make a rational decision based upon the costs of drug use which must be borne by the user; and
- There may be no mechanism by which the costs which drug use imposes on the rest of the community (the external costs) can be converted into internal costs to be directly borne by the user. For example, drug-taking drivers who cause accidents cannot be forced to bear their full health costs or to provide recompense for the costs which they impose upon the innocent victims of their accidents.

Thus, if the costs of drug use are to be classified as private costs, the following three conditions must be simultaneously satisfied. These are:

- The users are fully informed as to the costs which the drug use imposes upon themselves;
- The users are required to bear the full (internal and external) costs of their consumption; and
- The users make rational consumption decisions in the light of all the information available to them.
5.3 Problems of double counting

In dealing with the costs attributable to drug use great care needs to be taken to distinguish the real resource costs of use and costs which are simply pecuniary (ie. transfer payments). It is also important to ensure that there is no double counting of costs.

Where a person previously in the work force receives welfare benefits as a result of drug-use related injury it would be double counting to include in the estimate of social costs both the production loss and the cost of welfare benefits. The production loss is a real resource loss while the welfare payment simply represents a redistribution of consumption ability from the rest of the community to the abuser. However, if the drug user is both rational and fully informed the private resource costs will be fully internalised and should not be counted as part of the social costs. On the other hand, the welfare costs will represent an externality imposed on the rest of the community and in these circumstances should be incorporated in social costs. Which should be counted depends on the assumptions about the rationality of, and the amount of information available to the drug user. All welfare costs should be incorporated in estimates of budgetary impact.

5.4 Treatment and measurement of intangible costs

The major intangible costs of drug use to be considered in relation to road safety are caused by death, pain, suffering and bereavement. The most important characteristic of intangible costs is that, when they are reduced, there is no release of production or consumption resources for other uses. For example, any reduction of pain and suffering, while an important benefit, will permit no direct transfer of these benefits to any other person. A major implication of this characteristic is that there is no market in the benefits of cost reduction – the benefits cannot be bought and sold. Thus it is extremely difficult to place a value upon intangible costs and the temptation exists to ignore them. However, to do so may lead to misleading and unreasonable results.

It is clear that society itself considers that death and pain are costs to be avoided where possible since it applies such substantial resources to their reduction, even where there is no tangible benefit to be gained. For example, considerable effort is (rightly) applied to improving the health
status of senior citizens even if they are above the age at which they can participate in the work force.

If the value of intangibles is simply ignored because of extreme measurement difficulties, the benefits of many anti-drug abuse policies will be substantially underestimated and, as a result, insufficient public resources may be devoted to these programmes.

5.5 Valuation of loss of life

A major issue in relation to road safety is loss of life and any economic analysis will inevitably involve valuation of lives lost. The valuation of life is quite generally attempted in many advanced countries – for example in benefit-cost analysis of road investment projects. The two basic approaches to the valuation of life are the 'human capital' and 'willingness to pay' techniques.

The human capital approach estimates the discounted current value of the future stream of potential earnings of the victim. This approach undervalues life since it takes no account of the value of life to the victims over and above their earnings loss. To avoid death or sickness most substance users would be willing to pay much more than simply their lost future earnings. The human capital approach can take account of this objection by arbitrary scaling-up of the estimated values but the theoretical basis for choice of the scaling factor is exceedingly weak.

The willingness to pay approach examines what people would be willing to pay for relatively small changes in the risk of death and from these figures produces estimates of the value of life. While this technique appears to have a much sounder theoretical basis, there still remain considerable difficulties in the accuracy and consistency of estimates using this approach.

5.6 Treatment of research, education and law enforcement costs

Some costs which are clearly attributable to drug use result from public decisions to reduce abuse rather than being the direct effects of drug use. Costs in this category include expenditures on research on the impact of drug use, public education campaigns to minimise use or abuse and law enforcement programs to reduce illegal dealing and use. These costs are discretionary in the sense that governments could choose not to incur them, or indeed, to incur higher levels. It is to be expected that reduced
expenditures in these categories would lead to higher direct costs of substance use but these expenditures are, nevertheless, not themselves direct costs.

It is appropriate to indicate the level of social costs incurred in these expenditure areas but to categorise them as 'policy costs' rather than direct costs. They are, in this way, identified as being incurred in relation to substance use but are not classified as unavoidable costs of use.

5.7 Estimation of avoidable costs

It is assumed that the hypothetical alternative situation in which there is no drug abuse is simply that: hypothetical and not realisable under any circumstances. Estimates of the total costs of drug abuse comprise both avoidable and unavoidable costs. Unavoidable costs comprise the costs which are currently borne relating to drug abuse in the past, together with the costs incurred by the proportion of the population whose level of drug consumption will continue to involve costs. Avoidable costs are those costs which are amenable to public policy initiatives and behaviour changes. Some of the identified costs of abuse, while avoidable, may be reduced or eliminated only over long lead times.

6. TYPES OF PROGRAMS AND POLICIES

Programs which are currently being undertaken to reduce the consumption of and harm associated with drug abuse, if effective, will also reduce associated road traffic accidents. Estimates of the cost-effectiveness of individual programs are required to determine whether they should be continued, expanded or abandoned in favour of others with proven cost-effectiveness.

The development of policies which incorporate economic considerations of drug-related road accidents should reflect the relative costs and benefits of alternative policies. There are economic effects resulting from a range of causes, including:

- Unanticipated effects of consumption of illicit drugs, due to absence of information;
- Lack of compliance with prescribed medication due to insufficient information;
• Deliberate non-compliance with legal medications (eg. attempts to reduce tiredness and sleepiness); and

• Inadequate awareness of drug and alcohol interactions.

Different programs, policies, education and deterrents are required to address these causes. The recognition of the economic implications of the impact of these drugs on road safety, and the costs of alternative strategies to reduce harm should form an important component of policy-making.

7. CONCLUSION

The formulation of rational policies towards drug taking and road safety programs requires economic analysis of alternative policies. Only by the use of economic analysis (cost estimation, benefit-cost analysis, cost effectiveness analysis) can the disparate implications of drug taking be considered within a common framework. It is most important that the economic analysis be undertaken on the basis of a correct theoretical framework and using all relevant available data.

It must, however, be recognised that the information presented by economic analysis in a study of drug taking and road safety will be incomplete. This will result from a paucity of base data - particularly data on drug usage by drivers, cyclists and pedestrians and of epidemiological information on the relationship between drug taking and road safety. Without these base data, comprehensive economic analysis is not possible and policy advisers must accordingly be circumspect in the advice which they offer to governments.

The conclusion of the present Inquiry may well be that substantial further research is needed to provide the base data upon which comprehensive economic analysis and informed policy formulation will be founded.

It appears to the present authors that the impact of alcohol consumption on road safety cannot be totally ignored by the Inquiry. There are two reasons for this opinion being:

• There would appear to be significant evidence that alcohol consumption interacts with the consumption of other drugs to increase the probability of road accidents. In practice it is likely to be extremely difficult, if not impossible, to disentangle the effects of the various drugs; and
A considerable amount of research has been conducted on the impact of alcohol consumption and it may well be possible to draw conclusions from this work for appropriate policies towards other drugs. For example, the present authors have undertaken some unpublished work suggesting that the rate of return to expenditures on alcohol random breath testing programs is very high. Similar conclusions may well be able to be drawn for similar programs designed to test for the use by drivers of other drugs.

Evidence is starting to accumulate that tobacco consumption may, by a variety of mechanisms, be associated with road accidents. There is a strong case for including tobacco as one of the drugs under review by the Inquiry.
REFERENCES


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NOTES ON CONTRIBUTORS
OLAF DRUMMER

Professor Drummer is a forensic pharmacologist and toxicologist with some 20 years experience investigating the effects of drugs. He has published some 100 scientific papers in international journals covering both basic research and medico-legal issues of drugs and their effects.

He holds a PhD in Medicine (Pharmacology) at Melbourne University and a Bachelor's Degree in Applied Chemistry from RMIT and is a member of a number of professional bodies including the Australian Academy of Forensic Science.

He has given expert evidence in numerous Courts throughout the country in inquests, committals and criminal trials.

He is currently Assistant Director of the Victorian Institute of Forensic Pathology and is responsible for the management of the scientific services for the Institute. He also holds the position of Honorary Associate Professor in Forensic Medicine at Monash University.

MICHAEL McDONOUGH

Dr McDonough graduated in medicine and surgery from Monash University in 1982 and completed his general medical training in Melbourne. In 1987-88 he undertook specialist training in drug and alcohol related medicine in Toronto, Canada.

Dr McDonough was appointed Director of the Alcohol and Drug Unit at Box Hill Hospital in 1990 and in 1991 was elected State Council Member for APSAD (Australian Professional Society on Alcohol and other Drugs).

In 1992 he held a locum position as Director of Medicine, Drug Services Victoria and in the same year was appointed Consultant in Drug and Alcohol Medicine at Bethesda Hospital.

In 1993 Dr McDonough was appointed Visiting Physician, Department of Drug and Alcohol Studies at St Vincent's Hospital, Melbourne. In 1993 he was also appointed as a consultant to the Drug and Alcohol Clinical Advisory Service and became a member of the Committee on Drug and Alcohol Education with the Victorian Medical Postgraduate Foundation.

Currently he is Director of the Drug Services Unit at Box Hill Hospital.
GREG CHESHER

Dr Chesher's main research has been in the field of drug dependency, particularly cannabis.

Dr Chesher was a consultant on cannabis for the South Australian Royal Commission into the Non-Medical Use of Drugs in 1979. He has also given evidence to numerous government inquiries concerning cannabis.

Dr Chesher has retired from the position of Reader in the Department of Pharmacology, University of Sydney. He now holds honorary positions at the University of Sydney (Honorary Research Associate) and the National Drug and Alcohol Research Centre of the University of New South Wales (Visiting Fellow).

Dr Chesher is a member of the International Committee on Alcohol, Drugs and Traffic Safety and of the International Cannabis Research Society.

JUDITH PERL

Dr Perl is a Pharmacologist.

She received a Bachelor of Science from the University of Sydney in 1979, majoring in Pharmacology and Physiology. She received a Doctorate of Philosophy in Pharmacology from the University of Sydney in 1988.

Since 1979 Dr Perl has conducted research into the effects of alcohol and other drugs on cognitive functions and skills performance – particularly related to driving ability. This was also the topic of her PhD thesis.

She has personally tested many people in both the sober state and under the influence of alcohol and/or other drugs.

During the course of her research she has gained experience in blood analysis by gas chromatography and conducted breath analyses.

Dr Perl has numerous publications in both Australian and International medical and scientific journals and regularly presents papers in her research field and related fields at national and international conference proceedings. She regularly delivers lectures in this field to Police, members of the legal and medical professions and members of the public.

Dr Perl has been attending all levels of Court in New South Wales for over ten years for both the prosecution and defence, in coronial inquests and in Civil Courts. She has also attended Civil Courts in other states.

She has been an adviser to the Parliamentary Staysafe Committee of New South Wales and is a member of the Drug/Driving Task Force.

She is the Chairperson of the Drug Appeal Tribunal in Cycling in Australia.
THOMAS PAGE

Sergeant Thomas Page, the Officer-in-Charge of the Los Angeles Police Department’s Drug Recognition Expert (DRE) Unit, is a seventeen year veteran of law enforcement. He served for over three years as an officer with the Detroit Police Department prior to joining the Los Angeles Police Department.

Before undertaking a law enforcement career Sergeant Page served the Wayne County, Michigan Health Department for five years as a public health worker and supervisor.

Sergeant Page was the co-ordinator for the 1985 Los Angeles Field Validation Test (173 case studies) of the Drug Recognition Expert Procedure.

Sergeant Page has taught drug influence recognition, behavioural indicators of drug use, drug user identification for supervisors and other related topics to a wide range of audiences. These audiences include the American Bar Association, the California Department of Mental Health, the Swedish National Police Federation, nurses, physicians, psychiatrists, toxicologists and private industry.

Sergeant Page frequently provides expert testimony in court on drug influence signs and symptoms. He testified in the 1990 Arizona, the 1991 New York, the 1992 Maryland, the 1992 Colorado, the 1993 Minnesota and the 1994 Florida 'Frye' hearings on the Drug Recognition Expert Program and procedures. He also serves as the law enforcement representative on a US Department of Transportation sponsored committee that developed curricula to train prosecutors to effectively prosecute the 'drugged' driver.

Sergeant Page has authored numerous articles on drug user detection techniques. His credits include Police Chief Magazine, The Siren, The DRE, and the 1988 International Congress on Alcoholism and Drug Dependence, Oslo, Norway.

He is the first General Chairperson of the DRE Section of the International Association of Chiefs of Police (IACP), and is a member of IACP’s DRE Technical Advisory Panel. Sergeant Page is also an ex-officio member of the Canadian Society of Forensic Science's Drugs and Driving Committee.

Sergeant Page has completed instructor development programs sponsored by the US Department of Transportation and by UCLA. He holds a lifetime State of California College teaching credential in the area of Police Science. He received his Bachelor of Arts degree in Industrial Psychology, and his Master of Arts degree in Urban Affairs from the University of Detroit.
KEN WILKIE

Mr Wilkie began his driving career in 1966 and was a driver in the Australian Army during his National Service from 1967-69. Since that time he has been involved in both long-distance and short haul operations.

In 1974 he undertook to become self-employed and has been an owner driver since that time. In 1986 Mr Wilkie accepted a run servicing takeaway food stores in North Queensland. This run originated in Brisbane and consisted of time-sensitive freight which meant operating overnight. It was during this period of his career that he was made aware of the true nature of working at night and the extreme difficulties that can beset even the most conscientious of operators. He is still involved in long-distance transport; though time-sensitive freight is not accepted any more.

Mr Wilkie is an owner operator representative on the Boards of the Road Transport Forum and NatRoads and is involved in the pilot program of Queensland Transport's fatigue management program.

DAVID STEWART

After graduating from Rusden State College in 1981, David embarked upon a career of motivating and training athletes to achieve high levels of excellence. This involved working with professional football teams, elite tennis players, and Olympic paraplegic athletes. During this time he spent considerable time overseas in the United States researching successful teams.

In 1984 he commenced work helping to rehabilitate injured workers via motivation, goal setting and physical exercise (mainly in water). This work progressed through various organisations and institutions, involving a network of staff and locations. After establishing Network Hydrotherapy Pty Ltd, and growing this into more than fifteen regions throughout the state of Victoria, the organisation was sold in 1993 allowing David to focus on his other activities.

In 1985 David with a partner established a consulting company called Corporate Fitness Services Pty Ltd which he built up and sold in 1989. During this time the organisation established health promotion and fitness programs for clients such as BHP, the ANZ Bank, State Bank of Victoria, Department of Community Services and Health, Victorian Railways and the Clothing Company.

Since 1989 David has focused on providing services to organisations which help improve the performance of people via injury prevention, health, morale improvement, team building and so on.
KAREN McINTYRE

With a Bachelor of Science (Honours in Psychology), Karen commenced her career in road safety at the Road Traffic Authority (now VicRoads). After a year there analysing alcohol-related crashes, she joined the Australian Road Research Board (ARRB) as an experimental scientist. During her four years at ARRB, Karen undertook a major study on unsafe driving actions which led to the development of a technique for investigating road crashes.

In 1988 Karen moved to the Royal Automobile Club of Victoria (RACV) where she is Manager Road Safety and Education. In her role she is responsible for the development of policies on issues related to driver behaviour, licensing, and traffic safety education.

JANE HENDTLASS

Dr Hendtlass is a biochemist, a barrister, and a research consultant. She has been involved in relevant drug and alcohol-related policy development and research projects since 1970.

Dr Hendtlass was senior research consultant to the Victoria Police from 1980 to 1984; road safety manager for the Royal Automobile Club of Victoria from 1984 to 1986; research and promotion expert for the Federal Office of Road Safety in 1986-1987; adviser to the New Zealand working party on drugs and driving in 1988-1989; senior research officer and acting director of research for the Parliamentary Social Development Committee from 1991 to 1992; and senior research officer for the Parliamentary Road Safety Committee from 1992 to 1993.

Her research experience includes study of the interaction of alcohol metabolism with some pharmaceutical drugs and steroid hormones; establishing a drug screening facility to service drug treatment programs and sports medicine; describing the functions of the system for identifying and prosecuting drink drivers; analysing the frequency of drug use in driver and pedestrian fatalities; surveying drug use among drivers in Victoria and Northern Ireland and collating coronial data relating to heavy vehicle collisions.

DAVID COLLINS

David Collins is an Associate Professor in Economics at Macquarie University, Sydney. Until recently he was Head of the Department of Economics at Macquarie University and also Research Director of the Australian Tax Research Foundation, an independent research body. He was for five years Editor of Economic Papers, the economic policy journal of the Economic Society of Australia. In 1988 he chaired the New South Wales
Tax Task Force which produced for the Premier a comprehensive review of that State's tax system. His research interests have been in the area of taxation and fiscal federalism but he has recently developed a substantial interest in the economics of health and drug abuse. With Helen Lapsley, he produced the first comprehensive estimates of the costs of alcohol and drug abuse in Australia.

HELEN LAPSLEY

Helen Lapsley is an economist in the School of Health Services Management at the University of New South Wales. She teaches postgraduate courses in Health Economics, Health Care Systems, Ethics of Resource Allocation and Quality Assurance. She has been a member of a number of Commonwealth and State Government Committees, Reviews, Task Forces and National Health and Medical Research Council committees. She is currently a member of the Quality of Health Care and Outcomes Committee, a standing committee of the National Health and Medical Research Council. In addition, Helen is an author and co-author of books, papers and reports addressing issues relating to health services and health economics.

She has undertaken consultancies within Australia for the Commonwealth Government, State Governments and public and private sector hospitals and organisations. International consultancies undertaken on behalf of the World Bank, World Health Organisation, International Red Cross, and other international agencies have included assignments in Geneva, Malaysia, China, Laos, Hong Kong, Western Samoa and Fiji. These consultancies include studies of economic policy development, financial management, hospital and health care costs, the health workforce, quality management and costs of drug and alcohol abuse.
APPENDIX 1

BACKGROUND INFORMATION FOR OVERSEAS READERS
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety
SOME BACKGROUND INFORMATION FOR OVERSEAS READERS

Below are a few notes describing Victoria, the parliamentary system and road safety to assist overseas readers.

**Geographical Information**

Although comprising only 3% of the land area of Australia (a continent about the same size as the United States of America) the State of Victoria has approximately one quarter of the population. Key statistics are:

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area:</td>
<td>227,000 square kilometres (88,000 square miles)</td>
</tr>
<tr>
<td>Population:</td>
<td>4.5 million</td>
</tr>
<tr>
<td>Registered motor vehicles:</td>
<td>3.4 million</td>
</tr>
<tr>
<td>Total road length:</td>
<td>160,000 kilometres (100,000 miles)</td>
</tr>
</tbody>
</table>

The capital, Melbourne, has a population of over 3 million.

Further detail is provided in the maps on pages 250 and 251.

**Government in Australia**

There are three tiers of government in Australia. These operate at federal, state and local levels respectively. Each has different priorities and responsibilities.

**Federal Government:**

The Government of the Commonwealth of Australia is responsible for the conduct of national affairs.

These include defence, foreign policy, income taxation, social services such as pensions and family support, immigration, trade and commerce, customs and excise, radio and television control, airports and air safety, employment and unemployment strategies, currency, national public works, and post and telecommunications.

The Federal Parliament consists of the House of Representatives and the Senate and is located in Canberra, the National Capital. The political party holding the majority in the House of Representatives forms the
government and the leader of that party is the Prime Minister. All ministers are members of either house of Parliament. The Queen is represented by the Governor-General.

State Government:

Each State, with the exception of Queensland, the Northern Territory and the Australian Capital Territory, has a bicameral or two chamber legislature. Queensland and the two territories each has a single Lower House Parliament. The Lower House is the seat of Government. The political party holding the majority in the Lower House forms the government and the leader of that party is the Premier (and in the Territories, the Chief Minister). All ministers are members of Parliament. The Queen is represented by a Governor in each State.

The State Government's responsibilities include state financial management, health, education, agricultural development, state-based conservation and environmental management, motor registration, fire brigades, ambulance services, law and order, the statewide distribution of water, gas and electricity, public transport, urban and regional development, road systems and road safety.

Local Government:

In each State and the Northern Territory, a system of intra-regional governments administer matters peculiar to each region. Although the terminology varies, in Victoria such regions are known as cities, towns, boroughs or shires.

Generally, local government bodies provide such services and amenities as garbage collection and disposal, building regulations, provision and maintenance of public parks and gardens, libraries, infant welfare centres, construction and maintenance of local roads and streets, public swimming pools and cultural centres.

VICTORIAN PARLIAMENTARY COMMITTEE SYSTEM

Victoria has a long tradition of appointing Parliamentary committees to inquire into various issues. In the last century, select committees were appointed each Parliamentary session to consider a wide range of issues. In 1895 the concept of on-going committees was introduced with the
appointment of a Public Accounts Committee. A Statute Law Revision Committee emerged in 1916 and from the early 1950s there has been steady activity by the committees already mentioned and also by later additions. These included a Subordinate Legislation Committee and also those appointed over the years to consider specific subjects such as land drainage, conservation of energy resources, chiropractors and osteopaths, the meat industry, company take-overs and road safety.

The Victorian Parliament's involvement with road safety inquiries commenced in 1967 with the establishment of the first Joint Select Road Safety Committee. This Committee operated until 1982.

In 1982 the parliamentary committee system was extensively restructured and all existing committees (with the exception of one committee) were dissolved. One of the new committees created was the Social Development Committee which conducted road safety inquiries, as well as social issue inquiries such as the inquiries into options for dying with dignity, community violence, alternative medicine, IVF legislation etc.

In 1992 the parliamentary committee system was re-structured and the Road Safety Committee was re-established.

**Number of Inquiries**

Thirty-three inquiries have been undertaken and thirty-eight reports have been produced and tabled by the Road Safety Committees/Social Development Committee since 1967.

Virtually all have dealt with specific issues, the notable exception being the all-embracing Social Development Committee 'Road Safety in Victoria' Inquiry initiated in July 1982 and reported on in 1983 and 1984.

**Significant Achievements**

The most notable and world first achievement for the original Road Safety Committee was the inquiry and report which lead to Victoria being the first Government to introduce mandatory seat belt wearing. Other achievements which followed included .05 BAC legislation and random breath testing.

Notable achievements from road safety inquiries conducted by the Social Development Committee include mandatory helmet wearing for cyclists,
improvements in vehicle occupant protection and the revision of speed limits in Victoria.

As the current Road Safety Committee has been in existence for slightly more than two years, its achievements are not so readily apparent. Its recommendations involving motorcycle safety, amongst others, will ensure that appropriate training for novice riders is available and evaluated.

Recommendations regarding the demerit points scheme (if adopted by the Government) will see the operation of the scheme refined, certain inequities removed and significant funding made available for the complete overhaul of the Victorian driver licence database system.

Within the road safety area, when the first Committee commenced operations, road safety research and policy was far less developed than it is now. There were major gains to be made in road safety and so there were many important topics for the Committee to examine. From the time it commenced operation the Committee received significant support from the Government who saw road trauma as a major community problem requiring legislative and attitudinal changes. Ministerial support in this area has continued ever since.

Reports Tabled

Reports tabled by the first Road Safety Committee from 1967 to 1982 are as follows:

<table>
<thead>
<tr>
<th>TITLE</th>
<th>DATE TABLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadworthiness of motor vehicles.</td>
<td>15.10.68</td>
</tr>
<tr>
<td>Points demerit system.</td>
<td>2.4.69</td>
</tr>
<tr>
<td>Investigation into the desirability of the compulsory fitting and the compulsory wearing of seat belts.</td>
<td>9.9.69</td>
</tr>
<tr>
<td>An aspect of the alcohol and drug factor - The desirability of introducing blood alcohol tests at hospitals for certain driver victims of motor vehicle accidents.</td>
<td>19.3.70</td>
</tr>
<tr>
<td>An aspect of the alcohol and drug factor - The desirability of compulsory breath analysis tests for motor car drivers suspected of having a blood alcohol content in excess of 0.05 per cent.</td>
<td>29.9.70</td>
</tr>
<tr>
<td>Topic</td>
<td>Date</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>--------</td>
</tr>
<tr>
<td>Alcohol and road accidents.</td>
<td>25.11.70</td>
</tr>
<tr>
<td>Permits for learner drivers.</td>
<td>7.4.71</td>
</tr>
<tr>
<td>The Visual Average Speed Computer and Recorder (VASCAR).</td>
<td>27.4.72</td>
</tr>
<tr>
<td>Absolute speed limits, <em>prima facie</em> speed limits and speed zones.</td>
<td>1.12.71</td>
</tr>
<tr>
<td>Age for driver licensing.</td>
<td>24.10.72</td>
</tr>
<tr>
<td>Pedestrians and street lighting.</td>
<td>20.3.73</td>
</tr>
<tr>
<td>An aspect of statistical data for road safety purposes.</td>
<td>4.12.73</td>
</tr>
<tr>
<td>Aspects of roadworthiness, speedometers, alcohol and road accidents and intersectional management.</td>
<td>11.12.74</td>
</tr>
<tr>
<td>Alcohol and road safety (research projects involving drinking drivers).</td>
<td>7.5.75</td>
</tr>
<tr>
<td>Fatalities and injuries involving children under 8 who are unrestrained in motor cars.</td>
<td>11.11.75</td>
</tr>
<tr>
<td>Identification of motor vehicle drivers with blood alcohol levels in excess of .05 per cent.</td>
<td>2.6.76</td>
</tr>
<tr>
<td>The involvement of motorcyclists in road accidents.</td>
<td>7.12.76</td>
</tr>
<tr>
<td>Education, training and assessment of motorcycle learner riders.</td>
<td>18.10.77</td>
</tr>
<tr>
<td>Impounding of registration plates, penalties for unlicensed driving and some aspects of alcohol and road safety.</td>
<td>10.10.78</td>
</tr>
<tr>
<td>Mopeds.</td>
<td>13.11.79</td>
</tr>
<tr>
<td>Safety aspects of the hire and drive omnibus.</td>
<td>4.12.80</td>
</tr>
<tr>
<td>Restraint of children under 8 in the rear seats of motor cars.</td>
<td>29.4.81</td>
</tr>
<tr>
<td>Alcohol prohibition for first year drivers.</td>
<td>7.5.81</td>
</tr>
</tbody>
</table>
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety

Road safety inquiries conducted by the Social Development Committee from 1982 to 1992 are as follows:

<table>
<thead>
<tr>
<th>TITLE</th>
<th>DATE TABLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway Speed Limits.</td>
<td>29.3.83</td>
</tr>
<tr>
<td>Road Safety in Victoria (Interim Report).</td>
<td>29.11.83</td>
</tr>
<tr>
<td>Road Safety in Victoria (First Report).</td>
<td>3.5.84</td>
</tr>
<tr>
<td>Road Safety in Victoria (Final Report).</td>
<td>26.10.84</td>
</tr>
<tr>
<td>Child Pedestrian &amp; Bicycle Safety (First Report).</td>
<td>3.12.86</td>
</tr>
<tr>
<td>Management of Drink-Drivers Apprehended with High Blood Alcohol Levels (First Report). 'Alcohol Abuse and Road Safety'.</td>
<td>6.5.88</td>
</tr>
<tr>
<td>Management of Drink-Drivers Apprehended with High Blood Alcohol Levels. (Second and Final Report). 'Drink-Driver Education and Treatment'.</td>
<td>25.10.88</td>
</tr>
<tr>
<td>Vehicle Occupant Protection.</td>
<td>8.3.90</td>
</tr>
<tr>
<td>Speed Limits in Victoria.</td>
<td>13.11.91</td>
</tr>
<tr>
<td>Motorcycle Safety in Victoria (First Report). 'Motorcycle Visibility'.</td>
<td>25.3.92</td>
</tr>
</tbody>
</table>

Road safety inquiries conducted by the current Road Safety Committee from 1992 to date are as follows:

<table>
<thead>
<tr>
<th>TITLE</th>
<th>DATE TABLED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorcycle Safety in Victoria.</td>
<td>19.5.93</td>
</tr>
<tr>
<td>Demerit Points Scheme.</td>
<td>9.11.94</td>
</tr>
<tr>
<td>Revision of Speed Limits in Victoria.</td>
<td>11.4.95</td>
</tr>
<tr>
<td>Effects of Drugs (Other Than Alcohol) on Road Safety in Victoria. First Report Incorporating Collected Papers.</td>
<td>May 1995</td>
</tr>
</tbody>
</table>
VICTORIA'S ROAD SAFETY RECORD

This inquiry is being conducted against a background of ongoing road safety initiatives which are producing substantial benefits.

There have been major reductions in road trauma over the past 20 years, with particularly significant falls in the last 5 years. Australia had 3800 road fatalities in 1970, averaged around 2800 through the 1980s, and since 1989 the number of fatalities has fallen by 30% to 1941 in 1994. The latter figure is the lowest national level for 39 years. Similar though not identical reductions are being achieved for serious injuries.

In Victoria the decline in road fatality figures has been even more significant with the numbers dropping from 1061 in 1970, to 378 in 1994. Since 1989 road fatalities have fallen by 45%.

Research indicates that the main influences on the reductions achieved in Victoria have been:

- The enforcement of drink-driving legislation through random breath testing, substantial penalties and intensive mass media publicity support;

- The reduction in speeding due to speed camera operations with financial and demerit point penalties and targeted mass media publicity support;

- The progressive improvements in roads and traffic management through accident blackspot treatments;

- The mandatory wearing of bicycle helmets; and

- The impact of the economic downturn reducing the amount of vehicle travel. (It is estimated that 25% to 30% of the reduction in fatalities and injuries is as a result of the economic downturn.)
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety

To gain a comparison against figures from other States and internationally, the following ratios are used:

(1) Fatalities per 100,000 population; and

(2) Fatalities per 10,000 vehicles registered.

The following is a comparison of road fatality rates by State for 1994.

Road Fatality Comparisons For 1994

<table>
<thead>
<tr>
<th>State/Territory</th>
<th>Fatalities per 100,000 Population</th>
<th>Fatalities per 10,000 Vehicles Registered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Victoria</td>
<td>8.44</td>
<td>1.35</td>
</tr>
<tr>
<td>New South Wales</td>
<td>10.76</td>
<td>1.99</td>
</tr>
<tr>
<td>Queensland</td>
<td>13.20</td>
<td>2.14</td>
</tr>
<tr>
<td>South Australia</td>
<td>11.09</td>
<td>1.77</td>
</tr>
<tr>
<td>Western Australia</td>
<td>12.39</td>
<td>1.85</td>
</tr>
<tr>
<td>Tasmania</td>
<td>12.27</td>
<td>1.83</td>
</tr>
<tr>
<td>Northern Territory</td>
<td>23.96</td>
<td>4.46</td>
</tr>
<tr>
<td>Australian Capital Territory</td>
<td>5.65</td>
<td>0.93</td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td><strong>10.88</strong></td>
<td><strong>1.81</strong></td>
</tr>
</tbody>
</table>

*Source: Federal Office of Road Safety and Transport Accident Commission.*

Internationally, Australia and in particular Victoria, is at the forefront in road fatality reduction:
International Road Fatality Comparisons

<table>
<thead>
<tr>
<th>Country</th>
<th>Fatalities per 10 000 Vehicles Registered</th>
<th>Fatalities per 100 000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia (1994)</td>
<td>1.8</td>
<td>10.9</td>
</tr>
<tr>
<td>Canada (1993)</td>
<td>2.0</td>
<td>12.3</td>
</tr>
<tr>
<td>West Germany (1990)</td>
<td>2.2</td>
<td>12.3</td>
</tr>
<tr>
<td>Japan (1992)</td>
<td>1.4</td>
<td>9.2</td>
</tr>
<tr>
<td>Sweden (1993)</td>
<td>1.6</td>
<td>7.2</td>
</tr>
<tr>
<td>United Kingdom (1992)</td>
<td>1.8</td>
<td>7.6</td>
</tr>
<tr>
<td>USA (1993)</td>
<td>2.0</td>
<td>15.6</td>
</tr>
<tr>
<td>Victoria (1994)</td>
<td>1.3</td>
<td>8.4</td>
</tr>
</tbody>
</table>

Source: Federal Office of Road Safety.

Victorian Road Fatality Trends

<table>
<thead>
<tr>
<th>Year</th>
<th>Road Fatalities</th>
<th>Fatalities per 10 000 Vehicles Registered</th>
<th>Fatalities per 100 000 Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>654</td>
<td>3.4</td>
<td>16.8</td>
</tr>
<tr>
<td>1985</td>
<td>683</td>
<td>2.8</td>
<td>16.6</td>
</tr>
<tr>
<td>1990</td>
<td>548</td>
<td>2.1</td>
<td>12.5</td>
</tr>
<tr>
<td>1991</td>
<td>503</td>
<td>1.8</td>
<td>11.4</td>
</tr>
<tr>
<td>1992</td>
<td>396</td>
<td>1.3</td>
<td>8.8</td>
</tr>
<tr>
<td>1993</td>
<td>436</td>
<td>1.67</td>
<td>9.46</td>
</tr>
<tr>
<td>1994</td>
<td>378</td>
<td>1.34</td>
<td>8.40</td>
</tr>
</tbody>
</table>

Source: Federal Office of Road Safety, VicRoads and Transport Accident Commission.

It would appear that the downward trend for Victoria is still continuing. These ratios show that whilst Victoria has achieved remarkable results there can be no complacency or relaxation in road safety initiatives and programs.
APPENDIX 2

DESCRIPTION OF ORGANISATIONS
Inquiry into the Effects of Drugs (Other Than Alcohol) on Road Safety
DESCRIPTION OF ORGANISATIONS

To assist interstate, overseas and non-technical readers the following is a brief explanation of some organisations which are mentioned in this report and/or involved in road safety.

Victorian Organisations:

**Monash University Accident Research Centre** — is a leading provider of road safety research.

**Municipal Association of Victoria** — represents the interests of most local government councils.

**Royal Automobile Club of Victoria** — is the Victorian motorists association and the provider of emergency roadside service to members. It also offers other services to members and is involved in road safety research and policy.

**Transport Accident Commission** — is a State government agency and the sole provider of compulsory third party insurance in Victoria. It operates a 'no-fault' injury accident compensation system for people injured in motor vehicle accidents and also provides funding for mass media road safety campaigns, road safety related roadworks (blackspot programs) and road safety education programs.

**VicRoads** — is the state road authority responsible to the Minister for Roads and Ports for the management and construction of the road system in Victoria as well as the vehicle registration, driver licensing and accident recording processes. It also has lead agency role in road safety research and policy.

**Victoria Police** — is the state law enforcement agency in Victoria. (There are no municipal police forces) The Police have a major role in the development of road safety policies and traffic laws and their enforcement.

**Victorian Road Transport Association** — is an association of road trucking companies.
National Organisations:

**Austroads** — (formerly the National Association of State Road Authorities) - is the national association of State and Federal road transport and traffic authorities in Australia and is responsible for the development and promotion of national practices for the effective management and safe use of the nation's roads.

**Federal Office of Road Safety** — is a Federal Government agency providing policy advice and research on road safety in Australia.

**National Road Transport Commission** — was established by inter-government agreement and commenced operation in 1992 to develop a national package of transport laws in consultation with Federal and State governments, industry and other interest groups.

**Transport Workers Union** — is an industrial relations organisation whose membership includes truck and bus company employees and owner-drivers.
APPENDIX 3

RECENT AUSTRALIAN SOURCES OF INFORMATION ON DRUGS AND ROAD SAFETY
Those interested in making submissions may like to note the recent publication of a number of Australian documents of relevance to the Inquiry. They are:


APPENDIX 4

GUIDE FOR MAKING A SUBMISSION TO THE INQUIRY
GUIDE FOR MAKING A SUBMISSION

The Road Safety Committee welcomes submissions as sources of information and opinion. These notes provide a number of suggestions on how you might prepare and present a submission.

Who may make a submission?

Any person or organisation can make a submission to the Road Safety Committee. There is no restriction. Individuals, community groups, private organisations, local government and State government representatives—indeed, anyone or any body interested in an inquiry currently before the Committee can make a submission.

Terms of reference

Before preparing your submission, it is important that you read the Terms of Reference and the collected papers in this Report. The Road Safety Committee advertises its Terms of Reference, calls for submissions and identifies a due date for their receipt in the daily press. If an issue is of obvious local concern, advertisements will also be placed in regional and district newspapers.

Preparing a submission

It is most important that your submission address all or part of the Terms of Reference. You do not have to comment on every aspect of the Terms of Reference. Equally, you do not have to limit yourself to just one aspect. Your submission can contain factual information, opinion or both. You might wish to draw the attention of the Committee to something relevant to the Inquiry. You might choose to emphasise solutions to the matter or issue before the Committee. This is entirely your choice. The only criterion is that whatever you say, however you say it, must address the Terms of Reference. Your position or observations will be welcomed by the Committee subject to that one stipulation: your submission must be relevant.

Form submission should take

There is no specific method for organising or presenting a submission. Your contribution can take the form of a letter, a short summary paper or a longer research document. You can include relevant data in appendices or incorporate them in the body of the text. Be sure that the structure, argument and
conclusions of your submission are clear. If you are including tables, calculations or graphs, please check that these are correct.

There are certain technical conventions that the Committee asks you to observe:

- **Use A4 paper.** This helps with reproduction and distribution of your submission to Committee members.

- **Present a typed submission.** If this is not possible, a handwritten submission is acceptable; please ensure that your handwriting is legible.

- **Sign the submission.** Sign on behalf of yourself, or on behalf of the organisation you are representing. If you are representing an organisation, please indicate your position in the organisation. If relevant, specify at what level the submission has been authorised: branch, executive, president, sub-committee, executive committee, national body, etc.

- **Submit supporting computer disks** when possible. If you intend to present large quantities of statistical data, please provide the material on a 3.25 inch high density disk. The Committee can accept either Macintosh or IBM compatible disks.

- **Supplementary material.** You may wish to support your submission with other forms of material—video, photographs, etc. This is acceptable, and can be on a loan or donation basis. Any material borrowed by the Committee will be returned on completion of the Inquiry.

**Confidentiality**

A request should accompany a submission if an author wishes all or part of it to be treated as confidential. The Committee will then consider the request for confidentiality and advise the author of its decision. It should be noted that all submissions, unless deemed confidential, are public documents. It is the Committee's choice, not the author's, if and when a submission will be made public, and if and when a submission will be printed. Nor can an author publish all or part of a submission without the Committee's authorisation. Subject to the Committee's approval, all submissions are available for public scrutiny.
Parliamentary privilege

Submissions to the Road Safety Committee are protected by Parliamentary privilege. Submissions are considered to be the same as evidence taken by a Committee in a public hearing. As such nothing in a submission can give rise to legal action against the author or be subject to proceedings in a Victorian Court of law.

Public hearings

Under certain circumstances, the Committee might wish to discuss a matter further with the author of a submission. If this occurs, the Committee will contact you and advise you of the date, time and place of the public hearing.

The committee inquiry process

The Committee investigatory process falls into five distinct phases:

• The Committee advertises its Terms of Reference and calls for submissions.

• The Committee gathers information, including fact and opinion found in submissions and presented at public hearings.

• The Committee considers the arguments, evidence and data it has gathered. Findings and recommendations are agreed upon.

• The Committee tables a report, including its recommendations, in the Parliament.

• The Minister who initiated the Inquiry or who has portfolio responsibility for the matter addressed by the Inquiry replies to the Committee’s recommendations. The Minister has six months from the date of the report being tabled in which to reply. The Minister can accept, reject, modify or adapt the Committee’s recommendations.

It must be emphasised that the Road Safety Committee does not have legislative or regulatory powers. The Committee makes recommendations to the Parliament. It is then the responsibility of the Minister to reply.
Further questions

Address all inquiries to:

The Executive Officer
Road Safety Committee
Parliament House
Spring Street
Melbourne Victoria 3002
Australia

Telephone: (03) 655 6644
Facsimile: (03) 655 6858

International Telephone: 61 3 655 6644
International Facsimile: 61 3 655 6858

E Mail Address: parlrsc@vicnet.net.au