



E.M.C.D.D.A.



DRUGS MISUSE RESEARCH DIVISION  
HEALTH RESEARCH BOARD

# **An Inventory of Literature on the Relation between Drug Use, Impaired Driving and Traffic Accidents**

**CT.97.EP.14**

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Further copies of this bibliography can be obtained from the EMCDDA at the above address.

# CREDITS

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## Introduction

*An Inventory of Literature on the Relation between Drug Use, Impaired Driving and Traffic Accidents* was compiled as a resource document to accompany a major review of the scientific literature on the relation between drug use and driving performance<sup>1</sup>. The work was carried out for European Monitoring Centre for Drugs and Drug Addiction - EMCDDA, Lisbon. The health consequences of drug use are a priority area for the EMCDDA and impaired driving and road traffic accidents linked to drugs constitute an important topic on which comprehensive information is lacking.

There is increasing concern across the EU Member States about the role drug use may play in traffic accidents. This finds expression in different issues related to driving, for example the risks associated with late night driving and ecstasy/amphetamine use in dance and night club contexts, the implications for driving of methadone maintenance, or the consequences of the increasing levels of cannabis use reported in some countries. In a number of Member States a debate on drug testing of drivers, comparable to that already existing for alcohol, is gaining momentum.

The literature included here addresses inter alia the relationship between different patterns of drug consumption, impaired driving and traffic accidents. In addition literature relating to drug testing procedures and associated legislation regarding drug-impaired driving in the different EU Member States is included along with references which address the issues raised by such testing.

This inventory represents a large selection of the available literature on the subject of drugs and driving. The articles have been sourced from CD-ROM searches, libraries, web pages, professional organisations, government offices and individuals. They span several disciplines including psychology, economics, medicine, forensic science, sociology, politics, law, addiction studies and transport studies. The majority of articles were identified by key-word searches of relevant databases.

There are major differences in the number of studies, both experimental and epidemiological, devoted to each of the different drugs. Alcohol has received the greatest attention by far and has been the subject of intensive investigation for nearly one hundred years. The antidepressants and benzodiazepines have received considerable attention in the literature. The amphetamines and cocaine have received less attention. Following these drugs, cannabis and methadone have been the subject of somewhat less research, followed by the antihistamines and, finally, the new synthetic drugs including MDMA. Where the topic of drugs and driving specifically is concerned, most research has concentrated on alcohol, cannabis and benzodiazepines. The other drugs have certainly been examined in the context of driving, but not to the extent that the former have been,

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<sup>1</sup> European Monitoring Centre for Drugs and Drug Addiction. Literature Review on the Relation between Drug Use, Impaired Driving and Traffic Accidents. (CT.97.EP.14). Lisbon : EMCDDA, February 1999.

and where the new synthetic drugs are concerned, there is very little direct evidence available relating to their effects on driving behaviour.

The following alphabetically arranged list of studies gives details of authors, journal/book names and, in many cases, an abstract or summary of the contents of the study. Where applicable, the name of the conference at which a paper was presented is given. The 'workpackage number' refers to the original breakdown of work in the Workprogramme developed for the completion of the literature review resulting from this collection of articles. Thus 1 refers to *methodological issues*, 2 refers to *experimental studies*, 3 refers to *field studies*, and 4 refers to *drug testing procedures and legislation*.

## A

**Author:** ADAMS, H.A. AND WERNER, C.

**Year:** 1997

**Title:** From the racemate to the eutomer: (S)-ketamine. Renaissance of a substance?

**Journal/Book Name:** Anaesthesist

**Volume:** 46:12 1026-42

**Abstract:** The pharmacological profile of ketamine: Until recently, clinically available ketamine was a racemic mixture containing equal amounts of two enantiomers, (S)- and (R)-ketamine. The pharmacological profile of racemic ketamine is characterized by the so called dissociative anesthetic state and profound sympathomimetic properties. Among the different sites of action, N-methyl-D-aspartate (NMDA)-receptor antagonism is considered to be the most important neuropharmacological mechanism of ketamine. Effects on opiate receptors, monoaminergic and cholinergic transmitters, and local anesthetic effects are obvious as well. Following intravenous administration, a rapid onset of action is seen within 1 min, lasting for about 10 min. The anaesthetic state is terminated due to redistribution, followed by hepatic and renal elimination with a half-life period of 2-3 h. For alternative administration, the intramuscular and oral route is also appropriate. The most important adverse effects are hallucinations and excessive increases in blood pressure and heart rate. These reactions can be attenuated or avoided by combining of ketamine with sedative or hypnotic drugs like midazolam and/or propofol. During controlled ventilation, increases in intracranial pressure are unlikely to occur. The special pharmacological profile of (S)-ketamine: In general, the pharmacological properties of (S)-ketamine are comparable to the racemic compound. On the different sites of action, qualitatively comparable effects were found, but significant quantitative differences also became obvious. When compared with (R)-ketamine and the racemic mixture, the analgesic and anesthetic potency of (S)-ketamine is threefold or twofold higher. Thus, a 50% reduction of dosage is possible to achieve comparable clinical results. Because of the faster elimination of (S)-ketamine, better control of anesthesia will be provided. In summary, the pharmacokinetic improvements of (S)-ketamine are characterized by a reduced drug load, along with more rapid recovery. The clinical use of (S)-ketamine: The clinical use of (S)-ketamine depends on its analgesic and sympathomimetic properties, whereas the anaesthetic potency remains in the background. In clinical anesthesiology, (S)-ketamine, especially in combination with midazolam and/or propofol, can be used for short procedures with preserved spontaneous ventilation, for induction of anesthesia in patients with shock or asthmatic disorders, and for induction and maintenance of anesthesia in caesarean sections. Additional indications are repeated anesthesia, for example, in burn patients, analgesia during delivery and diagnostic procedures and intramuscular administration in uncooperative patients. The value of (S)-ketamine as an analgesic component for total intravenous anesthesia has not been defined yet. In comparison with opioids, the advantages are related to improved hemodynamic stability and reduced postoperative respiratory depression. When (S)-ketamine, especially in combination with midazolam, is used for analgo-sedation in

intensive care medicine, a reduction of exogenous catecholamine demand can be expected. Moreover, the effects on intestinal motility are superior to opioids. In combination with midazolam and propofol, excellent control of analgesedation was found, making both combinations suitable for situations in which repeated neurological assessment of patients is necessary. In emergency and disaster medicine, (S)-ketamine is of outstanding importance because of its minimal logistic requirements, the chance for intramuscular administration and the broad range of use for analgesia, anaesthesia and analgesedation as well. Further perspectives of (S)-ketamine may be the treatment of chronic pain and the assumed neuroprotective action of the substance.

**Workpackage No.:** 1

**Author:** ADLER, C.M., GOLDBERG, T.E., MALHOTRA, A.K., PICKAR, D. AND BREIER, A.

**Year:** 1998

**Title:** Effects of ketamine on thought disorder, working memory, and semantic memory in healthy volunteers.

**Journal/Book Name:** Biological Psychiatry

**Volume:** 1 43:11 811-6

**Keywords:** ketamine; memory

**Abstract:** BACKGROUND: The N-methyl-D-aspartate receptor antagonist, ketamine, produces a clinical syndrome of thought disorder, perceptual distortion, and cognitive impairment. METHODS: We have administered ketamine to healthy volunteers to characterize the formal thought disorder and specific memory dysfunction associated with ketamine. Ten healthy volunteers underwent a double-blind, placebo-controlled, ketamine infusion (0.12 mg/kg bolus and 0.65mg/kg/hour). Thought disorder was evaluated with the Scale for the Assessment of Thought, Language and Communication. Cognitive testing involved working and semantic memory tasks. RESULTS: Ketamine produced a formal thought disorder, as well as impairments in working and semantic memory. The degree of ketamine-induced thought disorder significantly correlated with ketamine-induced decreases in working memory and did not correlate with ketamine-induced impairments in semantic memory. CONCLUSIONS: This study characterizes the formal thought disorder associated with ketamine and may suggest that ketamine-induced deficits in working memory are associated with ketamine-induced thought disorder.

**Workpackage No.:** 2

**Author:** AITKEN, C., KERGER, M. AND CROFTS, N.

**Year:** 1998

**Title:** Qualitative and quantitative research on drivers who use illicit drugs

**Publisher:** The Centre for Harm Reduction, The Macfarlane Burnet Centre for Medical Research, Australia,

**Keywords:** heroin, opiates, driving, accidents, amphetamines, cannabis, sleepiness, alcohol, questionnaire, focus groups, Melbourne, quantitative data

**Abstract:** The research described in this report was conceived in response to the recommendations made by the 1996 Parliamentary Inquiry into the Effects of Drugs

(other than alcohol) on Road Safety. It consists of an investigation of the ways in which patterns of drug use interact with driving behaviour, users' attitudes to drug use and driving issues, and their perceptions of the risks involved. It has generated unique quantitative data on the driving and drug-using behaviour of heroin users in Melbourne. The project consists of two parts. Qualitative research was conducted using five focus groups - two with opiate users, two with amphetamine and cocaine users, and one with cannabis and alcohol users. The product of the focus groups was a large and extremely rich dataset. Key outcomes include:

- \* dependent heroin users need to use regularly and frequently, and would find it difficult to modify their behaviour to decrease accident risk associated with drug driving.
- \* heroin is commonly used in the car immediately after scoring and prior to driving home
- \* heroin use has several side-effects which pose risks for driving safety, including tiredness, poor vision and increased reaction time; conversely, feeling the need for heroin may also increase accident risk.
- \* amphetamine use promotes confidence and aggression, and alertness, but extreme tiredness can set in very suddenly; amphetamines induce greater alcohol consumption
- \* some users deliberately driver under the influence of amphetamines
- \* smoking cannabis in the car is common, especially for younger users
- \* cannabis induces caution in most drivers; may cause forgetfulness, paranoia and distorted time and distance perception
- \* alcohol and cannabis can be a potent combination, more so if cannabis is used after significant alcohol intake
- \* television campaigns aimed at drink-driving are thought to be effective but not relevant to use of illicit drugs and driving
- \* alcohol is viewed as more dangerous for driving than heroin, amphetamines or cannabis.

Information generated in the focus groups was used to construct a short questionnaire which was administered to 160 illicit drug injectors, 159 of whom turned out to be primarily heroin users. They were recruited at fixed needle exchanges and drug treatment centres and via our interviewer's personal networks. In this sample, over half of the respondents use heroin daily or more often. Although fewer than half of all heroin users surveyed are drivers, those who are drive frequently and cover over 11,000 kilometers per year on average (estimated). Almost ten percent are driving unlicensed. It is tentatively estimated that heroin users comprise one per cent of the victorian driving population. Our survey respondents frequently drive a short time after using heroin. Respondents gave frequencies of performance of several heroin-related conditions which they regarded as dangerous for driving, the most important of which is the tendency to nod off; this behaviour occurs approximately every two weeks for this sample. Many heroin users had experienced numerous minor accidents, and eighteen casualty accidents were reported by the 84 drivers surveyed. About half of all respondents were under the influence of heroin in some way at the time of their last accident.

**Workpackage No.: 2**



**Author:** ALBERY, I.P., GOSSOP, M. AND STRANG, J.

**Year:** 1998

**Title:** Illicit drugs and driving: a review of epidemiological, behavioural and psychological correlates

**Journal/Book Name:** Journal of Substance Misuse

**Volume:** 3, 140-149

**Keywords:** illicit drugs, driving, cannabis, heroin, cocaine, driving skills

**Abstract:** Large numbers of individuals use illicit drugs (e.g. cannabis, heroin, cocaine). The number of people driving vehicles has also increased. There is an increasing overlap between populations of illicit drug users and drivers. This paper describes the magnitude and nature of an illicit drugs and driving problem. The relationship between the consumption of illicit substances and driving skills, accident involvement and driving behaviour are examined using epidemiological data, injury and fatality statistics, empirical/behavioural evidence and survey research. Problems for the interpretation of such data are identified, and a number of questions remain unanswered for characterizing the magnitude and nature of the problem. Measures designed to counter the drugs and driving issue (e.g. secondary enforcement) are discussed. Proposals are made for further countermeasures based on current evidence.

**Workpackage No.:** 1

**Author:** ALVAREZ, F.J., PRADA, R. AND DEL RIO, M.C.

**Year:** 1992

**Title:** Patterns of drug consumption among spanish drivers

**Journal/Book Name:** Therapie

**Volume:** 47, 1, 63-6

**ISBN/ISSN:** 0040-5957

**Keywords:** adolescence, adult, automobile driving, drug utilization, female, human, male, middle age, questionnaires, Spain, support, Non U.S. Gov't, Gov't

**Abstract:** We have analysed regular drug consumption by Spanish drivers. 675 properly completed questionnaires were received from drivers attending three medical traffic centres in Valladolid (Spain) for medical examination prior to obtaining or renewing of their traffic licence in 1990. Among those surveyed, 28.9% were taking regularly drugs, mainly analgesics (6.5%), antiallergic drugs (5.2%), oral contraceptives (4.6%), anti-inflammatory drugs (4.1%), antihypertensive drugs (3.6%), tranquillizers (3.4%), hypnotics (2.8%) and drugs for rheumatic disorders (2.7%). The study indicates the frequent consumption of drugs by Spanish drivers, and suggests the need to regulate drug consumption by drivers.

**Workpackage No.:** 3

**Author:** ALVAREZ, F.J., PRADA, R. AND DEL RIO, C.

**Year:** 1992

**Title:** Drugs and alcohol consumption amongst Spanish drivers

**Journal/Book Name:** Forensic Science International

**Volume:** 53, 221-225

**ISBN/ISSN:** 0379-0738/92

**Keywords:** drugs, alcohol, driving, Spain

**Abstract:** We have analysed patterns of alcohol and regular drug consumption by Spanish drivers. Six hundred and seventy five properly completed questionnaires were received from drivers attending three medical centres in Valladolid (Spain) for medical examination prior to obtaining or renewing their driving licence in 1990. Among those surveyed, 24% were 'daily' drinkers and 56.7% were 'weekly' drinkers, the majority (55.5%) being 'light' drinkers (1-39g/day of pure alcohol). Of those surveyed 28.9% took drugs. The most commonly consumed drugs were analgesics (6.5%), anti-allergic drugs (5.2%) and oral contraceptives (4.6%). Of those driver taking drugs 28.2% were 'daily' drinkers and 53.8% were 'weekly' drinkers. The study indicates widespread consumption of alcohol and drugs by Spanish drivers

**Workpackage No.:** 3

**Author:** ALVAREZ, F.J. AND DEL RIO, M. C.

**Year:** 1994

**Title:** Drugs and driving

**Journal/Book Name:** The Lancet

**Volume:** 344, p.282

**ISBN/ISSN:** 0140-6736

**Keywords:** drugs, driving, EU-directive

**Abstract:** Refers to the 1991 European Community directive which laid down minimum standards of physical and mental fitness for driving licence applicants, and determined applicants' impaired ability due to alcohol consumption, illicit drug taking, or drugs taken for legitimate purposes. Each member state is supposed to have regulations in place by July 1, 1996. Outlines what is covered by directive and shortfalls.

**Workpackage No.:** 1

**Author:** ALVAREZ, F.J. AND DEL RIO, M.C.

**Year:** 1994

**Title:** Screening for problem drinkers in a general population survey in Spain by use of the CAGE Scale.

**Journal/Book Name:** Journal of Studies on Alcohol

**Volume:** 55, 471-474.

**Workpackage No.:** 4

**Author:** ALVAREZ, F.J., DELRIO, M.C. AND PRADA, R.

**Year:** 1995

**Title:** Drinking and driving in Spain

**Journal/Book Name:** Journal of Studies on Alcohol

**Volume:** 56, 4, 403-407

**Keywords:** emergency room, united states, alcohol consumption, patterns, driving

**Abstract:** Objective: The purpose of this study was to analyze the patterns of alcohol consumption among Spanish drivers and to evaluate possible repercussions on road safety policies. Method: A sample of 12,000 drivers aged over 16 were randomly selected from the National Register of Spanish Drivers. The questionnaires, with items on sociodemographic data and on patterns of driving and alcohol consumption, were mailed to selected drivers in the fall of 1993. The study was based on the 1,500 (1,016 from men, 484 from women) properly completed questionnaires received. Results: Among those surveyed, 62.9% were regular drinkers, who had a mean daily alcohol intake of 46.9 grams/day; of these regular drinkers 26.8% drank at a dangerous level. Those who drove regularly were more likely to drink and had a higher alcohol intake. The majority of drinkers recognized that they drove after drinking, 14.3% even acknowledged that last year on some occasions they drove "in a drunken state." Those who drink show high figures of involvement in road accidents. Conclusions: The study indicates widespread consumption of alcohol by Spanish drivers and the need to develop and improve driving and drinking policies in Spain

**Workpackage No.:** 3

**Author:** AMADOBOCCARA, I., GOUGOULIS, N., POIRIERLITRE, M.F., GALINOWSKI, A. AND LOO, H.

**Year:** 1994

**Title:** Effects of anti-depressants on cognitive functions - a review of the literature

**Journal/Book Name:** Encephale-Revue de Psychiatrie Clinique Biologique et Therapeutique

**Volume:** 20,1, 65-77

**Keywords:** psychomotor performance, 2 antidepressants, memory, amitriptyline, imipramine, nomifensine, mianserin, placebo, skills, drugs

**Abstract:** In this review the authors propose to study the impact of antidepressants on attention, memory and motor functions in healthy volunteers and depressed patients on single and long-term administration. After reviewing the principal cognitive functions, we examine the actual investigation means to conclude that the Critical Flicker Fusion Test (CFFT) is one of the most drugsensitive tests. It permits a categorization in: sedative antidepressants that in single administration lower CFFT; compounds with no effect on CFFT and no deleterious cognitive effect; and finally substances that raise CFFT and may have psychostimulating properties. On single administration amitriptyline is the most sedative antidepressant on attention or motor level. It seems to produce negative effects on memory level. However, experimental trials give contradictory results. Imipramine in single administration also has sedative effects on memory and car driving capacity. However divergent results of experimental trials do not allow any conclusions of a clearcut negative cognitive effect. Memory impairments with imipramine appear at administration levels of 150 mg. Mianserin has a sedative impact on attention and motor level at low doses (10mg). Among the tricyclics, nortriptyline has a highly dose dependent sedative effect that has been shown on attention tests (Time Reaction:TR, Digit Symbol Substitution Test: DSST). Among non-tricyclic compounds, doxepine lowers attention and motor performances. Maprotiline (75 mg) lowers CFFT and has a dose dependent effect. Trazodone also has a negative impact on attention tests. Finally

viloxazine lowers CFFT but does not impair other attention or motor tests on a 100 mg doses. Buspirone, lofepramine, midalcipran and zimelidine are antidepressants with no effect on CFFT and do not have any positive or negative cognitive effect. On the other hand nomifensine, paroxetine and fluoxetine raise CFFT in healthy volunteers on single administration. Improvement of CFFT performances was found in an isolated manner for nomifensine and paroxetine on 30 mg doses with no other memory or motor effects. MAO-Inhibitors do not impair attention or motor function; thus moclobemide has no negative impact on memory, attention or car driving tests. Cognitive impact of antidepressants in depressive patients seems the same with those of healthy volunteers on single administration. In long-term administration antidepressants have different effects in healthy and depressed subjects. In healthy volunteers cognitive effects of most compounds are normalized after the second week of treatment. However, attention and motor performances with amitriptyline are normalized after 3 weeks of treatment. Sedative motor or cognitive effects of imipramine do not exceed 8 days. As concerns secondary amine, desmethylimipramine or desipramine have no sedative effect after an eight-day administration, whereas nortriptyline has a sedative effect on memory after a two-week administration. Dissipation of the impact on memory and attention with mianserin and viloxazine was observed on the 8th day of administration. In depressed patients cognitive effects are less important especially since they are linked to clinical improvement. A normalization of attention performances has been found for amitriptyline after the third week of treatment. However, impairment of implicit memory persists. For imipramine memory and attention functions are normalized after the 4th week of treatment. Doxepine on the contrary has a persisting impairing effect on attention and coordination after 3 weeks of treatment. In depressed subjects long-term administration of mianserin shows a normalization of memory, attention and motor function after the 8th day of treatment, while for nomifensine three days seem enough. No impairment of attention or motor function were found with moclobemide on a six-week administration. In the aged subjects, cognitive effects of antidepressants are more marked and there is always a danger of inducing confusional states. Moreover, dissipation of these effects seems longer on long-term administration. As concerns the combined effect of alcohol and anti-depressants, a sedative effect is aggravated in the case of association alcohol + amitriptyline or + nortriptyline. On the other hand with desipramine attention and motor performances are less impaired. Association of alcohol + zimelidine or alcohol + clomipramine are comparable to the effects of alcohol + placebo. In the last part of this paper we try to analyze the methodological problems of experimental trials in neuropsychopharmacology. They are essentially linked to the difficulty of recruitment of homogeneous groups regarding diagnosis. Large acceptance of DSM III and DSM III-R permit a more rigorous application of valid diagnostic criteria. In the same way a large diversity of cognitive tests used by different teams in different countries contribute to contradictory results. In the effort of a homogeneization of test batteries one has to use tests that are sensible to impairment as well as to improvement. Familiarization is also a fundamental element in the beginning of tests. In ideal conditions one has to be sure that a stable learning performance has been reached before the beginning, thus excluding its continuation during the trial. In conclusion antidepressants with strong anticholinergic effect or of marked sedative effect are the most impairing compounds. Prescription to the aged subject should be cautious,

especially if previous cognitive impairment exists. Finally combination of alcohol + sedative antidepressants seems highly toxic whereas it can be tolerated with antidepressants that have no cognitive effect

**Workpackage No.:** 1

**Author:** AMERICAN AUTOMOBILE ASSOCIATION.

**Year:** 1997

**Title:** You, alcohol, other drugs and driving

**Keywords:** drugs, alcohol, driving, legal implications, young drivers

**Abstract:** This book examines drinking behaviour, explains how the body handles alcohol and discusses the effects of alcohol. It examines the impact of alcohol on drivers and driving. The author highlights why drinking and driving is especially dangerous for young drivers. Factors that can influence the effects of alcohol are described as well as the legal aspects of alcohol use by drivers and presents alternatives to drinking and driving. The drinking and driving of other people is addressed and guidelines to help the reader act responsibly toward others in drinking situations. Finally, the issue of drugs and driving is addressed.

**Workpackage No.:** 1

**Author:** ARAMISOVA, R.M. AND EL'GAROV, A.A.

**Year:** 1996

**Title:** Isradipine in arterial hypertension in motor vehicle drivers

**Journal/Book Name:** Med Tr Prom Ekol, Russia

**Volume:** 8, 21-3

**Keywords:** Isradipine, anti-hypertensive agents PD/\*TU, automobile driving, blood pressure DE, calcium channel blockers PD/\*TU

**Abstract:** The study covered influence of isradipine (2.5 mg administered twice daily during 6 weeks) on blood circulation in the heart and occupationally important functions and traits among 30 drivers having mild and moderate arterial hypertension (AH). Systolic and diastolic pressure demonstrate reliable decrease in all the examinees with mild AH and in 93.8% of the examinees with moderate AH. Isradipine proved to influence positively decrease of hypertensive reactions and subclinical myocardial ischemia. Isradipine presented statistically significant improvement of the studied psychophysiological parameters (quickness of latent and motor visual reaction, number of errors in color choice, exactness in following the mobile object). Thus, all above enables to recommend Isradipine (Lomir) as effective and safe method correcting arterial hypertension in drivers.

**Workpackage No.:** 2

**Author:** ARMSTRONG, J.L. AND WHITLOCK, F.A.

**Year:** 1980

**Title:** Mental illness and road traffic accidents

**Journal/Book Name:** Aust NZ Journal of Psychiatry

**Volume:** 14(1), 53-60

**ISBN/ISSN:** 0004-8674

**Keywords:** Accident Proneness; Accidents, Traffic\*; Adolescence; Adult; Aged; Agression PX; Alcohol Drinking; Alcoholism PX; Female; Human; Male; Mental Disorders DT/\*PX; Middle Age; Psychotropic Drugs AE; Schizophreniz Psychology

**Abstract:** One hundred psychiatric patients were carefully matched with 100 physically ill patients and their driving records compared. The psychiatric patients were consuming far greater quantities of psychotropic drugs and included a larger number of alcoholics and heavy drinkers. During the six months before admission there were no significant differences between the two groups of patients with respect to accident and traffic code infringements. Apart from individual patients, drugs did not appear to be influencing the outcome in statistical terms. Alcoholics and heavy drinkers showed an increased lifetime accident liability. No specific psychiatric diagnosis was otherwise associated with increased accidents rates. The majority of accidents reported were relatively trivial.

**Workpackage No.:** 2

**Author:** ASOH, T., UCHIUMI, M. AND MURASAKI, M

**Year:** 1995

**Title:** The effects of tandospirone and diazepam on actual driving performance

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** tandospirone/ driving performance/ diazepam/ eye-movement/ leepiness/steering wheel operation/speed variability

**Abstract:** The acute effects of tandospirone, a new anxiolytic agent, on actual driving performance were investigated in 12 healthy male subjects according to a double blind, cross-over design. Drug treatments were tandospirone 30mg, diazepam 5mg and placebo. The time of administration was 30 minutes prior to beginning of the driving test. Subjects were instructed to drive continuously for two hours at a speed of 60 kilometers an hour. Eye movement, steering wheel operation, speed variability and the Stanford Sleepiness Scale were continuously measured during driving. Diazepam significantly increased the frequency of long closure duration blinks and large steering reversals, the variability of driving speed and the Stanford Sleepiness Scale in comparison with tandospirone and placebo. These findings suggest a dangerous tendency to fall asleep during driving for the drivers administered diazepam. On the other hand, on all measurement items there was no difference between tandospirone and placebo. So it is concluded that tandospirone does not indicate the central nervous system depressant action and does not impair driving performance.

**Workpackage No.:** 2

**Author:** ATTWOOD, D.A., WILLIAMS, R.D., MCBURNEY, L.J. AND FRECKER, R.C.

**Year:** 1981

**Title:** Cannabis, alcohol and driving: Effects on selected closed course tasks

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T80 8th International Conference. Sweden, Graphic Systems, Goteborg. Edited by L. Goldberg  
**ISBN/ISSN:** 91-22-00425-4  
**Workpackage No.:** 2

**Author:** ATTWOOD, D., WILLIAMS, R., McBURNEY, L. AND FRECKER, R.  
**Year:** 1981  
**Title:** Cannabis, alcohol and driving: effects on selected closed-course tasks.  
**Journal/Book Name:** In: Alcohol, drugs and traffic safety, 3. (L.Goldberg, Ed.)Almqvist and Wiksell Int. Sweden.  
**Volume:** 938-953.  
**Keywords:** marihuana; experimental; closed-circuit  
**Workpackage No.:** 2

**Author:** AUCAMP, AK; WEIS, OF; MÜLLER, FO; GILL, CE. AND MALAN J  
**Year:** 1984  
**Title:** Oxprenolol plus ethanol causes no central nervous system depression - a comparison with lorazepam plus ethanol  
**Journal/Book Name:** S African Medical Journal  
**Volume:** 66(12), 445-6  
**ISBN/ISSN:** 0038-2469  
**Keywords:** Adult; Central Nervous System \*DE; Clinical Trials; Comparative Study; Double-Blind Method; Drug Interactions; Drug Therapy, Combination; Ethanol \*PD; Flicker Fusion DE; Human; Lorazepam \*PD; Male; Oxprenolol \*PD; Psychomotor Performance \*DE; Reaction Time DE; Time Factors  
**Abstract:** Oxprenolol, a fat soluble beta-adrenergic blocker, promoted as an anxiolytic agent to alleviate peripheral symptoms associated with anxiety, and lorazepam, a 1, 4-benzodiazepine anxiolytic drug, may both depress central nervous system (CNS) function. It is generally accepted that ethanol, when concurrently ingested, potentiates the CNS-depressant effects of drugs. The effects of CNS function of oxprenolol, lorazepam and placebo alone and in combination with ethanol were determined by a Leeds Psychomotor Tester and we concluded that oxprenolol in combination with ethanol is less hazardous to people operating power tools/machines or driving motor vehicles than the combination of lorazepam with ethanol.  
**Workpackage No.:** 1

**Author:** AUGSBURGER, M. and RIVIER, L.  
**Year:** 1996  
**Title:** Incidence of interactions between drugs in 641 drivers suspected of DUID  
**Journal/Book Name:** Proceedings of the 34th TIAFT Meeting Interlaken/Switzerland, August 11-15  
**Keywords:** drugs, driving, retrospective study, blood and urine analysis, chromatography

**Abstract:** In order to increase traffic safety, the Swiss government issued recommendations (1st January 1995) for precisising and standardizing different clauses to improve detection of drivers suspected of driving under the influence of drugs (DUID). In the same way, on 1st July 1996, in the European Community, directives concerning minimum standards of physical and mental fitness for driving applicants came into effect (Council Directive 91/439/EEC of 29 July 1991). The purpose of this study was to gain more information about the type of drugs used among drivers suspected of DUID during the 13 year period ranging from 1982-1994. The authors have done a retrospective evaluation of 641 cases received in the laboratory during this period dealing with living traffic drivers suspected of drug influence. The paper presents and evaluation of the incidence interactions between drugs found in these 641 drivers suspected of DUID. Toxicological analysis was conducted on blood and urine samples. Drugs included in analytical screening were drugs of abuse as amphetamines, cannabinoids, cocaine, LSD-25, opiates and medicinal drugs such as anti-epileptics, barbiturates, benzodiazepines, phenothiazines and tricyclic antidepressants.

**Workpackage No.:** 3

**Author:** AUGSBURGER, M. and RIVIER, L

**Year:** 1997

**Title:** Drugs and alcohol among suspected impaired drivers in Canton de Vaud

**Journal/Book Name:** Forensic Science International

**Volume:** 85 i2, 95-104

**ISBN/ISSN:** 0379-0738

**Keywords:** drugs, alcohol, impaired drivers, toxicology, marijuana

**Abstract:** Epidemiological and analytical laboratory records concerning living drivers suspected of driving under the influence of drug (DUID) during the 13 years period ranging from 1982 to 1994 were examined. This study included 641 records, 551 men (86%) and 90 women (14%). The average age of the drivers was 27+/-7 years (n=636, minimum 18 and maximum 74) and the 18-30 interval age range was overrepresented (80%) in this population sample. A traffic accident had occurred in 254 (40%) of the records, 273 (43%) drivers were suspected driving. One or more psychoactive drugs were found in 92.8% of the samples, In these records, cannabinoids were found in 57%, opiates in 36%, ethanol in 36%, benzodiazepines in 15%, cocaine in 11%, methadone in 10% and amphetamines in 4%. The majority (58%) of cases presented two or more drugs in biological samples, thus indicating a high incidence of potential interactions between drugs. This observation was specially relevant for methadone and methaqualone. We conclude that police suspicion about drivers under influence highly correlated with positive samples

**Workpackage No.:** 3



**Author:** AUSSÉDAT, M. and NIZIOLEK-REINHARDT, S.

**Year:** 1992

**Title:** Detection of cannabis and other drugs in 120 victims of road accidents

**Journal/Book Name:** In Cannabis: Physiopathology, Epidemiology, Detection. From the proceedings of the Second International Symposium organized by the National Academy of Medicine, with assistance of The City of Paris, April 8-9, CRC Press.

**Volume:** pp.73-77

**Keywords:** driving, vehicular accidents, alcohol, cannabis, opiates, benzodiazepines

**Abstract:** Analysis of blood or urine to detect substances which impair psychomotor performance were performed in 120 victims of road accidents, admitted as emergencies in the medical center of Metz-Thionville. 34% of samples were negative, 36% contained alcohol, 14% cannabis, 10% benzodiazepines and barbiturates and 1% opiates. Several drivers were polydrug users. This study illustrates the high incidence of previous drug consumption in drivers victims of road accidents. It calls for measures of information and prevention, as well as systematic detection among subjects victims of vehicular accident.

**Workpackage No.:** 3

## B

**Author:** BAILEY, J.P.M.

**Year:** 1987

**Title:** The role of alcohol and drugs in traffic injury road accidents in New Zealand

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam, Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 0 444 809031

**Workpackage No.:** 3

**Author:** BARGAINING REPORT

**Year:** 1993

**Title:** Alcohol and drug testing

**Journal/Book Name:** Bargaining Report

**Volume:** 134, 12-14

**Keywords:** alcohol, drug testing, employment, transport workers

**Abstract:** Alcohol and drug policies which include the testing of employees have recently been introduced by some major employers of public transport workers. However, the issue of testing is extremely contentious with trade unions tending broadly to be opposed to it. Bargaining report looks at the problems unions and workers are faced with when alcohol or drug testing is introduced, the safeguards which need to be negotiated, and the alternatives to testing is being put forward.

**Workpackage No.:** 1

**Author:** BARILLO, DJ

**Year:** 1993

**Title:** Arrest and conviction of injured intoxicated drivers in eastern Pennsylvania

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 25, 5, 635-9

**ISBN/ISSN:** 0001-4575

**Keywords:** Alcoholic Intoxication; Automobile Driving; Ethanol; Human; Injury Severity Score; Jurisprudence; Length of Stay; Pennsylvania; Wounds and Injuries

**Abstract:** The legal hazards of driving under the influence (DUI) are frequently not appreciated by alcohol users. Physicians who treat such patients following collisions are often unaware of the judicial disposition following hospital discharge. We examined the courthouse records of 511 intoxicated drivers involved in collisions and admitted to one Level 1 Trauma Center to determine if DUI arrests and convictions were obtained. The proportion arrested for DUI ranged from 6%-54% (mean 41%) depending on county of

crash site and distance from the trauma center. Of those arrested, the proportion of DUI convictions averaged 98% for all jurisdictions. Two hundred and nineteen intoxicated drivers were transported from the crash scene by helicopter. Increased transport distance was associated with a lower arrest proportion ( $p = 0.01$ ). Most injured intoxicated drivers in this study were not arrested for DUI. Of those identified and arrested, conviction was a virtual certainty. Helicopter transport may provide additional protection from prosecution.

**Workpackage No.:** 3

**Author:** BARNETT, G., LICKO, V. AND THOMPSON, T.

**Year:** 1985

**Title:** Behavioural pharmacokinetics of marijuana

**Journal/Book Name:** Psychopharmacology

**Volume:** 85, 1, 51-6

**ISBN/ISSN:** 0033-3158

**Keywords:** adult, attention, automobile driving, cannabis, dose response relationship, drug, half life, human, kinetics, male, psychomotor performance, reaction time, tetrahydrocannabinol, time factors

**Abstract:** Male volunteer subjects smoked one marijuana cigarette containing 100, 200, or 250 micrograms/kg delta-9-tetrahydrocannabinol (THC) and were tested on three perceptual-motor performance measures related to driving. Performance was measured and blood samples were collected for 24 h after smoking. The covariation between pharmacodynamics of performance and pharmacokinetics of TUC in plasma was investigated for decrement in performance as the response to smoking a single marijuana cigarette. A significant linear correlation was found between tracking errors under divided attention and TUC plasma levels over 5-25 ng/ml for approximately 2 h after smoking. A sigmoid relation was found between critical tracking breakpoint and log TUC plasma levels over 2-25 ng/ml for approximately 7 h after smoking.

**Workpackage No.:** 2

**Author:** BARRUCAND, D.

**Year:** 1983,

**Title:** Benzodiazepines, alcohol and effects on vigilance.

**Journal/Book Name:** Encephale

**Volume:** 9. 4 suppl 2, 117b-122b

**ISBN/ISSN:** 0013-7006

**Keywords:** accidents, traffic, alcoholic intoxication alcoholism, anti-anxiety agents, benzodiazepine, arousal, cognition disorders, comparative study, consciousness disorders, drug synergism, english abstract, France, human, liver

**Abstract:** It is evident, and has been confirmed by epidemiological and experimental data, that ingestion of alcohol can reduce alertness and disturb the concentration of drivers. However, there is still some confusion on this question, since it is impossible to predict what will be the exact level of alcoholemia following ingestion of a given quantity of alcohol, and because disturbances in alertness vary greatly from one

individual to another for the same level of alcoholemia . The essential distinction between acute alcoholisation and chronic alcoholisation (due to notions of alcohol tolerance and dependence ) must also be taken into account. Similar difficulties exist in interpreting the relation between ingestion of benzodiazepines and vehicle driving, but they are further complicated by other factors, notably the large number of drugs. Of course, it is possible to show by laboratory experiments, that some benzodiazepines (dipotassium clorazepate, for example) do not disturb the concentration of drivers when given alone, in normal doses and for the recommended indications. But in reality, epidemiological data show that, statistically speaking, drivers taking benzodiazepines have a higher risk of accident than the average drivers. It would appear from this that, for a driver ingesting both alcohol and benzodiazepines, the risk of accident is greatly enhanced. It is also clear that the difficulties in interpreting this risk are multiplied. To summarize very briefly, it appears that there is potentiation when the two substances are ingested together in cases of acute alcoholisation (with an increase in benzodiazepine blood levels), and attenuation in cases of chronic alcoholisation (due to acceleration in clearance provoked by hepatic microsomal induction).

**Workpackage No.:** 1

**Author:** BARZ, J; BONTE, W; KEULTJES, C. AND SIELAND, J

**Year:** 1990

**Title:** Concentrations of ethanol, methanol, propanol-2 and acetone in blood samples of impaired drivers.

**Journal/Book Name:** Acta Med Leg Soc (Liege)

**Volume:** 40, 49-60

**ISBN/ISSN:** 0065-1397

**Keywords:** Concentrations of ethanol, methanol, propanol, acetone in blood samples, alcoholic intoxication, alcoholism, automobile driving, biological markers, ethanol, methanol, time factors, 1-propanol

**Abstract:** The paper will give an overview about the blood alcohol levels in more than 1500 impaired drivers. Simultaneously the concentrations of acetone, as well as methanol and propanol-2 were analyzed. The significance of the results for the diagnosis of chronic alcohol abuse in motor vehicle drivers will be discussed.

**Workpackage No.:** 3

**Author:** BAUER, R.L.

**Year:** 1984

**Title:** Traffic accidents and minor tranquillizers: a review

**Journal/Book Name:** Public Health Reports

**Volume:** 99, 6, p. 572

**Keywords:** minor tranquillizers, traffic accidents, alcohol

**Abstract:** Minor tranquillizers, including benzodiazepines, have been found to impair driving skills such as hand-eye coordination and reaction time. Several studies have also demonstrated an association between minor tranquillizer use and traffic accidents; however, the association may be due entirely to more frequent alcohol use or to the

underlying anxiety found in users of minor tranquillizers. Whichever the case, patients taking minor tranquillizers do have higher accident rates. It is recommended that physicians emphasize the possible risks of driving while using these medicines, particularly if used with alcohol.

**Workpackage No.:** 1

**Author:** BECH, P., RAFAELSEN, L. AND RAFAELSEN, O.J.

**Year:** 1973.

**Title:** Cannabis and alcohol: effects on estimation of time and distance.

**Journal/Book Name:** Psychopharmacologia

**Volume:** 32, 373-381.

**Workpackage No.:** 2

**Author:** BECH, P

**Year:** 1989

**Title:** Methods of evaluation of psychoactive drugs

**Journal/Book Name:** Recenti Prog Med, Italy

**Volume:** 80(12), 706-11

**ISBN/ISSN:** 0034-1193

**Keywords:** Drug Evaluation ; Human ; Neurotic Disorders\*DT; Placebo Effect ; Psychiatric Status Rating Scales\*; Psychotropic Drugs AE/\*PD/TU

**Abstract:** The classification of psychoactive drugs into minor tranquilizers (i.e. antianxiety drugs) and major tranquilizers (i.e. antidepressants, antimaniacs and antipsychotics) is based on clinical symptom rating scales. The group of symptoms in these scales of anxiety, depression, mania and schizophrenia has a shared phenomenology in the sense that the symptoms can be ordered from less to more severe. The inter-observer agreement when using these scales is adequate as agreement is of 80% or higher. By use of rating scales it has been found in controlled clinical trials that minor psychiatric disorders such as anxiety states without depression have a good outcome of placebo in 60 to 65%. In depressive disorders placebo has a good outcome in 20-45%, but in the elderly depressed patient the placebo effect is poorest (25%). Antidepressants have a good outcome in 60-75%, but in the elderly depressed patients only in 50%. In other words the drug-placebo difference is around 25%. In the major psychiatric disorders such as mania and schizophrenia the drug-placebo difference is around 50%. The use of clinical symptom scales in evaluating side-effects of psychoactive drugs is increasing. However, also non-clinical or laboratory tests have an important role in measuring side-effects, especially in motor skills related to car driving. The use of mentally healthy volunteers in measuring side-effects of major tranquilizers seems inadequate. As yet no biological methods to measure clinical effects of the tranquilizers have been developed for practical use.

**Workpackage No.:** 1

**Author:** BECK, KH

**Year:** 1981

**Title:** Driving while under the influence of alcohol: relationship to attitudes and beliefs in a college population.

**Journal/Book Name:** AM Journal of Drug and Alcohol Abuse

**Volume:** 8, 3, 377-88

**ISBN/ISSN:** 0095-2990

**Keywords:** Adolsecense ; Adult ; Alcoholic Intoxication PX ; Attitude ; Automobile Driving ; Behavior ; Decision Making ; Human ; Middle Age ; Models Age ; Models, Psychological \* ; Support, Non-U.S. gov't

**Abstract:** Two social psychological theories (the Fishbein Model and the Health Belief Model) were used to derive attitude and belief factors to predict intentions to drive while under the influence of alcohol and actual drinking-driving behavior in a college population. The results revevealed strong support for the Fishbein theory; attitudes and normative beliefs predicted intentions, while intentions were the best predictor of subsequent behavior. From the Health Belief Model, specific beliefes regarding one's effecitiveness at being able to avoid getting caught by the police and cause an accident while driving under the influence of alcohol were also significantly related to drinking-driving intentions and behavior. These findings indicate that decisions to drink and drive are the result of one's personal evaluation of this behavior and one's perceived ability to control the threatening consequences. Thus drinking and driving may continue to be so prevalent in a college population because they erroneously believe that they are still safe drivers and effective at controlling the attendant risks.

**Workpackage No.:** 1

**Author:** BECKER, J., JUNKER, T., KOEPF, W., RUENAVUER, G. AND RITTNER, C.

**Year:** 1992

**Title:** Incidence of cannabis consumption among impaired road users in Rheinland-Pftz

**Journal/Book Name:** Sucht

**Volume:** 38, 4, 238-243

**Keywords:** road users, males, females, cannabinoids, toxicological analysis, fluorecence polarisation immunoassay

**Abstract:** The study population was composed of all road users at an age of 18-35 years, from which blood specimens were obtained in 1987 for the purpose of determining their blood alcohol concentrations (N8654). By means of random numbers two independent, anonymous samplings of 500 male and 150 female road users were formed. Parts of their blood specimens were analyzed for the presence of cannabinoids using fluorecence polarisation immunoassay (TDxr-system, Abbott GmbH, Wiesbaden). Cannabinoids were detected at concentrations greater than 20 ng ml in 38 of the specimens of the males and 4 (2.7 per cent) of the females. Although the study did not allow the authors to draw statistically safe conclusions of the number of cannabis users in the total population, the number of cannabis specimens in the randomly selected population of impaired road users indicated that blood specimens of sober or only slightly alcoholized drivers should be tested for prescribed or illicit drugs

**Workpackage No.: 3**

**Author:** BECKER, K

**Year:** 1994

**Title:** The consequences of drunken driving in South Africa

**Journal/Book Name:** Med Law

**Volume:** 12(1-2), 11-7 1994

**ISBN/ISSN:** 0723-1393

**Keywords:** Accidents, Traffic MO/SN ; Alcohol Drinking LJ/PC ; Alcoholism DI ; Automobile Driving LJ; Crime LJ ; Human ; Internal-External Control ; Punishment ; South Africa EP

**Abstract:** With the increase of alcohol use and abuse in South Africa, there has been an increase in the frequency of drunken driving offences. The community has become increasingly irate at the horrendous damage and loss of life which are occasioned by these offences. The courts have therefore been forced to take note of public opinion, and the penalties have consequently become more stringent and punitive. This article focuses primarily on the recurrent conflict between medical treatment and the imposition of punishment when the court is confronted by a person who has been driving whilst exceeding the legal blood alcohol limit. The courts are faced with having to differentiate between those persons who have an alcohol dependency and those who have merely behaved irresponsibly. What do they do? If the law deals with both cases in the same manner, it would not be achieving anything. The legal system in South Africa needs to differentiate between those persons who have an addiction and subsequently need treatment, and those who need education. The legal system needs, therefore, to make provision for proper independent professional diagnostic assessment. This article suggests alternative options which the courts could adopt in order to deal with these offences in a more flexible and effective manner.

**Workpackage No.: 1**

**Author:** BEIRNESS, DJ

**Year:** 1987

**Title:** Self-estimates of blood alcohol concentration in drinking-driving context

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 19, 1, 79-90

**ISBN/ISSN:** 0376-8716

**Keywords:** Accidents, Traffic PC ; Adult ; Attitude ; Automobile Driving; Breath Tests ; Ethanol BL ; Female ; Human ; Male ; Middle Age ; Self Concept \* ; Support, Non-U.S. Gov't

**Abstract:** A total of 72 social drinkers between the ages of 20 and 57 years participated in an ad lib social drinking session. At various intervals throughout the session participants provided estimates of their blood alcohol concentration (BAC) along with breath samples for objective determination of their BAC. Participants were classified into three groups, based on the pattern of their BAC estimation errors-Underestimators, Overestimators, or Mixed Pattern estimators. Underestimators consumed more alcohol

and attained higher BACs during the drinking session than the other two groups. Underestimators also rated their level of intoxication significantly lower than other groups and were most likely to judge themselves fit to drive when their actual BAC was in excess of the statutory limit.

**Workpackage No.:** 2

**Author:** BEIRNESS, D.J, SIMPSON HM; MAYHEW DR. AND WILSON, RJ

**Year:** 1994

**Title:** Trends in drinking driver fatalities in Canada

**Journal/Book Name:** Canadian Journal of Public Health

**Volume:** 85, 1, 19-22

**ISBN/ISSN:** 0008-4263

**Keywords:** Accidents, Traffic ML/SN ; Alcohol Drinking MO.TD ; Automobile Driving; Canada ED ; Comparative Study ; Ethanol BL ; Human ; Support, Non-U.S. Gov't

**Abstract:** Public and political concern and action focussed on the problem of drinking and *driving* during the 1980s was unprecedented. This paper examines the impact of these collective efforts by analysing trends in the magnitude of the alcohol crash problem in Canada as reflected by drinking driver fatalities. After many years of little or no change in the magnitude of the drinking-driving problem, beginning in the early 1980s, both the number and percent of drinking driver fatalities began to decline. This trend continued over the entire decade. Despite these gains, a significant problem remains, in particular drivers with very high blood alcohol concentrations who appear to be relatively unaffected by countermeasures based on traditional measures such as deterrence and persuasion. New, innovative programs will be necessary to deal effectively with this "hard core" heavy drinking group.

**Workpackage No.:** 1

**Author:** BENZODIAZEPINES/DRIVING COLLABORATIVE GROUP.

**Year:** 1993

**Title:** Are benzodiazepines a risk factor for road accidents?

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 33, 19-22

**ISBN/ISSN:** 0376-8716/93

**Keywords:** benzodiazepines, road accidents, alcohol, risk factor

**Abstract:** To assess the importance of benzodiazepines as a risk factor for road accidents, the number of blood samples positive for these drugs was compared among injured drivers responsible for a traffic accident and among injured non-responsible drivers and pedestrians. Benzodiazepines were detected by qualitative immunoenzymatic assay. A total of 3147 subjects were registered for responsibility for the accident. Benzodiazepines were detected in the serum of 8% of the study population. Comparison of the responsible and non-responsible groups did not show any significant difference between them when the part played by alcohol was disregarded, even after adjustment for age and sex. In conclusion, this study showed, once again, that alcohol is clearly an accident risk factor, but found no statistically significant evidence that this also applies to benzodiazepines.



**Workpackage No.: 3**

**Author:** BERGHAUS, G., STAAK, M., GLAZINSKI, R., HOHER, K., JOO, S. AND FRIEDEL, B.

**Year:** 1982/3

**Title:** Complementary empirical study on the driver fitness of methadone substitution patients

**Journal/Book Name:** Proceedings of the twelfth International Conference on Alcohol, Drugs and Traffic Safety - T'92, Cologne, Germany.

**Publisher:** methadone, patients, driving ability, experimental study, Germany, psychological tests, urine, blood analysis

**Volume:** pp.116-119

**ISBN/ISSN:** 3-8249-0131-5

**Abstract:** The research sought to answer the following questions: can methadone patients be considered as a homogenous group especially with respect to the consumption of additional drugs? and what about performance areas other than vehicle handling skills. For example, perception of traffic situations, risk taking, risk cognition, complex performance tasks and personality traits. Their study comprised 47 subjects. Subjects were administered a series of psychological tests. The next day they were given polamidone which was followed by questions about performance influencing factors such as sleeplessness or labor the night before. Afterwards a self-rating scale concerning performance, a mood scale and a traffic-specific questionnaire was completed by the subjects. Urine and blood samples were taken. At least 21 patients were considered unfit to drive. In many performance areas and traffic specific personality traits typical of traffic demands even the positive selection of patients yielded many significant impairments compared to the control group. The authors suggest that patients receiving methadone should be considered unfit to drive.

**Workpackage No.: 2**

**Author:** BERGHAUS, G; STAAK, M; GLAZINSKI, R; HOHER,K; JOO,S. AND FRIEDEL,B

**Year:** 1993

**Title:** Complementary empirical study on the driver fitness of methadone substitution patients

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety

**Publisher:** methadone; psychomotor; experimental

**Volume:** T92, 120-126

**Abstract:** Tested methadone maintenance patients on psychomotor tests including short term memory, tracing and speed estimation. Found that patients yielded poorer results compared to controls in all tests. Concludes that patients are unfit to drive according to the statistical point of view.

**Workpackage No.: 2**

**Author:** BERGHAUS, G. AND FRIEDEL, B.

**Year:** 1994

**Title:** Methadon-substitution und Fahreignung (Methadone substitution and driving aptitude)

**Journal/Book Name:** Neue Zeitschrift Fuer BVerkehrsrecht

**Volume:** 7, 10, 377-381

**Keywords:** methadone maintenance programme (MMP), driving aptitude, experimental study, psychotropic medication, licence

**Abstract:** In this report studies on the driving aptitude of participants in methadone maintenance programmes (MMP) are analysed and evaluated. The majority of the ten studies show that on different measures of psychomotor performance methadone-maintenance subjects did not differ from controls. Thus, stable MMP participants who do not use other psychotropic medication, can be regarded as fit to drive. In certain cases the medico-psychological evaluation may be indicated during ongoing treatment and the driving licence may be regranted.

**Workpackage No.:** 2

**Author:** BERGHAUS, G. AND GUO, B.

**Year:** 1995

**Title:** Medicines and driver fitness - findings from a metaanalysis of experimental studies as basic information to patients, physicians and experts

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** medicines/driver fitness/metaanalysis/ diazepam, benzodiazepines, blood concentration

**Abstract:** Holding an enquiry into the topic 'medicines and driver fitness' sponsored by the Federal Highway Research Institute more than 1000 published experimental studies on performance following drug intake were gathered. By means of a metaanalytic approach important information of the studies were PC-extracted (among other things: number, age and sex of subjects, manner of treatment, time between drug intake and testing, tasks presented and the experimental findings) and analysed with the help of inferential statistics. Three examples will prove the benefit of this methodological approach: applied to diazepam detailed statements on kind, intensity and duration of impairment are given. A comparison between the alterations of some benzodiazepines assist the physicians in prescribing an optimum substance to drivers. The combination of blood concentration curves and time dependant curve of impairment can be a valuable tool to experts judging the danger of a medicine in terms of substance concentration.

**Workpackage No.:** 1

**Author:** BERGHAUS, G., SCHEER, N. AND SCHMIDT, P.

**Year:** 1995/6

**Title:** Effects of cannabis on psychomotor skills and driving performance - a metaanalysis of experimental studies

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** road traffic/drugs/ marijuana/ psychomotor skills/ metaanalysis/

**Abstract:** Taking part in road traffic under the influence of drugs, especially marijuana, has become a serious problem in most western societies. Thus traffic medicine is demanded to provide scientific knowledge of the effects of cannabinoids on driving performance. The present study is intended to analyse all available data on the influence of cannabinoids on psychomotor skills relevant to driving behaviour using a metaanalytic approach. About 150 experimental studies including laboratory, driving simulator and on road experiments make up the basis of our investigation. With the help of a systematic questionnaire the most important information extracted were: number, age, sex and user behaviour of the subjects, manner of drug treatment, time between drug intake and testing, tasks presented and the experimental findings concerning the drug effects. Subsequently the data were examined by the means of inferential statistics. For the first time a methodological approach is applied enabling to establish detailed statements on kind, intensity and duration of drug impairment dependent on dose, user behaviour, treatment and further variables.

**Workpackage No.:** 3

**Author:** BERGHAUS, G.

**Year:** 1995/6

**Title:** ICADTS Working Group: "Standardization and Harmonization of methodology of experimental studies on drugs and driver fitness" - necessity, structure of the problem area, goals.

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** drugs/ driver fitness/ traffic safety

**Abstract:** Findings of experimental studies on drugs and driver fitness are of importance for decisions in the fields of traffic safety. Therefore there is an indispensable requirement to do research by an adequate and optimal methodology to produce reliable results. Bearing this fact in mind two International Workshops on methodology were organized in Padova and Cologne in 1991 and 1992, cosponsored by ICADTS. Due to the relevance and scope of endeavor needed the ICADTS established a Working Group on this topic in autumn '94. The goal of this Working Group is to prepare a sound guide to an optimal methodology of experimental studies on drugs and driver fitness publish these guidelines and attempt to get to acceptance by experts, institutions and authorities. Basis of these guidelines should be on the one hand the established national and international guidelines relating to clinical, therapeutic experiments (for example GCP, FDA) that can be adopted for research on drugs and driver fitness and on the other hand the results of the above mentioned workshops including their complementing publications. A main topic of discussion surely will be the optimum operationalization of the construct "driver fitness" including for example statistical problems such as about adequate effect sizes for equivalence testing or about the sample sizes needed for reliable statistical decisions.

**Workpackage No.: 3**

**Author:** BERNINI, M., CONTI, A., DE FERRARI, F., FORNACIARI, M. AND SALIGARI, E.

**Year:** 1995/6

**Title:** Alcohol, drugs and fatal accidents in Brescia and the Italian Highway Code Regulations

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** alcohol/drugs/ driving/ road traffic accidents

**Abstract:** Total road traffic accidents (survivors and death) reported in Brescia area in 1993 are compared with similar data from a 1988 study. In particular the deaths with evidence of the presence of alcohol and/or drugs are examined also in the years 1990 to 1994. The inadequacy of the 80mg/100ml limit beyond which driving is prohibited is underlined as alcohol has negative effects on a drivers ability at values below this level. Likewise stressed is the insufficiency of the regulating of the method of verifying the influence of the effects of alcohol and drugs. Particularly apparent is the differing levels of legislation in the various European countries at a time when the general tendency is for legislative uniformity among member states

**Workpackage No.: 3**

**Author:** BERNSTEIN, E. AND WOODALL, W.G.

**Year:** 1987

**Title:** Changing perceptions of riskiness in drinking, drugs, and driving: an emergency department-based alcohol and substance abuse prevention program.

**Journal/Book Name:** Annals of Emergency Medicine

**Volume:** 16, 12, 1350-4

**ISBN/ISSN:** 0196-0644

**Keywords:** adolescence, alcohol drinking, analysis of variance, automobile driving, comparative study, emergency service hospital, female, human, male, models, theoretical, perception, preventive health services, risk factors, substance related disorders, support, non U.S. Gov't

**Abstract:** For the last three years, the University of New Mexico School of Medicine/Division of Emergency Medicine has sponsored an Alcohol and Substance Abuse Prevention Program (ASAP). The program's objectives were to expose youth to the "real-life social and medical consequences of alcohol and substance abuse through visits and interviews with patients and their families at the University of New Mexico Emergency Department and Trauma Center. A pretest, post-test, and eight-month follow-up evaluation design was used to assess the program's effects. Questionnaires were administered to randomly selected experimental and control groups of seventh grade students (n = 27). Repeated-measures analysis of variance detected a significant experimental/control condition x time crossover interaction effect for stated perception of riskiness,  $F(2, 31) = 3.20$ ,  $P = .049$ . The data indicated that, over time, the experimental

group perceived the riskiness of driving under the influence of drugs or alcohol to be greater, while the control group perceived such behavior to be less risky.

**Workpackage No.:** 2

**Author:** BETTS, T.A. and BIRTLE, J.

**Year:** 1982

**Title:** Effect of two hypnotic drugs on actual driving performance next morning

**Journal/Book Name:** British Medical Journal

**Volume:** 285, 6345, 852

**Keywords:** hypnotic drugs, driving, morning-after, "hangover" effects, benzodiazepine, performance

**Abstract:** Most drugs that affect the central nervous system impair driving, at least temporarily. Furthermore, many hypnotic drugs of the benzodiazepine group have some "hangover" effects next morning and have been shown to impair performance in (experimental) psychomotor tasks, though the degree of impairment depends on the dose of the hypnotic, its plasma half life, and individual variability. Such impairment is taken to mean that morning driving might be impaired: but is it? We could find no evidence that other workers had looked at the effect of these drugs on actual driving so we decided to do so. We chose a drug with a relatively short half life, tamazepam, and one with a longer one, flurazepam. A single night-time dose of both hypnotics caused changes in driving behaviour next morning that increased the chance of a road accident. Whether the effect wears off in the day (and if so, when), whether subjects adapt to repeated dosing, whether the effect is dose dependent, and whether men would be affected we cannot say; we suggest, however, that doctors should advise patients to avoid morning driving for the first few days of taking one of these hypnotics. The effect of tamazepam was unexpected, as it has a short half life and has little effect on psychomotor tests the next morning.

**Workpackage No.:** 2

**Author:** BETTS, T; MARKMAN, D; DEBENHAM, S; MORTIBOY, D. AND McKEVITT, T

**Year:** 1984

**Title:** Effects of two antihistamine drugs on actual driving performance

**Journal/Book Name:** British Medical Journal (Clin Res Ed)

**Volume:** 288(6413), 281-2

**ISBN/ISSN:** 0267-0623

**Keywords:** Arousal DE; Automobile Driving; Benzhydryl Compounds\*PD; Clinical Trials; Comparative Study; Double-Blind Method; Emotions DE; Female; Histamine H1 Antagonists\*PD; Histamine Antagonists H001; Human; Pyridines\*PD; Triprolidine\*PD

**Abstract:** A double blind placebo controlled experiment was conducted measuring the effects of the centrally active antihistamine triprolidine and the peripherally acting antihistamine terfenadine on actual driving performance in a group of experienced women drivers. Triprolidine greatly impaired driving behaviour, whereas terfenadine did not. Triprolidine also impaired subjective and objective measures of mood and arousal,

and despite an awareness that their driving was impaired while they were taking this agent subjects could not correct their performance. This study suggests that drivers who need antihistamine drugs should avoid those that act centrally.

**Workpackage No.:** 2

**Author:** BETTS, T., HARRIS, D. AND GADD, E.

**Year:** 1991

**Title:** The effects of two anti-vertigo drugs (betahistine and prochlorperazine) on driving skills

**Journal/Book Name:** British Journal of Clinical Pharmacology

**Publisher:** 32, 4, 455-8

**ISBN/ISSN:** 0306-5251

**Keywords:** adult, automobile driving, betahistine, double-blind method, female, human, male, prochlorperazine, psychomotor performance

**Abstract:** 1. The effects of betahistine 72 mg three times daily, prochlorperazine 5 mg three times daily and placebo taken for 3 days before testing were compared on two actual driving tasks (weaving and gap estimation) and two psychomotor tasks (reaction time and kinetic visual acuity) in normal subjects in a double-blind prospectively randomised cross-over study. 2. The psychomotor effects of betahistine could not be distinguished from those of placebo. 3. Prochlorperazine impaired driving performance causing increased carelessness and slowing on the weaving test. 4. There was little subjective appreciation of impairment whilst taking prochlorperazine.

**Workpackage No.:** 2

**Author:** BHATTI, JZ. AND HINDMARCH, I

**Year:** 1989

**Title:** The effects of terfenadine with and without alcohol on an aspect of car driving performance.

**Journal/Book Name:** Clin Exp Allergy,

**Volume:** 19(6), 609-11

**ISBN/ISSN:** 0954-7894

**Keywords:** Adult; Automobile Driving\*; Benzhydryl Compounds AD/\*AE; Dose-Response Relationship, Drug; Drug Synergism; Ethanol AD/\*AE; Female; Histamine H1 Antagonists AD/AE Histamine Antagonists H001; Human; Middle Age; Psychomotor Performance DE; Support, Non-U.S. Gov't

**Abstract:** Twelve healthy female volunteers received acute doses of terfenadine, 60 mg, 120 mg, 240 mg or placebo, followed by a 'social' dose of alcohol equivalent to 0.5 g absolute alcohol/kg body weight. Performance was assessed on laboratory analogues of car driving both before and after alcohol administration. Terfenadine (240 mg) was found to significantly impair performance alone and following alcohol. The results demonstrate the importance of establishing the behavioural effects of drugs over a range of doses.

**Workpackage No.:** 2

**Author:** BIEHL, B

**Year:** 1985

**Title:** The effect of the analgesic flupirtine on automobile driving.

**Journal/Book Name:** Arzneimittelforschung

**Volume:** 35(1), 77-81

**ISBN/ISSN:** 0004-4172

**Keywords:** Adult; Aminopyridines \* AE; Analgesics \* AE; Attention DE; Automobile Driving\*; English Abstract; Female; Human; Male; Pentazocine AE; Psychomotor Performance \* DE

**Abstract:** The purpose of the present study was to investigate the effects on driving ability of the new analgesic ethyl-N-(2-amino-6-(4-fluor-phenylimethylamino) pyridin-3-yl) carbamate (flupirtine, D 9998) in comparison with pentazocine and placebo. Flupirtine was tested in a double blind cross-over experiment in 12 healthy volunteers using 7 different tests which are known to correspond to the most important aspects of driving ability. Subjects were given 3 consecutive doses of flupirtine of 1 00 mg each and tested following the first and third administration. The comparison drug pentazocine and placebo were administered in the same dosage regimen (a single dose of pentazocine amounting to 50 mg). Significant differences between flupirtine and placebo could not be detected. Following single dosage of pentazocine subjects more often reported a general feeling of discomfort, including nausea, dizziness and motion sickness, than was the case after administration of flupirtine. While single administration of pentazocine did not produce any significant differences from placebo, multiple administration resulted in both objective and subjective fatigue symptoms. It was concluded that flupirtine, in contrast to pentazocine, did not produce any impairment in driving ability in healthy volunteers.

**Workpackage No.:** 2

**Author:** BIRD, K.D., BOLEYN, T., CHESTER, G.B., JACKSON, D.M., STARMER, G.A. AND JEO, R.K.C.

**Year:** 1981

**Title:** Interactions among the cannabinoids (THC, CBO and CBN) alone and when combined with ethanol: effects on human performance, p.1111

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T80 8th International Conference. Sweden, Graphic Systems, Goteborg. Edited by L. Goldberg.

**ISBN/ISSN:** 91-22-00425-4

**Keywords:** cannabinoids, THC, CBO, CBN, ethanol, human performance

**Workpackage No.:** 2

**Author:** BITTMANN, K

**Year:** 1993

**Title:** Proof of alcoholic intoxication in automobile driving by breath alcohol content in austria from the legal viewpoint

**Journal/Book Name:** Clutalkohol

**Volume:** 30(6), 344-8

**ISBN/ISSN:** 0006-5250

**Keywords:** Accidents, Traffic ; Alcohol Drinking ; Alcoholic Intoxication ; Austria ; Breath Tests ; English Abstract ; Ethanol ; Homicide ; Human

**Abstract:** In Austria, automobile drivers are obligated to undergo a breathalyzer test if they are suspected of driving under the influence of alcohol. Drivers cannot be forced to take the test, but if they refuse, their conduct is then dealt with as a violation of civil law and is therefore punishable by law. If the Alcomat test yields an alcohol content of 0.4 ml/l, i.e. relevant amount, the suspect then has the right to demand that a blood test be carried out. If the authorities refuse to give him this test, then the suspect will not be held to have been in excess of the legal alcohol level by the civil authorities in the following proceedings. On the other hand, in a legal criminal proceeding, the suspect will then be found guilty of exceeding the legal alcohol level, if additional evidence--which must be examined by the judge within the framework of the free consideration of evidence (a principle recognized by Austrian law but not, for example, by American law)--suffices to show with relative certainty that the suspect exceeded the alcohol limit as defined in section 81 Z2StGB). If a blood test is completed and the results differ from those of the breathalyzer, then the blood test results are used.

**Workpackage No.:** 4

**Author:** BJÆRNEBOE, A, BJÆRNEBOE, G-E,AA, GJERDE, H, BUGGE, A., DREVN, C., AND MÆRLAND, J.

**Year:** 1987

**Title:** A retrospective study of drugged driving in Norway

**Journal/Book Name:** Forensic Science International

**Volume:** 33, 4, 43-251

**ISBN/ISSN:** 0379-0738/87

**Keywords:** drug driving, diazepam, THC, amphetamine, impairment

**Abstract:** The National Institute of Forensic Toxicology, Oslo, receives blood and urine samples from all Norwegian drivers apprehended on suspicion of driving under the influence of alcohol or drugs. In 1983 we received samples from 1446 drug-suspected drivers, out of which 445 underwent toxicological analysis. The drugs found were most frequently tetrahydrocannabinol (THC) (n=199), diazepam (n=166) and amphetamine (n=102). A cautious interpretation of the data indicate that about 200 of the 445 subjects selected for toxicological analysis drove under severe influence of drugs. Because of the high percentage of submitted cases not analysed for drugs, this figure represents a minimum estimate. Compared with the results from 1978, we found a several fold increase in detections of THC and amphetamine in 1983. The number of diazepam detections did not increase in a similar way, but we estimated that the diazepam detections would have increased 3-fold if we had analysed as frequently for this drug in 1983 as in 1978.

**Workpackage No.:** 3

**Author:** BLANK, C

**Year:** 1994

**Title:** Intoxicated drivers: everyone's problem.



**Journal/Book Name:** J Neurosci Nurs

**Volume:** 26(2), 107-10

**ISBN/ISSN:** 0888-0395

**Keywords:** accidents, traffic, alcohol drinking, automobile driving, human, lobbying, neurosciences, primary prevention, specialities, nursing, United States

**Abstract:** Kimball Maull a nationally recognized trauma surgeon writes "It is important to know that injury is a free ticket to absolution from drunk driving and that impaired survivors are rarely investigated." While legal remedies are part of the solution, driving while intoxicated is only a symptom of a deeper problem. The neuroscience nurse who cares for the alcohol-impaired patient has a unique opportunity to exert an impact on the DUI problem. Neuroscience nurses can assist in several ways; they can continue to help identify repeat offenders and problem drinkers and attempt to get counseling for them. They can lobby their legislatures for mandatory jail sentences, license revocations and fines for DUI offenders and making DUI a reportable offence. Finally, neuroscience nurse can take an active role in preventive activities, making prevention of alcohol-related injury and death part of their routines.

**Workpackage No.:** 1

**Author:** BLANQUART, D., COUDANE, H., AUSSDAT, M., PETON, P., PAGEL, E. AND NIZIOLEK, S.

**Year:** 1990

**Title:** Influence de la consommation de cannabis sur les accidents de la voie publique

**Secondary Author:** injuries, Use of cannabis and traffic

**Journal/Book Name:** Journal de Medecine Legale - Droit Medical,

**Volume:** 33, 4, 287-290

**Keywords:** cannabis, accidents, traffic injury, Zamal

**Abstract:** Les accidents de la voie publique resultent toujours de causes multiples. Un comportement anormal du conducteur est retrouve dans la majorite des cas. Cette alteration du comportement peut etre due a l'alcool ou a des medicaments psychotropes, mais aussi a des drogues illicites, comme le cannabis. Le but de cette etude est d'apprécier l'incidence de la consommation de cannabis chez les victimes d'accidents de la circulation dans une petite ville lorraine.

**Workpackage No.:** 3

**Author:** BLOMBERG, R. AND PREUSSER, D.F.

**Year:** 1974

**Title:** Narcotic use and driving behavior.

**Journal/Book Name:** Accident Analysis and Prevention.

**Volume:** 6, 21-32.

**Keywords:** methadone; field

**Workpackage No.:** 3

**Author:** BLYTH, A., STEWART, L. AND MASKILL, C.

**Year:** 1995

**Title:** Research Report: Perceptions of Drink-Driving and Alcohol-related Crashes in Rural Areas of New Zealand

**Keywords:** alcohol, crashes, driving, rural, drinking

**Abstract:** Describes a qualitative study of 59 interviews with key informants with an occupation/role or interest in alcohol-related crashes (e.g. police, health professionals) Interviews were conducted in ten rural communities about factors contributing to rural drinking driving crashes and strategies to reduce them.

**Workpackage No.:** 3

**Author:** BODE, HJ

**Year:** 1994

**Title:** Recent regulations on alcohol and other drugs in German criminal traffic law

**Journal/Book Name:** Blutalkohol

**Volume:** 31(3), 137-57

**ISBN/ISSN:** 0006-5250

**Keywords:** Alcohol Drinking AE/LJ ; Automobile Driving LJ ; English Abstract ; Ethanol PK ; Germany; Human ; Psychotropic Drugs /AE/PK ; Substance Abuse Detection LJ

**Abstract:** The article contains a compilation of decisions recently made by German criminal courts. These decisions regarded punishable offences due to driving vehicles under the influence of alcohol and other drugs. They also dealt with the assessment of respective criminal offences and their legal consequences (punishment and withdrawal of driving licences).

**Workpackage No.:** 1

**Author:** BODE, HJ

**Year:** 1994

**Title:** Alcohol related accidents and revoking the driving license for alcohol-induced traffic violations in Germany 1975-1993

**Journal/Book Name:** Blutalkohol

**Volume:** 31(6), 367-78

**ISBN/ISSN:** 0006-5250

**Keywords:** Accidents, Traffic; Adolescence; Adult; Aged; Alcohol Drinking Criminal Law; Cross-Sectional Studies; English Abstract; Female; Germany; Human; Licensur; Male ; Middle Age

**Abstract:** The Federal Office for Statistics and the Federal Office for Motor Vehicles made some statistics available on the development of accidents due to alcohol on German streets and the withdrawal of driving licences due to criminal offences involving drinking and driving in Germany from 1975 to 1993. These statistics are evaluated so that a connection between the accidents and the withdrawal of driving licences can be worked out. This evaluation showed that in the long run both the number of accidents caused by the influence of alcohol and the withdrawal of driving licences due to drinking and driving are failing in Germany.

**Workpackage No.: 1**

**Author:** BONTE, W

**Year:** 1992

**Title:** Measures against drunken driving in Germany

**Journal/Book Name:** Arukour Kenkyuto Yakubutsu Ison

**Volume:** 27 (1), 50-6

**ISBN/ISSN:** 0389-4118

**Keywords:** Accidents, Traffic PC ; Alcoholic Intoxication BL/DI ; Blood Chemical Analysis ; Breath Tests ; Ethanol BL ; Germany ; Human ; Punishment

**Abstract:** The German authorities tend to reinforce the combat against drunken driving. Three of the countermeasures will undergo changes. The usual blood tests will be replaced by breath tests in the near future. The legal BAC limit will be reduced. And the limit above which a BAC is thought to indicate deviant drinking behaviour will be lowered. The changes may be desirable. But at the same time they are associated with analytical problems which demand a critical discussion.

**Workpackage No.: 1**

**Author:** BORKENSTEIN, R.F.

**Year:** 1976

**Title:** Efficacy of law enforcement procedures concerning alcohol, drugs and driving

**Journal/Book Name:** Mod Probl Pharmacopsychiatry

**Volume:** 11, 1-10

**ISBN/ISSN:** 0077-0094

**Keywords:** accidents, traffic, Africa, alcoholic intoxication, Asia, Australia, Canada, Europe, human, legislation, substance related disorders, United States

**Abstract:** Fatality rates in automobile crashes vary widely from nation to nation. For instance, in 1970 Japan reported a rate of 11.4 and the United States 2.6. Finland stood about midway with 6.2 fatalities per 100 million vehicle kilometers 1970 (OECD, 1974). These rates reflect all fatal crash causes. The alcohol rates are quite imprecise for many nations but a comparison of the Finnish and United States figures reveals some interesting facts. The United States rate of alcohol involvement in highway deaths is about 50% (of a rate of 2.6). The Finnish rate of alcohol involvement is 27% (of a rate of 6.2). Thus the alcohol rate for Finland is about 1.7, and for the United States 1.3. These percentages provide a guide for enforcement officials. The higher the percentage, the higher the priority. Moreover, the role of traffic deaths in overall mortality is important. For instance, in Japan each year 25 traffic deaths occur in each 1 00,000 of population, while in the United Kingdom the figure is 13 (1970 figures; OECD, 1974). Another factor is available countermeasures. Safety features on cars, quality of roads, driver training, and cultural attitudes toward cars all contribute. Driver behavior controlled by law enforcement is a very important factor. There is evidence that enforcement of drunken driving laws is extremely lax even in those nations claiming vigorous programs. An enforcement program that will screen the corporate whole of the driving population on an optimal basis will identify those drivers whose drinking is a problem for treatment

ranging from punitive to therapeutic on the basis of their needs and at the same time bring about a general deterrence because of a perception of the high risk of being apprehended

**Workpackage No.:** 1

**Author:** BOST, R.O.

**Year:** 1988

**Title:** 3,4-Methylenedioxyamphetamine (MDMA) and other amphetamine derivatives

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 33, 2, 576-87

**ISBN/ISSN:** 0022-1198

**Keywords:** adult, alcoholic intoxication, amphetamines, automobile driving, case report, cause of death, chemistry, female, forensic medicine, human, male, street drugs, 3-4 Methylenedioxyamphetamine

**Abstract:** As various substances of abuse come under Drug Enforcement Administration (DEA) Schedule restrictions, slightly modified derivatives (designer drugs) replace them. A series of amphetamine derivatives are discussed in this presentation. Applicable analytical methods are presented. Details of cases handled by the office (hospital patients, driving while under the influence/driving under the influence of drugs [DWI/DUIDI, and medical examiner cases) are discussed.

**Workpackage No.:** 1

**Author:** BOWDLE, T.A., RADANT, A.D., COWLEY, D.S., KHARASCH, E.D., STRASSMAN, R.J. AND ROY-BYRNE, P.P.

**Year:** 1998

**Title:** Psychedelic effects of ketamine in healthy volunteers: relationship to steady-state plasma concentrations.

**Journal/Book Name:** Anesthesiology

**Volume:** 88:1 82-8

**Keywords:** ketamine; experimental

**Abstract:** BACKGROUND: Ketamine has been associated with a unique spectrum of subjective "psychedelic" effects in patients emerging from anesthesia. This study quantified these effects of ketamine and related them to steady-state plasma concentrations. METHODS: Ketamine or saline was administered in a single-blinded crossover protocol to 10 psychiatrically healthy volunteers using computer-assisted continuous infusion. A stepwise series of target plasma concentrations, 0, 50, 100, 150, and 200 ng/ml were maintained for 30 min each. After 20 min at each step, the volunteers completed a visual analog (VAS) rating of 13 symptom scales. Peripheral venous plasma ketamine concentrations were determined after 28 min at each step. One hour after discontinuation of the infusion, a psychological inventory, the hallucinogen rating scale, was completed. RESULTS: The relation of mean ketamine plasma concentrations to the target concentrations was highly linear, with a correlation coefficient of  $R = 0.997$  ( $P = 0.0027$ ). Ketamine produced dose-related psychedelic effects. The relation between steady-state ketamine plasma concentration and VAS scores was highly linear for all

VAS items, with linear regression coefficients ranging from  $R = 0.93$  to  $0.99$  ( $P < 0.024$  to  $P < 0.0005$ ). Hallucinogen rating scale scores were similar to those found in a previous study with psychedelic doses of N,N-dimethyltryptamine, an illicit LSD-25-like drug.

**CONCLUSIONS:** Subanesthetic doses of ketamine produce psychedelic effects in healthy volunteers. The relation between steady-state venous plasma ketamine concentrations and effects is highly linear between 50 and 200 ng/ml.

**Workpackage No.:** 2

**Author:** BRAUER, L.H., JOHANSON, C.E., SCHUSTER, C.R., ROTHMAN, R.B. AND DE WIT, H.

**Year:** 1996

**Title:** Evaluation of phentermine and fenfluramine, alone and in combination, in normal, healthy volunteers.

**Journal/Book Name:** Neuropsychopharmacology

**Volume:** 14:4 233-41

**Keywords:** phentermine

**Abstract:** Recent clinical reports indicate that combined administration of phentermine and fenfluramine may have useful effects in the treatment of drug abuse. The present study was designed to evaluate the subjective and mood-altering effects of these drugs, alone and in combination, in normal healthy volunteers. Seven male and five female volunteers participated in an eight-session, double-blind study in which each subject received each of the following drug conditions: d-amphetamine (10 and 20 mg), phentermine (30 mg), fenfluramine (40 and 80 mg), phentermine (30 mg) with fenfluramine (40 mg), phentermine (30 mg) with fenfluramine (80 mg), and placebo. Sessions were conducted in a laboratory setting two or three days a week. Subjects completed standardized self-report questionnaires and psychomotor tests before and at regular intervals after each drug administration. Phentermine produced effects that were similar to those of d-amphetamine, whereas fenfluramine produced different and apparently aversive effects (e.g., it increased measures of anxiety and confusion). Phentermine reduced the apparently aversive effects of fenfluramine when the two drugs were given together. These results suggest that the combination of phentermine and fenfluramine would have a low potential for abuse.

**Workpackage No.:** 2

**Author:** BRIELER, P. AND JANISCH, C.

**Year:** 1992/3

**Title:** Heroin substitution by methadone - implications for traffic safety

**Journal/Book Name:** Proceedings of the twelfth International Conference on Alcohol, Drugs and Traffic Safety - T'92, Cologne, Germany.

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** methadone, opiates, driving, impairment, argument, concentration, attentiveness, ability to react

**Abstract:** The authors comment on Klaus's argument that a person taking methadone must be describe as unsuitable to drive since methadone is also an opiate and the addict

can not be said to be over his/her addictive behaviour. The alternative argument is that methadone should be considered as a form of medication and that issues related to guilt, abstinence and renouncement of previous behaviour are not relevant to this argument. It is stated that there is insufficient research on the effects of methadone on driving performance. The arguments for and against driving while taking methadone are presented.

**Workpackage No.:** 1

**Author:** BRITISH MEDICAL ASSOCIATION.

**Year:** 1996

**Title:** Driving impairment through alcohol and other drugs

**Publisher:** Board of Science and Education

**Workpackage No.:** 1

**Author:** BROOKHUIS, K.A., LOUWERENS, J.W. AND O'HANLON, J.F.

**Year:** 1986

**Title:** EEG energy-density spectra and driving performance under the influence of some antidepressant drugs.

**Journal/Book Name:** In: 'Drugs and Driving', O'Hanlon, J.F. and de Gier, J.J. (Eds.) pp.213-220.

**Keywords:** antidepressants; eeg; experimental

**Workpackage No.:** 2

**Author:** BROOKHUIS, K.A., VOLKERTS, E.R.. AND O'HANLON, J.F.

**Year:** 1990

**Title:** Repeated dose effects of lormetazepam and flurazepam upon driving performance

**Journal/Book Name:** European Journal of Clinical Pharmacology

**Volume:** 39, 1, 83-7

**ISBN/ISSN:** 0031-6970

**Keywords:** adult, anti-anxiety agents, benzodiazepine, automobile driving, comparative study, double-blind method, female, flurazepam, human, lorazepam, male, psychomotor performance

**Abstract:** The residual effects of lormetazepam 1 mg and 2 mg in soft gelatine capsules on driving performance were assessed and compared to those of flurazepam 30 mg, which is also a powerful hypnotic, but possesses a far less favourable pharmacokinetic profile with a long-acting sedative metabolite. Driving performance was tested 10 to 11 h and 16 to 17 h post administration, after 2 days on placebo (baseline), and 2, 4 and 7 days of drug treatment (active), and after 1 and 3 days following the resumption of placebo (washout). The driving test consisted of operating an instrumented motor-vehicle over a 72 km highway circuit in light traffic. Flurazepam 30 mg significantly impaired the ability to control the lateral position of the vehicle compared to placebo baseline measurements. The degree of impairment was substantial in the female subjects and was greater in the morning than in the afternoon. Lormetazepam 1 mg showed no residual

effect on driving performance. Lonnetazepam 2 mg impaired driving performance to some extent on the following morning, 1 0 to 1 1 h post administration, but no residual effect was found in the afternoon. All drugs improved sleep quality and prolonged sleep duration to more or less the same extent.

**Workpackage No.:** 2

**Author:** BROOKHUIS, K.A., DE VRIES, G. AND DE WAARD, D.

**Year:** 1993

**Title:** Acute and subchronic effects of the H<sub>1</sub>-histamine receptor antagonist ebastine in 10, 20 and 30 mg dose, and triprolidine 10 mg on car driving performance

**Journal/Book Name:** British Journal of Clinical Pharmacology

**Volume:** 36, 1, 67-70

**ISBN/ISSN:** 0306-5251

**Keywords:** adult, automobile driving, butrophenones, comparative study, double-blind method, histamine, antagonists, human, male, piperidines, psychomotor performance, triprolidine

**Abstract:** 1. The effects of a new antihistamine, ebastine (1 0, 20 and 3 0 mg), on several parameters of driving performance in actual traffic were studied in 1 5 healthy male volunteers. Subjects were treated for 5 days, and their driving performance tested on day 1 and day 5. The study was double-blind, placebo controlled and included the antihistamine triprolidine (10 mg sustained release) as an active drug control. 2. General tolerability was good except in one case following the reference compound triprolidine. No significant changes in driving performance were found with the new antihistamine ebastine at any dosage, on day 1 or day 5. Triprolidine (1 0 mg) significantly increased both the amount of weaving and the delay in following speed manoeuvres of a leading car, compared with placebo. 3. The results suggest that ebastine in doses up to 30 mg may be relatively safe for use by those who drive motor vehicles while under medication. The results do not warrant such a conclusion for triprolidine 1 0 mg.

**Workpackage No.:** 2

**Author:** BROOKHUIS, K., DEWAARD, D. AND MULDER, B.

**Year:** 1994

**Title:** Measuring driving performance by car-following in traffic

**Journal/Book Name:** Ergonomics

**Volume:** 37, 3, 427-434

**Keywords:** driving performance, car-following, reaction time

**Abstract:** The measurement of impairing effects on driving performance by such external factors as alcohol, medicinal drugs, or mobile telephoning, etc., is extended with a new test. Most existing methods of measuring impairing effects in the actual driving environment have the drawback that, irrespective of high sensitivity, they measure driving skills that are involved in only a very low percentage of accident causes, i.e., accidents after motor-response or eye-hand co-ordination errors. Since in accident causation, attention and perception errors predominate over response errors, on-road studies should examine specifically deterioration in attention and perception. The ability

to follow a car in front, as measured by coherence and reaction time to speed variations, offers such a measure of attention and perception performance

**Workpackage No.:** 1

**Author:** BROOKOFF, D., COOK, C.S., WILLIAMS, C. AND MANN, C.S.

**Year:** 1994

**Title:** Testing reckless drivers for cocaine and marijuana

**Journal/Book Name:** New England Journal of Medicine

**Volume:** 331, 8, 518-522

**Keywords:** drug use, alcohol, abstinence, abusers, trauma

**Abstract:** Background. Driving under the influence of intoxicating drugs other than alcohol may be an important cause of traffic injuries. We used a rapid urine test to identify reckless drivers who were under the influence of cocaine or marijuana. Methods. We conducted a consecutive-sample study in Memphis, Tennessee, in the summer of 1993. Subjects arrested for reckless driving who were not apparently impaired by alcohol (did not have an odor of alcohol, tested negative on breath analysis, or both) were tested for cocaine and marijuana at the scene of arrest. The results of the drug tests were compared with clinical evaluations of intoxication made at the scene by a police officer. Results. A total of 175 subjects were stopped for reckless driving, and 150 (86 percent) submitted urine samples for drug testing at the scene of arrest. Eighty-eight of the 150 (59 percent) tested positive: 20 (13 percent) for cocaine, 50 (33 percent) for marijuana, and 18 (12 percent) for both drugs. Ninety-four of the 150 tested drivers were clinically considered to be intoxicated, and 80 of them (85 percent) tested positive for cocaine or marijuana. The intoxicated drivers had a broad range of affects and appearances. Nearly half the drivers intoxicated with cocaine performed normally on standard sobriety tests. Conclusions. Over half of the reckless drivers who were not intoxicated with alcohol were found to be intoxicated with other drugs. Toxicologic testing at the scene is a practical means of identifying drivers under the influence of drugs and is a useful adjunct to standard behavioral sobriety testing

**Workpackage No.:** 3

**Author:** BROWNLIE, A.

**Year:** 1975

**Title:** Drink, Drugs and Driving - A Survey

**Journal/Book Name:** Medical Legal Journal

**Volume:** 43, 4, 143-165

**Workpackage No.:** 1

**Author:** BUCHAN, B.J., WALSH, J.M. AND LEAVERTON. P.E.

**Year:** 1998

**Title:** Evaluation of the accuracy of on-site multi-analyte drug testing devices in the determination of the prevalence of illicit drugs in drivers

**Journal/Book Name:** Journal of Forensic Sciences



**Volume:** 43, 2, 395-399

**ISBN/ISSN:** 0022-1198

**Keywords:** forensic science, forensic toxicology, on-site-testing, drugs and driving, substance abuse, tetrahydrocannabinol, cocaine, opiates

**Abstract:** A principal goal of this research was to conduct a field evaluation of "on-site" multi-analyte drug testing devices to determine the most accurate, efficient, and cost effective device available for the purpose of rapidly detecting drivers under the influence of drugs. Four on-site kits were selected and evaluated for accuracy and efficiency for the detection of tetrahydrocannabinol (THC), the cocaine metabolites (COC), and opiates (OPI). From 16 December 1995 to 17 March 1996, 303 voluntary urine specimens were collected by law enforcement officers from persons arrested for driving-under-the-influence (DUI). These specimens were tested using the four selected kits and aliquots of the specimens were sent to a DHHS certified lab for "gold standard" comparison testing by immunoassay and Gas Chromatography/Mass Spectrometry. On-site kit sensitivity ranged from 82.9% to 100% for THC, 82.5% to 100% for COC, and all were at 100% for OPI. Specificity, and positive and negative predictive values were also determined. Accuracy ranged from 94.0% to 100% for OPA. All four kits were in very close agreement on prevalence: 15.5% to 15.8% for THC, all were at 13.2% for COC, and all were at 0.7% for OPI. For law enforcement purposes, sensitivity may be the most important indicator in these kits.

**Workpackage No.:** 4

**Author:** BUDD, R.D., MUTO, J.J. AND WONG, J.K.

**Year:** 1989

**Title:** Drugs of abuse found in fatally injured drivers in Los Angeles County

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 23, 153-158

**ISBN/ISSN:** 0376-8716

**Keywords:** blood, urine, fatally injured drivers, drugs, abused drugs, PCP, cocaine, opiates, marijuana

**Abstract:** Blood or urine specimens from nearly 600 fatally injured drivers in two Los Angeles County studies analyzed for the presence of alcohol and other drugs of abuse, including PCP, cocaine, opiates and marijuana. The results of the preliminary study indicate that 65 out of 102 fatally injured drivers had used alcohol and/or another drug of abuse - 34 had used alcohol only, 12 had used one or more other drug(s) of abuse, and 19 had used alcohol in combination with another drug of abuse. The results of the larger follow-up study, begun a year later, indicate a continued high level of both alcohol use (41.5%) and marijuana use (19%) with moderate cocaine usage (8%) and low levels (<2%) of barbiturates and PCP usage

**Workpackage No.:** 3

**Author:** BURNS, M. AND MOSKOWITZ, H.

**Year:** 1981

**Title:** Alcohol, marijuana and skills performance

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T80 8th International Conference. Sweden, Graphic Systems, Goteborg. Edited by L. Goldberg.  
**ISBN/ISSN:** 91-22-00425-4  
**Workpackage No.:** 1

**Author:** BURNS, M.

**Year:** 1987

**Title:** Characteristics of drivers arrested for driving under the influence of drugs

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam, Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 00 444 809031

**Keywords:** cannabis, PCP

**Workpackage No.:** 3

**Author:** BURNS, M. AND WILKINSON, C.

**Year:** 1992/3

**Title:** Screening for drug impairment with measurement of pupil ocular function

**Journal/Book Name:** Proceedings of the 12th International Conference on Alcohol, Drugs and Traffic Safety, Cologne.

**Volume:** 3, 1498-1505.

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** drug impairment, measurement, involuntary eye movements, pupil size, observations

**Abstract:** The authors suggest that the only truly feasible approach to the problem of measuring drug impairment is the measurement of involuntary responses which change predicably and reliably in the presence of drugs. The involuntary eye movements and changes in pupil size, which are associated with the presence of certain kinds of drugs, are widely associated with law enforcement. However, observations of the signs are subject to differences in the observer's skill and to the limits of an unaided eye. These limitations are generally not critical at high alcohol and drug levels which produce distinct eye signs. At lower levels, however, the signs are likely to be more subtle and difficult to detect. Unaided observations may not suffice to retain the utility of the signs.

**Workpackage No.:** 1

**Author:** BURNS, M.. AND ADLER, E.V.

**Year:** 1995/6

**Title:** Study of a drug recognition expert (DRE) program

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** Drug Influence Recognition (DIE)/ impairment/ driving/ drugs/ toxicological analysis/

**Abstract:** The Drug Influence valuation (DIE) is a systematic, standardized 12-step method. It yields information which is the basis for a DRE-trained officer's opinion (1) that a suspect is/is not impaired, (2) if impaired, that the impairment is/is not drug related, and (3) if drugs, that a specific drug category (or categories) is present. DIE records and toxicological analyses of urine and blood specimens from 500 suspected drug-impaired drivers were analyzed with data base software, which had been developed specifically for analysis of DRE data. The records were the 53-month work product of the Phoenix Police Dept. DRE unit. DRE opinions about suspect's drug impairment and identifications of drug categories were highly accurate. The Arizona Dept. of Public Safety Crime Laboratory reported finding 813 drugs in 416 specimens; 68 specimens contained no drug and 16 arrestees refused to provide a specimen. Officers identified at least one drug in 91% of the positive specimens. Specimen analysis confirmed or partially confirmed 83.5% of DRE drug identifications. It is concluded that the DRE program utilizes a valid method for detecting and classifying drug impairment.

**Workpackage No.:** 4

## C

**Author:** CALLEN, K

**Year:** 1983

**Title:** The secretary's Conference for Youth on Drinking and Driving; special report

**Journal/Book Name:** Public Health Report

**Volume:** 98(4), 336-43

**ISBN/ISSN:** 0033-3549

**Keywords:** Accidents, Traffic PC ; Adolescence ; Adolescent Behavior ; Adult ; Alcohol Drinking ; Dehavior Therapy MT ; Congresses; Female ; Human ; Male ; Peer Group ; Support, Non-U.s. Gov't ; United States

**Abstract:** Part of a Department of Health and Human Services initiative against teenage alcohol abuse, a national Conference for Youth on Drinking and Driving--held March 26-28, 1983 in Chevy Chase, Md. --brought together more than 300 high school student delegates and school superintendents from every State and Territory. The conference spotlighted successful programs that students around the country have undertaken to promote sober driving - programs that incorporate these key principles: (a) they rely almost soley on peer leadership "by students for students ; (b) they employ a "holistic approach to health promotion, emphasizing self-esteem and alternatives to alcohol and drug abuse; and (c) they use the resources of the whole community. Working with student leaders of these model programs, conference delegates devised ways to launch similar programs in their own schools and communities and to enlist help from parents, teachers, lawmakers, the media, and business and civic groups. The Department of Health and Human Services plans to hold similar conferences annually, to mobilize future generations of students against drunk driving.

**Workpackage No.:** 1

**Author:** CAMERON, TL

**Year:** 1982

**Title:** Drinking and driving among American youth: beliefs and behaviors

**Journal/Book Name:** Drug and Alcohol Dependence,

**Volume:** 10, 1, 1-33

**ISBN/ISSN:** 0376-8716

**Keywords:** Accidents, Traffic ; Adolescence ; Adolescent Behavior ; Adolescent Psychology ; Adult ; Alcohol Drining; Alcoholic Intoxication ; Attitude ; Automobile Driving ; Child ; Female ; Hostility ; Human ; Male ; Risk ; Social Alienation ; Support, U.S. Gov't, P.H.S. ; United States

**Abstract:** Data from research on traffic accident populations clearly indicate that a large proportion of accidents involve drivers under the age of twenty-five. Even after differential exposure to traffic accidents has been controlled for, young drivers remain over-redresented in both alcohol-related and non-alcohol-related traffic crashes. The relative risk of crash involvement begins to increase markedly among drivers at relatively

low blood alcohol concentrations. Data from general population surveys confirm these findings. When persons under 25 years of age are compared as a group with those 25 and older, a larger proportion of the young persons in the general population both approved of and reported that they engaged in drinking and driving behavior. However, the actual proportion of young persons in the general population who indicated that they had ever been arrested for driving while impaired, or that they had had a traffic accident as a result of drinking, was quite small. The somewhat limited data available on social, psychological and behavioral correlates of youthful drinking and driving problems indicate some association between feelings of rebellion hostility and alienation (as measured by attitudes toward parents, school, and society), and increased numbers of traffic violations and accidents.

**Workpackage No.:** 1

**Author:** CARY, P.L., JOHNSON, C.A., FOLTZ, R.L. AND PAPE, B.E.

**Year:** 1983

**Title:** Driving under the influence of phenobarbital

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 28, 2, 502-504

**Keywords:** DUI - driving under the influence, phenobarbital, toxicological analysis

**Abstract:** A driving under the influence (DUI) case with an unusually high phenobarbital concentration is presented. Significant toxicologic findings include a blood phenobarbital level of 132 mg/mL. Toxicology data relevant to interpretation are discussed.

**Workpackage No.:** 2

**Author:** CASSANI, M., DARE, N., GIULIANI, L. AND SESANA, F.

**Year:** 1997

**Title:** Experience with hair testing in the clinical biochemistry laboratory of Ca ' Granada Niguarda Hospital, Milan Italy

**Journal/Book Name:** Forensic Science International

**Volume:** 84, 1-3; 17, 17-24

**ISBN/ISSN:** 0379-0738

**Keywords:** biological markers, cocaine, hair, human, Italy, Laboratories, hospital, mass fragmentography, narcotics, radioimmunoassay, retrospective studies, sensistivity and specificity, substance abuse detection

**Abstract:** In our laboratory, analysis of human hair for drugs of abuse detection was first performed in 1980. In the last 10 years we have processed about 2000 subjects/year ('living subjects' only). In the last 3 years we have also introduced hair analysis of cocaine: at first only in clinical applications, but for the last 2 years this analysis is now routine. Our application of hair analysis includes: clinical toxicology, medico-legal and administrative agencies. Requests come for example from several Committees for Driving Licenses, Addiction Treatment Centers and Legal Authorities. Hair samples are currently collected from the occipital area at the back of the head, which appears to show less variability in hair growth rate. At present we perform hair analysis using highly

sensitive radioimmunoassay screening methods for the detection of parent drug and/or metabolises. All positive cases of cocaine and opiates abuse are confirmed by gas chromatography-mass spectrometry in electron impact or chemical ionization mode. Positive cases for opiates are also analysed using a specific morphine radioimmunoassay kit. Data show that, when the opiates/morphine ratio is higher than 6, we are dealing with consumption of codeine and/or dihydrocodeine. In our routine work last year there were 177 (263 samples) positive opiates subjects out of 2244 patients; positive cocaine subjects were 290 (362 samples) out of 2001 patients. Guidelines for hair analysis in Lombardia have been established based on the experience of our laboratory. Furthermore it will be possible to apply a unique protocol for all Committees for Driving Licenses, involving hair testing in addition to urine assay.

**Workpackage No.:** 4

**Author:** Chait, L.D.

**Year:** 1994

**Title:** Factors influencing the reinforcing and subjective effects of ephedrine in humans.

**Journal/Book Name:** Psychopharmacology

**Volume:** 113:3-4 381-7

**Keywords:** ephedrine

**Abstract:** There has been little study of the abuse liability of ephedrine, a naturally occurring drug used in medicine for thousands of years and currently sold as a "legal" stimulant. The present study measured the reinforcing and subjective effects of ephedrine in a group of 27 adults (18 females and 9 males) with no history of drug dependence.

**Workpackage No.:** 2

**Author:** CHAN, A.W.

**Year:** 1987

**Title:** Factors affecting the drinking driver

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 19, 2, 99-119

**ISBN/ISSN:** 0376-8716

**Keywords:** accidents, traffic, alcoholic intoxication, automobile driving, diazepam, ethanol, human, marijuana abuse, sex factors, substance related disorders

**Abstract:** Although the relationship between alcohol and traffic safety has been the subject of numerous studies, much remains unknown about the mechanisms by which alcohol contributes to traffic accidents. A number of other factors, which are reviewed in this paper, also can contribute to car accidents. They may also interact with alcohol, perhaps in a complex manner. Therefore, multiple factors rather than one single factor may contribute to automobile accidents for those who drink and drive.

**Workpackage No.:** 1

**Author:** CHAN, AW

**Year:** 1987

**Title:** Factors affecting the drinking driver

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 19(2), 99-119

**ISBN/ISSN:** 0376-8716

**Keywords:** Accidents, Traffic \*PC ; Alcoholic Intoxication \*; Automobile Driving\* ; Diazepam ; Ethanol \*ME ; Human ; Marijuana Abuse ; Sex Factors ; Substance-Related Disorders

**Abstract:** Although the relationship between alcohol and traffic safety has been the subject of numerous studies, much remains unknown about the mechanisms by which alcohol contributes to traffic accidents. A number of other factors, which are reviewed in this paper, also can contribute to car accidents. They may also interact with alcohol, perhaps in a complex manner. Therefore, multiple factors rather than one single factor may contribute to automobile accidents for those who drink and drive.

**Workpackage No.:** 1

**Author:** CHANG, G; ASTRACHAN, B; WEIL, U. AND BRYANT, K.

**Year:** 1992

**Title:** Reporting alcohol-impaired drivers: results from a national survey of emergency physicians.

**Journal/Book Name:** Annals of Emergency Medicine

**Volume:** 21(3), 284-90

**ISBN/ISSN:** 0196-0644

**Keywords:** Alcohol-impaired, drinking, attitude of health personnel, automobile driving, confidentiality, criminal law, data collection, discriminant analysis, emergency medicine, female, human, male, physician, population surveillance, questionnaires, societies, medical support, United States, U.S. Gov't

**Abstract:** **STUDY OBJECTIVE:** The purpose of this exploratory study was to learn of physicians' opinions on mandatory reporting of alcohol-impaired drivers they encounter in the course of their clinical work to the police or authorities from the Division of Motor Vehicles. **DESIGN AND PARTICIPANTS:** Two thousand four hundred sixty-four physicians randomly selected from the American College of Emergency Physicians were sent an anonymous, one-time only, self-administered questionnaire seeking demographic information and assessing attitudes toward mandatory reporting and alcohol treatment. **MEASUREMENTS AND MAIN RESULTS:** One thousand fifty-five physicians returned the survey. Seventy-eight percent of respondents agreed with mandatory reporting. More than half expressed strong agreement. Through canonical discriminant analysis we are able to identify the complex factors influencing attitude toward mandatory reporting. **CONCLUSION:** Although our preliminary results must be interpreted with caution, it appears that with the appropriate legal safeguards, physicians are supportive of mandatory reporting of the alcohol-impaired driver encountered in the course of clinical work.

**Workpackage No.:** 3

**Author:** CHAO, T.C; LO, D.S; BLOODWORTH, B.C. AND TAN-SIEW, W.F.

**Year:** 1992

**Title:** Drinking and driving in Singapore, 1987 to 1989

**Journal/Book Name:** Am J Forensic Med Pathol

**Volume:** 13 (3), 255-60

**ISBN/ISSN:** 0195-7910

**Keywords:** Accidents, Traffic MO/\*SN ; Adult ; Alcohol Drinking EP ; Alcoholic Intoxication DI/EP ; Automobile Driving SN ; Breath Tests ; Ethanol BL ; Human ; Male ; Middle Age ; Motorcycles ; Singapore EP ; Substance Abuse Detection

**Abstract:** Between 1987 and 1989 there were approximately 5,000 cases of fatal and injury-sustained road traffic accidents, of which 2.3-3.0% were alcohol related (blood alcohol levels greater than the legal limit of 80 mg% ethanol). The offenders of alcohol-related accidents are mostly Chinese (> 79%), male (> 98%), and more often 30-40 years old. The majority of the alcohol-related accidents (> 74%) took place between 8 P.M. and 4 A.M. in fine weather and light traffic. Rear-end, head-on, and side-on collisions comprised > 60% of all the alcohol-related accidents, and losing control of vehicles approximately 30%. Drunken driving cases for the same period that were not accidents showed a number of characteristics similar to those for accidents. In Singapore, motorcycle riders and pedestrians are more prone to road fatality than other road-user groups. International comparisons of road fatalities per 1 00,000 population gave Singapore one of the lowest accident rates (8.1-8.4) as compared with countries such as Australia, the United Kingdom, the United States, New Zealand, Canada, and Japan.

**Workpackage No.:** 3

**Author:** CHARLIER, C.AND PLOMTEUX, G.

**Year:** 1998

**Title:** Alcohol, drugs, medication and highway safety in Belgium.

**Journal/Book Name:** Rev Med Liege

**Volume:** 53, 1, 25-8

**ISBN/ISSN:** 0035-3663

**Keywords:** accidents, traffic, \*SN, adult, age factors, alcoholic intoxication, \*EP, anti-anxiety agents, benzodiazepine, automobile driving, Belgium, comparative study, drug interactions, drug therapy, marijuana smoking, middle age, opioid-related disorders, psychotropic drugs, substance related disorders, wounds and injuries

**Abstract:** The BTTS study (Belgian Toxicology and Trauma Study) was performed in Belgium between January 15th 1995 and June 15th 1996. The purpose was to investigate how frequently the drivers involved in road accidents were driving under the influence of-psyehotropic drugs. Two thousand fifty-three blood tests were performed of which 207 in the Li'ege region. The results obtained at the national level are compared to those obtained at the level of the Li'ege region. In both cases, the BTTS study allows the conclusion that a considerable proportion of drivers involved in road accidents resulting in significant traumatic consequences were driving under the influence of substances with psychotropic properties.

**Workpackage No.:** 3



**Author:** CHESHER, G.B., FRANKS, H.M., HENSLEY, V.R., HENSLEY, W.J., JACKSON, D.M., STARMER, G.A. AND TEO, R.K.C.

**Year:** 1976

**Title:** The interaction of ethanol and  $\Delta^9$  tetrahydrocannabinol in man: effects on perceptual, cognitive and motor functions

**Journal/Book Name:** Medical Journal of Australia

**Volume:** 2, 159-163

**Keywords:** tetrahydrocannabinol, ethanol, human, perceptual, cognitive, motor functions, performance

**Abstract:** Twelve paid student volunteers (8 male, 4 female) were used in a double-blind crossover experiment to investigate the effects of  $\Delta^9$  tetrahydrocannabinol (THC) alone, and in combination with ethanol, on human perceptual, cognitive and motor functions. Both THC (10 mg/70kg) and ethanol (0.54 g/kg) had little effect when administered alone. The combination of drugs, however, induced a significant decrement in performance in some of the tests and this interaction was considered to be at least additive. The peak blood ethanol concentration was higher ( $P=0.05$ ) when subjects received both ethanol and THC than when they received ethanol alone

**Workpackage No.:** 2

**Author:** CHESHER, G.B.

**Year:** 1985

**Title:** The influence of analgesic drugs in road crashes

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 17, 4, 303-309

**ISBN/ISSN:** 0001-4575/85

**Keywords:** analgesic drugs, alcohol, road crashes, traffic safety, heroin, methadone

**Abstract:** The involvement in road crashes of two classes of drug referred to as analgesics is discussed. Evidence for the effect on traffic safety of each drug group is examined in terms of their behavioural pharmacology and of the available epidemiological data. In the case of the antipyretic analgesics, such as aspirin, there is no evidence to suggest any causative involvement in road crashes. In view of the striking differences in the supply and manner of use of the legal and illegal narcotic analgesics, these are examined separately. The behavioural pharmacology of intravenously administered heroin suggests that any drug induced deficit in driving performance is not due to any effect on psychomotor function, but might be expected from the effect of the drug on mood states. Methadone, as used in treatment schedules for narcotic dependence produces no significant effect on measures of human skills performance. Epidemiological data are contradictory though the suggestion is that the involvement of the narcotic analgesic drugs in road crashes is unlikely to be a source of significant concern. A suggestion is made that a closer examination be undertaken of the involvement in road crashes of the more widely available narcotic drugs codeine and propoxyphene when they are taken together with alcohol

**Workpackage No.:** 3

**Author:** CHESHER, G.B.

**Year:** 1989

**Title:** Understanding the opioid analgesics and their effects on skills performance

**Journal/Book Name:** Alcohol, Drugs and Driving

**Volume:** 5, 111-38

**Keywords:** opioid analgesics, drugs, driving, road crashes, alcohol, human skills performance, mood states

**Abstract:** By far the greatest source of the available information on the effect of drugs on driving-related skills and of their role in road crashes has been obtained from the study of one drug, alcohol. In recent years there has been increasing concern about the possible involvement of drugs other than alcohol in road crashes. However, before approaching this question, it is important to realise that alcohol is unique amongst psychoactive drugs and the means available to the law enforcement officer to determine the degree of intoxication of an individual (e.g. by breathanalysis) are not necessarily applicable to other drugs. Similarly, the effects on driving-related skills of drugs other than alcohol are not necessarily the same as those exhibited by alcohol. This paper reviews the available evidence for the effects of opioid analgesics on human skills performance and on mood states. The pharmacological differences between alcohol and the opioid drugs are outlined to indicate the important areas of difference in their pharmacological effects.

**Workpackage No.:** 1

**Author:** CHESHER, G., LEMON, J., GOMEL, M. AND MURPHY, G.

**Year:** 1995/6

**Title:** Are the driving-related skills of clients in a methadone maintenance programme affected by methadone?

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005.

**Keywords:** methadone/ driving/ human skills performance/ opioids/ alcohol/ diazepam

**Abstract:** A study was undertaken to examine the effects of methadone, as used in the methadone maintenance program, on human performance skills which are related to those required to drive a motor vehicle with safety. The tests used for the study were chosen for their relevance to driving as well as for the distinctive properties of the opioids. The interaction between methadone and two other drugs commonly used by clients on a methadone program were also examined. These were (i) alcohol, to produce a mean blood alcohol concentration at peak of 0.064 g per 100 ml blood and (ii) a therapeutic dose of the benzodiazepine, diazepam (15 mg). The test battery proved to be sensitive to the effects of alcohol and diazepam at the doses used. There was however, no evidence for an effect of the acute dose of methadone on any of the experimental groups of clients on the methadone program. These results suggest that these clients enrolled on the methadone maintenance programme should not be considered as impaired in their ability to perform complex tasks such as driving a motor vehicle. Both alcohol and diazepam produced a significant decrement in the performance on the test battery by the

control groups and the stabilized methadone clients. However, there was no difference in the intensity of this effect between the groups. There was no evidence for an interaction between methadone and either alcohol or diazepam in the group of methadone clients stabilized on the program.

**Workpackage No.:** 2

**Author:** CHIANG, CN. AND HAWKS, RL

**Year:** 1986

**Title:** Implications of drug levels in body fluids: basic concepts.

**Journal/Book Name:** NIDA Research Monographs

**Volume:** 73, 62-83

**ISBN/ISSN:** 1046-9516

**Keywords:** Body Fluids\* AN; Human; Street Drugs\*AN/PD/PK; Substance-Related Disorders\*DI

**Abstract:** Drug concentrations in biological fluids are affected by the dose, route of administration, pattern of drug use, and the dispositional kinetics (distribution, metabolism, and excretion) of the drug. As most drugs are distributed to the site of action by blood, drug concentration measurement in this body fluids provides the best information as to the potential effect on behavior such as driving impairment or on psychological high. Due to wide individual variations in the pharmacokinetics and pharmacodynamics of drugs, however, the use of plasma drug concentrations for the estimation of impairment has not been established for most drugs. As for urinalysis, drug concentrations in the urine are further complicated by other factors such as urine flow and pH. Even if a specific method is used for the quantitation of a specific drug (the active species, not the inactive metabolite), interpretation in forensic samples to predict time of drug use or impairment is not possible, except within broad time periods, because of the variations in urine drug concentration as well as the limited knowledge available about the dose or the route of administration.

**Workpackage No.:** 1

**Author:** CHIN, R.L., SPORER, K.A., CULLISON, B., DYER, J.E. AND WU, T.D.

**Year:** 1998

**Title:** Clinical course of gamma-hydroxybutyrate overdose.

**Journal/Book Name:** Annals of Emergency Medicine

**Volume:** 31:6 716-22

**Abstract:** **STUDY OBJECTIVE:** To describe the clinical characteristics and course of gamma-hydroxybutyrate (GHB) overdose. **METHODS:** We assembled a retrospective series of all cases of GHB ingestion seen in an urban public-hospital emergency department and entered in a computerized database January 1993 through December 1996. From these cases we extracted demographic information, concurrent drug use, vital signs, Glasgow Coma Scale (GCS) score, laboratory values, and clinical course. **RESULTS:** Sixty-one (69%) of the 88 patients were male. The mean age was 28 years. Thirty-four cases (39%) involved coingestion of ethanol, and 25 (28%) involved coingestion of another drug, most commonly amphetamines. Twenty-five cases (28%)

had a GCS score of 3, and 28 (33%) had scores ranging from 4 through 8. The mean time to regained consciousness from initial presentation among nonintubated patients with an initial GCS of 13 or less was 146 minutes (range, 16-389). Twenty-two patients (31%) had an initial temperature of 35 degrees C or less. Thirty-two (36%) had asymptomatic bradycardia; in 29 of these cases, the initial GCS score was 8 or less. Ten patients (11%) presented with hypotension (systolic blood pressure < or = 90 mm Hg); 6 of these patients also demonstrated concurrent bradycardia. Arterial blood gases were measured in 30 patients; 21 had a PCO<sub>2</sub> of 45 or greater, with pH ranging from 7.24 to 7.34, consistent with mild acute respiratory acidosis. Twenty-six patients (30%) had an episode of emesis; in 22 of these cases, the initial GCS was 8 or less. **CONCLUSION:** In our study population, patients who overdosed on GHB presented with a markedly decreased level of consciousness. Coingestion of ethanol or other drugs is common, as are bradycardia, hypothermia, respiratory acidosis, and emesis. Hypotension occurs occasionally. Patients typically regain consciousness spontaneously within 5 hours of the ingestion

**Workpackage No.:** 3

**Author:** CHRISTENSEN, L.Q., NIELSEN, L.M. AND NIELSEN, S, L.

**Year:** 1990

**Title:** Traffic accidents and drivers suspected for drug influence

**Journal/Book Name:** Forensic Science International

**Volume:** 45, 273-280

**ISBN/ISSN:** 0379-0738/90

**Keywords:** traffic accidents, antidepressives, barbiturates, opioids, benzodiazepines, narcotics

**Abstract:** All records from the Danish Medicological Council concerning drivers suspected for drug influence were examined for the 5 year period 1981-1985. 461 records were included, 62 women and 399 men. In 250 cases drugs from more than one of ten groups had been taken thus making 786 combinations of drug/driving. The major drug group was benzodiazepines, accounting for 65% of all drug intake. Opioids also contributed substantially, found in 38% of cases. A traffic accident had occurred in 180 (39%) of the records. Drivers who had been taking antidepressives were involved in an accident in 67%, significantly above the mean. For benzodiazepines, the corresponding percentage was 43%, while for opioids it was only 23%, significantly below the mean. This striking difference has been demonstrated in most of the studies concerning drugs in traffic. It may support the hypothesis that opioids do not necessarily make driving dangerous, as do antidepressives, barbiturates and especially benzodiazepines.

**Workpackage No.:** 3

**Author:** CHRISTENSEN, L.Q., NIELSEN, L.M. AND NIELSEN, S.L.

**Year:** 1990

**Title:** Traffic accidents and drivers suspected of driving under the influence

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety

**Volume:** 45, 3, 273-280

**Keywords:** benzodiazepines, opioids, anti-depressives, drugs, driving, accidents

**Abstract:** All records from the Danish Medicolegal Council concerning drivers suspected for drug influences were examined for the 5 year period 1981-1985, 461 records were included, 62 women and 399 men. In 250 cases drugs from more than one of ten groups had been taken thus making 786 combinations of drug/driving. The major group was benzodiazepines, accounting for 65% all drug intake. Opioids also contributed substantially, found in 38% of the cases. A traffic accident had occurred in 180 (39%) of the records. Drivers who had been taking antidepressives were involved in an accident in 67%, significantly above the mean. For benzodiazepines, the corresponding percentage was 43 per cent, while for opioids it was only 23 per cent, significantly below the mean. This striking difference has been demonstrated in most of the studies concerning drugs in traffic. It may support the hypothesis that opioids do not necessarily make driving dangerous, as do antidepressives, barbiturates and especially benzodiazepines

**Workpackage No.:** 3

**Author:** CHRISTOPHERSEN, A.S., GJERDE, H., BJORNEBOE, A., SAKSHAUG, J. AND MORLAND, J.

**Year:** 1990

**Title:** Screening for drug use among Norwegian drivers suspected of driving under the influence of alcohol or drugs

**Journal/Book Name:** Forensic Science International

**Volume:** 45, 1-2, , 5-14

**ISBN/ISSN:** 0379-0738

**Keywords:** adolescence, adult, age factors, alcoholic intervention, amphetamine, automobile driving, benzodiazepines, cannabinoids, cocaine, ethanol, female, human, male, Norway, sex factors, substance related disorders, tetrahydrocannabinol

**Abstract:** Two hundred and seventy blood samples selected at random from Norwegian drivers apprehended on the suspicion of drunken or drugged driving were screened for the presence of amphetamine, benzodiazepines, cannabinoids, tetrahydrocannabinol (THC) and cocaine. Of the samples tested, 223 were from drivers suspected of driving under the influence of alcohol only (A-cases). In the rest (n = 47) of the cases, the police also suspected drugs as a possible reason for driving impairment (D-cases). In the A-cases, benzodiazepines were found in 17%, cannabinoids in 26%, THC in 13% and amphetamine in 2% of the blood samples. One or more drugs besides ethanol were found in 38% of the A-samples. In the D-cases, benzodiazepines were found in 53%, cannabinoids in 43%, TUC in 43%, amphetamine in 13% and 77% of these samples contained one or more drugs. Cocaine was not detected in any sample. Blood alcohol concentrations (BAC) above the legal limit of 0.05% were found in 80% of the drug positive A-cases and in 28% of the drug positive D-cases. The frequency of drug detection in A-samples was similar (40%) in samples with BAC above and below 0.05%, while this frequency was much higher (above 90%) in D-samples with BAC below 0.05% than in D-samples with BAC above 0.05% (53%). Benzodiazepines were most frequently found among drivers above 25 years of age, while cannabinoids were most frequently found among drivers below 35 years. For about 15-20% of the A-cases with BAC below 0.05%, other drugs were detected at concentrations which may cause driving

impairment. It was concluded that analysis of alcohol only might often be insufficient in A-cases to reveal driving impairment.

**Workpackage No.:** 3

**Author:** CHRISTOPHERSEN, A.S. AND MORLAND, J.

**Year:** 1990

**Title:** The influence and use of drugs other than alcohol among drivers

**Journal/Book Name:** Tidsskr Nor MLaegeforen

**Volume:** 110, 9, 1103-5

**ISBN/ISSN:** 0029-2001

**Keywords:** alcohol drinking, automobile driving, drug interactions, english abstract, human, Norway, substance abuse detection

**Abstract:** During the last few years, the National Institute of Forensic Toxicology has recorded an increasing number of cases of impaired driving due to drugs other than alcohol. Screening for drug use among drivers who are suspected of drunken driving only have also shown high frequencies of drug positive blood samples, indicating that a large number of drugged drivers are not discovered. Our results also show that the combined influence of both alcohol and drugs is common. Several new regulations were passed by the Norwegian Parliament in 1988 pursuant to the Norwegian Road Traffic Act. These new regulations include differentiation of sentences depending on blood alcohol concentration, introduction of evidential breath alcohol analysis and reduced use of clinical examination. The article discusses today's procedures for handling cases of suspected impairment by drugs. It is concluded that several problems will arise when dealing with cases of combined alcohol and drug impairment in accordance with the new Road Traffic Act, and that the introduction of evidential breath alcohol analysis and reduced use of clinical examination will make it more difficult to detect drugged drivers, particularly when they are also influenced by alcohol.

**Workpackage No.:** 1

**Author:** CHRISTOPHERSEN, A.S., BEYLICH, K.M., BJÆRNEBOE, A., FOSSER, S., GLAD, A. AND MÆRLAND, J.

**Year:** 1995/6

**Title:** Prevalence of alcohol and drugs in blood samples from Norwegian drivers involved in road traffic accidents

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** alcohol/ drugs/ road accidents/non-fatal/ blood samples/ benzodiazepines/ cannabis/ opiates/ amphetamine

**Abstract:** The prevalence of alcohol and drugs in blood samples from drivers involved in non-fatal accidents (n=394) has been investigated. In 62,9% (n=248) of the blood samples, alcohol was found either alone or together with drugs, in 24,1% (n=95) of the cases drugs were found alone or with alcohol, and 11,2% (n=44) of the samples contained both alcohol and drugs. The most prevalent drugs were benzodiazepines (13,7%),

cannabis (7,5%), opiates (4,3%) and amphetamine (4,1%). In about 3/4 of the drug positive samples the concentration was so high that it was considered likely or very likely that the driver was influenced by drug(s). The bias due to the police's inability to detect all drivers influenced by drugs was estimated. With bias correction it was estimated that at least 2,7% of the drivers involved in injury accidents will have significant concentrations of drugs in blood, and at least 4,4% will have significant blood alcohol concentrations. As for other comparable studies, our results showed that the accident risk increases rapidly with increasing blood alcohol concentration (BAC). The prevalence of high dose use of benzodiazepines, use of cannabis and amphetamine among drivers was estimated. Comparing these estimates with the results from our study, showed that drivers who use cannabis, amphetamine or high doses of benzodiazepines run a considerable risk of being involved in an injury accident, comparable to BAC levels of 0,1 - 0,15%.

**Workpackage No.:** 3

**Author:** CHRISTOPHERSEN, A.S. AND MORLAND, J.

**Year:** 1997

**Title:** Drugged driving: a review based on the experience in Norway

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 47, 125-135

**ISBN/ISSN:** 0376-8716

**Keywords:** fatally injured, gas chromatography, alcohol, benzodiazepines, diazepam, driving, performance, drugs

**Abstract:** Since 1959, the Norwegian Road Traffic Act has prohibited driving under the influence of drugs other than alcohol. On suspicion, the police request a clinical examination from any driver, as well as blood analyses for illegal and prescribed drugs affecting driving performance. During the last few years, there has been a marked increase in the number of drivers suspected of being influenced by drugs (1983, n = 900; 1995, n = 3329). The most commonly detected drugs are tetrahydrocannabinol, amphetamine, benzodiazepines and opiates. Multi-drug use is frequently found (> 60%). The occurrence of amphetamine (1991, n = 216; 1995, n = 937) and heroin (1991, n = 19; 1995, n = 172) has increased considerably. The frequency of drugged drivers apprehended in roadside traffic appears to be at least countries. This is probably mainly due to differences between national road traffic acts and the level of attention to the problem, and not to national differences in the prevalence of drugged driving.

**Workpackage No.:** 3

**Author:** CHRISTOPHERSON, A.S., BEYLICH, K.M., BJORENBOE, A., SKURTVEIT, S. ET AL.

**Year:** 1996

**Title:** Recidivism among drunken and drugged drivers in Norway

**Journal/Book Name:** Alcohol and Alcoholism

**Volume:** 31(6), 609-611

**Keywords:** driving/ alcohol/driving-under-the-influence/drugs/recidivism/adulthood/blood-alcohol-concentration/longitudinal studies

**Abstract:** Examined the prevalence of re-arrest among drunken drivers in relation to different blood alcohol concentrations (BACs) at the time of the offences. Re-arrest rates for 2,400 Norwegian drivers apprehended on the suspicion of driving under the influence of alcohol or other drugs were followed over an 11-yr period. Overall, 38-45% of the Ss were re-arrested for similar driving offences, with re-arrest rates generally increasing with increasing BAC. The authors conclude that drivers with high re-arrest rates have a careless attitude to the Road Traffic Act and require different treatment and follow-up programs.

**Workpackage No.:** 3

**Author:** CIMBURA, G., WARREN., R.A., BENNETT, R., ET AL

**Year:** 1980

**Title:** Drugs detected in fatally injured drivers and pedestrians in the province of Ontario

**Journal/Book Name:** Traffic Injury Research Foundation of Canada

**Keywords:** fatally injured, driving, alcohol, drugs, cannabis, benzodiazepines

**Abstract:** Study on 484 fatally injured drivers and pedestrians.

\* 55% alcohol positive

\* 26% drug positive

\* cannabis most frequent drug (12%)

\* benzodiazepines (3%)

**Workpackage No.:** 3

**Author:** CIMBURA, G., LUCAS, D.M., BENNETT, R.C., WARREN, R.A. AND SIMPSON, H.M.

**Year:** 1982

**Title:** Incidence and toxicological aspects of drugs detected in 484 fatally injured drivers and pedestrians in Ontario

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 27, 4, 855-867

**ISBN/ISSN:** 0022-1198

**Keywords:** toxicology, drugs, alcohol, driving, traffic safety

**Abstract:** Results are presented of a comprehensive drug study carried out on specimens from drivers and pedestrians fatally injured in Ontario. Toxicological analyses were regularly performed on blood and urine and occasionally on vitreous humor, stomach contents, and liver. The analytical procedures could detect and quantitate a wide variety of drugs including such illicit drugs as Cannabis. With respect to drivers, alcohol was found in 57% of the study sample and drugs other than alcohol, in 26%. However, in only 9.5% of the drivers were psychoactive drugs (other than alcohol) detected in the blood in concentrations that may adversely affect driving skills. Delta-9-Tetrahydrocannabinol and diazepam accounted for a majority of the findings in this category.

**Workpackage No.:** 3



**Author:** CIMBURA, G., LUCAS, D.M., BENNETT, R.C. AND DONELSON, A.C.

**Year:** 1990

**Title:** Incidence and toxicological aspects of cannabis and ethanol detected in 1394 fatally injured drivers and pedestrians in Ontario (1982-1984)

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 35, 5, 1035-41

**ISBN/ISSN:** 0022-1198

**Keywords:** accidents, traffic, adolescence, adult, age factors, automobile driving, chromatography, gas, ethanol, female, human, male, mass fragmentography, middle age, Ontario, radioimmunoassay, sex factors, support, non U.S. Gov't, tetrahydrocannabinol, walking

**Abstract:** A comprehensive epidemiological study of the involvement of cannabis and ethanol in motor vehicle fatalities in the Province of Ontario, Canada, is described. The study is based on toxicological analyses of blood and, when available, urine specimens. Ethanol was determined by headspace gas chromatography (GC). For cannabis, the methods employed were radioimmunoassays (RIAs) for screening and gas chromatography/mass spectrometry (GC/MS) for the determination of delta-9-tetrahydrocannabinol (THC) in blood. The study sample consisted of 1169 drivers and 225 pedestrians. THC was detected in the blood of 127 driver victims (10.9%) in concentrations ranging from 0.2 to 37 ng/mL, with a mean of 3.1  $\pm$  5.0 ng/mL. Ethanol was found in 667 driver victims (57.1%), in concentrations ranging from 9 to 441 mg/100 mL, with a mean of 165.8  $\pm$  79.5 mg/100 mL. For pedestrians, the incidence of THC and ethanol in the blood was 7.6 and 53.3%, respectively. The incidence of THC in the driver victims in this study constitutes an approximately threefold increase over the results of an Ontario study completed in 1979. At least a part of the increase may be attributed to interstudy differences in analytical methodology for cannabinoids.

**Workpackage No.:** 3

**Author:** CIRIMELE, V., KINTZ, P. AND MANGIN, P.

**Year:** 1996

**Title:** Detection and quantification of lorazepam in human hair by GC-MS/NCI in a case of traffic accident

**Journal/Book Name:** International Journal of Legal Medicine

**Volume:** 108, 5, 265-7

**ISBN/ISSN:** 0937-9827

**Keywords:** accidents, traffic, anti-anxiety agents, benzodiazepines, dose-response relationship, lorazepam, drug, hair, mass fragmentography

**Abstract:** A traffic accident caused by a man who declared that he was driving under influence of drugs (Temesta), led our laboratory to develop a procedure for the detection and the quantification of lorazepam in human hair. The method involves decontamination of hair with dichloromethane, incubation in Soerensen buffer (pH 7.6) in the presence of lorazepam-d<sub>4</sub>, liquid-liquid extraction with diethylether-chloroform (80:20, v/v) at pH 8.4, derivatization by silylation and detection by GC-MS/NCI. The increasing concentrations of lorazepam from the end to the roots of a 16-cm-long hair strand (i.e. 31

pglmg, 40 pg/mg and 49 pglmg) proved that the driver had taken the drug over a long period of time.

**Workpackage No.:** 4

**Author:** CLARSON, P.M. AND THOMPSON, H.S.

**Year:** 1997

**Title:** Drugs and sport. Research findings and limitations.

**Journal/Book Name:** Sports Medicine

**Volume:** 24:6 366-84

**Abstract:** Many types of drugs are used by athletes to improve performance. This paper reviews the literature on 3 categories of drugs: those that enhance performance as stimulants (amphetamines, ephedrine, and cocaine), those that are used to reduce tremor and heart rate (beta-blockers) and those involved in bodyweight gain or loss (anabolic-androgenic steroids, growth hormone, beta 2-agonists, and diuretics). Limitations of research on these drugs as they relate to performance enhancement are also discussed.

**Workpackage No.:** 3

**Author:** C.M.A. EDITORIAL

**Year:** 1972

**Title:** Cannabis and driving skills

**Journal/Book Name:** Canadian Medical Association Journal

**Volume:** 107, 269-271.

**Workpackage No.:** 1

**Author:** COHEN, AF; POSNER, J; ASHBY, L; SMITH, R. AND PECK, AW

**Year:** 1984

**Title:** A comparison of methods for assessing the sedative effects of diphenhydramine on skills related to car driving.

**Journal/Book Name:** European Journal of Clinical Pharmacology

**Volume:** 27(4), 477-82

**ISBN/ISSN:** 0031-6870

**Keywords:** Adult; Automobile Driving \*; Comparative Study; Diphenhydramine\*PD; Female; Human; Hypnotics and Sedatives\*; Male; Posture DE; Psychomotor Performance\*DE; Reaction Time DE; Time Factors; Visual Acuity DE

**Abstract:** A double blind cross-over study was performed to compare the sensitivity of road driving with that of laboratory tests of driving-related skills to drug induced sedation. Twelve experienced drivers (6 M, 6 F) received single oral doses of the HI - antagonist diphenhydramine 25, 50 and 100 mg and placebo. Each treatment was administered on 2 separate occasions, once in the driving school when real driving skills were assessed and again in the laboratory when performance of an adaptive tracking task, body sway and visual reaction were measured. On all occasions subjects assessed their own performance and alertness/sedation using visual analogue scales. Data were subjected to analysis of variance and differences assessed by Newman Keul's test.

Diphenhydramine failed to impair driving performance at any dose while all doses produced significant changes in each of the 3 laboratory tests. Subjects rated themselves sedated after all 3 doses of active drug in the laboratory but only after the 100 mg dose in the driving school. Tests performed in the psychopharmacology laboratory appear to be more sensitive to the sedative effects of diphenhydramine than tests of road driving. The implications are discussed.

**Workpackage No.:** 2

**Author:** COMPTON, R., SHINAR, D. AND SCHECHTMAN, E.

**Title:** Drug effects on ocular behavior

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety

**Volume:** 2, 519-526

**ISBN/ISSN:** 2-9511746-0-8

**Keywords:** drugs, fitness impairment tester, codeine, alprazolam, d-amphetamine, cannabis, ocular performance, drug users

**Abstract:** Ocular behavior measures were measured with a prototype device, the Fitness Impairment Tester (FIT), following ingestion of four different drugs: codeine (a narcotic analgesic), alprazolam (a CNS depressant), d-amphetamine (a CNS stimulant), and cannabis. The FIT provides 100 measures of ocular performance that are derived from tests requiring saccadic eye movements in response to a 'jumping' target, smooth tracking movements in response to smoothly moving target, steady fixations (vs nystagmus) in response to targets appearing in the peripheral field, pupil dilation and constriction in response to changes in background luminance, and convergence of the two eyes in response to a target moving towards the observer. The present study analyzed the data obtained from a sample of self-proclaimed drug users after administrations of placebo, low, and high dosage levels of the four different drugs, and compared their performance to non-dosed normal subjects. The sensitivity and specificity of the over 100 ocular measures were assessed in terms of their ability to distinguish the presence of drugs (a) relative to placebo, and (b) relative to the ocular performance of the normal (non-drug using) population. Using logistic regressions, it was possible to distinguish between drug dosed and placebo dosed regular drug users, and between drug dosed regular users and normal subjects at above chance levels relative to two drugs: alprazolam and cannabis. Examination of the specific tests that entered the logistic regression indicates that (1) most measures are not sensitive to the drug impairments studied, (2) the tests and measures that are, are not the ones predicted from the literature review.

**Workpackage No.:** 4

**Author:** CONIGRAVE, K.M. AND CARSELDINE, D.A

**Year:** 1996

**Title:** The New South Wales Driver Assessment Programme: A pilot programme for assessment of drink drivers

**Journal/Book Name:** Drug and Alcohol Review

**Volume:** 15(4), 369-376

**Keywords:** driving-under-the-influence, drug usage screening, government programs

**Abstract:** The New South Wales Driver Assessment Program operated in Sydney from 1991-1994 as a pilot scheme for the medical assessment of 18-83 yr old drink driver offenders. In this report, the authors describe its functioning and characterize its 2,267 participants. Offenders who had been convicted of driving with a blood alcohol concentration of 0.15 g/dL or more, or of refusing a breath test were referred to 1 of 5 Driver Assessment Clinics in Sydney. Medical assessment was mandatory before the driver's license could be renewed. Of the 2,267 offenders referred to the Program, 922 (41%) attended an assessment during the operation of the scheme, with non-attenders having longer disqualification periods than attenders. Among attenders, 691 (75%) were judged fit to drive (i.e. "passed"). There was no significant variation in pass rate between centers. Of the 112 offenders who had laboratory results available from both 1st and 2nd assessments, 68 (61%) showed a significant reduction in gamma glutamyltransferase (GGT) levels. It is concluded that there was evidence of health benefit from the Program in the fall in GGT levels in 61% repeat attenders.

**Workpackage No.:** 3

**Author:** CONSENSUS DEVELOPMENT PANEL

**Year:** 1985

**Title:** Consensus report. Drug concentrations and driving impairment.

**Journal/Book Name:** Journal of the American Medical Association

**Volume:** 254(18), 2618-21

**ISBN/ISSN:** 0098-7484

**Keywords:** Alcohol Drinking\*; Alcoholic Intoxication DI; Automobile Driving\*; Drug Teraphy\* AE; Ethanol BL; Human; National Institutes of Health (U.S.); Pharmaceutical Preparations ME; Substance-Related Disorders\*DI; United States

**Abstract:** Most drugs that affect the central nervous system have the potential to impair driving ability. For many years, alcohol (ethanol) has been the drug of greatest concern, since it is, by far, the most frequently recognized cause of drug-impaired driving. Yet as more therapeutic agents, such as benzodiazepines, are introduced and widely used, and as social use of unsanctioned drugs such as cannabis (marijuana) increases, attention must be directed toward other drugs. The National Institute on Drug Abuse sponsored a conference on drugs and driving in Durham, NC, in October 1983. The objective was to reach a consensus on several key issues associated with the current state of knowledge about the relationship between body fluid concentrations of drugs and their phannaeologically active metabolises and degree of driving impairment. It was also of interest to ascertain whether a sufficient body of knowledge exists for an expert to form an opinion, which will meet the applicable standards of proof for legal proceedings, that a person's driving ability was impaired based on body fluid concentrations of a drug. The consensus panel, representing the disciplines of clinical pharmacology, analytical and forensic toxicology, law, and forensic medicine agreed on answers to the following questions: Is ethanol a good model for other drugs? What drugs might have a potential for impairing a driver? How is driving impairment measured? What is known about correlations between driving impairment and drug concentrations? Could "per se concentrations be established for drugs other than alcohol? Can impairment be established from body fluid concentrations?

**Workpackage No.: 1**

**Author:** COOPER, W.E. SCHWAR, T.G., AND SMITH, L.S.

**Year:** 1979

**Title:** Alcohol, Drugs and Road Traffic (Book)

**Publisher:** Juta Co. Capetown, South Africa

**Keywords:** offences, alcohol, drugs, alcohol activity, performance, breath/urine analysis, deceased persons, analysis

**Abstract:** This book is divided into two parts. Part One concerns itself with driving under the influence and kindred offenses and Part Two with alcohol and drugs. The latter is a review of updated general and specific information on various aspects of alcohol activity including absorption, distribution, metabolism, elimination, effect, clinical examination, blood sampling, methods of analysis, levels and circulations of blood alcohol, urine and breath alcohol determinations, alcohol in deceased persons, performance under the influence, drugs and driving, and other intoxicants. The material is international in scope.

**Workpackage No.: 1**

**Author:** COSBEY, S.H.

**Year:** 1986

**Title:** Drugs and the impaired driver in Northern Ireland: An analytical survey

**Journal/Book Name:** Forensic Science International

**Volume:** 32, 245-258

**ISBN/ISSN:** 0379-0738/86

**Keywords:** drugs, driving, high performance liquid chromatography, benzodiazepines

**Abstract:** The techniques used to analyse 212 "under-the-limit" drink-driving blood and urine specimens for drugs during a 3-year period (1982-85) in Northern Ireland are described. In all of these specimens (representing 15% of all below-limit cases) either the police surgeon who carried out the clinical examination, or the police, strongly suspected that drugs may have been a contributory factor in driving impairment, considering the lower than expected alcohol concentration. Thirty eight (18%) samples were found to contain significant drug(s). Benzodiazepines were the most frequently encountered group of drugs (87% of all positive cases). The analytical procedures were radioimmunoassay, gas chromatography using nitrogen selective and electron capture detection along with high performance liquid chromatography (HPLC) using ultra-violet detection. Drugs and their metabolites were identified using a mixture of these techniques along with GC/MS where possible. The usefulness of HPLC coupled with a rapid scanning diode-array spectrophotometer is also demonstrated, the technique being particularly useful in the analysis of some of the more "difficult" benzodiazepines (e.g. lorazepam, tamazepam, nitrazepam) not directly amenable to gas chromatography without derivatisation.

**Workpackage No.: 3**

**Author:** COSBEY, S.H

**Year:** 1986

**Title:** Drugs and the impaired driver in Northern Ireland: an analytical survey.

**Journal/Book Name:** Forensic Science International

**Volume:** 32(4), 245-58

**ISBN/ISSN:** 0379-0738

**Keywords:** Benzodiazepines, Radioimmunoassay, Chromatography, Spectrophotometer, barbiturates, automobile driving, high pressure liquid, human, Northern Ireland, substance related disorders

**Abstract:** The techniques used to analyse 212 "under-the-limit drink-driving blood and urine specimens for drugs during a 3-year period (1 982-85) in Northern Ireland are described. In all of these specimens (representing 15% of all below-limit cases) either the police surgeon who carried out the clinical examination, or the police, strongly suspected that drugs may have been a contributory factor in driving impairment, considering the lower than expected alcohol concentration. Thirty-eight (1 8%) samples were found to contain significant drug(s). Benzodiazepines were the most frequently encountered group of drugs (87% of all positive cases) with diazepam being that most frequently encountered (1 8 cases). The analytical procedures were radioimmunoassay, gas chromatography using nitrogen selective and electron capture detection along with high performance liquid chromatography (UPLC) using ultra-violet detection. Drugs and their metabolises were identified using a mixture of these techniques along with GCIMS where possible. The usefulness of HPLC coupled with a rapid-scanning diode-array spectrophotometer is also demonstrated, the technique being particularly useful in the analysis of some of the more "difficult benzodiazepines (e.g. lorazepam, temazepam, nitrazepam) not directly amenable to gas chromatography without derivatisation.

**Workpackage No.:** 3

**Author:** COSGROVE, J. AND NEWELL, T.G.

**Year:** 1991

**Title:** Recovery of neuropsychological functions during reduction in use of phencyclidine.

**Journal/Book Name:** Journal of Clinical Psychology

**Volume:** 47:1 159-69

**Keywords:** pcp

**Abstract:** A battery of 12 neuropsychological tests were administered on two occasions to 15 chronic PCP users who reduced or eliminated use of PCP over a 4-week period.

**Workpackage No.:** 2

**Author:** CRANCER, A. JR., DILLE, J.M., DELAY, J.C., WALLACE, J.E. AND HAYKIN, M.D.

**Year:** 1969

**Title:** Comparison of the effects of marijuana and alcohol on simulated driving performance

**Journal/Book Name:** Science

**Volume:** 164, 881, 851-4

**ISBN/ISSN:** 0036-8075

**Keywords:** drugs, marijuana, simulated driving performance, alcohol, comparison, no treatment

**Abstract:** The effects of marijuana, alcohol, and no treatment on simulated driving performance were determined for experienced marijuana smokers. Subjects experiencing a "social marijuana high" accumulated significantly more speedometer errors than when under control conditions, whereas there was no significant differences in accelerator, brake, signal, steering, and total errors. The same subjects intoxicated from alcohol accumulated significantly more accelerator, brake, signal, speedometer, and total errors than under normal conditions, whereas there was no significant difference in steering errors. Impairment in simulated driving performance does not seem to be a function of increased marijuana dosage or inexperience with drugs.

**Workpackage No.:** 2

**Author:** CRANDON, L.

**Year:** 1997

**Title:** Signs of Drugs

**Journal/Book Name:** Police Review

**Volume:** 19 September

**Keywords:** drugs, traffic police, driving, drug recognition

**Abstract:** Describes the work of two Strathclyde traffic police officers (acting Inspector Paul Fleming and Sgt David Stewart). The research, funded by the Home Office, analyses how training in drug symptom recognition for police officers and police casualty surgeons can be improved. (They have conducted a force-wide assessment survey).

**Workpackage No.:** 4

**Author:** CREIGHTON, F.J., BLACK, D.L. AND HYDE, C.E.

**Year:** 1991

**Title:** 'Ecstasy' psychosis and flashbacks.

**Journal/Book Name:** British Journal of Psychiatry

**Volume:** 159, 713-715.

**Keywords:** MDMA; psychosis; field; ecstasy

**Workpackage No.:** 3

**Author:** CREMONA, A

**Year:** 1986

**Title:** Mad drivers: psychiatric illness and driving performance

**Journal/Book Name:** British Journal of Hospital Medicine

**Volume:** 35(3), 193-5

**ISBN/ISSN:** 0007-1064

**Keywords:** Accidents, Traffic\*; Alcohol Drinking\*; Automobile Driving\*; Ethanol BL; Female; Human; Male; Mental Disorders\*PP; Psychomotor Performance DE; Psychotropic Drugs\*AE; Substance-Related Disorders

**Abstract:** Road traffic accidents are a leading cause of mortality and morbidity. It has been estimated that over 25% of drivers involved in accidents had impaired driving due to alcohol, drugs, illness or emotional distress. This paper reviews the association between road traffic accidents and psychiatric illness including the effects of alcohol, drugs and psychotropic medication.

**Workpackage No.:** 1

**Author:** CROUCH, D.J., PEAT, M.A., CHINN, D.M. AND FINKLE, B.S.

**Year:** 1983

**Title:** Drugs and driving: a systematic analytical approach

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 28, 4, 945-56

**ISBN/ISSN:** 0022-1198

**Keywords:** accidents, traffic, automobile driving, chromatography, gas, high pressure liquid, thin layer, human, mass fragmentography, pharmaceutical preparations, radioimmunoassay, street drugs, substance-related disorders, support, non U.S. Gov't

**Abstract:** To collect useful epidemiological data about drug involvement in highway safety, it is essential that sensitive and specific analytical procedures be used to establish the presence of and to determine the concentrations of drugs and metabolites in samples collected from drivers. This paper describes a comprehensive and systematic screening procedure requiring 6 mL of blood, which has been used for the analysis of samples collected from injured and fatally injured drivers. The procedure uses radioimmunoassay, gas chromatography with selective detectors, and high performance liquid chromatography. Drugs and metabolites presumptively identified are then confirmed primarily using gas chromatography--chemical ionization mass spectrometry.

**Workpackage No.:** 4

**Author:** CROUCH, D., BIRKY, M.M., GUST, S.W. ROLLINS, D.E., WALSH, J.M., MOULDEN, J.V., QUINLAN, K.E. AND BECKEL, R.W.

**Year:** 1993

**Title:** The prevalence of drugs and alcohol in fatally injured truck drivers

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 38, 6, 1342-1353

**Keywords:** toxicology/ ethanol/ cocaine/ THC, THC-COOH/ caffeine/impairment/fatal-to-the-driver/trucking/crashes/accidental death

**Abstract:** To assess the impact of alcohol and other drug use in the trucking industry, the National Transportation Safety Board, in collaboration with The National Institute on Drug Abuse investigation fatal-to-the-driver trucking accidents in eight states over a one year period. Comprehensive drug screens were performed on blood specimens collected from 168 fatally injured drivers. One or more drugs were detected in 67% of the drivers and 33% of the drivers had detectable blood concentrations of psychoactive drugs or



alcohol. The most prevalent drugs were cannabinoids and ethanol, each found in 13% of the drivers. Cocaine or benzoylecgonine was found in 8% of the cases. Seven percent of the driver's blood specimens contained amphetamine or methamphetamine and 7% contained phenylpropanolamine, ephedrine, or pseudoephedrine. A panel of toxicologists reviewed the accident investigation report and the toxicology findings for each case and determined that impairment due to marijuana use was a factor in all cases where the delta-9-tetrahydrocannabinol concentration exceeded 1.0 ng/mL and that alcohol impairment contributed to all accidents where the blood alcohol concentration was 0.04% wt/vol or greater. In 50 of 56 cases where psychoactive drugs or alcohol were found impairment due to substance use contributed to the fatal accident

**Workpackage No.:** 3

**Author:** CROUCH, D.J., CHEEVER, M.L., ANDRENYAK, D.M., KUNTZ, D.J. AND LOUGHMILLER, D.L.

**Year:** 1998

**Title:** A Comparison of ONTRAK TESTCUP, Abuscreen ONTRAK, Abuscreen ONLINE, and GC/MS Urinalysis Test Results

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 43, 1, 35-40

**Keywords:** forensic science, forensic toxicology, on-site drug testing, GC/MS, immunoassay

**Abstract:** This study was designed to compare results obtained from two separate on-site drug testing kits (ONTRAK TESTCUP and Abuscreen ONTRAK) with those obtained from laboratory based immunoassay and GC/MS. Abuscreen ONLINE immunoassay was used to select 250 negative samples and 100 presumptive-positive samples each for cocaine/metabolites, opiates and cannabinoids. Presumptive-positive samples were selected if the immunoassay response was  $\geq 50$  ng/mL for cocaine/metabolites (BZE)  $\geq 300$  ng/mL for opiates or  $\geq 50$  ng/mL for cannabinoids (THC-COOH). GC/MS was used to confirm that each selected sample contained  $\geq 150$  ng/mL BZE,  $\geq 300$  ng/mL morphine/codeine or  $\geq$  ng/mL THC-COOH. TESTCUP results had a 100% agreement with GC/MS and a  $>99\%$  agreement with ONLINE when testing negative samples. The agreement between TESTCUP and ONLINE results for samples containing opiates was 100%. Results of testing samples containing BZE with TESTCUP demonstrated a 98% agreement with both GC/MS and ONLINE. Both discrepant samples contained BZE at concentrations  $\leq 300$  ng/mL. The least agreement between TESTCUP and ONLINE results was found when testing samples containing THC-COOH. The agreement with ONLINE and GC/MS was 92% and all discrepant samples had GC/MS determined THC/COOH concentrations less than 50 ng/mL. A 100% agreement was obtained between expected and recorded TESTCUP results for QC samples fortified to contain BZE, morphine or THC-COOH at concentrations within 120% of the screening cutoffs. ONTRAK had a 100% agreement with both GC/MS and ONLINE when testing negative samples and samples that contained opiates. ONTRAK had a 91% agreement with GC/MS and ONLINE for testing of samples that contained BZE. The least agreement between ONTRAK and ONLINE results was found when testing samples that contained THC-COOH. The agreement was 89%, however, all discrepant samples contained

GC/MS concentrations of THC-COOH less than the 50 ng/mL cutoff. With ONTRAK, a 100% agreement was obtained between expected and recorded results on QC samples that contained morphine or THC-COOH and a 97.7% agreement was obtained between expected and recorded results on QC samples that contained BZE.

**Workpackage No.:** 4

**Author:** CURRAN, H.V. AND TRAVILL, R.A.

**Year:** 1997

**Title:** Mood and cognitive effects of +/-3,4-methylenedioxyamphetamine (MDMA,'ecstasy'): week-end 'high' followed by mid-week low.

**Journal/Book Name:** Addiction

**Volume:** 92, 7, 821-31

**Keywords:** MDMA; ecstasy; cognitive; experimental

**Workpackage No.:** 2

**Author:** CURRIE, D., HASHEMI, K., FOTHERGILL, J., FINDLAY, A., HARRIS, A. AND HINDMARCH, I.

**Year:** 1995

**Title:** The use of anti-depressants and benzodiazepines in the perpetrators and victims of accidents

**Journal/Book Name:** Occupational Medicine

**Volume:** 45, 6, 323-325

**ISBN/ISSN:** 0962-7480(95)00040-2

**Keywords:** drugs, driving, responsibility for accident, accident, benzodiazepine, tricyclic antidepressants, alcohol

**Abstract:** The objective of this study was to determine whether there is a greater incidence of psychotropic drugs in the blood of those 'responsible' for an accident compared with those not 'responsible' for an accident. Blood samples were taken from people involved in accidents presenting at the accident and emergency departments of two teaching hospitals over a five-month period and analysed for the presence of alcohol, tricyclic antidepressants (TCAs) and benzodiazepines (BZs). Details of the accident were used to produce a test group (accidents where a drug may have contributed) and a control group (accidents where the presence of a drug could not have been a factor). In total, 229 samples were collected. The only criterion for inclusion in the study was that the accident was of sufficient severity to merit the routine taking of a blood sample, in which case an additional amount was taken for the purposes of this investigation. In all, 63 samples (27.5%) were positive for at least one of alcohol, TCA or BZ. Of the accidents represented by these samples, 48 could have been caused by the presence of the drug (responsible group) and 15 could not (not responsible group). There was a significantly greater representation of TCAs and BZs in the blood taken from the responsible group compared with the not responsible group ( $P < 0.0045$ ).

**Workpackage No.:** 3

## D

**Author:** D'AURIA, D.

**Year:** 1994

**Title:** Drug-induced impaired performance

**Journal/Book Name:** Ann Acad Med

**Volume:** 23, 5, 760-4

**ISBN/ISSN:** 0304-4602

**Keywords:** behaviour, human, industry, pharmaceutical preparations, risk assessment, task performance and analysis, workplace

**Abstract:** The use of medication is becoming increasingly common in the workforce in an effort to minimise the time away from work. Little is written about the behavioural impact of drugs and rarely is it considered in risk assessments. Employees may equally suffer from the effects of illicit drugs, alcohol or even the residual effects of anaesthesia after day-case or minimally invasive surgery. This paper sets out to accomplish three objectives: first, to review methods of evaluating behavioural effects of drugs, their strengths and weaknesses; second, to review established performance effects of principal classes of behaviourally toxic drugs on driving as a model; and third, to propose some guidelines to assist occupational physicians and other clinicians in assessing the risks incurred from drug-induced impaired performance.

**Workpackage No.:** 1

**Author:** DALDRUP, T. AND MUBHOFF, F.

**Year:** 1992/3

**Title:** Detection of cannabinoids in serum of vehicle drivers after smoking cannabis in coffee shops

**Journal/Book Name:** Proceedings of the Twelfth International Conference on Alcohol, Drugs and Traffic Safety, Cologne, Germany

**Volume:** pp. 490-496

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** Hydroxy-THC, THC, cannabis, coffee shops, the Netherlands, Germany, driving, police checkpoints, toxicological analysis

**Abstract:** It is observed that studying the use of marijuana in driving populations is difficult because of the problem of obtaining blood specimens. In the Netherlands, there are "coffee shops" where individuals can smoke cannabis and this permits such studies to be carried out, particularly of German drivers who cross the borders to use the coffee shops and then drive home. Regularly, check points are installed by German police. If there is any suspicion of an offence under the influence of drugs, blood specimens are taken. The analysis of these samples is described. From all the samples the researchers had to analyze in the first six months of the year, they selected those positive for cannabimoids and negative for other drugs. In the sample studied there were 92 individuals who had smoked hashish. 33 were called moderate, 27 heavy and 32 chronic

cannabis users. The results indicated that the group of chronic cannabis users showed by far the highest concentrations for both THC and its active metabolite Hydroxy-THC. However, the ratio Hydroxy-THC to THC was nearly identical in all three groups. A ratio of around 0.6 to 0.8 was found. These ratios are considerably higher than the ratio of 0.1 observed in controlled studies which is further proof that such studies do not reflect reality.

**Workpackage No.:** 3

**Author:** DAMKOT, DK

**Year:** 1982

**Title:** Alcohol incidence in rural drivers: characteristics of a population and clues for countermeasures.

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 9(4), 305-24

**ISBN/ISSN:** 0376-8716

**Keywords:** Adolescence ; Adult ; Age Factors ; Alcohol Drinking \* ; Alcoholilic Intoxication ; Automobile Driving \*; Beer ; Breath Tests MT; Educatinal Status ; Ethanol BL ; Female ; Human ; Male ; Marriage ; Middle Age ; Rural Population ; Sex Factors ; Social Class ; Support, U.S. Gov't Non-P.H.S.

**Abstract:** A roadside survey operated at 42 rural sites in Vermont, U.S.A. between 10:30 p.m. and 3:00 a.m. obtained breath alcohol concentrations (BAC) from 1663 motorists. Interview data concerning biographical variables, drinking patterns, and knowledge about drinking and driving were also obtained. BACs of 0.10 or higher were found in 4.6% of this nocturnal driving population. Interview results confirmed that young male motorists are an important population-at-risk, but older male and female liquor drinkers are also prevalent. The importance of heavy and frequent beer drinking was noted, and the prevalence of a double standard with regard to beer and liquor was apparent. Intervention strategies and ideas are suggested on the basis of the data obtained in this study.

**Workpackage No.:** 2

**Author:** DAUNCEY, H., CHESHER, G., CRAWFORD, J., ADENA, M. AND HORNE, K.

**Year:** 1992/3

**Title:** Alcohol and marijuana, a less than additive interaction?

**Journal/Book Name:** Proceedings of the Twelfth International Conference on Alcohol, Drugs and Traffic Safety, Cologne, Germany

**Volume:** pp. 620-624

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** marijuana, driving ,drugs, alcohol, psychomotor skills, additive interaction

**Abstract:** There have been many studies that have investigated the effects of the interaction between alcohol and marijuana driving or driving related tasks. Most studies have found that the combination produced an additive impairment however a small number have reported less-than-additive results. In a recent paper Perez-Reyes et al., (1988) concluded that the majority of studies found the combination produced additive

detrimental effects on performance when the potency was low. The study reported here was carried out to determine the effects of a combination of alcohol and marijuana driving related psychomotor skills in a group of regular alcohol and marijuana users, with the objective of defining the nature and extent of the interaction between the two drugs over a range of doses.

**Workpackage No.:** 1

**Author:** DE GIER, J.J., HART, B.J., NELEMANS, F.A. AND BERGMAN, H.

**Year:** 1981

**Title:** Psychomotor performance and real driving performance of outpatients receiving diazepam

**Journal/Book Name:** Psychopharmacology

**Volume:** 73, 340-344

**ISBN/ISSN:** 0033-3158/81/0073/0340

**Keywords:** diazepam, N-desmethyldiazepam, real driving performance, laboratory task performance, outpatients, saliva analysis, level-response relationships

**Abstract:** The primary aim of this study was to compare task performance in a laboratory test and real driving performance of outpatients receiving diazepam medication with those of control subjects. Plasma and saliva samples were taken to investigate a level-response relationship. Real driving performance was measured by trained observers. The design of the laboratory test was based on vigilance task (high attention) directly followed by a simple eye-hand coordination task (low attention). Twenty two males participated in the study. Diazepam was given orally by prescription, mostly as a maintenance dose of 5mg three times a day. Patients receiving diazepam showed impaired performance in driving test and the low-attention task. Furthermore, the results indicate no relationship between plasma or saliva levels of diazepam and/or its metabolite N-desmethyldiazepam and real driving performance and/or laboratory task performance

**Workpackage No.:** 2

**Author:** DE GIER, JJ

**Year:** 1984

**Title:** Driving tests with patients

**Journal/Book Name:** British Journal of Clinical Pharmacology

**Volume:** 18 Suppl 1, 103S-108S

**ISBN/ISSN:** 0306-5251

**Keywords:** Adult; Age Factors; Automobile Driving; Body Weight; Carbolines AE; Diazepam AE; Histamine H1; Antagonists AW Histamine Antagonists H001; Human; Male; Mental Disorders\*PX; Middle Age; Psychotropic Drugs\*AE/ME; Saliva AN

**Abstract:** Mental illness and the use of psychotropic drugs are considered to influence driving skills of patients. However, studies which indicate the relative contributions of these factors are rare. It is emphasized that for measuring the effects of psychotropic drugs on driving performance of patients, real driving tests are needed. Actual driving and psychomotor performance of patients receiving diazepam, and patients and healthy volunteers receiving mebhdyrolin were measured to illustrate the use of real driving tests.

The results of both studies are discussed in terms of problems associated with the application of these tests. Patient recruitment is considered to be a major problem. To draw conclusions under these circumstances is extremely difficult, but still acceptable in comparison with the limitations and methodological difficulties of the more commonly used laboratory tests. Some guidelines for driving tests with patients are given

**Workpackage No.:** 1

**Author:** DE GIER, J.J., UIJPENS, L. AND NELEMANS, F.A.

**Year:** 1986

**Title:** The effects of astemizole on actual car driving and psychomotor performance

**Journal/Book Name:** In: 'Drugs and Driving', O'Hanlon, J.F. and de Gier, J.J. (Eds.) pp.271-282.

**Keywords:** astemizole; antihistamines; experimental

**Workpackage No.:** 2

**Author:** DE GIER, J.J., 'T HART, B.J. AND NELEMANS, F.A.

**Year:** 1986

**Title:** The effects of lorazepam and bromazepam on actual driving psychomotor performance of patients.

**Journal/Book Name:** In: 'Drugs and Driving', O'Hanlon, J.F. and de Gier, J.J. (Eds.) pp.137-152.

**Keywords:** lorazepam; bromazepam; benzodiazepines; experimental

**Workpackage No.:** 2

**Author:** DE GIER, J.J.

**Year:** 1993

**Title:** Driving licences and known use of licit or illicit drugs

**Journal/Book Name:** Study conducted with support of the Directorate General for Transport of the Commission of the European Communities

**Keywords:** drugs, driving, EC directive, impairment, driving licences

**Abstract:** This report determines whether and how authorities responsible for issuing and renewing driving licences in eight EVC Member States (Belgium, Denmark, France, Germany, Italy, Spain, The Netherlands and the United Kingdom) are in fact meeting their present obligation to ascertain applicants' lack of impairment due to the use of illicit drugs or drugs used for legitimate medicinal purposes; and whether those authorities plan to modify screening procedures in response to the new EC Council Directive 91/439/EEC of 29 July 1991

**Workpackage No.:** 1

**Author:** DE GIER, J.

**Year:** 1995

**Title:** Drugs other than alcohol and driving in the European Union: Study conducted with support of the European Road Safety Federation and the Directorate General for Transport of the Commission of the European Communities.

**ISBN/ISSN:** 90-5147-027-4

**Keywords:** drugs, driving, European Union, EU Commission, national statistics, legislation, information, education, research needs

**Abstract:** This report provides a description of the consensus achieved by experts from eight EU Member States (Germany, Denmark, Spain, France, United Kingdom, the Netherlands, Sweden and Italy) regarding the hazards posed by drugs other than alcohol for driving safety. These experts were asked to present summarised descriptions of existing national statistics, legislation, information and education programmes and research needs concerning the topic. After discussing the responses during a two-day workshop in Brussels (16 and 17 March 1995) this final report was prepared for the Working Party I "Alcohol & Drugs" of the High Level Group of Governmental Experts on Road Safety of the EC Commission General Directorate VII (Transport).

**Workpackage No.:** 1

**Author:** DE GIER, J.J. AND VERMEEREN, A.

**Year:** 1995/6

**Title:** Methodological guidelines for experimental research on medicinal drugs affecting driving performance: What happened after Padua and Cologne?

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** medicinal drugs/ guidelines/ drugs/ driver fitness

**Abstract:** After the publication of the results of an international expert survey on methodology of experimental research on medicinal drugs, a set of guidelines is now available to all those who need to use them. Final practical application, however, will require additional concerted action and development by all parties involved; individual investigators, professional organizations, the pharmaceutical industry and regulatory authorities. A set of recommendations will be presented to support a concerted action and to provide input for discussions within the newly started ICADTS Working Group on Standardization and Harmonization of Methodology of Experimental Studies on Drugs and Driver Fitness.

**Workpackage No.:** 1

**Author:** DE LA TORRE, R., SEGURA, J., DE ZEEUW. AND WILLIAMS, J.

**Year:** 1997

**Title:** Recommendations for the reliable detection of illicit drugs in urine in the European Union, with special attention to the workplace.

**Journal/Book Name:** Annals of Clinical Biochemistry,

**Volume:** 34, 339-344.

**Keywords:** drug testing; legislation  
**Workpackage No.:** 4

**Author:** DEL RIO, M.D. AND JAVIER ALVAREZ, F.

**Year:** 1995

**Title:** Illegal drug taking and driving: patterns of drug taking among Spanish drivers

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 37, 1, 83-6

**ISBN/ISSN:** 0376-8716

**Keywords:** accidents, traffic, adolescence, adult, aged, automobile driving, cross-sectional studies, female, human, incidence, male, marijuana abuse, middle age, psychotropic drugs, safety, street drugs, substance related disorders, support, non I.U.S. Gov't

**Abstract:** This study investigated patterns of illegal drug taking among Spanish drivers. The study was conducted in the fall of 1993 on 1500 drivers aged over 16, who properly completed and returned the questionnaires. The statistical SAS package was used. Among those surveyed, 23.5% had taken illegal drugs within their lifetime, 6.1 % in the past year, 4.2% in the past month and 3.1 % in the past week. Cannabis was the drug most frequently taken drug within lifetime (17.3%), the past year (3.4%), the past month (2.7%) or the past week (2.1%). Of those surveyed, 3 % had driven after taking illegal drugs in the last year before the survey, and had been stopped during road checks ( $P < 0.001$ ) and involved in road accidents ( $P < 0.0001$ ) more often than those who had not driven under the influence of drugs. The study shows that driving under the influence of illegal drugs is somewhat frequent in Spain.

**Workpackage No.:** 3

**Author:** DEL RIO, M.C. AND ALVAREZ, F.J.

**Year:** 1995

**Title:** Illegal drug taking and driving: patterns of drug taking among Spanish drivers.

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 37, 83-86.

**Workpackage No.:** 3

**Author:** DEMERDASH, AM; MIZAAL, H; EL FAROUKI, S. AND EL MOSSALEM, H

**Year:** 1981

**Title:** Some behavioural and psychological aspects of alcohol and drug dependence in Kuwait Psychiatric Hospital

**Journal/Book Name:** Acta Psychiatr Scand

**Volume:** 63(2), 173-85

**ISBN/ISSN:** 0001-690X



**Keywords:** Adult; Alcoholism \*PZ; Comparative Study; Drug and Narcotic Control; Family Characteristics; Female; Hospitalisation; Human; Kuwait; Male; Personality; Social Behaviour; Substance-Related Disorders \*PX; Support; Non-U.S. Gov't

**Abstract:** Seventy Kuwait alcohol and drug-dependent inpatients at Kuwait Psychiatric Hospital were compared with a matched group of 40 abstinent inpatients on a surgical ward in a general hospital in order to find out the drugs abused, pattern of consumption, the effect of prohibition and sanctions, motives, personality type, social complications, religious attitudes and family history. The majority abused alcohol (62%) followed by hypnotics. The reason most frequently stated for starting consumption was to relieve boredom (39%). Gamma type drinking was prominent at an early stage. The addicts showed a greater proportion of abnormal personalities. Prohibition and sanction had little effect but led to a shift to more toxic substances. The most common legal involvement was driving offenses. Compared with the control group there was higher marital instability and a higher incidence of alcohol and/or drug addicts in the families of the experimental group, and they were also less religious. The role of cultural and religious factors is discussed in detail.

**Workpackage No.:** 2

**Author:** DEPARTMENT OF ENVIRONMENT, TRANSPORT AND THE REGIONS

**Year:** 1998

**Title:** Report on incidence of drugs in road accident victims: interim results of survey, January 1998

**Journal/Book Name:** Road Safety Division, Department of Environment, Transport and the Regions

**Keywords:** drugs, driving, accidents, fatalities, cannabis, amphetamines, opiates, cocaine, methadone, alcohol, medicinal drugs, survey

**Abstract:** This report summarises findings from the first 15 months of a 3 year study and reports on the findings from 619 road user fatalities. The fatalities include drivers, riders of two wheeled vehicles and passengers/pedestrians. The drugs detected included: medicinal drugs, cannabis, amphetamines, opiates, cocaine, methadone, multiple drugs and alcohol. The overall percentage of medicinal drugs was 6% and 16% for illicit drugs. The findings suggest that there has been a significant increase in the number of cannabis users killed in road accidents. However, cannabis remains traceable in the blood stream for up to 4 weeks after it is taken, whereas its' effects on driving is probably limited to 24 hours at most after it is taken. It does not follow therefore that cannabis was a factor in all accidents where the driver or rider tested positive for cannabis. So far no case has been found involving LSD, and only one involving cocaine on its own; there is little evidence of use of amphetamines (including ecstasy). Opiates and methadone appear to be a problem, albeit not a major one. There has been a noticeable increase, from the first seven month report, in the number of fatalities, particularly among drivers and riders, who had taken two or more different types of illicit drug. On the other hand, only a few drivers and riders (19%) had taken both an illicit drug and alcohol over the legal limit. The number of fatalities found to be over the legal limit for alcohol is still considerable, and alcohol remains a major problem. If (as seems reasonable to assume) many of the

cannabis users had taken it sufficiently in advance of their accident for it no longer to be affecting their driving, alcohol is still a much larger one than that represented by drugs.

**Workpackage No.:** 3

**Author:** DEPARTMENT OF HEALTH AND HUMAN SERVICES (U.S.)

**Year:** 1997

**Title:** Ninth Special Report to the U.S. Congress on Alcohol and Health, from the Secretary of Health and Human Services.

**Workpackage No.:** 1

**Author:** DETSCH, O. AND KOCHS, E.

**Year:** 1997

**Title:** Effects of ketamine on CNS-function

**Journal/Book Name:** Anaesthesist

**Volume:** 46 Suppl 1: S20-9

**Abstract:** The present review summarises the main actions of racemic ketamine and ketamine enantiomers on central nervous system receptors. The primary CNS action of ketamine appears to be a non-competitive block of N-methyl-D-aspartate receptors. Although numerous other receptors (e.g., GABA, nicotinic acetylcholine, opiate, voltage-operated channels) have been reported to interact with ketamine, their role in inducing dissociative anaesthesia is still under discussion. In humans, characteristic electroencephalographic (EEG) changes after administration of ketamine are dose-dependent increases in delta, theta, and beta power. In equipotent doses S-(+)-ketamine induces similar EEG changes. However, in comparison to racemic ketamine and S-(+)-ketamine, R-(-)-ketamine does not suppress the EEG to the same extent. Former studies suggested that ketamine is a proconvulsive agent; however, recent studies have demonstrated anticonvulsive and even neuroprotective properties. In humans, low-dose ketamine has no influence on early cortical peaks of somatosensory evoked potentials (SEP). Larger doses induce increases in SEP amplitude while latencies are unchanged. Recent data indicate that analgesia induced by low-dose ketamine may be quantitated by specific pain-related SEP. Significant reductions of pain-induced cortical potentials may be correlated with subjective pain ratings. Brain-stem auditory evoked potentials (AEP) are not influenced by ketamine. Interestingly, in contrast to many other anaesthetics, middle-latency AEP were not altered by racemic and S-(+)-ketamine. This observation may indicate insufficient suppression of auditory stimulus processing during ketamine anaesthesia. Motor evoked responses to transcranial electrical or magnetic stimulation in humans are not markedly suppressed by ketamine.

**Workpackage No.:** 1

**Author:** DEVEAUX, M., PRANGERE, T., MARSON, J-C., GOLDSTEIN, P. AND GOSSET, D.

**Year:** 1996

**Title:** The incidence of psychotropic drugs, opiates, and alcohol in fatally injured drivers: A prospective study in northern France

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 20, 74

**Keywords:** psychotropic drugs, alcohol, fatally injured, drivers, northern France,

**Abstract:** Although the main cause of fatal road accidents is undoubtedly alcohol consumption, the use of psychotropic drugs and narcotics has an adverse effect on road safety. Specific studies on fatally injured drivers are rare in France. This work describes the second one in the Region Nord Pas de Calais (northern France). The method used was as follows: within 1 year, blood samples obtained at the time of death from 103 drivers and pedestrians killed in traffic accidents were analysed for alcohol (BAC) by GC, for tricyclic antidepressants (TA), barbiturates, and benzodiazepines by FPIA, and for morphine (MO) by RIA; GC-MS was used to identify opiates (OP). The results were as follows: only 29% of the fatalities were studied: 85% were male and 15% were female. We distinguished three classes: pedestrians (12%), two-wheeled vehicles (25%), and four-wheeled vehicles (63%). Fifty one percent of BAC was greater than 0.1 g/L and 45% was greater than the legal limit (0.7 g/L). Psychotropic drugs, including OP, were present in 39% of the cases; half of them were TA. Drugs and alcohol were present simultaneously in 19% of the individuals. Five samples were positive simultaneously in 19% of individuals. Five samples were positive for MO, but 6-monoacetylmorphine was not found. Where data were available, results were compared with those of our previous study.

**Workpackage No.:** 3

**Author:** DICKMAN, FB

**Year:** 1988

**Title:** Alcohol and highway safety in a public health perspective

**Journal/Book Name:** Public Health Report

**Volume:** 103(6), 653-8

**Keywords:** Accidents Traffic \*PC/SN ; Alcohol Drinking \* ; Alcoholic Intoxication PC ; Automobile *Driving* \* ; Consumer Organizations ; Government Agencies ; Human ; Legislation ; Public Health \* ; United States

**Abstract:** The Public Health Service and the National Highway Traffic Safety Administration share the responsibility for problems related to injury prevention and control regarding the alcohol-impaired operation of motor vehicles. NUTSA activities have evolved over several decades within a general framework which emphasizes community-based systems. The National Highway Traffic Safety Administration is promoting program activities that stress community-level involvement in problems of alcohol and highway use. The public health approach to the mortality and morbidity resulting from alcohol use and motor vehicle operation entails examining and promoting those activities that address human factors. Techniques for Effective Alcohol Management (TEAM) is a cooperative effort representing sports, entertainment, insurance, vehicle manufacturer, and other organizations and agencies building community coalitions. The Centers for Disease Control is establishing research and collaborating centers to stimulate studies and exchange information on injury-related research. Alcohol

countermeasures programs include training for law enforcement and legal officials, technology development efforts, and changes in laws applied to use of alcohol and other drugs. Outreach and networking activities have encouraged the initiation and coordination of community level groups active in promoting highway safety with regard to the use of alcohol. Statistical method changes are being discussed for surveillance of motor vehicle-related injuries for Health Objectives for the Nation for the Year 2000. NHTSA data systems being discussed are thought to be more timely and more sensitive to crash activity than methods now in use

**Workpackage No.:** 1

**Author:** DOGOLOFF, LEE I

**Year:** 1980

**Title:** Marihuana and Driving

**Journal/Book Name:** Journal of Traffic Safety Education

**Volume:** 8-10

**Workpackage No.:** 1

**Author:** DONELSON, A.C.

**Year:** 1987

**Title:** Cannabis and alcohol use among drivers and pedestrians fatally injured in traffic crashes

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam, Elsevier Publications B.V. 9-12, Sept 1986, Noordzij, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 0 444809031

**Keywords:** THC, alcohol; field study

**Abstract:** Toxicological analyses of 1,169 accident fatalities suggested that cannabis use has increased in Ontario since 1979.

**Workpackage No.:** 3

**Author:** DONELSON, A.C.

**Year:** 1989

**Title:** Drugs and Driving by O'Hanlon, J.F and de Gier, J.J.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 21, 4, 402-404

**Keywords:** drugs, driving, book review, prescriptions

**Abstract:** Book review. The book presents the proceedings of the First International Symposium on Prescription Drugs and Driving Performance which took place in the Netherlands in 1984. Participants comprised an international group of experts who ostensibly share the view "that certain commonly used medicinal drugs profoundly impair the performance of particular individuals in specific driving tasks; that large differences exist between the effects of different drugs within the same therapeutic class;

and that health professionals and the driving public are largely unaware of these effects and differences". With this publication, O'Hanlon and de Gier have accomplished their goal of bringing "theories, models, methods, results, conclusions and even spontaneous disagreements to the attention of all those concerned".

**Workpackage No.:** 1

**Author:** DONOVAN, DM; UMLAUF, RL. AND SALZBERG, PM

**Year:** 1990

**Title:** Bad drivers: identification of a target group for alcohol-related prevention and early intervention.

**Journal/Book Name:** J Stud Alcohol

**Volume:** 51(2), 136-41

**ISBN/ISSN:** 0096-882X

**Keywords:** adult, alcohol drinking, alcoholic intoxication, automobile driving, female, human, risk factors, support, Non U.S. Gov't, U.S. Gov't, Non P.H.S.

**Abstract:** Individuals arrested for driving while intoxicated (DWI) have been targeted for preventive intervention of alcohol-related problems. However, high rates of diagnosed alcoholism among DWI arrestees suggest a need to identify individuals at risk earlier in the developmental process. The present study investigates one such group, namely male "bad drivers with a history of multiple nonalcohol-related driving convictions". Over 11% of a sample of 254 men identified as bad drivers during an index year received an initial DWI arrest over a subsequent 3-year follow-up period. This was over five times greater than the rate of initial DWI arrest among a representative sample of men from the general driving population over the same time period. The same high rate of subsequent DWI arrest among drivers having four or more driving offences within the index year was replicated in a 1% probability sample of over 39,000 drivers from the general driving population. Those individuals from the original group of 254 bad drivers who received an initial DWI had significantly higher levels of drinking at the time of their original identification as bad drivers than did those who did not receive a DWI. The results were discussed in terms of early identification and preventive interventions within the population of bad drivers.

**Workpackage No.:** 3

**Author:** DONOVAN, J.E.

**Year:** 1993

**Title:** Young adult drinking-driving: behavioural and psychosocial correlates

**Journal/Book Name:** J Stud Alcohol

**Volume:** 54, 5, 600-13

**ISBN/ISSN:** 0096-882X

**Keywords:** adolescence, adult, age factors, alcohol drinking, automobile driving, comparative study, ethanol, female, human, male, narcotics, risk taking, sex factors, substance-related disorders, support, U.S. Gov't

**Abstract:** Behavioral and psychosocial correlates of drinking and driving were examined in two independent samples of licensed drivers aged 18 to 25 selected from the Colorado

Division of Motor Vehicles database. Mail questionnaires were returned by 2,300 young adults (1,196 in Sample 1; 1,104 in Sample 2). Structural equation modeling was used to examine the relation of a latent-variable measure of drinking-driving to latent-variable measures of other driving behaviors, problem behaviors and psychosocial variables. Drinking-driving, drug-driving and risky driving were found to comprise a more general, second-order factor of problem driving behavior. Drinking-driving was also found to constitute one aspect of a larger second-order latent variable that included problem drinking, marijuana use, other illicit drug use and delinquent-type behavior. In combination, the variables of problem driving, other problem behaviors, psychosocial unconventionality, risk-taking and hostility/aggression accounted for 57% of the variance in young adult drinking-driving. All of these Sample 1 findings were buttressed by confirmatory analyses in the independent Sample 2 data. The conclusion can be drawn that drinking-driving is part of a more general lifestyle involving behavior and psychosocial unconventionality

**Workpackage No.:** 3

**Author:** DOTT, A.B.

**Year:** 1972

**Title:** Effect of marihuana on risk acceptance in a simulated passing task.

**Journal/Book Name:** Public Health Service Report ICRD, RR-71-3, Washington DC.

**Keywords:** marihuana; simulator

**Workpackage No.:** 2

**Author:** DOTT, A.B.

**Year:** 1974

**Title:** Effect of marijuana on risk acceptance in an automotive simulator

**Journal/Book Name:** In: Singh J.M., Lal, H. (ed.), Drug addiction Vol 3: Neurobiology and influences on behaviour. New York, Stratton.

**Keywords:** adult, automobile driving, cannabis, decision making, gambling, heart rate, human, male, reaction time, risk taking

**Workpackage No.:** 2

**Author:** DRUMMER, O.H.

**Year:** 1995/6

**Title:** Drugs and accident risk in fatally-injured drivers

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** drugs/ accidents/ fatally injured/ alcohol/ marijuana/ amphetamines/ stimulants/ benzodiazepines/ opiates/ driving

**Abstract:** Risk analysis studies to investigate the contribution of drugs to accident causation are limited. We have used a method based on establishing the responsibility of a driver to investigate the involvement of drugs other than alcohol in 1052 fatally injured

drivers. The proportion of drivers deemed to be responsible in a drug-free group were compared to drivers with target drugs found in their blood stream. Drugs (including alcohol) were detected in 49% of the drivers. Alcohol was detected in 36% of the cases, whilst drugs were detected in 22%. 13% had only drugs detected. The remaining 9% of the population involved a combination of drugs and alcohol. The order of prevalence of drugs were marijuana (112 cases), amphetamines and related stimulants (35), benzodiazepines (34) and opiates (34). Drivers in whom only opiates were detected had an odd's ratio of 2.4, whilst marijuana cases provided a relative risk of 0.6. Drivers in whom stimulants were detected gave an odd's ratio of 1.4 whilst benzodiazepines gave an odd's ratio of 1.0. By contrast the odd's ratio for alcohol was 6.8. Drivers with higher than therapeutic concentrations detected represented 22 drivers (2.1%). Most of these drivers were found to be culpable. Multiple drug cases also tended to be culpable. The culpability rate in this group was 89% compared to 70% in drug-free drivers. These data show that only a small proportion of impaired drivers are drug effected, the remainder being impaired by alcohol. The relative risk for psychoactive drugs is also not uniform, with marijuana use providing the least effect on risk, whilst opiate use seems to provide the largest increase in risk compared to the other drug groups studied.

**Workpackage No.:** 3

**Author:** DUBEY, Y. AND GUJER, H.R

**Year:** 1993

**Title:** Alcohol intoxication at the wheel in the Waadt canton (Switzerland). A comparative study of penal and administration measures 1970 and 1989 in the canton capital city (Lausanne) and a rural area

**Journal/Book Name:** Blutalkohol

**Volume:** 30 (5), 266-89

**ISBN/ISSN:** 0006-5250

**Keywords:** Adolescence ; Adult ; Aged ; Aged, 80 and over ; Alcohol Drinking LJ/PC ; Alcoholic Intoxication EP/PC ; Automobile driving LJ/SN ; Comparative Study ; Cross Sectional Studies; English Abstract; Ethanol PK ; Female ; Human ; Incidence ; Male ; Middle Age ; Rural Population \*/SN ; Switzerland ; Urban Population /SN

**Abstract:** The canton of Vaud is one of the major wine-growing areas of Switzerland. The driving ban rate for drunk driving is the highest in the country. This is the result of the very important rise in the number of drivers intercepted by the police for drunk driving (accidentless cases), in the course of the last ten years (+260%). In order to find out what penal and administrative measures were taken against drunk drivers (those who did not commit an accident), a comparative retrospective study of the offenses committed in the area of Lausanne and in rural area of the canton of Vaud (La Broye) was undertaken. This study deals with the years of 1970 and 1989. In a parallel, the average blood alcohol concentration (BAC) value, relative distribution of the BAC (frequency profile), and the concordance between the doctor's medical examination and the suspect's BAC were studied. Our results demonstrate that only the urban area (Lausanne) showed a significant increase in the drunk-driving offenses without accident, resulting in a significant decrease in the average BAC value as well as a veering towards the left of the BAC frequency profile curve. The legal sanctions and the administrative measures

diverge according to the different areas, the most striking fact is the lowering of the average term of imprisonment for second-time or multiple offenders in the study group of Lausanne. The results of the clinical examination undertaken by the doctor at the moment of the blood test have shown that there is often a difference between the clinical evaluation and the actual BAC: for a BAC of 2 to 3/1 000, the objective clinical symptoms of drunkenness (Romberg, unstable gait, coordination troubles) are noticed in only half of the cases. As a result, the assessment is no longer based on objective criteria but on subjective criteria as well as on the life-style of a certain period. In conclusion it is our belief that the efforts made by the vaudois police (especially in urban areas) should be pursued further, since positive results are apparent. The Judiciary system should however rebalance the sanctions delivered to drunk-drivers, showing greater severity towards second-time or multiple offenders.

**Workpackage No.:** 3

**Author:** DUNBAR, J.A., MACRAE, W.A., MURPHIE, J.H., WHITTET, D. AND MATHER, A.M.

**Year:** 1985

**Title:** Evidential breath testing of drivers - day surgery and halothane anaesthesia

**Journal/Book Name:** Medicine, Science and the Law

**Volume:** 25, 3, 162-164

**Keywords:** breath analysis, halothane anaesthesia, driving, legal limit, day surgery

**Abstract:** Recent criticisms of breath analysis for alcohol make the following case of interest. In this instance, the driver claimed that he could not possibly have consumed enough alcohol to be over the legal limit and that the reading must have been due to halothane administered for surgery earlier that day. The case highlights the problem of substances which absorb at the same operational wavelength as alcohol. Halothane is one such substance, but experimental testing demonstrated that clinical concentrations are too low to affect the Camic breath analyser and there is no interaction between ethanol and halothane in breath analysis.

**Workpackage No.:** 4

**Author:** DYE, L.

**Year:** 1990

**Title:** Measuring the effects of psychotropic drugs during the menstrual cycle: a methodological review.

**Journal/Book Name:** In: Hindmarch, I. and Stonier, P. (Eds.). Human Psychopharmacology: Methods and Measures (Vol.2). Chichester: Wiley and sons Ltd.

**Keywords:** female; methodology

**Workpackage No.:** 2



## E

**Author:** E.U. COMMISSION, DIRECTORATE GENERAL FOR TRANSPORT OF THE EUROPEAN COMMISSION

**Year:** 1995?

**Title:** Alcohol, Drugs and Medicines and Driving

**Journal/Book Name:** Directorate General for Transport of European Commission

**Keywords:** alcohol, drinking, driving, road accidents, statistics, legislation, countermeasures

**Abstract:** This report was commissioned by the Directorate General for Transport (DG VII) of the European Commission to draw up some conclusions leading to recommendations for the High Level Group in the field of drinking and driving and the influence of drugs and medicines on driving. The results of epidemiological studies show that all drivers have a higher risk of an accident after drinking. The problem of acquiring reliable statistical data on drinking and driving is discussed. Further issues reported include: legislation, blood alcohol limits, secondary and regulatory limits, sanctions, rehabilitation of drink-driving offenders, police practice and countermeasures to drinking and driving.

**Workpackage No.:** 1

**Author:** EDWARDS, JG

**Year:** 1981

**Title:** Adverse effects of antianxiety drugs

**Journal/Book Name:** Drugs

**Volume:** 22(6), 495-514

**ISBN/ISSN:** 0012-6667

**Keywords:** Anti-Anxiety Agents \* AE Antianxiety Agents; Autonomic Nervous System DE; Cardiovascular System DE; Central Nervous System DE; Drug Interactions; Drug Tolerance; Endocrine Glands DE; Eye DE; Female; Gastrointestinal System DE; Human; Immunity DE; Liver DE; Pregnancy; Respiration DE; Skin DE; Substance-Related Disorders ET/PP

**Abstract:** Antianxiety drugs, like other drugs used in psychiatry, can cause a wide range of adverse effects. Many physiological systems may be affected, but, as the main action of antianxiety drugs is on the central nervous system, this system is particularly vulnerable. All antianxiety drugs have the potential to produce untoward effects on higher cerebral functions, although the effect seen is also influenced by psychological and social factors. The most common effects is oversedation, which is a particular problem for the very young and the very old. It is also a serious problem for those who drive motor vehicles and may be a hazard when working in dangerous situations. Subjects are especially vulnerable when (a) antianxiety drugs are first introduced; (b) the dose is increased; and (c) these agents are taken in combination with alcohol and other drugs. Dependence on antianxiety drugs is well known, but only recently has it been

recognised that dependence on benzodiazepines is a larger problem than previously realised. Other adverse effects are reviewed and summarised according to the system they predominantly affect. A review of this kind can easily give a biased impression of the dangers of antianxiety drugs; it should be made clear at the outset that many effects are rare, and in some instances a causal connection with the drug has not been established with certainty. Overall, benzodiazepines are the most widely used of all drugs and are remarkably safe-even when taken in massive overdoses. Some unwanted effects are readily preventable if antianxiety drugs are used with caution or avoided altogether in conditions where pathological disturbances of tissue sensitivity or drug disposition lead to exaggerated reactions. Particular care should be taken when prescribing these drugs for children and the elderly, and drugs that are not clearly essential for the well-being of the mother should be avoided during pregnancy and breast feeding. Antianxiety agents are grossly overprescribed. The frequency of occurrence of some adverse effects is therefore not so much a manifestation of the intrinsic toxicity of antianxiety drugs, but a reflection of their widespread use. Overprescribing and irrational prescribing also contribute to self-poisoning with these and other agents and to the cost of health services. The reasons for overprescribing are complex, but one contributing factor is the ready availability of effective antianxiety drugs.

**Workpackage No.:** 1

**Author:** EDWARDS, J.G.

**Year:** 1995

**Title:** Depression, antidepressants, and accidents: pharmacological concerns need epidemiological elucidation

**Journal/Book Name:** British Medical Journal

**Volume:** 311, 7010, 887(2)

**ISBN/ISSN:** 0959-8138

**Keywords:** depression, antidepressants, driving, impairment, sedation, anxiety, suicidal tendencies, sleeplessness, older patients

**Abstract:** Antidepressant drugs may contribute partially to automobile accidents. With or without medication, depressed people may not fully concentrate on driving in traffic. Lack of food, sleeplessness, anxiety, and suicidal tendencies often add to pharmaceutical effects. In addition, some older antidepressants such as amitriptyline and dothiepin may cause greater sedation. Various driving simulations indicated patients were prone to very few accidents regardless of the type of antidepressant ingested. However, traffic accidents are a risk for older patients with other health problems in addition to depression. Such impairments include cognitive disorders, vertigo, vision defects, and low blood pressure. Until the role of antidepressants in road accidents becomes clear, newer antidepressants should be prescribed. These drugs include selective serotonin reuptake inhibitors and reversible inhibitors of monoamine oxidase A.

**Workpackage No.:** 1

**Author:** ELLINGROD, V.L., PERRY, P.J., YATES, W.R., MACINDOE, J.H., WATSON, G., ARNDT, S. AND HOLMAN, T.L.

**Year:** 1997

**Title:** The Effects of Anabolic-Steroids on Driving Performance as Assessed by the Iowa Driver Simulator

**Journal/Book Name:** American Journal of Drug and Alcohol Abuse

**Volume:** 23, 4, 623-636

**Keywords:** prescription drugs, anabolic steroids, testosterone cypionate, driving, simulator, drugs

**Abstract:** The effect of physiologic (100 mg/wk) and supraphysiologic (250 and 500 mg/wk) doses of testosterone cypionate (TC) on automobile driving were studied using the Iowa Driver Simulator. Six normal subject-volunteers were studied off TC and on TC once steady-state concentrations were achieved after at least three weeks of dosing. Despite the administration of supraphysiologic testosterone doses, an increase in aggressive driving behavior was not detected. Likewise, corresponding psychometric testing using the Buss-Durkee Hostility Inventory to assess aggression was unable to detect any change in aggression in the test subjects. Although aggressive driving behavior may be increased by testosterone administration, the drug itself may not be responsible for these effects. Supraphysiologic doses greater than 500 mg/wk and a semi-controlled research environment may be necessary to produce this effect since case reports of AAS abuse causing altered driving behavior may be multifactorial in nature

**Workpackage No.:** 2

**Author:** ELLINWOOD, EH Jr. AND HEATHERLY, DG

**Year:** 1985

**Title:** Benzodiazepines, the popular minor tranquilizers: dynamics of effect on driving skills

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 17(4), 283-90

**ISBN/ISSN:** 0001-4575

**Keywords:** Accidents, Traffic; Automobile Driving\*; Benzodiazepines ME/\*PD; Diazepam BL; Drug Tolerance; Ethanol BL/ME/PD; Female; Human; Male; Pentobarbital BL; Psychomotor Performance DE; Sex Factors; Support U.S. Gov't, P.H.S.; Time Factors

**Abstract:** The adverse effects of minor tranquillizers, and more specifically benzodiazepines, on psychomotor and cognitive performance have been documented repeatedly over the years, and epidemiological studies have provided sufficient evidence of their role in traffic accidents. These studies indicate that drug plasma level (DPL) is insufficiently correlated with impairment and that other factors need to be considered in determining the impairment vulnerability. This report reviews several sources of individual variability, particularly as they relate to differential impairment effects. These sources, which include such factors as acute peak effects, acute tolerance, chronic tolerance, benzodiazepine receptor affinity and individual sensitivity, need to be examined before quantification of DPL is introduced as a criterion for driving under the influence. Behavioural testing itself may become the critical means of assessing drug -

and/or drug with alcohol-induced driving impairment if acceptable standardized procedures can be developed. Attention is drawn to the rapid onset of impairment associated with acute effects of more lipid soluble drugs. The discussion of impairment of benzodiazepines should be seen in the perspective of their relative overall safety compared to other drugs used as minor tranquilizers.

**Workpackage No.:** 1

**Author:** EVANS, M.A., MARTZ, R., BROWN, D.J., RODDA, B.E., KIPLINGER, G.F., LEMBERGER, L. AND FORNEY, R.B.

**Year:** 1973

**Title:** Impairment of performance with low doses of marihuana

**Journal/Book Name:** Clinical Pharmacology and Therapeutics

**Volume:** 14, 936-940

**Keywords:** impairment, cannabis, THC, mental performance, delayed auditory feedback

**Abstract:** Eight volunteers smoked marihuana cigarettes under controlled laboratory conditions on 4 separate occasions. The cigarettes were calibrated to deliver doses of 0, 3, 6, and 9 ug per kilogram of delta-9-tetrahydrocannabinol (THC). The experimental design was a double blind random block with a 1 week interval between sessions. Analysis of variance revealed a significant linear decrease in stability with increase in dose of THC. The tracking scores with Pursuit Meter (PM) demonstrated a significant increase above control for the three doses of THC. Mental performance, as evaluated by Delayed Auditory Feedback (DAF), and subjective evaluation revealed no consistent change with dose.

**Workpackage No.:** 2

**Author:** EVANS, W.N; NEVILLE D. AND GRAHAM, J.D

**Year:** 1991

**Title:** General deterrence of drunk driving: evaluation of recent American policies (see comments)

**Journal/Book Name:** Risk Analysis

**Volume:** 11(2), 279-89

**ISBN/ISSN:** 0272-4332

**Keywords:** Accidents, Traffic ; Adult ; Alcohol Drinking ; Automobile Driving ; Beer ; Evaluation Studies ; Human ; Seat Belts LJ; Support, Non-U.S. Gov't ; Support , U.S. Gov't, P.H.S. ; Taxes ; United States

**Abstract:** A testable hypothesis of deterrence theory is that efforts to increase the expected cost of criminal activity by increasing the threat of punishment should, other things being equal, reduce the crime rate. In this paper, we examine whether the incidence of drinking and driving is responsive to escalation of the punitive threat. The recent national campaign against drunk driving provides a natural experiment in which to test the predictions of deterrence theory. Using state level data over the 1975-1986 period, we report no conclusive evidence that any specific form of punitive legislation is having a measurable effect on motor vehicle fatalities. We report suggestive evidence that multiple laws designed to increase the certainty of punishment (e.g., sobriety

checkpoints and preliminary breath tests) have a synergistic deterrent effect. The most striking finding is that mandatory seat belt use laws and beer taxes may be more effective at reducing drunk driving fatalities than policies aimed at general deterrence.

**Workpackage No.:** 1

**Author:** EVEREST, J.T. AND TUNBRIDGE, R.J.

**Year:** 1989

**Title:** Incidence of drugs in road accident fatalities in Great Britain

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety, Perrine, M.W.B (ed). Proceedings of the 11th International Conference, Chicago

**Abstract:** Drugs of abuse in 2.5% of 1273 fatalities - notably cannabis. Two-thirds of the sample had taken medicinal drugs.

**Workpackage No.:** 3

**Author:** EVETT JK, FINLEY, C.J., NUNEZ, A, BRITT, L.D. AND HUFF, J.S.

**Year:** 1994

**Title:** Judicial outcome for the intoxicated driver admitted to a regional trauma center

**Journal/Book Name:** Acad Emerg Med

**Volume:** 1(3), 254-7

**ISBN/ISSN:** 1069-6563

**Keywords:** Accidents, Traffic ; Alcohol Drinking ; Crime ; Human ; Retrospective Studies ; Trauma Centres ; Virginia

**Abstract:** **OBJECTIVE:** To examine the judicial outcomes for intoxicated drivers who were admitted to regional trauma centers as a result of motor-vehicle collisions (MVCs). **METHODS:** A retrospective review of the trauma registry of a Level 1 trauma center was conducted for the period from January 1, 1989, through December 31, 1990. Inclusion criteria for entry into the study were 1) identification of the patient as the driver involved in an MVC, 2) a blood alcohol content (BAC) above 0.10 g/dL, and 3) survival until discharge from the hospital. A total 245 patients from the trauma registry met the inclusion criteria. The number of persons from the submitted list who were later convicted of driving under the influence of alcohol (DUI) was obtained from the Department of Motor Vehicles (DMV) of the Commonwealth of Virginia. **RESULTS:** Of the list submitted to the DMV, only nine individuals (3.7%; 95% confidence interval = 1.3--6.0%) were convicted of DUI during the MVCs that led to hospitalization during the study period. During the same time period, the statewide conviction rate for DUI-cited drivers was 85%. **CONCLUSION:** Admission to the trauma service at a Level 1 trauma center may provide a refuge from legal consequences for intoxicated drivers involved in MVCs.

**Workpackage No.:** 3

## F

**Author:** FAGAN, D., TIPLADY, B. AND SCOTT, D.B.

**Year:** 1987

**Title:** Effects of ethanol on psychomotor performance.

**Journal/Book Name:** British Journal of Anaesthesia

**Volume:** 59, 961-965.

**Keywords:** alcohol; experimental

**Workpackage No.:** 2

**Author:** FANTUS, RJ; ZAUTCKE, JL; HICKEY, PA; FANTUS, PP. AND NAGORKA, FW

**Year:** 1991

**Title:** Driving under the influence - a level - 1 trauma center's experience (see comments)

**Journal/Book Name:** J Trauma

**Volume:** 31(11), 1517-20

**ISBN/ISSN:** 0022-5282

**Keywords:** accidents, traffic, alcoholic intoxication, automobile driving, ethanol, human, Illinois, jurisprudence, retrospective, retrospective studies, wounds and injuries

**Abstract:** Alcohol-impaired driving is a major issue confronting today's society. New legislation is emerging to help curtail this ongoing problem. To evaluate the legislative effects in terms of outcome pertaining to injured drivers, we analyzed the records of 116 consecutive motor vehicle drivers who were admitted to our trauma centre over a 16-month period. Medical reports, police reports, and drivers' abstracts were reviewed. Of the 116 drives, 61 (53%) had blood alcohol concentrations that exceeded the legal limit (blood alcohol level greater than or equal to 100 mg/dL) on arrival at the emergency department. Only four of these patients were ticketed for driving under the influence and received the mandatory suspension of their driver's license. None was convicted of this offence, which carries criminal charges and a revocation of the driver's license. Mechanisms for efficient collection of blood specimens and mandatory occurrence reporting are two recommendations that merit investigation to obviate further escape of injured, intoxicated drivers from the legal net. In addition, alcohol rehabilitation and education cannot be overlooked and should warrant strong societal support.

**Workpackage No.:** 3

**Author:** FARRELL, S

**Year:** 1989

**Title:** Policy alternatives for alcohol-impaired driving

**Journal/Book Name:** Health Education Quarterly

**Volume:** 16(3), 413-27

**ISBN/ISSN:** 0195-8402

**Keywords:** Age Factors ; Alcohol Drinking \* ; Alcoholic Beverages SD ; Alcoholic Intoxication \* ; Automobile Driving \* ; Health Policy \* ; Human ; Legislation ; Taxes ; United States

**Abstract:** This article summarises current scientific evidence about the impact of public policy measures on alcohol related motor vehicle crashes. The public policy measures considered are (1) minimum drinking age laws, (2) taxation of alcoholic beverages, (3) drinking and driving laws, (4) laws and regulations governing the physical availability of alcoholic beverages, and (5) server intervention programs. It is concluded that certain public policy measures reduce alcohol-related crashes. These measures include higher taxes on alcoholic beverages and at least some laws and regulations governing the physical availability of alcohol (as well as the minimum drinking age). The article suggests that strengthening drinking and driving laws without also adopting these other measures may have less than optimum (and possibly disappointing) effects.

**Workpackage No.:** 1

**Author:** FARROW, JA

**Year:** 1985

**Title:** Drinking and driving behaviour of 16 to 19 year-olds

**Journal/Book Name:** J Stud Alcohol

**Volume:** 46(5), 369-74

**ISBN/ISSN:** 0096-882X

**Keywords:** Achievement ; Adolescence ; Adult ; Alcohol Drinking \* ; Automobile Driving ; Blacks ; Comparative Study ; Crime ; Educational Status ; Female ; Human ; Male ; Sex Factors ; Substance-Related Disorders ; Support, Non-U.S. Gov't ; Whites

**Abstract:** A total of 192 high-school-age drivers (67 girls) were interviewed with respect to their drinking and driving behavior and academic performance. Although traffic violations and citations were correlated with increases in risky driving behavior and alcohol and drug use, much dangerous driving and social drinking went without consequence. It is suggested that the young male driver is at significantly greater risk for involvement in dangerous driving and drinking. Contributing developmental, situational and personality factors are discussed.

**Workpackage No.:** 3

**Author:** FARROW, JA

**Year:** 1987

**Title:** Young driver risk taking: a description of dangerous driving situations among 16- to 19-year-old drivers.

**Journal/Book Name:** International Journal of Addiction

**Volume:** 22(12), 1255-67

**ISBN/ISSN:** 0020-773X

**Keywords:** Accidents, Traffic PC ; Adolescence ; Adult ; Alcoholic Intoxication CO ; Automobile Driving \* ; Dangerous Behavior ; Female ; Human ; Male ; Peer Group ; Risk-Taking \* ; Sex Factors ; Support, Non-U.S. Gov't ; Violence

**Abstract:** Dangerous drinking and driving situations contribute heavily to morbidity and mortality among older adolescents. One hundred ninety-two high school drivers related 662 dangerous driving incidents (430 by males, 232 by females) in which they were involved in the preceding 6 months. Dangerous driving incidents were characterized by reckless intent, driving late at night, riding with other peers involving alcohol and drugs, reporting impaired driving, and distractions in the car. Adolescent drivers are commonly involved in dangerous drinking-driving situations with peers and without significant consequences. There are points along the continuum leading up to, during, and after such events that offer opportunities for significant prevention and intervention. Such strategies are reviewed.

**Workpackage No.:** 3

**Author:** FARROW, JA

**Year:** 1987

**Title:** The use of vignette analysis of dangerous driving situations involving alcohol to differentiate adolescent DWI offenders and high school drivers.

**Journal/Book Name:** Am Journal of Drug and Alcohol Abuse

**Volume:** 13(1-2), 157-74

**ISBN/ISSN:** 0095-2990

**Keywords:** Adolescence ; Adolescent Behavior ; Adult ; Alcoholic Intoxication PX ; Attitude ; Automobile Driving ; Comparative Study ; Decision Making ; Female ; Human ; Male ; Questionnaires ; Students PX

**Abstract:** Adolescent drivers are commonly involved in a variety of dangerous driving situations involving alcohol and drug use. Both situational and personality factors contribute to the adolescent DWI phenomenon. Little is known about young drivers' ability to analyze common potentially dangerous alcohol-involved driving situations, or in what respects differing patterns of analysis differentiate adolescent drivers at risk for DWI. Three groups of adolescent drivers (N = 153) completed an analysis of vignettes questionnaire to assess their decision-making skills and attitudes with respect to drinking and driving. The three comparison groups consisted of high school drivers, young DWI offenders, and juvenile offenders without DWI citations. Subjects were demographically similar except for academic performance, employment, family intactness, car ownership, and drug and alcohol use, with DWI offenders and non-DWI offenders showing significant differences in these measures (p less than .001). Situation analysis showed that adolescent DWI offenders more often than controls drink prior to driving (p less than .001), associate alcohol with many social events and dating (p less than .001), become angry when questioned about driving ability (p less than .001), play drinking games (p = .001), drive fast to resolve stress (p = .001), are less likely to recruit parents when faced with driving intoxicated (p less than .001), and a number of other situational characteristics indicating differential risk between groups for DWI. In many cases, other juvenile offenders matched responses of DWI offenders. Important aspects of these findings are discussed in the context of intervention strategies and the use of vignette analysis as one tool to identify high-risk adolescent drivers for DWI.

**Workpackage No.:** 1



**Author:** FEIGHNER, JP

**Year:** 1987

**Title:** Impact of anxiety therapy on patients' quality of life

**Journal/Book Name:** Am Journal of Medicine

**Volume:** 82(5A), 14-9

**ISBN/ISSN:** 0002-9343

**Keywords:** Anti-Anxiety Agents \*AE/TU Antianxiety Agents; Anti-Anxiety agents; Benzodiazepine AE/TU Anti-Anxiety agents Benzodiazepine; Anxiety Disorders \*DT/PX; Automobile Driving; Diazepam AE/TU; Drug Interactions; Drug Therapy, Combination; Ethanol AE/PD; Human; Psychomotor Performance DE; Pyrimidines AE/TU; Quality of Life \*; Sleep Stages

**Abstract:** The treatment of anxiety is one of the leading problems in medicine today. Although traditional anxiolytic drugs have been effective in reducing the symptoms of anxiety, their efficacy has often been achieved at the expense of the patient's quality of life. The sedative side effects and impaired psychomotor functioning associated with the use of benzodiazepine anxiolytics not only impede the success of therapy, but jeopardize the patient's safety. This article addresses these salient issues and provides evidence suggesting that the antianxiety drug buspirone better achieves the goal of optimal anxiolytic therapy with minimal unwanted effects.

**Workpackage No.:** 1

**Author:** FELL, J.

**Year:** 1995/6

**Title:** What's New in Alcohol, Drugs and Traffic Safety in the U.S.?

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** alcohol/drugs/ fatal/ traffic accidents

**Abstract:** Alcohol involvement in fatal traffic crashes has decreased 30% over the past twelve years but still accounts for over 40% of traffic fatalities. Other drugs are also a significant problem in fatal crashes but nowhere near the extent of alcohol. New impaired driving goals have been set in the USA that will take bold new strategies to realize. New research in strategic advertising, alternative transportation, enforcement procedures and target populations hold promise to form the foundation for these new strategies.

**Workpackage No.:** 1

**Author:** FERRARA, S.D.

**Year:** 1987

**Title:** Alcohol, drugs and traffic safety.

**Journal/Book Name:** British Journal of Addiction

**Volume:** 82, 871-883

**ISBN/ISSN:** 0952-0481

**Keywords:** alcohol, drugs, driving, traffic safety, antidepressants, sedatives, hypnotics, stimulants, opiates, cannabis, anaesthetics

**Abstract:** This paper reviews existing empirical evidence on the possible influence of a wide range of psychotropic substances on driving ability. Substances which are considered include alcohol; antidepressants; sedatives and hypnotics; stimulants; opiates; cannabis; anaesthetics. Data are much richer in some of these areas than others. Different research approaches are outlined. Legislative, medico-legal and prevention aspects are briefly noted.

**Workpackage No.:** 1

**Author:** FERRARA, SD; ZANCANER, S. AND GIORGETTI, R

**Year:** 1994

**Title:** Low blood alcohol concentrations and driving impairment. A review of experimental studies and international legislation.

**Journal/Book Name:** International Journal of Legal Medicine

**Volume:** 106(4), 169-77

**ISBN/ISSN:** 0937-9827

**Keywords:** Blood Alcohol Concentration, alcoholic drinking, alcoholism, alcoholic intoxication, automobile driving, breath tests, comparative study, cross-cultural comparison, dose response relationship, drug, ethanol, female, human, male, psychomotor performance

**Abstract:** While noting that there is no international scientific or legislative uniformity in blood alcohol concentration (BAC) levels admissible for driving motor vehicles, the authors analyse problems concerning the effects of low levels of ethyl alcohol on driving ability. A summary of the international literature on this subject reveals: the existence of contrasting assumptions, with scientific evidence clearly demonstrating altered psychomotor functions; the need to adopt sufficiently complex psychometric tests to reveal the effects of low BACS; the need to improve standardization of experimental studies on man-machine interaction; the need to investigate the following areas: tolerance to alcohol; low BACs with inexperienced, infrequent drinkers and chronic, heavy drinkers; hangover effects; alcohol-gender-age interactions, and specific effects on young drivers; alcohol-drug combinations. The analysis of legislation and enforcement policies also reveals the need for: re-evaluation of the international legal BAC threshold and standardization of procedures for ascertaining the degree of driving disability; further scientific research to compare and evaluate selected legislative initiatives currently in place in most states; to identify the best strategies and procedures to detect and arrest impaired drivers; to determine the optimum random testing rate to maximize deterrent effects in the workplace at minimal cost; to design innovative and comprehensive approaches to rehabilitation programs needed for subgroups of offenders and of workers; to study the effectiveness of new legislations and policies.

**Workpackage No.:** 1

**Author:** FERRARA, S.D.

**Year:** 1995/6

**Title:** Toxicological assay in experimental studies on drugs and driver fitness

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** toxicological analysis/ drugs/ driver fitness/ metabolites

**Abstract:** Studies on man-machine interaction frequently lack the results of chemico-toxicological investigations. This lack may involve several aspects of pharmacological experimentation, with the possibility of errors in: verification of exclusion criteria during screening of subjects; choice and timing of administration of psychometric tests; interpretation of results; and use of quali-quantitative chemico-toxicological data for applicational purposes (e.g. epidemiological studies, legislative changes). The reasons for this lack are to be sought in a series of factors of which most important are: objective technical difficulties in analysis of new drugs and their metabolites; need for quantitative data; limited availability of biological samples; high cost of toxicological investigations. This presentation aims at facing methodological aspects in carrying out chemico-toxicological tests within the framework of studies on man-machine interaction, focusing attention on the following points: need (or otherwise) for pharmacokinetic studies; timing and methods of collecting biological samples; types and quantities of biological samples; choice of analytical approach; correlation between analytical data and psychomotor performance; need for Quality Assurance; and optimization of cost/benefit ratio.

**Workpackage No.:** 1

**Author:** FERRERA, S.D., CASTAGNA, F. AND TEDESCHI, L.

**Year:** 1980/1

**Title:** Alcohol, drugs and road accidents in Northeast Italy. Preliminary Report

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T80 8th International Conference. Sweden, Graphic Systems, Goteborg. Edited by L. Goldberg.

**ISBN/ISSN:** 91-22-00425-4

**Keywords:** tranquilizers, stimulants, amphetamines, metaamphetamines, cocaine, narcotics, methadone, analgesics, marijuana, blood, urine analysis

**Workpackage No.:** 3

**Author:** FISHBEIN, D.H.

**Year:** 1996

**Title:** Female PCP-using jail detainees: proneness to violence and gender differences.

**Journal/Book Name:** Addict Behav

**Volume:** 21:2 155-72

**Keywords:** pcp

**Abstract:** Previous studies indicate that PCP users have different characteristics from other drug users and that female PCP use is more common than use among males. Furthermore, there is evidence that those who respond to PCP with violence may differ

from those who do not. This study attempted to examine comprehensively the psychological, behavioral, and background factors among female jail inmates that may contribute to a PCP preference and subjects' perception of various behavioral states while using PCP. Female PCP users were further examined relative to male PCP users to differentiate them on the basis of these perceptual factors. A distinction was further made between females and males prone to PCP-induced violence and those who do not become violent with respect to the above psychological and behavioral measures. Our results showed differences between male and female PCP users that are discrepant with the assumption that men and women perceive similar drug-related experiences. In particular, female PCP using subjects reported more dysphoria and aggressiveness when not using PCP, while male subjects were more likely to report aggressive behavior and dysphoria under the influence. Overall, these results suggest that males who prefer PCP may be self-stimulating and females who prefer PCP may be attempting to self-medicate.

**Workpackage No.:** 3

**Author:** FLISHER, A.J., ZIERVOGEL, C.F., CHALTON, D.O., LEGER, P.H. AND ROBERTSON, B.A.

**Year:** 1993

**Title:** Risk taking behaviour of Cape Peninsula high school students. Part VI. Road-related behaviour.

**Journal/Book Name:** South African Medical Journal

**Volume:** 83, 7, 486-90

**ISBN/ISSN:** 0038-2469

**Keywords:** accidents, traffic, adolescence, adolescent behaviour, alcohol drinking, cannabis, educational status, female, human, language, male, prevalence, questionnaires, risk taking, seat belts, South Africa, substance related disorders

**Abstract:** The prevalence of a wide range of risk-taking behaviour among high-school students in the Cape Peninsula, South Africa, was investigated. In this article, the findings for road-related behaviour are presented. Cluster sampling techniques produced a sample of 7,340 students from 16 schools in the three major education departments. A self-administered questionnaire was completed in a normal school period. Estimates for each education department were weighted to produce an overall estimate. During the previous year, 8.5% of the students had been involved in a motor vehicle accident, and 7.4% had been injured in a pedestrian accident. Of those who had driven a vehicle, 63.2% reported driving without a licence; 16.1 % drove an overcrowded vehicle; and 8% reported driving under the influence of alcohol or cannabis. Of those who had been on a motorcycle, 47.9% reported riding without a helmet. Despite the availability of seat belts, 37.3% had failed to wear one on the last occasion they were in the front seat of a vehicle. Variations according to gender, standard, and home language(s) were identified. The prevalence of risk behaviour was higher in males, who also showed a more pronounced increase in such behaviour with age. The need for accident prevention programmes remains urgent.

**Workpackage No.:** 3

**Author:** FORCIER, M.W, KURTZ NR; PARENT DG. AND CORRIGAN, MD

**Year:** 1986

**Title:** Deterrence of drunk driving in Massachusetts: criminal justice system impacts.

**Journal/Book Name:** International Journal of Addiction

**Volume:** 11, 1197-220

**ISBN/ISSN:** 0020-773X

**Keywords:** Accidents, Traffic PC ; Alcoholic Intoxication /PC ; Automobile Driving ; Criminal Law ; Human ; Legislation, Drug /TD ; Massachusetts

**Abstract:** This paper examines the extent to which a "toughened drunk driving law in Massachusetts has deterred drunk driving and the law's impact on criminal justice system operations. Included are analyses of pre- to postlaw trends in: alcohol-related highway fatalities and arrests, drunk driving arraignments and convictions, and jail sentences served by drunk driving offenders. Many of the positive trends found since the implementation of the law (increased arrests, reduced fatalities, and increased conviction rates) actually began before the law took effect. Moreover, the law has exacerbated existing problems in the criminal justice system such as overcrowded jails.

**Workpackage No.:** 1

**Author:** FOUS, R.

**Year:** 1995

**Title:** Intake of addictive drugs and traffic safety - a report of experiences of the Vienna federal police department

**Journal/Book Name:** Blutalkohol

**Volume:** 32, 3, 174-9

**ISBN/ISSN:** 0006-5250

**Keywords:** accidents, traffic, adolescence, adult, Austria, cross-sectional studies, female, human, incidence, psychotropic drugs, street drugs, substance abuse detection, substance related disorders

**Abstract:** Urine samples of 27 individuals with extremely conspicuous behaviour in road traffic were analysed by means of the Abbott ADx-analyser for cocaine metabolites, cannabinoids and opiates. Gas chromatography/mass spectrometry (GCIMS) confirmed positive results. 52% of those 26 positive samples confirmed the simultaneous consumption of two drugs. In 16% all three drugs tested could be found positive, exceeding the threshold values given for the tests hundred fold. Without exception, all 25 urine samples found positive in the ADx-analyser belonged to young people (22 males, 3 females) with 48% of them born between 1968 and 1970. 84% of tested people had previous convictions and 68% had drug addiction records. We also see this project as the beginning of continuing investigations of other drugs and pharmaceuticals. Given the fact that 25 out of 27 samples were found to be positive we most certainly detected nothing but the "tip of the iceberg". We should strive, in conjunction with other European countries, for a political solution to the problem of the illegal and legal consumption of drugs and pharmaceuticals and their effect on driving performance.

**Workpackage No.:** 3

**Author:** FRANCIS, M., ELDEMIRE, D. AND CLIFFORD, R.

**Year:** 1995

**Title:** A pilot study of alcohol and drug-related traffic accidents and death in two Jamaican Parishes, 1991

**Journal/Book Name:** West Indian Medical Journal

**Volume:** 44,3, 99-101

**Keywords:** alcohol, drugs, marijuana, cocaine, fatalities, traffic accidents, Jamaica

**Abstract:** This study is a preliminary effort to document the role of drugs in motor vehicle accidents as it examines the presence of alcohol, marijuana and cocaine in blood samples of thirty-one motor vehicle fatalities. The study identified that males (90.3% and pedestrians (41.9%) were killed most often. Evidence of alcohol intake was found in 77.5% of the fatalities and 35.5% had alcohol levels above the legal acceptable limits. Traces of marijuana were found in 22.5% and a combination of alcohol and marijuana in 22.5% of the victims.

**Workpackage No.:** 3

**Author:** FRIEDAL, B.

**Year:** 1995/6

**Title:** Legal limits for the assessment of illegal drug use with regard to driving in the Federal Republic of Germany

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** drugs/ driving/ law/ legal limits/ cannabis/ heroin/ cocaine/ amphetamines

**Abstract:** In the Federal Republic of Germany a differentiated approach exists in the administrative and criminal code for the assessment of drunken driving according to different levels of BAC. Such an approach does not exist for the evaluation of illegal drug use. The Federal Highway Research Institute (BASt) has therefore conducted two hearings of experts in the fields of Legal Medicine, Forensic Toxicology and Traffic Medicine. The results with regard to legal limits for cannabis, heroin, cocaine and amphetamines and their derivatives are described in the paper. Also steps for changing the German law will be outlined.

**Workpackage No.:** 1

**Author:** FRIEDEL, B. AND STAAK, M.

**Year:** 1992

**Title:** Benzodiazepines and driving.

**Journal/Book Name:** Reviews in contemporary pharmacotherapy.

**Volume:** 3, 415-474

**Keywords:** benzodiazepines; methodology

**Workpackage No.:** 3

**Author:** FRIEDEL, B. AND BERGHAUS, G

**Year:** 1995/6

**Title:** Methadone and driving

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** methadone/driving/ licence

**Abstract:** The importance of Methadone substitution of Heroin addicts with regard to driving a car is increasing in the Federal Republic of Germany. Making use of the driving license may be a prerequisite of the intended integration in the society e.g. in a new start of a job. In the paper the experimental studies regarding the ability to drive under Methadon are reviewed, the results achieved are compared and assessed. The consequences for reissuing a driving license are described and a new formulation of adequate criteria is outlined.

**Workpackage No.:** 1

**Author:** FRIEL, P.N., LOGAN, B.K. AND BAER, J.

**Year:** 1995

**Title:** An Evaluation of the Reliability of Widmark Calculations Based on Breath Alcohol Measurements

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 40, 1, 91-94

**Keywords:** toxicology, breath alcohol, Widmark calculations

**Abstract:** This study evaluated the reliability of Widmark calculations, based on breath ethanol readings (BrACs) for estimating the amount of alcohol consumed. A standard ethanol dose (males 0.51 g/kg; females 0.43 g/kg) was given to 115 college seniors and BrACs were measured for two hours. Calculations of ethanol dose were performed using BrACs taken at 60, 75, 105 and 125 minutes after drinking. Mean calculated ethanol doses were lower than actual doses at each time point ( $P < .001$ ). Mean underestimates were 13, 12, 15 and 14 mL of 100 proof vodka at 60, 70, 105 and 125min after drinking. Calculated doses overestimated actual doses in 11, 10, 3 and 3 subjects at 60, 75, 105, and 125 mins after drinking. The maximum overestimates were 13, 11, 6, and 8mL of vodka at 60, 75, 105 and 125 min after drinking. At the 95% confidence level, the calculated dose at 105 and 125min did not overestimate the true dose, but could underestimate it by as much as 30 mL vodka.

**Workpackage No.:** 4

**Author:** FUELLMICH, R.

**Year:** 1995

**Title:** Civil responsibility for driving under the influence of pharmaceutical drugs in Germany

**Journal/Book Name:** Med Law, South Africa

**Volume:** 14, 1-2, 23-35

**ISBN/ISSN:** 0723-1393

**Keywords:** automobile driving, drug industry, drug therapy, Germany, human, informed consent, liability, legal, physicians, prescription drugs, social responsibility

**Abstract:** The dangers of medication for traffic safety have been vastly underestimated in modern society. The widespread and ever-growing use of medical drugs - in particular psychopharmaca - without a thought given to how these drugs may affect the ability to drive a car, gives a clear indication that it is time to take a close look at the problem. This article focuses on the civil liability under German law for traffic accidents resulting from the use of medication. Basically, three potential defendants come to mind when one searches for addressees of claims for damages. Apart from the driver himself or herself, these are the doctor who prescribed the drug and the manufacturer who manufactured the drug. This article argues that - at least from a German law perspective - in many cases it will ultimately make more sense to include the doctor (on a negligence liability theory) and the drug manufacturer (on a strict liability theory) as defendants in an action for damages than merely to go after the obvious perpetrator, namely the driver

**Workpackage No.:** 1



## G

**Author:** GALLOWAY, G.P., FREDERICK, S.L., STAGGERS, F.E. Jr., GONZALES, M., STALCUP, S.A, AND SMITH, D.E.

**Year:** 1997

**Title:** Gamma-hydroxybutyrate: an emerging drug of abuse that causes physical dependence.

**Journal/Book Name:** Addiction

**Volume:** 92:1 89-96

**Keywords:** GHB

**Abstract:** Gamma-hydroxybutyrate (GHB) is a compound found in mammalian brain which meets many criteria of a neurotransmitter. GHB has been investigated as a tool for inducing absence (petit mal) seizures, for use as an anesthetic, and for treatment of narcolepsy, alcohol dependence and opiate dependence. Since 1990 GHB has been abused in the United States for euphoric, sedative and anabolic effects. Coma and seizures have been reported following abuse of GHB, but dependence liability has received little attention. The neuropharmacology, potential therapeutic uses and acute adverse effects of GHB are reviewed, followed by a case series of eight people using GHB. Adverse effects of GHB may include prolonged abuse, seizure activity and a withdrawal syndrome. This withdrawal syndrome includes insomnia, anxiety and tremor; withdrawal symptoms resolve in 3-12 days. GHB has the potential to cause a significant incidence of abuse and adverse effects. Prolonged use of high doses may lead to a withdrawal syndrome, which resolves without sequelae. Educational efforts should address the narrow therapeutic index, possible physical dependence and dangers of combining GHB with other drugs of abuse.

**Workpackage No.:** 3

**Author:** GAMBARO, V., FROLDI, R., SALIGARI, E., DELL'ACQUA, L. AND BERNINI, M.

**Year:** 1995

**Title:** Blood and urine determination of drugs: An application to the control of the presence of illegal substances in drivers

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** driving/ illegal substances/ drugs/ alcohol/ fast screening procedure

**Abstract:** Even though in Italy definite rules of driving under influence of illegal substances, drugs and alcohol, have got to be approved under the traffic code, a fast screening procedure is described that allows the identification of the presence, in blood and urine, of the most common substances that normally influence the driving ability. This procedure is based on separation from the blood and urine of acid, neutral

and basic substances using solid phase extraction, with Bon Elut Certify Cartridges. A single determination with various type of solvents and at different pH is carried out for each sample. The extracts are then analyzed by linear programmed GC/MS, using capillary column.

**Workpackage No.:** 4

**Author:** GARRIOT, J.C. DI MAIO, V.J.M. AND RODRIGUEZ, R.G.:

**Year:** 1986

**Title:** Detection of cannabinoids in homicide victims and motor vehicle fatalities

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 31, 4, 1274-1282

**Keywords:** cannabinoids, toxicology, marijuana, chemical analysis, toxicology

**Abstract:** A gas chromatographic/mass spectrometric (GC/MS) procedure is described for the detection and measurement of D9 tetrahydrocannabinol, 11-hydroxy-D9-tetrahydrocannabinol, and 11 nor D9-tetrahydrocannabinol-9-carboxylic in blood, or 11-nor-D9-tetrahydrocannabinol-9-carboxylic acid in urine. About 59% of all homicide victims and motor vehicle drivers killed in Bexar County in 1985 were tested for the presence of cannabinoids. Of 130 homicides and 69 drivers tested, blood was analysed primarily in all but 15 and 3 cases, respectively. In these latter cases, blood was analysed after urine was found to be positive. Of the homicide victims, 44 (34%), and all drivers, 19 (28%), tested were positive for one or more of the cannabinoids. As a separate group, 16 motorcycle drivers tested had 38% positive compared with 25% of the other vehicle drivers. Ethyl alcohol was present in 55% of the drivers, and in 63% of the homicide victims. Drugs other than alcohol or cannabinoids were found in 10% of the drivers, and in 12% of the homicide victims

**Workpackage No.:** 4

**Author:** GAWRON, V.J. AND RANNEY, T.A.

**Year:** 1990

**Title:** The effects of spot treatments on performance in a driving simulator under sober and alcohol-dosed conditions.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 22(3), 263-79

**ISBN/ISSN:** 0001-4575

**Keywords:** accident prevention, accidents, traffic, adult, alcoholic intoxication, automobile driving, human, male, middle age, psychomotor performance

**Abstract:** Accident studies have identified night-time conditions on rural roads as particular problems for alcohol-impaired drivers. Uneventful driving is hypothesized to result in progressive degradation of tracking performance and a reduced ability to handle the demands of hazardous locations, such as curves. To address these problems, four spot treatments (i.e. herringbone road marking, flashing beacon, chevron, and post delineator) were evaluated in a driving simulator. Twelve subjects drove a simulator under two conditions of task demand (with and without obstacles) and three levels of blood alcohol concentration (BAC): .00%, .07%, and .12%. The purpose of the study was to determine

whether providing enhanced visual information about hazardous areas would improve the performance of subjects when sober or alcohol-dosed. Driver performance measures included speed, lateral position, and lateral acceleration on the approach and negotiation of horizontal curves of varying length and curvature. The results indicate that spot treatment effects were primarily curve-specific rather than uniform across curves. The effectiveness of spot treatments as alcohol countermeasures is discussed.

**Workpackage No.:** 2

**Author:** GELLER, ES; CLARKE, SW. AND KALSHER, MJ

**Year:** 1991

**Title:** Knowing when to say when: a simple assessment of alcohol impairment.

**Journal/Book Name:** Journal of Applied Behavior Analysis

**Volume:** 24(1), 65-72

**ISBN/ISSN:** 0021-8855

**Keywords:** accidents, traffic, adult, alcohol drinking, alcoholic intoxication, automobile driving, ethanol, female, handwriting, human, male, psychomotor performance, social control, informal

**Abstract:** The use of writing samples as indices of alcohol impairment was explored. Students at a campus fraternity party wrote a sentence and their signatures before and after consuming alcohol (in beer and mixed drinks). Later, undergraduate and graduate students attempted to discriminate between pre- and postparty handwriting samples. The average percentage of correct discriminations of entrance and exit writing samples was 83.7% for sentences and 67.5% for signatures, and the percentage of correct discriminations increased directly with the blood alcohol concentration of the partner who gave the writing sample. When a partner's blood alcohol concentration reached 0.15, all of the judges accurately discriminated 90% or more of the sentences, and 25 of the 28 judges correctly discriminated at least 80% of the signatures. All of the judges correctly discriminated at least 90% of the 18 sentences written by partners with a blood alcohol concentration of 0.12 or more. Implications of these findings for reducing the risk of driving while intoxicated are discussed, as well as directions for follow-up research.

**Workpackage No.:** 2

**Author:** GENGO, FM. AND GABOS, C

**Year:** 1987

**Title:** Antihistamines, drowsiness and psychomotor impairment: central nervous system effect of cetirizine.

**Journal/Book Name:** Ann Allergy

**Volume:** 59(6 Pt2), 53-7

**ISBN/ISSN:** 0003-4738

**Keywords:** Automobile Driving; Brian \*DE; Clinical Trials; Comparative Study; Diphenhydramine AE; Double-Blind Method; Histamine H1 Antagonists \*AE Histamine Antagonists H001; Human; Hydroxyzine \*AA/AE; Psychomotor Performance \*DE; Random Allocation; Reaction Time DE; Research Design; Sleep Stages \*DE

**Abstract:** Altered central nervous system function as indicated by drowsiness and impaired psychomotor performance is often a consequence of the use of traditional antihistamines. Demonstration that newer agents lack these CNS effects requires quantitative and objective measurements that are sensitive enough to assess the psychomotor capabilities required for such activities as driving an automobile. These capabilities include extended attention span, vigilance, visual tracking, rapid information processing, and reaction time. We have used several psychomotor function tests to conduct two investigations assessing the CNS effects of cetirizine. In the first study, 12 healthy, atopic subjects received single oral doses of hydroxyzine 25 mg, cetirizine 10 mg and 20 mg, and placebo in a double-blind, four-way crossover study. Skin-wheal response to intradennal histamine, psychomotor effects, and serum concentrations of each drug were measured for 36 hours after each dose. The CNS effects were measured using critical flash-fusion frequency tests and Stroop word testing. Perceived feelings of drowsiness were measured using a visual analogue scale (VAS). In the second study, 15 healthy subjects received single oral doses of diphenhydramine 50 mg, cetirizine 5 mg, 10 mg, and 20 mg, and placebo in a double-blind, five-way crossover study. Skin-wheal response to intradermal histamine, psychomotor effects, and serum concentrations of each drug were measured for 24 hours after each dose. The CNS effects were measured using digit-symbol substitution testing, "Trails-B" maze tracking, and an analyzer of driving performance that assessed reaction time and vigilance

**Workpackage No.:** 1

**Author:** GENGO, F.M. AND MANNING, C

**Year:** 1990

**Title:** A review of the effects of antihistamines on mental processes related to automobile driving.

**Journal/Book Name:** J Allergy Clin Immunol

**Volume:** 86(6 Pt 2), 1034-9

**ISBN/ISSN:** 0091-6749

**Keywords:** automobile driving, histamine, antagonists, human, hydroxyzine, psychomotor performance, reaction time

**Abstract:** The newer, second-generation H<sub>1</sub>-receptor antagonists have been shown to have potent antiallergenic effects without inducing sleepiness. However, because traditional antihistamines may cause functional or cognitive impairment, the clinician still must consider warning patients about activities that could be hazardous. Because the effects of drugs on driving an automobile are difficult to measure directly, studies must use surrogate activities in a laboratory setting. Effects of antihistamines on the central nervous system are assessed with psychomotor tests, which are selected on the basis of their relativity to real-world activities, to develop a profile of mental processes that may be affected. This article reviews the psychomotor tests and study design used to characterize the intensity and duration of drug effects after single and multiple doses and in combination with other impairing agents such as ethanol. Several studies have been published that assess the effects of cetirizine, an H<sub>1</sub>-receptor blocker, on mental performance. In the study discussed here, diphenhydramine hydrochloride and hydroxyzine were used as positive controls to demonstrate that the period during which

some traditional antihistamines impair performance is different than the period of reported drowsiness they induce. The results of this series of studies show that cetirizine induced minimal changes in mental performance tests and only following the highest (20 mg) dose studied.

**Workpackage No.:** 1

**Author:** GERHARD, U. AND HOBI, V

**Year:** 1984

**Title:** Cognitive-psychomotor functions with regard to fitness for driving of psychiatric patients treated with neuroleptics and antidepressants.

**Journal/Book Name:** Neuropsychobiology

**Volume:** 12(1), 39-47

**ISBN/ISSN:** 0302-282X

**Keywords:** Accidents, Traffic PC; Adult; Antidepressive Agents \*AE; Antipsychotic Agents\*AE; Attention; Automobile Driving\*; Human; Mental Disorders\*DT/PX; Patient Compliance; Psychomotor Disorders \*CI; Reaction Time; Support, Non-U.S. Gov't

**Abstract:** In contrast to the usual type of drug studies it is not our intention to single out specific drug

effects, but we are interested in cognitive-psychomotor functioning of psychiatric patients across various periods of therapy, whether due to drug treatment or to underlying mental-affective disorders. 3 groups of psychiatric male patients (7 anxious/inhibited depressives, 7 schizophrenics, 6 patients with psychotic episodes) matched for age (mean = 30 years) and education (no academic training) with a group of healthy controls (n = 7) were examined three times during the first 6-8 weeks of their ordinary clinical therapy. The major criterion for the inclusion of a patient next to these diagnostic categories was an initial favorable response to the specified drugs (amitriptyline for the depressives, haloperidol for the schizophrenics, and thioridazine for the patients with psychotic episodes). Each subject was tested in an experimental laboratory with respect to cognitive-psychomotor performance (vigilance, divided attention, choice reaction time), mood, subjective fitness for driving, depression, and paranoia. All groups of patients improved significantly between the acute and the chronic phase. However, healthy controls showed a sharper increase of achievement. While the depressives and the patients with psychotic episodes function on a level of questionable fitness for driving, schizophrenics vary greatly intra- and interindividually, generally on a lower level.

**Workpackage No.:** 2

**Author:** GEROSTAMOULOS, J. AND DRUMMER, O.H.

**Year:** 1993

**Title:** Incidence of psychoactive cannabinoids in drivers killed in motor vehicle accidents

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 38, 3, 649-656

**Keywords:** high performance liquid chromatography (HPLC), Delta-9-Tetrahydrocannabinol (THC), enzyme-multiplied immunoassay technique (EMIT), drugs and driving

**Abstract:** A high performance liquid chromatography (HPLC) assay was developed for the psychoactive cannabinoids Delta-9-Tetrahydrocannabinol (THC) and 11-Hydroxy-THC (11-OH-THC) using electrochemical detection (ECD). A C8 bonded column was used and the mobile phase consisted of acetonitrile, methanol and 0.01 M sulphuric acid at a flow rate of 1.5ml/min. The detection limits for both THC and 11-OH-THC were 1.0 ng/ml. Preliminary screening of 193 drivers using an enzyme-multiplied immunoassay technique (EMIT) showed 21 tested positive on either blood, urine or both. Of these subjects 13 were confirmed as positive by the HPLC/ECD method in blood. Blood concentrations for THC ranged from 1.4ng/ml up to 20 ng/ml and for 11-OH-THC 2.5ng/ml up to 85 ng/ml.

**Workpackage No.:** 4

**Author:** GHONEIM, M.M., MEWALDT, S.P. AND THATCHER, J.W.

**Year:** 1975

**Title:** The effect of diazepam and fentanyl on mental, psychomotor and electroencephalographic functions and their rate of recovery.

**Journal/Book Name:** Psychopharmacologia

**Volume:** 14 44:1 61-6

**Abstract:** Ten healthy male subjects received diazepam (10 or 20 mg), fentanyl (0.1 or 0.2 mg) or a placebo intravenously at weekly intervals according to a latin square design. They were tested on a battery of psychological and electroencephalographic tests at 0.5, 2, 6, and 8 hrs following injection. Fentanyl had little effect on memory while diazepam reduced the ability to learn without increasing forgetting of material already acquired.

**Workpackage No.:** 2

**Author:** GIERGINGER, D.H.

**Year:** 1988

**Title:** Marijuana, driving, and accident safety

**Journal/Book Name:** Journal of Psychoactive Drugs

**Volume:** 20, 1, 93-101

**ISBN/ISSN:** 0279-1072

**Keywords:** accidents, traffic, automobile driving, human, marijuana smoking, psychomotor performance

**Workpackage No.:** 1

**Author:** GIERINGER, D.H.

**Year:** 1988

**Title:** Marijuana, driving, and accident safety

**Journal/Book Name:** Journal of Psychoactive Drugs

**Volume:** 20 (1), 94-101

**Workpackage No.:** 1

**Author:** GIGUIERE, W. AND BENSON, S.G.

**Title:** Measuring the Mellanby effect of alcohol through microprocessor tasks

**Keywords:** fatal accidents, driving, impairment, psychomotor functions, alcohol

**Workpackage No.:** 4

**Author:** GIROUD, C., AUGSBURGER, M., SADEGHIPOUR, F., VAREGIO, E., VEUTHEY, J.L. AND RIVIER, L.

**Year:** 1997

**Title:** Ecstasy - the status in French - speaking Switzerland.

**Journal/Book Name:** Schweiz Rundsch Med Prax.

**Volume:** 86, 13, 510-23

**Keywords:** ecstasy; field

**Workpackage No.:** 3

**Author:** GJERDE, H., CHRISTOPHERSEN, A.S. AND MORLAND, J.

**Title:** Drug Analyses in cases of suspected drug driving in Norway

**Journal/Book Name:** Drugged Driving, National Institute of Forensic Toxicology, Oslo, pp217-220

**Keywords:** drug analyses, driving, toxicology, norway

**Abstract:** Several legal and illegal drugs impair driving performance. There has been a steady increase in the number of cases of suspected drugged driving in Norway. Blood samples from 2207 cases of suspected driving under influence of drugs alone or in combination with alcohol were sent to the National Institute of Forensic Toxicology for drug analyses in 1990. In 1983 we received 1446 blood samples of this type. Because of the increasing number of cases, we had to make case handling and analytical procedures more efficient. Our system of case handling has been presented previously. In the present paper we present some of our analytical methods including those that are used most frequently.

**Workpackage No.:** 3

**Author:** GJERDE, H., BJORNEBOE, A., BJONEBOE, G.E. A.A., BUGGE, A., DEVRON, C.A. AND MORLAND, J.

**Year:** 1988

**Title:** A three-year prospective study of rearrests for driving under the influence of alcohol or drugs

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 20, 1, 53-57

**ISBN/ISSN:** 0001-4575/88?

**Keywords:** drugs, driving, amphetamine, diazepam, THC, rearrests, alcohol, substance-related disorders, social control, alcoholic intoxication

**Abstract:** Fifty drunken drivers and 50 drivers with high blood drug concentrations arrested during the first four months of 1983 were selected for a study of rearrests for driving under influence of alcohol or drugs. Of the drugged drivers selected, 32 had been

driving with high blood concentrations of diazepam (>.10uM). 50% of these drivers were rearrested during the subsequent three years. The rearrest rate was low (6%) among those who had been driving with high blood concentrations of amphetamine (>2.0uM) or THC (>0.010uM). Among the drunken drivers arrested (BAC >0.05%), the rearrest rate was 20%. The drivers were mostly rearrested for driving under the influence of alcohol  
**Workpackage No.:** 3

**Author:** GJERDE, H., SMITH-KIELLAND, A., NORMANN, P.T. AND MORLAND, J.  
**Year:** 1990

**Title:** Driving under the influence of toluene

**Journal/Book Name:** Forensic Science International

**ISBN/ISSN:** 0379-0738/90

**Keywords:** toluene, driving, adolescents, rearrests, toxicology

**Abstract:** Toluene is the most common volatile used for sniffing among adolescents. During 1983-1987, 114 drivers were arrested in Norway with blood toluene concentrations (BTCs)>10 uM. Only four of these drivers were women. The age range was 15-34 years, and the mean age was 21. The mean BTC was 109 uM. There was no simple relation between blood toluene concentration and degree of impairment, however, most drivers with BYTCs >100 uM were considered as impaired or probably impaired by toluene. In a five year prospective study of rearrests among drivers arrested for driving after toluene sniffing, 12 out of 15 drivers were rearrested. They were responsible for 40 cases of suspected driving under influence of toluene, alcohol, or other drugs. The blood levels of toluene determined in this study must be regarded as minimum concentrations, since the toluene concentration fell rapidly in samples stored at 4 C or 23 C. Blood samples from drivers suspected of driving under the influence of toluene must therefore be kept frozen

**Workpackage No.:** 2

**Author:** GJERDE, H., SMITH-KIELLAND, A., NORMANN, P.T. AND MORLAND, J.  
**Year:** 1990

**Title:** Driving under the influence of toluene

**Journal/Book Name:** Forensic Science International

**Volume:** 44, 1, 77-83

**ISBN/ISSN:** 0379-0738

**Keywords:** administration, inhalation, adolescence, adult, age factors, automobile driving, blood preservation, female, freezing, human, male, Norway, prospective studies, substance-related disorders, temperature, toluene

**Abstract:** Toluene is the most common volatile used for sniffing among adolescents. During 1983-1987, 114 drivers were arrested in Norway with blood toluene concentrations (BTCS) greater than 10 microm. Only four of these drivers were women. The age range was 15-34 years, and the mean age was 21. The mean BTC was 109 microm. There was no simple relation between blood toluene concentration and degree of impairment, however, most drivers with BTCs greater than 100 microm were considered as impaired or probably impaired by toluene. In a five year prospective study of rearrests



among drivers arrested for driving after toluene sniffing, 12 out of 15 drivers were rearrested. They were responsible for 40 cases of suspected driving under influence of toluene, alcohol, or other drugs. The blood levels of toluene determined in this study must be regarded as minimum concentrations, since the toluene concentration fell rapidly in samples stored at 4 degrees C or 23 degrees C. Blood samples from drivers suspected of driving under influence of toluene must therefore be kept frozen.

**Workpackage No.:** 2

**Author:** GJERDE, H. AND KINN, G.

**Year:** 1991

**Title:** Impairment in drivers due to cannabis in combination with other drugs

**Journal/Book Name:** Forensic Science International

**Volume:** 50, 1, 57-60

**ISBN/ISSN:** 0379-0738

**Keywords:** amphetamines, automobile driving, benzodiazepines, human, marijuana abuse, narcotics, Norway, street drugs, substance related disorders, tetrahydrocannabinol

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

**Workpackage No.:** 3

**Author:** GJERDE, H., CHRISTOPHERSEN, A.S. AND MORLAND, J.

**Year:** 1992

**Title:** Amphetamine and drugged driving

**Journal/Book Name:** Journal of Traffic Medicine

**Volume:** 20, 1, 21-26

**Keywords:** amphetamine, dangerous driving, impairment, road traffic accidents, clinical tests, blood analysis

**Abstract:** Amphetamine was found in blood samples from 380 suspected drug drivers arrested during 1989 and 1990. 92% had higher blood amphetamine concentrations than normally found in therapeutic use, and 79% had other drugs present. Clinical tests of impairment were performed at time of blood sampling of 248 drivers, 84% of the drivers said they were impaired. The reasons for apprehension were known in 164 cases. 39% were arrested for irregular/dangerous driving or involvement in road accidents. It seems that amphetamine abuse may cause impairment which in some cases may lead to irregular driving, dangerous driving and involve road traffic accidents

**Workpackage No.:** 3

**Author:** GJERDE, H., BEYLICH, K-M. AND MORLAND, J.

**Year:** 1993

**Title:** Incidence of alcohol and drugs in fatally injured car drivers in Norway

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 25, 4, 479-483

**ISBN/ISSN:** 0001-4575/93

**Keywords:** drugs, alcohol, driving, fatally-injured, Norway, benzodiazepines, tetrahydrocannabinol

**Abstract:** Blood samples from 159 fatally injured drivers from 1989 and 1990, corresponding to 57% of all fatally injured drivers in Norway during this period, were analysed for alcohol and psychoactive drugs. Alcohol was found in 28.3% of the drivers. 27% above the legal limit of 0.05%. Drugs were found in 16.4% of the drivers: benzodiazepines and tetrahydrocannabinol were the drugs most frequently found. Among 79 drivers fatally injured in single-vehicle accidents, 41.8% were positive for alcohol and 21.5% were positive for drugs

**Workpackage No.:** 3

**Author:** GOBER, G.

**Year:** 1990

**Title:** Initial Medical Advisory Board review of medical impairment: effect on driver performance and traffic safety

**Journal/Book Name:** Tex Med

**Volume:** 86, 12, 64-8

**ISBN/ISSN:** 0040-4470

**Keywords:** accidents, traffic, adult, automobile driver examination, evaluation studies, female, governing board, human, male, middle age, texas

**Abstract:** Medical impairment poses a potential threat to the driver and others who share the roads, if the condition is not identified and controlled. In Texas, the Texas Medical Advisory Board evaluates a driver's medical condition to determine its effect on the individual's driving ability. This study attempted to determine if the board's initial review resulted in an improvement in driving performance of persons whose medical conditions were evaluated. The results show a 46% reduction in the number of violations and a 53% reduction of collisions in the study population after the review. The control population showed a 17% violation and 3% collision reduction for the same period.

**Workpackage No.:** 3

**Author:** GOERINGER, K.E., LOGAN, B.K. AND CHRISTIAN, G.D.

**Year:** 1997

**Title:** Identification of Tramadol and its metabolites in blood from drug-related deaths and drug impaired drivers

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 21, 529-537

**ISBN/ISSN:** 0146-4760

**Keywords:** tramadol, driving, allergic reactions, seizures, fatalities

**Abstract:** Tramadol is a centrally acting, binary analgesic that is neither an opiate-derived nor nonsteroidal anti-inflammatory drug and that was approved for use in the United States in 1995. It is used to control moderate pain in chronic pain settings such as osteoarthritis and postoperative cases. Used in therapy as a racemic mixture, the (+)-enantiomer weakly binds to the m-opioid receptor, and both enantiomers inhibit serotonin and norepinephrine reuptake. Tramadol's major active metabolic,  $\mu$ -desmethyltramadol (ODT), shows higher affinity for the m-opioid receptor and has twice the analgesic potency of the parent drug. The synergism of these effects contributes to tramadol's analgesic properties with the (+)-enantiomer. Although tramadol was initially thought to exhibit low abuse potential, Ortho-McNeil, the drug's manufacturer, recently reported a large number of adverse events attributed to tramadol including abuse by opioid-dependent patients, allergic reactions, and seizures. The high number of adverse reactions has prompted the company to up-date the prescribing information for the drug. An analytical method of using gas chromatography-mass spectrometry (GC-MS) without derivatization for the determination of tramadol and its metabolites is reported. An n-butyl chloride extraction is followed by GC-MS analysis using a 5% phenylmethylsilicone involving tramadol revealed concentrations ranging from 0.03 to 22.59 mg/L for tramadol, from 0.02 to 1.84 mg/l for ODT, and from 0.01 to 2.08mg/L for N-desmethyltramadol. Three traffic accident deaths were clearly attributable to acute morphine toxicity, one was a doxepin overdose, and six were multiple drug overdoses. the role of tramadol was explored in each death.

**Workpackage No.:** 2

**Author:** GOLDBERG, H.L

**Year:** 1984

**Title:** Benzodiazepine and nonbenzodiazepine anxiolytics

**Journal/Book Name:** Psychopathology

**Volume:** 17, Suppl 1, 45-55

**ISBN/ISSN:** 0254-4962

**Keywords:** Adrenergic beta-Antagonists TU; Anti-Anxiety Agents\* Antianxiety Agents; Anti-Anxiety Agents; Benzodiazepine \*TU Antianxiety Agents Benzodiazepine; Antidepressive Agents TU; Antipsychotic Agents TU; Anxiety Disorders \*DT; Barbiturates TU; Biotransformation; Diphenhydramine TU; Ethanol TU; Glycerol AA/TU; Gaba ME; Human;Hydroxyzine TU; Propylene Glycols TU; Receptors, Cell Surface ME; Spiro Compounds TU

**Abstract:** A review of anxiolytic drugs is presented, including ethyl alcohol, barbiturates, diphenylmethane derivatives, glycerol and propanediol derivatives, antipsychotics, and antidepressants. Focus on the benzodiazepines and their metabolism and method of action follows. The newest two groups are then reviewed: triazolobenzodiazepines and azaspirodecanediones. The first member of this latter group, buspirone, is then reviewed in detail including the author's personal studies of the drug. The fact that it appears nonaddicting, nonsynergistic with alcohol, lacks impairment of driving-related skills, and is very effective in treating anxiety, may represent a breakthrough.

**Workpackage No.:** 1

**Author:** GOMM, P.J., WESTON, S.I. AND OSSELTON, M.D.

**Year:** 1990

**Title:** The effect of respiratory aerosol inhalers and nasal sprays on breath alcohol testing devices used in Great Britain

**Journal/Book Name:** Medicine, Science and the Law

**Volume:** 30, 3, 203-206

**Keywords:** respiratory aerosol inhalers, alcohol, breath tests

**Abstract:** Subjects suffering from respiratory diseases occasionally experience difficulty when attempting to provide breath samples to satisfy the requirements of breath alcohol testing devices. In order to assist ventilation, such subjects may resort to the use of an aerosol inhaler. Twenty aerosol inhalers containing drugs which exhibit an effect on the respiratory system and five nasal sprays used to relieve the symptoms of hay fever, have been tested for interference on the range of breath alcohol measuring devices used by the Police in Great Britain. No interference attributable to the contents of any of the aerosol inhalers or nasal sprays tested was observed on any of the instruments in police use.

**Workpackage No.:** 2

**Author:** GOODALL, C.R. AND BASTEYNS, B.J.

**Year:** 1995

**Title:** A reliable method for the detection, confirmation, and quantification of cannabinoids in blood

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 19, 6, 419-26

**ISBN/ISSN:** 0146-4760

**Keywords:** automobile driving, cannabinoids, fluorescence polarization, hallucinogens, human, reference standards, reproducibility of results, support, non-US gov't, Tetrahydrocannabinol

**Abstract:** A sensitive and reliable method was developed for the identification and quantitation of cannabinoids in blood. Samples were screened by fluorescence polarization immunoassay. Analysis was completed on a benchtop mass selective detector using selected ion monitoring. The limits of detection were 0.2 ng/mL for delta9-tetrahydrocannabinol (THC and 11 -hydroxy-THC and 2 ng/mL for 11 -nor-9-carboxy-THC. Extensive method validation is presented, including within-run variation, between-run variation, and results from external proficiency testing. Sample stability was studied over a 6-month period. Several derivatives and extraction techniques were evaluated to determine optimum performance. Data from a blind study of 217 samples were used to determine the predictive value of the screening procedure. The procedure is used routinely in the laboratory on samples from drivers issued a citation for impaired driving and also on postmortem blood from death investigations.

**Workpackage No.:** 3

**Author:** GORDON, N.B.  
**Year:** 1970  
**Title:** Reaction times of methadone treated ex-heroin addicts.  
**Journal/Book Name:** Psychopharmacologia  
**Volume:** 16, 337-344.  
**Keywords:** methadone; reaction time; experimental  
**Workpackage No.:** 2

**Author:** GORELICK, D.A. AND WILKINS, J.N.  
**Year:** 1989  
**Title:** Inpatient treatment of PCP abusers and users.  
**Journal/Book Name:** Am Journal of Drug and Alcohol Abuse  
**Volume:** 15:1 1-12  
**Keywords:** pcp  
**Abstract:** Screening of 155 consecutive admissions to a voluntary, 4-6 week substance abuse inpatient rehabilitation program revealed a 13% prevalence of PCP abuse (defined by DSM-III criteria) and a 23% prevalence of nonabusive PCP use.  
**Workpackage No.:** 3

**Author:** GRAEVEN, D.B., SHARP, J.G. AND GLATT, S.  
**Year:** 1981  
**Title:** Acute effects of phencyclidine (PCP) on chronic and recreational users.  
**Journal/Book Name:** Am Journal of Drug and Alcohol Abuse  
**Volume:** 8:1 39-50  
**Keywords:** pcp  
**Abstract:** Snowball sampling techniques were used to generate a sample of 200 phencyclidine users from an area with a 10-year history of extensive PCP use. Three types of users were studied: heavy chronic, light chronic, and recreational users.  
**Workpackage No.:** 3

**Author:** GRILLY, D.M.  
**Year:** 1981  
**Title:** People's views on marijuana, other drugs and driving: an update  
**Journal/Book Name:** J Psychoactive Drugs  
**Volume:** 13, 4, 377-9  
**ISBN/ISSN:** 0279-1072  
**Keywords:** alcohol drinking, attitude, automobile driving, cannabis, human  
**Workpackage No.:** 3

**Author:** GRUNER, O. AND BILZER, N.  
**Year:** 1992  
**Title:** Current Status of forensic breath alcohol analysis

**Journal/Book Name:** Blutalkohol

**Volume:** 29(2), 98-107

**ISBN/ISSN:** 0006-5250

**Keywords:** Alcoholic Intoxication ; Automobile Driving ; Breath Tests ; English Abstract ; Ethanol ; Expert Testimony ; Human ; Reproducibility of Results

**Abstract:** 1) As long as the requirements mentioned in the expert opinion of the BGA concerning the analysers and measuring systems are not fulfilled, the measuring results can only be used as pretest results. At the present time there are not any analysers available on the world market, which fulfill all requirements! 2) Even if all requirements would be fulfilled, there still arise many doubts concerning the actual probative force of breath alcohol analysis. They are essentially based on inadequate knowledge of physiological and pathological influences. 3) If presuppositions mentioned under 1) and 2) are disregarded, it should be possible to lay down analogic results from the BAK-limits to breathalcohol concentrations, but problems will always appear, if conversions to another time (than the analysis time) or comparisons with BAK-values are to be effected. The dimension and their difficulties for the forensic and legal expert opinion are not yet in sight.

**Workpackage No.:** 4

**Author:** GULLBERG, RG

**Year:** 1990

**Title:** An application of probability theory to a group of breath-alcohol and blood-alcohol data

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 35(6), 1342-52

**ISBN/ISSN:** 0022-1198

**Keywords:** Alcoholic Intoxication ; Automobile Driving ; Breath Tests ; Data Interpretation, Statistical ; Ethanol ; Human ; Probability ; Wisconsin

**Abstract:** Many jurisdictions have "per se driving-while-intoxicated (DWI) status expressed in terms of a blood-alcohol concentration (BAC) standard (in grams per 100 mL or the equivalent). Since breath-alcohol (BrAC) analysis is typically employed to determine BAC, there is often challenge to the use of an assumed 2100:1 conversion ratio. This concern may be relevant in light of considerable data which show a low percentage of cases in which BrAC greater than BAC, and this concern increases when the BrAC is used to predict BAC in the context of "per se legislation. Probability theory provides a basis for estimating the likelihood of an individual having a BRAC greater than or equal to  $g/210L$  with a corresponding BAC less than  $0.10g/100mL$ . Actual field data from the state of Wisconsin ( $n = 404$ ) were evaluated to determine the probability of this occurrence. The probability for this occurrence involves the multiplication law for independent events. The computed probability from the data was  $0.018$ . The actual number of occurrences where BRAC greater than or equal to  $0.10g/210L$  and BAC less than  $0.10g/100mL$  was 5, resulting in a probability of  $0.012$ . The concern of having BRAC greater than BAC at the critical "per se level has a very low probability of occurrence, which thus supports the reasonableness of "per se DWI legislation based upon a blood-alcohol standard determined by breath-alcohol analysis.

**Workpackage No.: 3**

**Author:** GULLBERG, R.G AND MCELROY, AJ

**Year:** 1992

**Title:** Comparing roadside with subsequent breath alcohol analyses and their relevance to the issue of retrograde extrapolation (see comments)

**Journal/Book Name:** Forensic Science International

**Volume:** 57(2), 193-201

**ISBN/ISSN:** 0379-0738

**Keywords:** Alcoholic Intoxication ; Automobile Driving ; Breath Tests ; Calibration ; Comparative Study ; Ethanol ; Human ; Police ; Regression Analysis ; Substance Abuse Detection ; Time Factors

**Abstract:** Driving while intoxicated (DWI) legislation requires proving the critical breath alcohol concentration (BrAC) at the time of driving. With time delayed analysis, retrograde extrapolation is occasionally employed but has several uncertainties associated with it. The present study attempts to address whether subjects actually arrested for DWI are likely to have BRAC values near the time of driving differing largely from those performed at a subsequent time. Selected officers arrested n = 161 subjects where roadside BrAC was determined with Pre-Arrest Breath Test (PBT) devices along with subsequent duplicate evidential analyses followed by an additional PBT analysis. These two sets of duplicates, one with large time interval (mean = 63.5 min.) and one with a 2-3 min difference, were then compared by several statistical methods. The results showing duplicate variability did not differ when the long time interval existed ( $F = 1.0, P > 0.05$ ). A small but significant decrease in BrAC with respect to time appeared for the duplicate PBT data. Retrograde extrapolation applied to the data employing an assumed  $0.015 \text{ g}/21 \text{ l}/\text{h}$  yielded a small but significant overestimate of the actual roadside PBT result. Finally, evidentiary analyses performed within 2 h of driving will provide good estimates and certainly not overestimates, of the BrAC existing at the time of driving and it appears that extrapolation may be unwarranted in these cases.

**Workpackage No.: 3**

**Author:** GULLBERG, R.G.

**Year:** 1993

**Title:** The application of control charts in breath alcohol measurement systems

**Journal/Book Name:** Medicine, Science and the Law

**Volume:** 33, 1, 33-40

**Abstract:** Measurement provides numerical information usually to assist in some decision process. Quality control is fundamental to the measurement process if the results are to provide confidence to the decision maker. The degree of quality control required depends on the context and purpose of the measurements. Quality control is particularly important in the forensic science measurement of breath alcohol in light of the significant consequences involved. Control charts are an important and widely used tool in quality control for both measuring and manufacturing processes. They help evaluate measurement variability and provide a visual assessment of the system's state of

statistical control. Control charts can be developed and applied in a variety of different ways. Several examples are illustrated that apply control charts to breath alcohol measuring systems. Application of these methods should result in improved process monitoring in addition to improved confidence for forensic purposes.

**Workpackage No.:** 4

**Author:** GUTHRIE, S., LINOILA, M.

**Year:** 1986/7

**Title:** Epidemiological and laboratory studies on alcohol, drugs and traffic safety

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam, Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 0 444 809031

**Workpackage No.:** 2



## H

**Author:** HALE, A.S.

**Year:** 1994

**Title:** The importance of accidents in evaluating the cost of SSRIs: a review

**Journal/Book Name:** Int Clin Psychopharmacol

**Volume:** 9, 3,195-201

**ISBN/ISSN:** 0268-1315

**Keywords:** accidents, traffic, antidepressive agents, tricyclic, comparative study, cost-benefit analysis, depressive disorder, flicker fusion, human, psychomotor performance, sensory thresholds, Serotonin Uptake Inhibitors

**Abstract:** Economic studies attempting to justify the increased cost of new antidepressants such as the SSRIs are often difficult to interpret, marginal benefits hinging on minute differences in assumptions and interpretation. Studies to date have focused largely upon the costs of treatment failure, which in turn relates to compliance rates. A missing factor is the cost of accidents, especially serious road traffic accidents. Most tricyclic antidepressants seriously impair driving performance, even more so than alcohol or benzodiazepines, whilst SSRIs do not. With moves towards maintenance and continuation therapy for depression, patients on tricyclics remain at long-term risk for such accidents. Cost savings from reducing the rate of accidents could more than pay for the increased costs of SSRIs.

**Workpackage No.:** 1

**Author:** HALL, J.E.

**Year:** 1995/6

**Title:** Alcohol and other drug use in commercial transportation

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** transport workers/ drivers marijuana/cocaine/alcohol/compulsory testing

**Abstract:** Quite a bit of progress has been made in the United States in reducing the use of alcohol and drugs by commercial vehicle operators in all modes of transportation over the past few years. Drug use prevention and testing programs have been required by the Federal Government since the mid to late 1980's. More than 7,000,000 employees in safety-sensitive jobs are covered by the required programs. Random drug testing of rail workers in 1993 continued to show a reduction in the number of those testing positive for the fourth consecutive year. The positive rate was again less than 1.00 percent. This percentage is down from 6 percent in 1988. The U.S. Federal Aviation Administration reported that 1993, was the fourth year in a row that aviation workers tested positive at a rate less than one percent. Because of these low rates, new regulations that became effective in 1995, will permit the random testing rates for those industries to be reduced from 50 percent to 25 percent. In the trucking industry, one survey conducted by the

American Trucking Associations, compiled drug testing data from its member companies for the year 1990. A positive rate from random tests was 2.5 percent. As in the other industries, marijuana was the drug of choice followed by cocaine. More recently, the Federal Highway Administration conducted a four State roadside random pilot drug and alcohol testing program. Through the end of 1993, the positive rate for drugs was 3.8 percent and for alcohol the positive rate was 0.18 percent. Earlier studies in the trucking industry had found considerably higher positive testing rates. This paper discusses the progress that has been made and review current developments in the field and discuss new testing requirements.

**Workpackage No.:** 1

**Author:** HANKS, G.W.

**Year:** 1995

**Title:** Morphine sans Morpheus

**Journal/Book Name:** The Lancet

**Volume:** 346, 652-653

**Keywords:** morphine, psychomotor function, impairment

**Abstract:** Outlines the effects of morphine. Refers to the possible impact on driving. The evidence indicates that morphine produces little measurable impairment in cognitive and psychomotor function.

**Workpackage No.:** 1

**Author:** HANSEN, A.C., KRISTENSEN, I.B., DRAGSHOLT, C. AND HANSEN, J.P.B.

**Year:** 1996

**Title:** Alcohol and Drugs (Medical and Illicit) in Fatal Road Accidents in a City of 300000 Inhabitants

**Journal/Book Name:** Forensic Science International

**Volume:** 79, 1, 49-52

**Keywords:** drug driving, fatal traffic accidents, alcohol, drivers

**Abstract:** During a 1-year period all fatal road accidents in the police district of Aarhus, Denmark, were investigated regarding the presence of alcohol, medical drugs or narcotic substances, and the nature of the accident. Out of a total of 30 accidents 24 were investigated. Two thirds had been caused by the victim him- or herself. In one third of the accidents alcohol was present and considered an important contributory factor. Medical drugs and narcotic substances played a lesser role.

**Workpackage No.:** 3

**Author:** HANSTEEN R.W., MILLER, R.D., LONERO, L., REID, L.D. AND JONES, B.

**Year:** 1976

**Title:** Effects of cannabis and alcohol on automobile driving and psychomotor tracking.

**Journal/Book Name:** Annals of the New York Academy of Sciences

**Volume:** 282, 240-256.

**Workpackage No.:** 2

**Author:** HARRISON, C; SUBHAN, Z. AND HINDMARCH, I

**Year:** 1985

**Title:** Residual effects of zopiclone and benzodiazepine hypnotics on psychomotor performance related to car driving.

**Journal/Book Name:** Drugs Exp Clin Res

**Volume:** 11(12), 823-9

**ISBN/ISSN:** 0378-6501

**Keywords:** Adult; Anti-Anxiety Agents, Benzodiazepine AE ANTIANXIETY AGENTS BENZONDIAZEPINE; Automobile Driving; Double-Blind Method; Female; Flicker Fusion DE; Human; Piperazines AE; Psychomotor Performance DE; Random Allocation; Reaction Time DE; Sleep DE; Support, Non-U.S. Gov't

**Abstract:** A double-blind, randomized, cross-over study was carried out in 10 normal healthy volunteers to investigate the residual effects of 7.5 mg zopiclone, 1 mg lormetazepam, 0.25 mg triazolam, 1 mg flunitrazepam and placebo. Tests of psychomotor performance and analogues of car driving ability were administered the morning following night-time medication. Changes with respect to placebo in an information-processing task one hour after taking the medications confirmed the hypnotic efficacy of zopiclone, triazolam and flunitrazepam. Flunitrazepam also produced a significant depression of the Critical Flicker Fusion Threshold (CFF) and increased subjective ratings of sedation one hour after nocturnal dosing. Flunitrazepam impaired the reaction time on the information-processing test the morning following doses of 1 mg.

**Workpackage No.:** 2

**Author:** HART, B.J; WILTING J. AND DE GIER, J.J

**Year:** 1988

**Title:** The stability of benzodiazepines in saliva

**Journal/Book Name:** Methods Find Exp Clin Pharmacol

**Volume:** 10(1), 21-6

**ISBN/ISSN:** 0379-0355

**Keywords:** Benzodiazepines\*AN; Drug Stability; Human ; Male ; Nitrazepam AA/AN ; Saliva\*AN; Specimen Handling

**Abstract:** The stability of some selected benzodiazepines in saliva has been studied. The benzodiazepines nitrazepam and clonazepam were found to be unstable in saliva at room temperature and nitrazepam was converted into 7-aminonitrazepam. The conversion rate of nitrazepam was strongly dependent on the composition of the subject's saliva. Nitro-reduction may complicate the use of saliva in epidemiological studies on drugs and driving. This could occur particularly if saliva drug concentrations are to be used as a quantitative measure of driving performance.

**Workpackage No.:** 4

**Author:** HATTORI, H., KOMURA, S. AND FURUNO, J.

**Year:** 1992

**Title:** Legislation on alcohol detection in alcohol-related traffic accidents involving casualties in Japan and Canada

**Journal/Book Name:** Arukoru Kenkyuto Yakubutsu Ison

**Volume:** 27(3), 233-41

**ISBN/ISSN:** 0389-4118

**Keywords:** Accidents, Traffic LJ/MO/PC ; Alcohol Drinking LJ ; Automobile Driving LJ ; Breath Tests ; Canada ; Comparative Study ; Ethanol BL ; Human ; Japan

**Abstract:** A comparative study of the law concerning the arrest and conviction of alcohol-related casualty traffic accident was made between Japan and Canada. In Japan, the incidence of alcohol-related traffic accident has declined since 1970, but the number of fatal traffic accidents remains unchanged over the last 6 years, and amount to 9% of the total number of fatalities in traffic accidents. Hence, an effort is being made to reduce this number. According to the Road Traffic Act, a driver can be convicted for drunken driving if his or her blood alcohol level is above 0.5 mg/ml or above 0.25 mg/l in exhaled air, and if driver is judged as a drunken state by sobriety test. Unlike Canada, however, police officer cannot demand a blood sample from a suspected drunken driver. Instead, they must rely on the breath analysis and sobriety test. These tests are considered to be less accurate than blood test. These drawbacks are reflected in a number of court cases which are related to the relationship between alcohol concentration and the state of driving. In Canada, the operation of a motor vehicle with a blood alcohol level of over 0.8 mg/ml is a criminal offense punishable by fine or imprisonment or both, and results in the suspension of driving privileges for 6 months. Initially, a breath alcohol analysis is performed on everyone suspected of motor vehicle after consuming alcohol within the preceding two hours. Subsequently, with the suspect's consent, a police officer is allowed to request a blood sample for further analysis.

**Workpackage No.:** 1

**Author:** HAWKS, R.L.

**Year:** 1981

**Title:** Development and application of assays for cannabinoids in biological samples

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T80 8th International Conference. Sweden, Graphic Systems, Goteborg. Edited by L. Goldberg.

**ISBN/ISSN:** 91-22-00425-4

**Keywords:** cannabinoids, driving, samples

**Workpackage No.:** 4

**Author:** HAWORTH, N. AND VULCAN, P.

**Year:** 1997

**Title:** The roles of alcohol and other drugs in single vehicle crashes

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety - T'97. Annecy, France, CERMT Centre d'Etudes et de Recherches en Medecine du Traffi, Annecy.

**Volume:** 1, 111-118

**ISBN/ISSN:** 2-9511746-0-8

**Keywords:** drugs, alcohol, cannabis, BAC, driving, single-vehicle crashes, fatality

**Abstract:** Single vehicle crashes comprise about 30% to 40% of fatal crashes in most jurisdictions. While the role of alcohol and other drugs in these crashes is thought to be high, the detail of investigation of these crashes is often minimal in the (approximately) two-thirds of crashes in which the driver is killed. Overall, 40% of the known BACs of drivers were greater than 0.05%, compared with 0.5% of control drivers. Cannabis (measured as carboxy-THC) was present in 19% of crashed drivers, while 0.6% of control drivers stated they had used cannabis in the previous 12 hours. Cannabis was generally found in conjunction with alcohol in crashed drivers: 16% of drivers had BAC>0.05% and cannabis. No control drivers had alcohol and cannabis. The odds ratios for taking prescription and non-prescription drugs in the previous 12 hours were not significantly greater than one.

**Workpackage No.:** 3

**Author:** HEIFER, U

**Year:** 1991

**Title:** Blood alcohol concentration and effect, traffic medicine characteristics and legal traffic relevance of alcohol limit values in road traffic

**Journal/Book Name:** Blutalkohol

**Volume:** 28(3), 121-45

**ISBN/ISSN:** 0006-5250

**Keywords:** Accidents, Traffic ; Alcohol Drinking ; Alcoholic Intoxication ; Automobile Driving ; English Abstract ; Ethanol ; Human ; Metabolic Clearance Rate ; Risk Factors

**Abstract:** Since the expert report of the Federal Health Office (FHO) in 1966 (also compare FHO expert report 1977) numerous papers about the influence of small doses of alcohol on driving ability have been published (see Blood Alcohol, Alcohol, Drugs and Behavior). These papers emphasise the possibility to prove an acute influence on the central nervous system of man with characteristic consequences for his readiness to perform and his general effectiveness with regard to the safe conduct of a vehicle above a concentration of blood alcohol from 0.2 to 0.3% upwards. This experimentally observed increase in knowledge which conforms with jurisdiction i.e. assuming the possibility of alcohol-effected reduced driving ability above 0.3% in individual cases, -however, does not include a regular capability to detect a reduced driving ability for a range in blood alcohol concentration of 0.3% to 1.0% (see opinion of the directors and boards in the German Society for Legal Medicine, 1984). From All presentations the following conclusions may be drawn regarding the level and traffic medicals als well as psychophysical relevance and the forensic importance of alcohol threshold values in road traffic: 1. The 0.0% would be consistent. Each trace of blood alcohol can influence driving ability. Such a limit would, however, be linked to an intolerable cover-up-level. 2. The threshold level to prove the effect of alcohol lies at 0.3% to 0.4% as a basic value (jurisdiction = 0.3%). This level must definitely be regarded as preventing traffic accidents. At 0.4% the relative probability to become involved a lethal traffic accident is 2.1 times higher than the sober value. At 0.4% the relative probability to cause an

accident is not significantly higher than the sober value. A blood alcohol concentration of 0.4% may be proven by an analytical average value of 0.5% (safety margin: 0.1 %). From legal and traffic medical viewpoint nothing contradicts the intention to establish an abstract danger ceiling at  $0.4 + 0.1\% = 0.5\%$  linked to unlawful behaviour and the prohibition to drive. 3. The danger ceiling presently in operation contains a basic value of 0.6 to 0.7% and a safety margin of  $0.15\% = 0.8\%$ . At 0.6 to 0.7% the majority of drivers are unable to participate in the traffic. At 0.7% the relative possibility to become involved in an traffic accident is 3.7 times higher also compared to the sober value. At 0.7% the relative probability to cause an accident is increased 2.7 times.

**Workpackage No.:** 1

**Author:** HEISSER, H.

**Year:** 1993

**Title:** Personality changes after cannabis use. Driving ability

**Journal/Book Name:** Unfall-und Sicherheitsforschung Strassenverkehr

**Volume:** 89, 62-64

**Keywords:** cannabis, drugs, driving, impairment, driving test, emotional change, self-control, motivation, responsibility, alcohol

**Abstract:** 1971 drivers undertook a driving test after cannabis use (2.5-7g/day each). No serious impairment was observed, however with extreme variance from 50-70%. In contrast emotional change, self-control, motivation, and responsibility were considerably altered. The impact on driving behaviour was presumed to be serious as alcohol induced

**Workpackage No.:** 3

**Author:** HEMMELGARN, B., SUISSA, S., HUANG, A., BOIVIN, J.F. AND PINARD, G.

**Year:** 1997

**Title:** Benzodiazepine use and the risk of motor vehicle crash in the elderly

**Journal/Book Name:** Journal of the American Medical Association

**Volume:** 278, 1, 27-31

**ISBN/ISSN:** 0098-7484

**Keywords:** accidents, traffic, aged, aged 80 and over, automobile driving, benzodiazepines, case-control studies, central nervous system agents, cohort studies, female, human, logistic models, male, psychomotor performance, Quebec, risk, sampling studies, support, non-U.S. Gov't

**Abstract:** CONTEXT: Benzodiazepines, used by a sizable number of the elderly population, may affect the ability to drive and thus increase the risk of a motor vehicle crash. Epidemiologic studies of this question have produced inconsistent results that may be due to the different effects of long- and short-half-life benzodiazepines and variations in their duration of use. OBJECTIVE: To determine whether the use of benzodiazepines of either long- or short-elimination half-life is associated with the risk of injurious motor vehicle crash in the elderly. DESIGN AND SETTING: Nested case-control design within a cohort of 224,734 drivers from the Canadian province of Quebec, aged 67 to 84 years, followed up from 1990 to 1993. Computerized data for the study were obtained from

provincial driver's license files, police reports of injurious crashes, and health insurance records. **PATIENTS:** We identified all 5579 drivers involved in an injurious crash (cases) and a random sample of 10 controls per case selected from a subcohort of 13,256 subjects. **MAIN OUTCOME:** Involvement of a cohort member as a driver in a motor vehicle crash in which at least 1 person (not necessarily the driver) sustained bodily injury. **RESULTS:** The adjusted rate ratio of crash involvement within the first week of long-half-life benzodiazepine use was 1.45 (95% confidence interval [CI], 1.04-2.03). The rate ratio for continuous use of longer duration up to 1 year was slightly lower but remained significant (rate ratio, 1.26; 95% CI, 1.09-1.45). In contrast, there was no increased risk after the initiation of treatment with short-half-life benzodiazepines (rate ratio, 1.04; 95% CI, 0.81-1.34) or with their continued use (rate ratio, 0.91; 95% CI, 0.82-1.01). **CONCLUSIONS:** Brief or extended periods of exposure to long-half-life benzodiazepines are associated with an increased risk of motor vehicle crash involvement in the elderly population. There is no such elevated risk for short-half-life benzodiazepines.

**Workpackage No.:** 3

**Author:** HERBERG, K.W.

**Year:** 1994

**Title:** Antidepressives and traffic safety

**Journal/Book Name:** Fortschr Neurol Psychiatr

**Volume:** 62 Suppl 1, 24-8

**ISBN/ISSN:** 0720-4299

**Keywords:** adult, antidepressive agents, arousal, automobile driving, double-blind method, doxepin, english abstract, ethanol, female, human, male, middle age, orientation, paroxetine, psychomotor performance, reaction time, stress, psychological

**Abstract:** The influence of paroxetine (1 x20 mg/day) on safety-relevant performance was compared with the effects of doxepin (2x50 mg/day) and placebo. The medication covered a 3-week period. On day 20 of treatment, ethanol was additionally administered (0.05% BAC). The study group comprised 60 healthy male and female volunteers in the age range 37-60 years, who were assigned to the three structurally identical medication groups under randomized, double-blind conditions. The functional capacity of primary interest was investigated in seven tests to record visual orientation, forced concentration, simple reaction time, choice reaction time, reaction under stress, vigilance, and motor coordination. Test sessions took place before the treatment and five times during the medication phase. Paroxetine proved comparable to placebo in all cases, while in comparison with the two reference substances doxepin revealed loss of vigilance and motor coordination, as well as of concentration and the simple (acoustic) reaction time.

**Workpackage No.:** 2

**Author:** HERNANDEZ, M., McDANIEL, C.H., COSTANZA, C.D. AND HERNANDEZ, O.J.

**Year:** 1998

**Title:** GHB-induced delirium: a case report and review of the literature of gamma

hydroxybutyric acid.

**Journal/Book Name:** Am Journal of Drug and Alcohol Abuse

**Volume:** 24:1 179-83

**Keywords:** GHB

**Abstract:** We describe what we believe is the first psychiatric hospitalization due to GHB-induced delirium reported in the medical literature. We examine the use of the substance gamma hydroxybutyric acid (GHB) and describe the clinical findings in a patient who presented to an acute inpatient psychiatric unit with a chief complaint of feeling suicidal and a 1-year history of GHB use. A review of the literature and GHB's availability through the Internet are discussed.

**Workpackage No.:** 3

**Author:** HERSACK, R.A.

**Year:** 1994

**Title:** Ketamine's psychological effects do not contraindicate its use based on a patient's occupation.

**Journal/Book Name:** Aviat Space Environ Med

**Volume:** 65:11 1041-6

**Keywords:** ketamine

**Abstract:** Since ketamine was approved for clinical use, there has been debate over whether the psychological effects of ketamine warrant avoiding use of the drug in patients based on their occupation. This article reviews the literature to determine if such concerns are valid. After 25 years of clinical experience with ketamine, fewer than 10 cases document the occurrence of delayed psychological effects potentially attributable to that drug. In most cases, the delayed effects were temporary, resolving within 3 weeks. Further, there were no long-term psychological effects clearly attributable to ketamine. Children who manifested delayed effects had several other factors present placing them at risk for long-term psychological changes independent of their receiving ketamine. Several controlled studies investigating the risk of long-term psychological effects due to ketamine fail to document that the risk of permanent psychological changes from ketamine is any greater than that from any other anesthetic. In conclusion, there is no evidence in the literature that ketamine presents a higher risk compared to other anesthetics for causing long-term psychological effects that result in a patient not being able to return to his or her occupation. The decision of whether to use ketamine should be a clinical decision weighing relative risks versus benefits, and not a decision based on the patient's career.

**Workpackage No.:** 3

**Author:** HERXHEIMER, A.

**Year:** 1982

**Title:** Driving under the influence of oxazepam: guilt without responsibility?

**Journal/Book Name:** Lancet

**Volume:** 2, 829, , 223

**Keywords:** drugs, oxazepam, careless driving, side-effects, criminal law



**Abstract:** This article reports the case of a nineteen year old man who was charged with careless driving. The man had recently started to take oxazepam and had not be warned of possible side-effects by his doctor or by the labelling of the tablets themselves. The drug did not induce feelings of drowsiness in the man but he nodded off at the wheel. Coupled with the fact that the individual had no independent knowledge of the drugs it was deduced that it was unreasonable to expect him to have foreseen or avoided the accident. Three lay magistrates found him not guilty of careless driving. The author states that a doctor who fails to warn his/her patient of possible side-effects shares some of the responsibility of the accident.

**Workpackage No.:** 1

**Author:** HILDEGARD, G. AND BERGHAUS, G.

**Year:** 1998

**Title:** Impairment of driving ability by medicines - metaanalysis of epidemiological studies

**Journal/Book Name:** Proceedings of the International Congress "Road Safety in Europe"

**Keywords:** impairment, drugs, medicines, metaanalysis, epidemiology, analysis, crash

**Abstract:** The evaluation of more than 200 epidemiological studies preliminary showed only 13 studies with detailed information for example about the drivers (originator of the hazard), drug analysis. Serum concentrations were documented just in 3 studies. On the base of this small amount of selected studies the final result can be summarised in the following matter: - a valid estimation of the risk of road safety induced by medicines, based on best methods, is hardly possible at present, - the exploration of data in the publications results - as an approximation - in a percentage of 3.5 - 7% of drivers under the influence of medicines, and the medicinal drug is postulated as the cause for a crash.

**Workpackage No.:** 3

**Author:** HINDMARCH, I. AND GUDGEON, AC

**Year:** 1980

**Title:** The effects of clobazam and lorazepam on aspects of psychomotor performance and car handling ability.

**Journal/Book Name:** British Journal of Clinical Pharmacology

**Volume:** 10(2), 145-50

**ISBN/ISSN:** 0306-5251

**Keywords:** Adult; Analysis of Variance; Anti-Anxiety Agents, Benzodiazepine AE/\*PD Antianxiety Agents Benzodiazepine; Attention DE; Automobile Driving\*; Benzodiazepinones\*PD; Comparative Study; Concept Formation DE; Female; Human; Lorazepam \*PD; Mental Processes \*DE; Motor Activity \*DE; Sleep DE

**Abstract:** Laboratory tests of psychomotor performance and 'on road' assessments of car handling ability were made following repeated doses of clobazwn 10 mg three times daily, lorazepam 1 mg three times daily and matching placebo 1 capsule three times daily. 2 Both active compounds produced on impairment, compared to placebo, in some mental arithmetic and letter cancellation tasks, but these effects were neither widespread

nor consistent. 3 Lorazepam produced a significant impairment of car driving tasks and analogue rating scales of subjective alertness. The pronounced sedative activity of the drug was also shown in the verbal reports of side effects and in indices of early morning sedation derived from the Leeds Sleep Evaluation Questionnaire. 4 Clobazam did not produce either the objective, or the subjective impairment of performance and alertness found with lorazepam. 5 The results taken as a whole show important differences between the 1,4 benzodiazepine, lorazepam, and the 1,5 benzodiazepine, clobazam, in their effects on the integrity of psychomotor performance related to car driving ability.

**Workpackage No.:** 2

**Author:** HINDMARCH, I.

**Year:** 1980

**Title:** Psychomotor function and psychoactive drugs

**Journal/Book Name:** British Journal of Clinical Pharmacology.

**Volume:** 10;189

**Workpackage No.:** 1

**Author:** HINDMARCH, I.

**Year:** 1980

**Title:** Psychomotor function and psychoactive drugs.

**Journal/Book Name:** British Journal of Clinical Pharmacology

**Volume:** 10, 189.

**Keywords:** experimental; methodology

**Workpackage No.:** 2

**Author:** HINDMARCH, I. AND SUBHAN, Z

**Year:** 1983

**Title:** The effects of midazolam in conjunction with alcohol on sleep, psychomotor performance and car driving ability.

**Journal/Book Name:** International Journal of Clinical Pharmacology Research

**Volume:** 3(5), 323-9

**ISBN/ISSN:** 0251-1649

**Keywords:** Adult; Automobile Driving\*; Benzodiazepines\*AE; Drug Interactions; Ethanol\*AE; Female; Flicker Fusion DE; Human; Hypnotics and Sedatives\*AE; Psychomotor Performance\*DE; Reaction Time DE; Sleep\*DE

**Abstract:** The acute and early morning effects of midazolam 15mg and alcohol 0.5g/kg on subjective measures of CNS activity, psychomotor performance and car driving ability were investigated in eight healthy female volunteers. One hour following treatment with midazolam and midazolam + alcohol, critical flicker fusion threshold (CFFT) was significantly depressed and subjects perceived themselves as feeling more sedated when compared to treatment with placebo or alcohol alone. Perceived ease of getting to sleep (GTS) was also improved by midazolam and the midazolam + alcohol combination. Stimulus processing time was significantly increased at one hour after treatment by

midazolam taken in conjunction with alcohol, thus resulting in an overall increase in total reaction time. On the morning following administration, both "on the road assessments of car driving ability and laboratory tests of psychomotor performance were unaffected by any of the treatment conditions. Midazolam 15mg was found to be an effective sleep inducer with no evidence of residual or "hangover effects, although the drug's hypnotic activity may be augmented by social doses of alcohol.

**Workpackage No.:** 2

**Author:** HINDMARCH, I. AND GUDGEON, AC

**Year:** 1983

**Title:** Chlormezanone: its effects on subjective aspects of sleep and on skilled performance related to car

**Journal/Book Name:** Methods Find Exp Clin Pharmacol

**Volume:** 5(1), 59-65

**ISBN/ISSN:** 0379-0355

**Keywords:** Adult; Automobile Driving\*; Chlormezanone \*PD; Double-Blind Method; Female; Flicker Fusion DE; Human; Psychomotor Performance \*DE; Reaction Time DE; Sleep \*DE

**Abstract:** A double-blind, crossover study compared chlormezanone 200 mg t.d.s., chlormezanone 400 mg nocte and placebo in twelve female volunteers. There was no obvious evidence of chlormezanone causing an impairment in early morning psychomotor performance, car driving ability or subjective ratings of early morning behaviour. Subjectively reported mood changes were consistent with those expected of a tranquillising drug and the sleep-inducing and improving properties of chlormezanone were confirmed. This volunteer study suggests that chlormezanone may well be a nocturnal sedative which does not have a morning hangover effect.

**Workpackage No.:** 2

**Author:** HINDMARCH, I. AND BHATTI, JZ

**Year:** 1987

**Title:** Psychomotor effects of astemizole and chlorpheniramine, alone and in combination with alcohol

**Journal/Book Name:** Int Clin Psychopharmacol

**Volume:** 2(2), 117-9

**ISBN/ISSN:** 0268-1315

**Keywords:** Adult; Automobile Driving; Benzimidazoles \*PD; Chlorpheniramine \*PD; Drug Synergism; Ethanol \*PD; Female; Histamine H1 Antagonists \*PD Histamine Antagonists H001; Human; Middle Age; Psychomotor Performance \*DE

**Abstract:** Road traffic accidents are a leading cause of mortality and morbidity, and their association with alcohol and drugs such as minor tranquillizers is well established (Seppala et al., 1979). There is also epidemiological evidence to associate the older, sedative antihistamines with motorcycle accidents (Skegg et al., 1979). Astemizole is a recently introduced H1 -antagonist which, unlike older antihistamines, does not cause central nervous system sedation. The present study was designed to compare the effects

of astemizole and chlorpheniramine, alone and in combination with alcohol, on an objective measure of psychomotor performance relating to car-driving ability

**Workpackage No.:** 2

**Author:** HINDMARCH, I; HARRISON, C. AND SHILLINGFORD, C.A.

**Year:** 1988

**Title:** An investigation of the effects of lofepramine, nomifensine, amitensine, amitriptyline and placebo on aspects of memory and psychomotor performance related to car driving.

**Journal/Book Name:** Int Clin Psychopharmacol

**Volume:** 3(2), 157-65

**ISBN/ISSN:** 0268-1315

**Keywords:** Adult; Amitriptyline PD; Automobile Driving; Comparative Study; Dibenzazepines PD; Female; Flicker Fusion DE; Human; Hypnotics and Sedatives; Lofepramine PD; Memory DE; Middle Age; Nomifensine PD; Psychomotor Performance DE; Reaction Time DE; Sleep DE; Visual Perception DE

**Abstract:** Ten healthy, female volunteers took part in a double-blind, placebo-controlled study to investigate the effects of lofepramine 70 mg, lofepramine 140 mg, nomifensine 100 mg, amitriptyline 50 mg and placebo on psychomotor performance related to driving. One subject failed to complete the study for reasons unrelated to the medications. Each subject received each of the treatments in random order at weekly intervals and was then assessed for psychomotor performance, sedation and quality of sleep. Amitriptyline 50 mg served as a positive control producing results consistent with its known sedative properties. In contrast, lofepramine 70 mg and 140 mg and nomifensine 100 mg were generally free from any significant effect on psychomotor performance.

**Workpackage No.:** 2

**Author:** HINDMARCH, I

**Year:** 1997

**Title:** The Effects of antidepressants on psychomotor function with particular reference to reboxetine

**Journal/Book Name:** European-Neuropsychopharmacology

**Volume:** 7 (Suppl 1) S17-S21

**ISBN/ISSN:** 0924-977X

**Keywords:** accidents/psychomotor function/ anti-depressant drugs/ tricyclic antidepressants/ norepinephrine/cognitive ability/motor coordination

**Abstract:** Explores the relative efficacy and side-effect profile of the currently available treatment options for major depression and the new selective noradrenergic agent, reboxetine by discussing previous research. The effects of these treatments on psychomotor function are reviewed using: choice reaction time (I. Hindmarch, 1975) and critical flicker fusion threshold (I. Hindmarch, 1975) measurements to compare and contrast the various antidepressants. Tricyclic antidepressant agents are associated with an increased risk of accidents, especially in the elderly (primarily accidents related to driving or falls/fractures due to postural hypotension). In comparison, the newer

noradrenergic agents, such as reboxetine, have demonstrated significant improvements in the incidence and severity of effects on psychomotor function. The lack of side-effects make agents like reboxetine most useful for the treatment of depression in ambulant patients performing their usual activities of daily living.

**Workpackage No.:** 1

**Author:** HINDMARCH, I. AND KERR, J.S.

**Year:** 1998

**Title:** The Effects of Alcohol Alone or in Combination with Other Drugs on Information Processing, Task-Performance and Subjective Responses

**Journal/Book Name:** Human Psychopharmacology-Clinical Experimental

**Volume:** 13,1, 1-9

**Keywords:** drugs psychomotor performance, alcohol, ethanol, nicotine, caffeine, reaction time, car driving

**Abstract:** This paper reviews the effects of alcohol on human psychomotor performance and cognitive function. It concentrates particularly on effects on reaction time and on skills related to car driving. The effects of alcohol on performance are very variable at low doses (under 1g per kg body weight). The variability is due to the different measures and methods employed by the researchers and to the large interindividual and interoccasional differences in the effects of alcohol. That is, alcohol affects different people in different ways and it affects the same person differently on separate occasions. Greater performance deficits are observed as the dose increases and as the tasks become more complex. Although results vary, both nicotine and caffeine appear to antagonize the detrimental effects of alcohol on performance. Many other drugs interact with alcohol, the most important of which are sedative agents that can combine synergistically with alcohol to produce profound psychomotor and cognitive impairment.

**Workpackage No.:** 1

**Author:** HINGSON, R. AND HOWLAND, J.

**Title:** Prevention of drunk driving crashes involving young drivers: an overview of legislative countermeasures

**Journal/Book Name:** In 'Young Drivers Impaired by Alcohol and Drugs'. Edited by T. BENJAMIN, International Congress and Symposium Series, No. 116, Royal Society of Medicine Services Limited.

**Keywords:** drink driving, teenagers, counteract, measures

**Abstract:** Describes measures employed in various states in the US to counteract drunk driving amongst teenagers. Their analysis showed that persons who drive after heavy drinking are less likely to wear seat-belts, more likely to drive after psychoactive drug use, and more likely to be arrested for moving violations other than drunken driving, e.g. speeding, running red lights, etc.

**Workpackage No.:** 1

**Author:** HINGSON, R., HEEREN, T. AND MANGIONE, T.

**Year:** 1982

**Title:** Teenage driving after using marijuana or drinking and traffic accident involvement

**Journal/Book Name:** Journal of Safety Research, USA, National Safety Council and Pergamon Press Ltd.

**Volume:** pp.33-37

**ISBN/ISSN:** 0022-4375/82 010033-06

**Keywords:** marijuana, drinking, driving, accidents, telephone survey

**Abstract:** Anonymous random digit dialing telephone surveys of nearly 6000 16-19 year old respondents were conducted in Massachusetts and Upstate New York in 1979-1981. These surveys explored frequency of driving after using marijuana, driving after drinking, respondent accident involvement in the year prior to the interview, and a variety of other respondent characteristics. Frequency of driving after using marijuana and after drinking were each associated with greater accident involvement. To isolate the accident risk of driving after marijuana use, respondents who drove after drinking were excluded from a logistic regression analysis. This analysis also controlled for the distance respondents drove and several respondent demographic characteristics. Compared to respondents who did not drive after marijuana use, teenagers who drove after smoking marijuana on at least 6 occasions per month were 2.4 times more likely to be involved in traffic accidents. Those who drove after marijuana use on at least 15 occasions per month were 2.9 times more likely to have an accident.

**Workpackage No.:** 3

**Author:** HINGSON, R.

**Year:** 1996

**Title:** Prevention of drinking and driving

**Journal/Book Name:** Alcohol Health and Research World

**Volume:** 20, 4, 219-226

**Keywords:** alcohol, drugs, community-based intervention, accidents, mortality, law enforcement, imprisonment, probation, recidivism, impaired driving, deterrence of alcohol and other drug use

**Abstract:** Since the early 1980's, legislative initiatives, such as the minimum legal drinking age of 21, administrative license revocation, and lower legal blood alcohol concentration limits for youth and adults, have significantly decreased alcohol-related traffic fatalities. General deterrence legislation is aimed at dissuading the general public from driving after drinking, whereas specific deterrence laws seek to prevent people who have been convicted for driving under the influence from repeating their offense. Education, enforcement, and comprehensive community programs, combined with legislation, can substantially reduce alcohol-related traffic deaths

**Workpackage No.:** 1

**Author:** HOBI, V; KIELHOLZ P. AND GILSDORF U

**Year:** 1981

**Title:** How capable of driving are hospitalised psychiatric patients under psycho-active drug therapy?

**Journal/Book Name:** J Int Med Res

**Volume:** 9(6), 434-47

**ISBN/ISSN:** 0300-0605

**Keywords:** Adult; Antidepressive Agents\*PD/TU; Antipsychotic Agents\*PD/TU; Automobile Driving\*; Comparative Study; Female; Human; Institutionalisation; Male; Mental Disorders\*DT; Middle Age; Psychomotor Agitation DT; Reaction Time DE; Support, Non-U.S. Gov't

**Abstract:** In an open investigation design two patient groups, under neuroleptics (n=30) and under antidepressants (n=31), were examined three times, the third time under steady-state conditions. A matched control group (n=32) provided the normative values. Various variables, thought to be psychologically relevant in traffic situations were measured on two test apparatus (tracking and complex reaction time). The result shows that the antidepressant group closely approaches the achievement of the control group on the most important variables measured. It may be concluded that psychopharmacologically well balanced depressive patients at the time of the steady-state are capable of producing results comparable to a control group with respect to traffic-relevant cognitive-psychomotor functions. The neuroleptic group, however, exhibits deviations on the same variables. In this sub-sample the primary disturbances of the underlying morbus (maintaining attention, continuous focusing ability) become conspicuous. From the medical point of view, the call for an individual clinical judgement of driving capacity by the treating physician continues to remain necessary, although the results produced offer some general decision aids.

**Workpackage No.:** 2

**Author:** HOBI, V; DUBACH, UC; SKRETA, M; FORGO, J. AND RIGGENBACH, H

**Year:** 1981

**Title:** The effect of bromazepam on psychomotor activity and subjective mood

**Journal/Book Name:** J Int Med Res

**Volume:** 9(2), 89-97

**ISBN/ISSN:** 0300-0605

**Keywords:** Adult; Anti-Anxiety Agents, Benzodiazepine \*PD Antianxiety Agents Benzodiazepine; Attention DE; Bromazepam \*PD; Clinical Trials; Double-Blind Method; Emotions \*DE; Flicker Fusion DE; Human; Male; Motor Activity \*DE; Reaction Time DE

**Abstract:** The effects of short-term (acute) doses of bromazepam were studied in a double-blind trial with the aid of three dosage groups comprising a total of fifty-five healthy male medical students (who received placebo, and 1.5 mg or 3.0 mg bromazepam, respectively). Subjective well-being was recorded through self-ratings by the volunteers, and the variables of psychomotor function by standard testing instruments. In terms of subjective well-being, fatigue and decreased performance (statistically confirmed throughout) were reported by the probands in all three dosage groups after they were administered either the drug or placebo. None of the dose-effect relationships were statistically significant, although this trend was more pronounced, purely in quantitative terms, in the group that received 3 mg bromazepam than in either the placebo or the 1.5 mg bromazepam group. In the reaction time and in critical flicker-

frequency (CFF) testing, the trend mentioned above was confirmed. In the attentiveness and memory span test, learning effects were statistically confirmed in equally uniform fashion. The action of the substance was again not statistically significant. It may be concluded from this that subjective, and also in part objective, fatigue and decreased performance were related to the type of trial design employed, and not, generally speaking, to the action of the substance. However, again independently of the drug's activity, statistical confirmation was obtained of improved performance and/or learning activity in three variables of the alertness testing apparatus. Variables of driving ability were not adversely affected, but--if anything--stabilized. Our investigation studied the single-dose schedules of bromazepam--viz. 1.5 mg and 3 mg--that are most commonly prescribed for patients. The subacute and personality-related effects of the drug will be the subject of a later report.

**Workpackage No.:** 2

**Author:** HOBBI, V; KIELHOLZ, P. AND DUBACH, UC

**Year:** 1981

**Title:** The effect of bromazepam on fitness to drive (author's transl)

**Journal/Book Name:** MMW Munch Med Wochenschr

**Volume:** 123(42), 1585-8

**ISBN/ISSN:** 0341-3098

**Keywords:** Adult; Anti-Anxiety Agents, Benzodiazepine \* AE Antianxiety Agents Benzodiazepine; Automobile Driving\*; Awareness DE; Bromazepam \*AE; English Abstract; Flicker Fusion DE; Human; Male; Reaction Time DE

**Abstract:** On 3 days (1, 8, 15) the acute (on day 1) and subacute (days 8 and 15) effects of bromazepam (Lexotanil) on variables of driving ability were studied in 55 young male medical students, randomly divided into 3 groups (placebo, 1.5 mg, 3.0 mg). The drug was well tolerated (no notable side effects). Dose-effects showed trends in group 3 (3.0 mg) with a stronger subjective impression of performance impairment which was, however, not confirmed by objective performance assessment, although time of reaction to optical stimuli was significantly longer after the 3 mg dose. In the discussion, it is pointed out that the results of this type of study in healthy subjects can only be regarded as indicative.

**Workpackage No.:** 2

**Author:** HOLLISTER, L.E.

**Year:** 1986

**Title:** Health aspects of cannabis

**Journal/Book Name:** Pharmacol Review

**Volume:** 38, 1,1-20

**ISBN/ISSN:** 0031-6997

**Keywords:** analgesics, animal, anticonvulsants, antiemetics, asthma, automobile driving, cannabis, cardiovascular diseases, chromosome aberrations, drug contamination, drug tolerance, endocrine glands, eye diseases, female, fetus, glaucoma, human, immunity, insomnia, lung diseases, mental disorders, pregnancy



**Abstract:** Marijuana seems firmly established as another social drug in Western countries, regardless of its current legal status. Patterns of use vary widely. As with other social drugs, the pattern of use is critical in determining adverse effects on health. Perhaps the major area of concern about marijuana use is among the very young. Using any drug on a regular basis that alters reality may be detrimental to the psychosocial maturation of young persons. Chronic use of marijuana may stunt the emotional growth of youngsters. Evidence for an amotivational syndrome is largely based on clinical reports; whether marijuana use is a cause or effect is uncertain. A marijuana psychosis, long rumored, has been difficult to prove. No one doubts that marijuana use may aggravate existing psychoses or other severe emotional disorders. Brain damage has not been proved. Physical dependence is rarely encountered in the usual patterns of social use, despite some degree of tolerance that may develop. The endocrine effects of the drug might be expected to delay puberty in prepubertal boys, but actual instances have been rare. As with any material that is smoked, chronic smoking of marijuana will produce bronchitis; emphysema or lung cancer have not yet been documented. Cardiovascular effects of the drug are harmful to those with pre-existing heart disease; fortunately the number of users with such conditions is minimal. Fears that the drug might accumulate in the body to the point of toxicity have been groundless. The potential deleterious effects of marijuana use on driving ability seem to be self-evident; proof of such impairment has been more difficult. The drug is probably harmful when taken during pregnancy, but the risk is uncertain. One would be prudent to avoid marijuana during pregnancy, just as one would do with most other drugs not essential to life or well-being. No clinical consequences have been noted from the effects of the drug on immune response, chromosomes, or cell metabolism. Contamination of marijuana by spraying with defoliant has created the clearest danger to health; such attempts to control production should be abandoned. Therapeutic uses for marijuana, THC, or cannabinoid homologs are being actively explored. Only the synthetic homolog, nabilone, has been approved for use to control nausea and vomiting associated with cancer chemotherapy.

**Workpackage No.:** 1

**Author:** HOLMGREN, P, LOCH, E . AND SCHUBERTH, J

**Year:** 1985

**Title:** Drugs in motorists traveling Swedish roads: on-the-road detection of intoxicated drivers and screening for drugs in these offenders

**Journal/Book Name:** Forensic Science International

**Volume:** 27, 57-65

**ISBN/ISSN:** 0379-0738

**Keywords:** drug driving, screening, alcohol, traffic safety, benzodiazepines, cannabinoids, motorists, DUI

**Abstract:** This paper deals with the police officer's or police doctor's ability to find drivers under the influence of drugs. We have also studied whether the protocol on the driver's previous histories of drug intake is useful for directing the chemist in his analytical approach to revealing intoxicants in the suspect's body fluids. A comprehensive procedure for screening traffic-hazardous drugs in the urine was found necessary and is described. By using this method, we have studied the incidence of

drunken drivers with detectable medicinal or illicit agents. The results demonstrate that 91% of those drivers found by the officer or doctor of the police to be on intoxicants other than ethanol, carried some kind of traffic hazardous drug in their body fluids, and that the doctor was a better judge than the police in identifying these offenders. By using a series of chemical methods for drugs screening, the authors found that every third driver suspected of drunken driving due to ethanol, but not to other intoxicants, held some kind of traffic hazardous drug substance in his urine; benzodiazepines and cannabinoids were the most common findings. The data imply that 34% of these suspects revealed their intakes of traffic-dangerous intoxicants. We conclude that the judgements of both the officer and doctor of the police are needed for an efficacious detection of drivers under the influence of drugs. Moreover, the results infer that the chemist has to screen for intoxicants to reveal these in a suspect driver. They also conclude that drugs, particularly the benzodiazepines or cannabinoids may be commonly encountered in drunken drivers, suspected of being inebriated by ethanol but no other toxicants.

**Workpackage No.:** 4

**Author:** HOMEL, R

**Year:** 1994

**Title:** Drink-driving law enforcement and the legal blood alcohol limit in New South Wales

**Journal/Book Name:** Accident Analysis and Prevention.

**Volume:** 26 (2), 147-55

**ISBN/ISSN:** 0001-4575

**Keywords:** Accidents, Traffic LJ/MO/PC ; Alcohol Drinking AE/BL/PC ; Automobile Driving LJ ; Breath Tests ; Child ; Child Welfare LJ ; Criminal Law SN ; Ethanol BL ; Holidays SN ; Human ; Intervention Studies ; Linear Models ; New South Wales EP ; Seat Belts LJ ; Support, Non-U.S. gov't

**Abstract:** This paper reports the results of a preliminary analysis of daily fatal crashes in New South Wales, Australia, between July 1975 and December 1986. The analysis unexpectedly uncovered a small but statistically significant decline in crashes coinciding with the introduction of a law lowering the legal blood alcohol concentration (BAC) from .08 to .05 g%. The original aim of the analysis was to develop for a larger study appropriate log-linear techniques to assess the impact of a range of government initiatives, including laws aimed at the drinking driver: increased penalties, the .05 law, and random breath testing (RBT). The analysis showed that RBT immediately reduced fatal crashes by 19.5% overall and by 30% during holiday periods, and that the .05 law, introduced two years before RBT, apparently reduced fatal crashes by 13% on Saturdays. There was no significant effect of the .05 law on any other day of the week, and there was no clear evidence that any other initiative had a statistically significant effect on accidents. Although the apparent impact of the .05 law was small, it is surprising that any effect was discernible, since the law was not extensively advertised and police enforcement was no more intense than is usual over Christmas. However, any effects of the .05 law may not have been sustained if RBT had not been introduced two years later.

**Workpackage No.:** 3

**Author:** HONKANEN, R., ERTAMA, L., LINNOILA, M., ALAHA, A., LUKKARI, I., KARLSSON, M., IVILUOTO, O. AND PURO, M.

**Year:** 1980

**Title:** Role of drugs in traffic accidents.

**Journal/Book Name:** British Medical Journal

**Volume:** 281, 1309-1313

**Keywords:** benzodiazepines; field study

**Workpackage No.:** 3

**Author:** HOOFT, P.J. AND CAN DE VOORDE, H.P.

**Year:** 1994

**Title:** Reckless behaviour related to the use of 3,4-methylenedioxyamphetamine (ecstasy): apropos of a fatal accident during car-surfing

**Journal/Book Name:** International Journal of Legal Medicine

**Volume:** 106, 6, 328-9

**ISBN/ISSN:** 0937-9827

**Keywords:** accidents, traffic, adult, alcoholism, brain injuries, case report, dangerous behaviour, fatal outcome, human, male, N-Methyl-3,4-methylenedioxyamphetamine, substance related disorders

**Abstract:** A 26-year-old man died from severe brain contusion after falling from a moving car during an attempt at car-surfing. Toxicological urine screening was positive for amphetamines, the blood analysis revealed a MDMA level of 0.63 mg/l and a blood alcohol concentration of 1.23 g/l. The case is another example of the bizarre and reckless behaviour which may result from the euphorogenic activity of ecstasy and the circumstances in which it is commonly used.

**Workpackage No.:** 1

**Author:** HURST, P.M.

**Year:** 1962

**Title:** The effects of d-amphetamine on risk-taking

**Journal/Book Name:** Psychopharmacology

**Volume:** 3, 283-290

**Keywords:** amphetamine; dextroamphetamine; experimental; risk taking

**Workpackage No.:** 2

**Author:** HURST, P.M., WEIDNER, M.F. AND RADLOW, R.

**Year:** 1967

**Title:** The effects of amphetamines upon judgements and decisions.

**Journal/Book Name:** Psychopharmacologia

**Volume:** 11(5), 397-404.

**Keywords:** amphetamines; experimental

**Workpackage No.:** 2

**Author:** HURST, P.M.

**Year:** 1976

**Title:** Amphetamines and driving behaviour

**Journal/Book Name:** Accident Analysis and Behaviour

**Volume:** 8, 9-13

**Keywords:** amphetamines; experimental

**Workpackage No.:** 2

**Author:** HURST, P.M.

**Year:** 1987

**Title:** Amphetamines and driving

**Journal/Book Name:** Alcohol, Drugs and Driving

**Volume:** 3, 13-17

**Keywords:** amphetamines; experimental

**Workpackage No.:** 2

# I

**Author:** IRVING, A

**Year:** 1988

**Title:** A proposed Investigation into Drug Impairment Testing Methodology

**Journal/Book Name:** Int. Clin Psychopharmacol

**Volume:** 3, Supp 1, 99-109

**Keywords:** drug testing; simulators; methodology

**Abstract:** Describes testing methodology and equipment used by the Transport and Road Research Laboratory.

**Workpackage No.:** 4

**Author:** IRVING, A. AND JONES, W.

**Year:** 1992

**Title:** Methods for testing impairment of driving due to drugs

**Journal/Book Name:** European Journal of Clinical Pharmacology

**Volume:** 43, 1, 61-6

**ISBN/ISSN:** 0031-6970

**Keywords:** automobile driving, comparative study, ethanol, female, human, lorazepam, middle age, perception, statistics, task performance and analysis, triprolidine

**Abstract:** The Transport and Road Research Laboratory has been concerned for a long time with possible causes of driving difficulties and has developed methods for investigating driving performance. The question addressed here was how applicable these methods are in assessing driving problems arising from the use of drugs which can impair performance, particularly widely-available centrally-acting drugs. We assessed four types of driving-related tests by comparing their sensitivities with two laboratory tests, developed elsewhere, which measure more basic effects of drugs on performance, using drugs known to impair skills. Performances under the influences of ethanol, the benzodiazepine lorazepam, and the antihistamine triprolidine, each given both as a single high dose and a single low dose, were compared with performances after placebo. We used double-blind crossover design, in which subject variability was minimized by studying only women of a limited age range (45-55 y). The driving-related tests detected the effects of the substances used, although they were generally less sensitive than the laboratory tests. The individual sensitivities of the driving test could be improved to match those used for more general assessments.

**Workpackage No.:** 2

**Author:** ISACCS, S.O., MARTIN, P. AND WASHINGTON, J.A. Jr.

**Year:** 1986

**Title:** Phencyclidine (PCP) abuse. A close-up look at a growing problem.

**Journal/Book Name:** Oral Surg Oral Med Oral Pathol

**Volume:** 61:2 126-9

**Keywords:** pcp

**Abstract:** PCP or "angel dust" is a dissociative anesthetic agent with notoriety as an abuse substance.

**Workpackage No.:** 3

**Author:** ISAACS, AJ

**Year:** 1988

**Title:** Driving and drug regulation

**Journal/Book Name:** Int Clin Psychopharmacol

**Volume:** 3 Suppl 1, 141-3

**ISBN/ISSN:** 0268-1315

**Keywords:** Accidents, Traffic \*PC; Automobile Driver Examination; Drug Labeling ST; England; Human; Pharmaceutical Preparations\*AE; Risk Factors

**Abstract:** The UK Licensing Authority, aided by advice from expert committees, has the statutory duty to evaluate new medicines in respect of quality, safety and efficacy. All drug applications in the EC must now be accompanied by a summary of product characteristics which includes a statement on the effects of the products on the ability to drive and operate machinery. Any claims or warnings made in this or other respects must be based on data resulting from scientific experiments and will appear in data sheets. Appropriate label warnings may also be required, in some cases imposed by the Labelling Regulations, such as the standard antihistamine warning. The use of package inserts to give further warning to the public is currently under study.

**Workpackage No.:** 1

## J

**Author:** JANSSEN, W.H.

**Year:** 1979

**Title:** Routeplanning en geleiding: een literatuurstudie

**Journal/Book Name:** Rapport IZF 1979-C13, Institute for Perception TNO, Soesterberg

**Keywords:** Methodology; models

**Workpackage No.:** 1

**Author:** JEFFERY, W.K., LESLIE, J.M. AND MERCER, W.

**Year:** 1995/6

**Title:** Drug and alcohol concentrations of drivers involved in fatal motor vehicle accidents in British Columbia, Canada: A one year study

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95)NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** fatally injured/ drivers/ drugs/ blood samples/ toxicological analysis/ alcohol/ tetrahydrocannabinol (THC/THCCOOH)/ benzodiazepines/ cocaine

**Abstract:** Blood Samples of 41 female and 181 male fatally injured drivers were examined. Analyses suggested that drugs other than alcohol are contributing to fatal traffic accidents in British Columbia. Toxicological Analysis showed: alcohol alone (37%); alcohol-and-drugs (11%); and drugs alone (9%). The most frequently encountered drugs were alcohol (48%); tetrahydrocannabinol or its metabolite (THC/THCCOOH) (13%); benzodiazepines (5%); and cocaine (4%). Blood samples were screened by EMIT, capillary GC with NP and EC detection and LC with diode array detection. All samples were confirmed by GC/MS and quantified by GC with NP or EC Detection, LC with diode array (uv) detection or GC/MS.

**Workpackage No.:** 3

**Author:** JEFFERY, W.K., HINDMARCH, K.W. AND MULLEN, P.W.

**Year:** 1996

**Title:** The involvement of drugs in driving in Canada: an update to 1994

**Journal/Book Name:** Canadian Forensic Science Journal

**Volume:** 29, 2, 93-98

**Keywords:** drugs, Canada, impaired driving, benzodiazepines, cannabis, stimulants, opioids, barbiturates, diazepam

**Abstract:** A drugs and driving database, maintained by the Drugs and Driving Committee of the Canadian Society of Forensic Science, includes case data collected from 11 Forensic Laboratories across Canada. The data presented herein are from 1158 submitted cases. The major drug classifications reported for impaired driving and fatal motor vehicle accidents are benzodiazepines, cannabis, stimulants, opioids and the

barbiturates. The most frequently reported drug in each group was diazepam, THC, cocaine, codeine and butalbital, respectively. Alcohol was also detected in many of these cases. Une base de données maintenue par le Comité sur les drogues au volant de la Société canadienne des sciences judiciaires inclut des données d'enquêtes recueillies auprès de 11 laboratoires judiciaires à travers le Canada. Les données présentées ici proviennent de 1158 enquêtes. Les classifications principales de drogues rapportées dans les enquêtes de conduite avec facultés affaiblies et d'accidents mortels de la route sont les benzodiazépines, les produits du Cannabis, les stimulants, les opiacés et les barbituriques. Les drogues les plus communément rencontrées dans chaque catégorie sont le diazepam, le THC, la cocaïne, la codeïne et le butalbital. L'alcool a également été décelé dans plusieurs de ces enquêtes.

**Workpackage No.:** 3

**Author:** JICK, H., HUNTER, J.R., DINAN, B.J., MADSEN, S. AND STERGACHIS, A.

**Year:** 1981

**Title:** Sedating drugs and automobile accidents leading to hospitalization

**Journal/Book Name:** American Journal of Public Health

**Volume:** 71, 12, 1399-1400

**Keywords:** sedating drugs, automobile accidents, drivers at fault/drivers not at fault, injuries, hospitalization

**Abstract:** The use of central nervous system depressant drugs among 244 people hospitalized for injuries suffered in an automobile accident was similar for drivers presumed at fault for the accident compared with other drivers and passengers. It was only slightly higher in the three groups than it was in the population at large. The absence of an important association in this population might be related to the warnings given to people filling prescriptions for these drugs

**Workpackage No.:** 3

**Author:** JOHN, H

**Year:** 1980

**Title:** Hypertension treatment and ability to drive a large vehicle

**Journal/Book Name:** Z Gesamte Inn Med

**Volume:** 35(21), 143-4

**Tertiary Author:** 0044-2542

**Keywords:** Accidents, Traffic PC, Antihypertensive Agents AE/TU; Automobile Driving\*; Drug Therapy, Combination; English Abstract; Human; Hypertension \*DT; Risk

**Abstract:** The principles of the judgment of the ability of driving a motor vehicle during the antihypertensive medicamentous long-term therapy are discussed. Taking into consideration complications depending on pressure the experienced hypertensive therapy with avoidance of side-effects of medicaments endangering traffic is no contraindication for driving a motor vehicle. The judgment must be carried out in a different way for professional drivers and private drivers. The patients with hypertension shall be instructed and referred to their own responsibility in driving a motor vehicle.



**Workpackage No.: 1**

**Author:** JOHNSON, V. AND WHITE, H.R.

**Year:** 1989

**Title:** An investigation of factors related to intoxicated driving behaviours among youth

**Journal/Book Name:** J Stud Alcohol

**Volume:** 50, 4, 320-30

**Tertiary Author:** 0096-882X

**Keywords:** accidents, traffic, adolescence, adult, alcoholic intoxication, automobile driving, cross-sectional studies, female, human, male, marijuana abuse, risk-taking, support, U.S. Gov't, United States

**Abstract:** This study assessed the prevalence of driving under the influence of alcohol and marijuana among a sample of 18 and 21 year olds and examined the across-time relationships between intoxicated driving and consumption, risk-taking/impulsive orientation, negative intrapersonal state, stress and use of alcohol and other drugs to cope with problems. Self-report data were collected from 556 men and women, ages 18 and 21, at two points in time. The data indicated that at least a minimum level of drinking and driving, as well as smoking marijuana and driving, is engaged in at least once for the majority of youth. Correlations between eight driving behaviors and consumption variables indicated that frequency of substance use was strongly related to frequency of driving while intoxicated (DWI). Regression analyses revealed that coping use of substances was the strongest predictor of driving under the influence. A path model examining the effect of stress, negative states and risk-taking orientations (T1) on driving under the influence as mediated through coping use (T2) was tested. Results showed that risk-taking orientation was the strongest predictor of DWI, both directly and indirectly (as mediated through coping use). Findings suggest that impaired driving may be part of a global syndrome of risk-taking behavior and is an activity engaged in most often by those who frequently use alcohol and other drugs to cope with problems

**Workpackage No.: 3**

**Author:** JONES, J.D.

**Year:** 1987

**Title:** Targeting Interventions at Substance Abuse Problems - Identifying and Prosecuting Persons for Driving under the Influence of Drugs

**Journal/Book Name:** Public Health Reports

**Volume:** 102, 6, 627-629

**Keywords:** drugs, driving, law enforcement

**Abstract:** Unfortunately there are few hard data to examine whether driving under the influence of drugs other than alcohol is a serious problem. Although the information has yet to be captured by the police, there is a strong likelihood that the department (Atlanta Police) has made very few such arrests. The very few prosecutions for DUI-drugs that occur are generally the result of law enforcement officials removing people from serious traffic accidents and taking a blood sample, either for the criminal investigation or when

blood is drawn during medical treatment. The second reason police officers do not arrest for DUI-drugs is that they are not trained to recognise the subtle symptoms of drug abuse. Through its research the Los Angeles Police Department has identified seven broad categories of drugs that cause impairment: narcotics and analgesics, central nervous system (CNS) depressants, CNS stimulants, inhalants, marijuana, phencyclidine (PCP), and hallucinogens. The author suggests a number of prerequisites for a law enforcement agency to establish a DUI program.

**Workpackage No.:** 1

**Author:** JONES, A.W. AND ANDERSSON, L.

**Year:** 1996

**Title:** Variability of the blood/breath alcohol ratio in drinking drivers

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 41, 6, 916-921

**Keywords:** forensic science, forensic toxicology, age, alcohol, analysis, blood analysis, breath analysis, blood/breath ratio, drunk drivers, variability

**Abstract:** The ratio of blood-alcohol concentration (BAC) to breath-alcohol concentration (BrAC) was determined for 799 individuals apprehended for driving under the influence of alcohol (DUI) in Sweden. The BrAC was determined with an infrared analyzer (Intoxilyzer 5000S) and venous BAC was measured by headspace gas chromatography. The blood samples were always taken after the breath tests were made and the average time delay was  $30 \pm 12$  min (= SD) spanning from 6 to 60 min. The blood/breath ratios of alcohol decreased as the time between sampling blood and breath increased ( $F=15.4$ ,  $P<.001$ ), being  $2337 \pm 183$  (6 to 15 min),  $2302 \pm 202$  (16 to 30 min),  $2226 \pm 229$  (31 to 45min), and  $2170 \pm 225$  (46 to 60 min). When the BAC was corrected for the metabolism of alcohol at a rate of  $0.019$  g%/h, the mean blood/breath ratios were  $2395 \pm 193$  (6 to 15 min),  $2416 \pm 211$  (16 to 30 min),  $2406 \pm 223$  (31 to 45 min), and  $2407 \pm 210$  (45 to 60 min): no significant differences ( $F=0.197$ ,  $P>.05$ ). The overall mean time adjusted blood/breath ratio ( $\pm$ SD) was  $2407 \pm 213$  and the 95% limits of agreement (LOA) were 1981 and 2833. During 1992, 1993, and 1994 the mean blood/breath ratios of alcohol were remarkably constant, being  $2409 \pm 288$ ,  $2407 \pm 206$ , and  $2421 \pm 235$ , respectively, and the values were not significantly influenced by the person's age, gender or blood-alcohol content. In 34 individuals (4.3%) the blood/breath ratio was less than 2100 after compensating for metabolism of alcohol between the times of sampling blood and breath. This compares with 156 individuals (19.6%) having a blood/breath ratio less than 2100:1 without making any correction for the metabolism of alcohol.

**Workpackage No.:** 3

**Author:** JOO, S.

**Year:** 1995

**Title:** Detection of drugs and pharmaceuticals in suspected drivers

**Journal/Book Name:** Blutalkohol

**Volume:** 32, 2, 84-91

**ISBN/ISSN:** 0006-5250

**Keywords:** alcohol drinking, automobile driving, cross-cultural comparison, cross-sectional studies, ethanol, Germany, human, incidence, psychotropic drugs, street drugs, substance abuse detection, substance related disorders

**Abstract:** The report describes a study on impaired drivers undertaken at the Institute for Legal Medicine of the University of the Saarland. The objective of the study was to obtain an insight into the frequency of drug use in addition to the use of other impairing pharmaceuticals. In 86 per cent of the checked blood samples only alcohol was detected. 10 per cent of the blood samples were found to be positive for drugs and other pharmaceuticals as well as alcohol. 4 per cent of the blood samples were found to be negative for alcohol but positive for drugs and other pharmaceuticals as well as alcohol. 4 percent of the blood samples were found to be negative for alcohol but positive for drugs and other pharmaceuticals. Polytoxicomania was found to be a wide-spread phenomenon and the BACs analysed, often very high. The results of the study were compared with those of a Swiss and a U. S. American study. The former study was based on blood samples sent in by the police who suspected that the drivers in question had been under the influence of drugs or pharmaceuticals. In the latter study blood samples of fatally injured drivers had been analysed. Although the results were found to correlate quite often, a number of differences were also found.

**Workpackage No.:** 3

**Author:** JUDD, L.L.

**Year:** 1979

**Title:** Effect of lithium on mood, cognition and personality function in normal subjects.

**Journal/Book Name:** Arch. Gen. Psychiatry

**Volume:** 36, 860-865.

**Keywords:** lithium; antidepressants; experimental

**Workpackage No.:** 2

**Author:** JUDD, L.L

**Year:** 1985

**Title:** The effect of antipsychotic drugs on driving and driving related psychomotor functions.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 17(4), 319-22

**ISBN/ISSN:** 0001-4575

**Keywords:** Antipsychotic, Psychoactive, Schizophrenic, Piperazine, Antihistamines, Phenothiazines, Butyrophenones.

**Abstract:** Despite the extremely widespread use of antipsychotic medications, there is little evidence from the surveys conducted to date, that this class of psychoactive medications is significantly implicated in vehicular crashes or deaths. In five major surveys of vehicular fatalities, in which drug and alcohol analyses were obtained, only two of over 800 victims studied involved detection of antipsychotic medications. It is clear that the acute administration of antipsychotics in normal individuals does induce

sedation and performance decrements in visual-motor coordination and specific attentional behaviours, which have a deleterious effect on driving behaviour. On the other hand, it should be emphasized that antipsychotics are rarely used on an acute basis and tolerance to the sedation and decreased alertness does occur during chronic treatment. Antipsychotic drugs have the capacity to potentiate the effects of alcohol, sedative hypnotics, narcotics and antihistamines; therefore, the combination of antipsychotics with these substances increases the impairment of driving behaviour. There is an indication that the less sedating piperazine phenothiazines and the butyrophenones may have little or no effect on psychomotor performance, and antipsychotic drugs of these two subclasses may have a distinct advantage, at least in terms of driving performance, over the other more sedating drugs. Antipsychotic drugs are almost never used for recreational or abuse purposes; therefore, more central to the focus of this review is the effect that antipsychotics may have on the driving behaviour of those seriously disordered mentally ill patients who require continued maintenance on these medications. There is good agreement in the literature which suggests that schizophrenic patients demonstrate improved psychomotor performance during chronic treatment with antipsychotic drugs.(ABSTRACT TRUNCATED AT 250 WORDS)

**Workpackage No.: 3**

## K

**Author:** KAFERSTEIN, H., MENKE, H., STAAK, M. AND STICHT, G.

**Year:** 1992/3

**Title:** Toxicological analysis for the purpose of medical psychological aptitude tests for drug abusers

**Journal/Book Name:** Proceedings of the twelfth International Conference on Alcohol, Drugs and Traffic Safety - T'92, Cologne, Germany.

**Volume:** pp.116-119

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** toxicological analysis, amphetamines, cocaine, cannabinoids, opiates, chromatography, EMIT

**Abstract:** Describes the toxicological analysis of drugs in Germany. Samples were taken from 376 drivers suspected of drug influence and these were assessed between September 1990 and April 1992. The drugs tested for were cannabinoids, cocaine, opiates and amphetamines. The tests yielded the following positive cases: 7 positive results for cocaine; 2 positive results for amphetamines; 27 positive cases for opiates; and 94 positive cases for cannabis. Although the test subjects had weeks or months to prepare themselves for the appointment, narcotics or their metabolites could still be detected chromatographically in more than 20% of cases examined.

**Workpackage No.:** 4

**Author:** KALANT, H. AND CRANCER, A. JR.

**Year:** 1969

**Title:** Marijuana and simulated driving

**Journal/Book Name:** Science

**Volume:** 166, 905, 640

**ISBN/ISSN:** 0036-8075

**Keywords:** marijuana, driving, critique, experimental study, alcohol, comparisons

**Abstract:** The article criticises a report by Crancer, Dille, Delay, Wallace and Haykin on relative effects of alcohol and marijuana on simulated driving task. The main criticism is the arbitrary choice of a single dose of each substance for the comparison. The dose of marijuana given would produce a normal social marijuana "high", however the dose of alcohol would far exceed the amount need for a normal social alcohol-related "high".

**Workpackage No.:** 1

**Author:** KAPLAN, J.

**Title:** Marijuana The New Prohibition

**Volume:** pp.293-294

**Keywords:** drugs, driving simulator test, marijuana, alcohol

**Abstract:** Reports study by Crancer et al. who ran a series of driving simulator tests to compare the effects of marijuana and alcohol use. The author (Craner) determined that there was no significant difference between the performance under the influence of marijuana and under no drug at all but that there was a considerable difference between these two and the performance under alcohol.

**Workpackage No.:** 1

**Author:** KARRASS, W

**Year:** 1985

**Title:** Hismanal--a non-sedating H1 antihistaminic.

**Journal/Book Name:** Z Hautkr

**Volume:** 60 Suppl 1, 59-66

**ISBN/ISSN:** 0301-0481

**Keywords:** Antihistamines, Pharmacopsychological, Pharmacotherapy, arousal, automobile driving, benzimidazoles, brain, clinical trials, comparative study, dose-response relationship, drug, electroencephalography, english abstract, histamine, antagonists, human, hypersensitivity, psychomotor performance, reaction time, visual acuity, wakefulness

**Abstract:** The intake of antihistamines with CNS depressing side effects leads to a multiple increase of risk for accidents with lethal results in traffic. 12 special pharmacopsychological trials, e.g. at the Royal Air Force Institute, Great Britain; at the Association for Research into Accident Causes, Cologne; and the Department of Pharmacotherapy (Drugs and Driving Research Group), University of Utrecht, Netherlands, showed Hismanal to have neither sedation nor performance reducing side effects.

**Workpackage No.:** 2

**Author:** KELLEY, D., WELCH, R. AND McNELLEY, W.

**Year:** 1978

**Title:** Methadone maintenance: An assessment of potential fluctuations in behavior between doses.

**Journal/Book Name:** International Journal of the Addictions

**Volume:** 13, 1061.

**Keywords:** methadone; doses; experimental

**Workpackage No.:** 2

**Author:** KELLY, T.H., FOLTIN, R.W., EMURIAN, C.S. AND FISCHMAN, M.W.

**Year:** 1993

**Title:** Performance-based testing for drugs of abuse: dose and time profiles of marijuana, amphetamine, alcohol, and diazepam

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 17, p.264

**Keywords:** performance-based testing, drugs, amphetamine, alcohol, diazepam, impairment, detection

**Abstract:** The time courses of the effects of acute doses of amphetamine (5 and 10mg/70kg), alcohol (0.3 and 0.6% THC) on performance engendered by each of four computerised behavioural tasks were evaluated in six human subjects. These performance based tasks have potential commercial utility for drug use detection in the workplace. Alcohol and marijuana effects were reliably detected for up to three hours following dose administration with most procedures. Amphetamine and diazepam effects were also detected, but the dose effects and time courses were variable. The profile of behavioural effects varied across drugs, suggesting that performance based testing procedures might be useful in discriminating which drug was administered and the time course of the drug's effects. Results indicate that repeated measurement with performance-based drug detection procedures can provide immediate indications of performance impairment in a cost-effective and noninvasive manner, and as such, would be a useful supplement to biological sample testing for drug use detection

**Workpackage No.:** 2

**Author:** KENNEDY, R.S., TURNAGE, J.J. AND LANHAM, D.S.

**Year:** 1995/6

**Title:** Criteria for evaluating tests intended to assess driver fitness

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** drugs/ alcohol/ performance tests/ interlocking device/ driving

**Abstract:** In drug and alcohol studies performance tests for laboratory applications must meet the usual metric requirements of stability, reliability, and sensitivity. Sensitivity, of course, is the ability to detect perceived substances at low levels. However, when such tests are applied for use as interlock devices to prevent persons from driving who may have had alcohol and drug problems previously, emphasis can shift from sensitivity to a concern for specificity (i.e., minimization of false positive). From a series of experiments using a set of performance tests, and by combining data using extended baseline, size of the decrement, and multiple cutoffs, we have had success developing a computer program which can be used to "tune" these false positives to very low levels (0-3%). The simulation program can be used with any performance battery and application for research into interlock devices will be discussed.

**Workpackage No.:** 4

**Author:** KERR, J. AND HINDMARCH, I.

**Year:** 1995

**Title:** Accidents and antidepressants

**Journal/Book Name:** Geriatric Medicine

**Volume:** 27, 7, 29-31

**Keywords:** drugs, driving, elderly

**Abstract:** This article discusses the role of psychoactive drugs in accident causation with particular emphasis on implications for the elderly. The elderly are more likely to require tricyclic antidepressants (TCAs) as they have increased rates of depression. It has been demonstrated that TCAs, such as amitriptyline, carry an increased risk of disruption to psychomotor and cognitive performance. For the elderly, the slower metabolism and elimination means that the drug and/or its metabolites will persist in the body for longer. This increases the duration of clinical activity, and may result in undesirable side-effects. Furthermore, it has been suggested that there is an increase in the sensitivity of the brain to CNS drugs with advancing age resulting in a greater response for a given tissue concentration. The authors suggest that clear warnings should be put on medications to advise the patient of the dangers of taking the medicine and driving. They also suggest prescribing medicines that do not have behaviourally toxic effects, such as the new SSRIs.

**Workpackage No.:** 1

**Author:** KERR, J S. AND HINDMARCH, I

**Year:** 1998

**Title:** The Effects of Alcohol Alone or in Combination with Other Drugs on Information Processing, Task Performance and Subjective Responses

**Journal/Book Name:** Human Psychopharmacology

**Volume:** 13, 1-9

**Keywords:** alcohol; ethanol; nicotine; caffeine; reaction time; psychomotor performance; cognitive function; car driving

**Abstract:** This paper reviews the effects of alcohol on human psychomotor performance and cognitive function. It concentrates particularly on effects on reaction time and on skills related to car driving. The effects of alcohol on performance are very variable at low doses (under 1g per kg body weight). The variability is due to the different measures and methods employed by the researchers and to the large interindividual and interoccasional differences in the effects of alcohol. That is, alcohol affects different people in different ways and it affects the same person differently on separate occasions. Greater performance deficits are observed as the dose increases and as the tasks become more complex. Although results vary, both nicotine and caffeine appear to antagonize the detrimental effects of alcohol on performance. Many other drugs interact with alcohol, the most important of which are sedative agents that can combine synergistically with alcohol to produce profound psychomotor and cognitive impairment. (AS27)

**Workpackage No.:** 1

**Author:** KIELHOLZ, P., HOBI, V., LADEWIG, D., MIEST, P. AND RICHTER, R.

**Year:** 1973

**Title:** An experimental investigation about the effect of cannabis on car driving behaviour

**Journal/Book Name:** Pharmakopsychiatr Neuropsychopharakol

**Volume:** 6, 2, 91-103



**Keywords:** cannabis, car driving, THC, experimental investigation, psychosomatic complaints, impairment, motor functions, dysphoric as euphoric experience reactions

**Abstract:** By a double-blind test 54 volunteers were tested for their car driving capacity before and after taking delta-9-tetrahydrocannabinol at doses of 350, 400 or 450 micrograms per kilogram bodyweight and placebo. The medical examination of those in the THC group revealed injected conjunctival vessels, increased pain sensitivity as well as an increase of pulse rate and a rise in diastolic blood pressure. Five effects were especially prominent in the self-assessment of the THC-group:

1. an increase of psychosomatic complaints
2. a definite inward turning followed by an impairment of attention and concentration capacities
3. change in motor functions, co-ordination and associations
4. resulting from a discrete alienation experience, an impaired "coming to terms" with the environmental situation
5. as well dysphoric as euphoric experience reactions

These self-assessments agreed with the results of experimental studies of a number of variables in driving and personality features. The study demonstrates that THC, because of its inhibiting as well as stimulating effects, influences psychological and physiological functions important for driving in a manner different from alcohol. It changes and worsens adaptability as the mentioned aspects of driving behaviour, especially if there is simultaneous stress. At times when rapid decisions and actions are required, prolongation of reaction time and an increased frequency of wrong and inadequate responses were observed. The smooth automatism, which is so important in car driving, was disturbed. The degree of impairment depended on the initial personality structure and individual effects of the drug on basic mood and attitude. The intensity of THC was still measurable five to six hours after intake. The subjects still noticed a definite effect eight to ten hours after intake, 24 hours later still a discrete after-effect.

Unter Doppelblindbedingungen wurden 54 freiwillige Versuchspersonen vor und nach oraler Einnahme von delta-9-Tetrahydrocannabinol in Dosen von 350, 400 oder 450 Micro-gramm pro kg Körpergewicht und eines Placebos auf Fahrerhalten untersucht. Die medizinische Untersuchung ergab bei den Probanden der THC-Gruppe injizierte Konjunktivalgefäße, erhöhte Schmerzempfindlichkeit sowie einen Pulsanstieg und eine Steigerung des diastolischen Blutdrucks. In der Selbstbeurteilung der THC-Probanden wurden 5 Wirkungen besonders hervorgehoben:

1. Eine Zunahme psychosomatischer Beschwerden,
2. eine deutliche Tendenz, sich der eigenen Erlebniswelt zuzuwenden mit nachfolgender Einschränkung der Wahrnehmungs- und Konzentrationsfähigkeit,
3. Veränderung der Motorik und Koordination sowie des Assoziationsablaufes,
4. eine in Folge diskreter Entfremdungserlebnisse erschwerte Umwelteinordnung,
5. sowohl euphorische wie dysphorische Stimmungsveränderungen. Eine Dosis-Wirkungskurve konnte nicht festgestellt werden. Diese Selbstbeurteilung stimmt mit den Ergebnissen der instrumentellen Untersuchung einer Reihe von Fahrer- und Persönlichkeitsvariablen überein. Die Untersuchung zeigte, daß Tetrahydrocannabinol wegen seiner sowohl dämpfenden als auch stimulierenden Wirkungskomponente die für das Fahrerhalten wichtigen psychologischen und physiologischen Funktionen qualitativ

andersartig beeinflusst als Alkohol. Es vermindert das Adaptationsvermögen sowie die untersuchten Parameter des Fahrerhaltens, besonders unter gleichzeitiger Streflanforderung. In Phasen von großer Informationsdichte, die rasch aufeinander folgende Entscheidungsprozesse und Handlungsvorgänge erfordern, konnten eine Verlangsamung der Reaktionszeit und eine Häufung falscher inadäquater Reaktionen festgestellt werden. Die eingeschliffenen Automatismen, die beim Lenken eines Motorfahrzeuges von großer Bedeutung sind, waren gestört. Der Grad der Beeinträchtigung hing wesentlich von der Ausgangspersönlichkeit und der individuellen Wirkung der Drogen auf die Grundstimmung und das Umweltempfinden ab. Die Wirkungsintensität des Tetrahydrocannabinol war 5-6 Stunden nach Einnahme deutlich meßbar. Die Probanden merkten nach 8-10 Stunden nach Einnahme eine deutliche Wirkung, 24 Stunden später noch eine diskrete Nachwirkung.

**Workpackage No.:** 2

**Author:** KINTZ, P. AND MANGIN, P.

**Year:** 1991

**Title:** Analysis of opiates in human hair with FPIA, EMIT and GC/MS

**Journal/Book Name:** Adli Tip Dergisi

**Volume:** 7, 3-4, 129-132

**Keywords:** opiates, hair analysis, FPIA, EMIT, GC/MS

**Abstract:** The authors evaluate use of immunoassay techniques (EMIT, FPIA) and gas chromatography coupled to mass spectrometry in estimation of chronic opiate abuse using human hair. Samples were obtained from 18 heroin abusers and decontaminated in 5ml of dichloromethane for 15 min at 37 degree C and then incubated in 1 ml of 1 M NaOH for 10 min at 100 degree C. Afterwards, the aliquots were neutralized with 1 ml of 1 M HCl, centrifugated and directly analyzed using the Abbott ADx, the Syva ETS Plus and GC/MS. No false response was obtained with the Abbott ADx, by comparison with GC/MS, clearly demonstrating the capability of ADx for opiate screening of human hair. This was not the case for EMIT, since a great number of false negative responses was observed.

**Workpackage No.:** 4

**Author:** KINTZ, P., CIRIMELE, V. AND LUDES, B.

**Year:** 1998

**Title:** Codeine testing in sweat and saliva with Drugwipe

**Journal/Book Name:** International Journal of Legal Medicine

**Volume:** 111, 82-84

**Keywords:** Drugwipe, codeine, saliva, sweat

**Abstract:** With the growing interest in drug testing within different sectors of society, there has become a need for drug assays that can be performed immediately at the site of the specimen collection. Recently, Securetec (Ottobrunn, Germany) has introduced the Drugwipe, a non instrument-based, on-site immunodiagnostic assay for the detection of drugs on surfaces. Different tests are available for opiates, cocaine and cannabis. To document the applications of drugwipe "opiate" on human biological fluids, 60mg

codeine phosphate were orally administered to 6 subjects. First sweat testing with the Drugwipe was studied. The wiping section of the kit was used to swab the forehead of the subjects for 10 s at 1, 4, 9, and 24 h after codeine administration. At the same time, for each period, a sweat patch (Pharmchek, USA) was applied to the outer portion of the upper arm. Codeine was then quantified in the patch by GC/MS and the measured concentrations used as reference. In all subjects except one the Drugwipe tested positive for opiates, however with few false negative results. In the second part of the study, results of the Drugwipe were compared with those obtained by GC/MS for saliva. The tongue of the subjects was carefully wiped over a period of 24h, and at the same time a specimen of saliva collected. Although codeine could be detected using the Drugwipe, numerous false negative results were observed. Codeine tested positive by GC/MS but remained negative using the Drugwipe in several cases. This can be explained by a codeine concentration which was too low to show positive with Drugwipe, interfering substances may be present in saliva or the sampling procedure is inadequate.

**Workpackage No.:** 4

**Author:** KIRBY, J.M., MAULL, K.I. AND FAIN, W.

**Year:** 1992

**Title:** Comparability of alcohol and drug use in injured drivers

**Journal/Book Name:** South Medical Journal

**Volume:** 85, 8, 800-2

**ISBN/ISSN:** 0038-4348

**Keywords:** accidents, traffic, adolescence, adult, alcoholic intoxication, automobile driving, comparability study, ethanol, female, human, injury severity score, male, prospective study, substance related disorders, Tennessee, wounds and injuries

**Abstract:** During a recent 5-month period, 201 injured drivers were admitted to a level 1 trauma center. Blood alcohol concentrations (BACS) and drug screens were obtained in 187 and 164 subjects, respectively. BACs were positive in 37% and other drugs were confirmed in 40%, suggesting that alcohol and drug use among injured drivers is comparable. More than half of the drivers using alcohol also had drugs detected on the screening examination. Other investigators have previously established driving impairments associated with some of these drugs. These results indicate that the drug problem on our highways may be greater than previously recognized.

**Workpackage No.:** 3

**Author:** KIRCHER, V. AND PARLAR, H.

**Year:** 1996

**Title:** Determination of delta-9-tetrahydrocannabinol from human saliva by tandem immunoaffinity chromatography-high performance liquid chromatography

**Journal/Book Name:** Chromatography B Biomed Appl

**Volume:** 677, 2, 245-55

**ISBN/ISSN:** 0378-4347

**Keywords:** chromatography, affinity, chromatography high pressure liquid, female, human, male, reference values, reproducibility of results, saliva, spectrophotometry, ultraviolet, tetrahydrocannabinol

**Abstract:** Smoking or ingestion of cannabis causes cognitive, perceptual and behavioural changes, which are responsive for impaired performance in driving motor vehicles. In this paper a novel liquid chromatographic assay for the selective quantification of delta 9-tetrahydrocannabinol, the major indicator of a present cannabis intoxication in saliva, is described. The method involves a column-switching procedure and requires an extremely simple pre-treatment of the sample. Deproteinized saliva was directly injected into the chromatographic system. The clean-up and enrichment procedure was performed in an immunoaffinity column, followed by the transfer of the antigens to an octylsilica analytical column. The immunoaffinity sorbent was obtained by covalent immobilization of specific antibodies on epoxy-activated silica. The mobile phase consisted of methanol-aqueous 0.15 mol/l NaCl solution (elution programmed) and the analyte was detected by measuring the UV absorption at 220 nm. Using an injection volume of 4.5 ml (dilution 3:2, v/v) the limit of quantification was 20 ng/ml, at a signal-to-noise ratio of 5. Recoveries were estimated to be in the range of 70%. Both intra- and inter-day coefficients of variation were below 5%.

**Workpackage No.:** 4

**Author:** KLEBELSBERG, D.

**Year:** 1988

**Title:** Drugs and Traffic Safety, some basic reflections.

**Journal/Book Name:** IATSS Research

**Volume:** 12(1), 24-32.

**Keywords:** methodology; models

**Workpackage No.:** 1

**Author:** KLEIN, J.L.; ANTHENELLI, R.M.; BACON, N.M.; SMITH, T.L. AND SCHUCKIT, M.A

**Year:** 1994

**Title:** Predictors of drinking and driving in healthy young men: a prospective study.

**Journal/Book Name:** Am Journal of Drug and Alcohol Abuse

**Volume:** 20(2), 223-35

**ISBN/ISSN:** 0095-2990

**Keywords:** Drinking, Driving, accidents, adolescence, adult, alcohol drinking, alcoholic intoxication, alcoholism, automobile driving, California, follow-up studies, human, life style, male, personality assessment, prospective studies, risk taking, support, non P-H-S, support, U.S. Gov't, P.H.S.

**Abstract:** This paper explores the ability of information about alcohol use and problem patterns in men's early 20s to predict drinking and driving by their early 30s. The sample consisted of 231 healthy young men who were students or nonacademic staff at a university. Subjects were evaluated initially with questionnaires and interviews, and subsequently followed-up using interviews with themselves and with a resource person.

The reported rate of drinking and driving at follow-up was nearly 38%. Using logistic regression, the combination of variables that best predicted drinking and driving included prior alcohol-related auto accidents, a measure of typical drinking, and a measure of drinking-related problems. The overall prediction employing this combination was 72%, the specificity was 86%, and the sensitivity was 48%.

**Workpackage No.:** 3

**Author:** KLEINSCHMIDT, S AND MERTZLUFFT, F.

**Year:** 1995

**Title:** Gamma-hydroxybutyric acid--significance for anesthesia and intensive care medicine?

**Journal/Book Name:** Anesthesiol Intensivmed Notfallmed Schmerzther

**Volume:** 30:7 393-402

**Keywords:** GHB

**Abstract:** Gamma-hydroxybutyric acid (GHB) as a natural component of the mammalian brain was first introduced in clinical anaesthetic practice more than 30 years ago. Although GHB induced a reliable state of sedation and anaesthesia without depressing either respiratory or cardiocirculatory parameters or liver and kidney function, the drug was nearly displaced from clinical practice because of its prolonged duration of action. The results of recent clinical studies indicate a re-evaluation of GHB in emergency and critical care medicine. GHB is regarded as a natural neuronal transmitter with circuits which synthesise, accumulate and release GHB. Specific binding sites have also been demonstrated and identified. GHB is completely metabolized in the liver to the natural substrates carbon dioxide and water without accumulation in central or peripheral tissues. The reduction of energy metabolism and its possible properties as an "oxygen radical scavenger" may be of therapeutic benefit if tissues are exposed to hypoxia or reperfusion. Therefore, the application of GHB seems to be of advantage in states of traumatic brain injury with cerebral oedema or ischaemic lesions of brain or extraneural tissues. In hypovolaemic states or in patients with impaired cardiovascular function, the pressure effects of GHB may be beneficial for the prevention of tissue damage and may improve survival in the case of cardiocirculatory resuscitation. In the intensive care unit, GHB might be a favourable alternative to established sedative agents. Occurrence of side effects such as tolerance and withdrawal syndromes after the application of sedative drugs, an impaired metabolism with the accumulation of metabolites in the case of liver or kidney dysfunction as well as an insufficient regulation of natural sleep may be diminished by the application of GHB. The results of various clinical studies also suggest that GHB may be useful in the treatment of alcohol and opiate withdrawal syndrome. However, further studies are necessary to specify the proposed indications of GHB in anaesthesiology and critical care medicine.

**Workpackage No.:** 1

**Author:** KLEPP, KI; PERRY, CL. AND JACOBS, DR Jr

**Year:** 1991

**Title:** Etiology of drinking and driving among adolescents: implications for primary prevention.

**Journal/Book Name:** Health Education Quarterly

**Volume:** 18(4), , 415-27

**ISBN/ISSN:** 0195-8402

**Keywords:** Adolescent drinking, adolescence, adolescent psychology, alcohol drinking, automobile driving, female, follow-up studies, health behaviour, health education, human, incidence, male, Minnesota, models

**Abstract:** A prospective study was conducted to investigate what factors are predictive of self-reported drinking and driving (DD) among adolescents. The study employs a theoretical framework taken from Problem Behaviour Theory; environmental, personality, and behavioural factors are explored for their predictability of DD. A cohort of 1482 high school students completed a written survey in spring of 1986 and again in fall of 1986. The findings confirm that Problem Behaviour Theory provides a useful theoretical framework with which to identify etiological factors predictive of DD among adolescents. Identified personality, perceived environmental, behavioural, and demographic factors accounted for approximately 50% of the reported variance in DD at baseline. The same factors accounted for approximately 40% percent of the variance in follow-up DD and were predictive both among the students who did not drink and drive at baseline (incidence cases), and among those students who did drink and drive at baseline (continuation versus discontinuation of the behaviour). Based on these etiological data, we recommend that school-based, peer-led educational prevention programs be designed to reach young adolescents prior to the age at which a driver's license is obtained. We further recommend that the programs be broad-based and consider DD within the larger context of drinking and driving related behaviours and traffic safety in general.

**Workpackage No.:** 3

**Author:** KLONOFF, H.

**Year:** 1974

**Title:** Marijuana and driving in real-life situations

**Journal/Book Name:** Science

**Volume:** 186, 4161, 317-24

**ISBN/ISSN:** 0036-8075

**Keywords:** adult, automobile driving, behaviour, cannabis, educational status, female, heart rate, human, male, motor skills, regression analysis, smoking, task, performance and analysis, tetrahydrocannabinol

**Workpackage No.:** 3

**Author:** KOHLER-SCHMIDT, H. AND BESCHORNER, C.

**Year:** 1993

**Title:** Medicinal and illicit drug effects on automobile drivers in the Munster area 1980 to 1989. A retrospective study

**Journal/Book Name:** Versicherungsmedizin

**Volume:** 45, 1, 17-20

**ISBN/ISSN:** 0933-4548

**Keywords:** adult, automobile driving, english abstract, female, Germany, human, male, pharmaceutical preparations, psychotropic drugs, retrospective studies, street drugs, substance abuse detection

**Abstract:** Chemical and toxicological investigations were carried out on blood and/or urine samples from 367 cases from the years 1980 to 1989 when there was a suspicion of driving under the influence of medication or drugs. During the investigation period no increase in the number of cases was found. This shows a clear discrepancy to the increasing misuse of medication and drugs and subsequently poses a substantial problem in traffic medicine. In 72% of the cases substances were found, which are capable of reducing the psychic and physical competence, most commonly benzodiazepines, barbiturates and opiates. In some cases these substances were present in overdose levels. The proportion of female road-users was 20% of the total. The age group between 20 and 29 was the most strongly represented rein both men and women.

**Workpackage No.:** 3

**Author:** KOOLER, J.M. AND BRUVOLD, W.H.

**Year:** 1992

**Title:** Evaluation of an educational intervention upon knowledge, attitudes, and behaviour concerning drinking drugged driving

**Journal/Book Name:** Journal of Drug Education

**Volume:** 22, 1, 87-100

**Keywords:** drinking, drugs, driving, educational intervention

**Abstract:** The Contra Costa County educational program for juveniles found guilty of driving under the influence (DUI) was evaluated. Over 600 juveniles convicted of DUI from 1983 to 1988 formed the study group for this research and of these over 100 participated in the educational program. Assessment of program participants was conducted for knowledge, attitudes and behavior. Participants demonstrated increased knowledge, stronger attitudes against driving under the influence, and less risky alcohol and automobile related behaviors. County juvenile records analyzed by the logit procedure showed that class participants had a significantly lower number of repeat offenses compared to non-program participants that could not be explained by race, offense severity, age or gender

**Workpackage No.:** 3

**Author:** KORTTILA, K

**Year:** 1981

**Title:** Recovery and driving after brief anaesthesia

**Journal/Book Name:** Anaesthesist

**Volume:** 30(8), 377-82

**ISBN/ISSN:** 0003-2417

**Keywords:** Anesthesia\*; Anesthesia, Inhalation; Anesthesia, Intravenous; Anesthetics, Local PD; Automobile Driving\*; Human; Motor Skills DE; Occupational Diseases PX; Postoperative Period\*; Preanesthetic Medication; Psychotropic Drugs PD; Surgical Procedures, Operative\*; Time Factors

**Abstract:** It seems clear that patients should always be escorted when leaving the hospital after brief anaesthesia. The length of hospital stay should be based on the patient's test performance as well as on the supposed effects of the drugs on psychomotor performance. Minimal requirements for safe discharge should, in addition to stable vital signs and the ability to maintain oral fluids, include that patients are able to dress themselves and able to walk out. Recommendations not to drive should be based on the extent of the impairment of performance when assessed at the hospital, as well as on documented objective knowledge of the residual effects of the drugs used. In most cases patients should refrain from driving for at least 24 hours after anaesthesia.

**Workpackage No.:** 1

**Author:** KOZENA, L., FRANTIK, E. AND HORVATH, M.

**Year:** 1995

**Title:** Vigilance impairment after a single dose of benzodiazepines

**Journal/Book Name:** Psychopharmacology

**Volume:** 119, 1, 39-45

**ISBN/ISSN:** 0033-3158

**Keywords:** acoustic stimulation, adult, alprazolam, arousal, benzodiazepines, diazepam, dose-response relationship, drug, double-blind method, female, human, male, nitrazepam, psychiatric status rating scales, time factors

**Abstract:** While outpatients or other users of therapeutic drugs have to be informed about the risk of impaired functioning during driving or work, the prescribing physician needs to be familiar with the side effects of alternative drugs in order to select the most suitable treatment. With this aim, several types of benzodiazepine anxiolytics in low anxiolytic doses (diazepam 5 mg or 10 mg, nitrazepam 5 mg, oxazepam 10 mg, medazepam 10 mg, and alprazolam 0.2 or 0.5 mg-per 2m<sup>2</sup> body surface) were tested under laboratory conditions for their effects on vigilance performance. In a double-blind design, 145 healthy volunteers performed a 60 min vigilance test (composed of discriminatory reactions to acoustic stimuli and a secondary visual tracking task) and four short psychomotor tests (lasting 1-7 min each) before and after a single dose of drug or placebo. Subjects described their perception of the drug effect with the help of a mood check list, and fatigue, sleepiness, and effort scales. Only diazepam 5 mg and 10 mg, alprazolam 0.5 mg, and nitrazepam 5 mg caused significant deterioration in vigilance performance along with perceived sleepiness and the need for a greater effort to overcome it. The onset of diazepam effect was quicker, whereas alprazolam effect lasted longer. No effect was noted in the short psychomotor tests except for the Bourdon Cancellation Test, where the first phase of diazepam effect was registered.

**Workpackage No.:** 2



**Author:** KRANTZ, P. AND WANNERBERG, O

**Year:** 1981

**Title:** Occurrence of barbiturate, benzodiazepine, meprobamate, methaqualone and phenothiazine in car occupants killed in traffic accidents in the south of Sweden

**Journal/Book Name:** Forensic Science International

**Volume:** 18(2), 141-7

**ISBN/ISSN:** 0379-0738

**Keywords:** Accidents, Traffic \*; Adult; Aged; Anti-Anxiety Agents, Benzodiazepine AE Antianxiety Agents Benzodiazepine; Antipsychotic Agents; Phenothiazine AE; Barbiturates AE; Case Report; Human; Male; Meprobamate AE; Methaqualone AE; Psychotropic Drugs \*AE; Sweden

**Abstract:** An investigation of the following psychoactive drugs: barbiturate, benzodiazepine, meprobamate, methaqualone and phenothiazine, was performed on all automobile occupants killed in accidents in southern Sweden during 1977 and 1978. Of 122 drivers and 55 passengers analysed, low concentrations of these drugs were found in nine drivers and in five passengers. Thus, 7.3% of the drivers were driving under the influence of drugs and, of these, two drivers (1.6% of all analysed drivers) were also inebriated. Twenty-three per cent of the drivers were inebriated only. According to the circumstances in the accidents and the number of drivers whose analyses proved positive, drug influence seldom seems to be the cause of fatal traffic accidents.

**Workpackage No.:** 3

**Author:** KRETSCHMER-BAUMEL, AND KROL, G.

**Title:** Drinking and driving - data from the Federal Republic of Germany.

**Journal/Book Name:** In Young Drivers Impaired by Alcohol and Drugs. Edited by T. BENJAMIN, International Congress and Symposium Series, No. 116, Royal Society of Medicine Services Limited.

**Keywords:** alcohol, accidents, youth, drivers, risk

**Abstract:** Discusses the importance of alcohol in accident causation. Describes results of research which focused on the circumstances associated with the drinking and driving behaviour of 'normal' drivers. Compares older and younger drivers, decision-making in drinking and driving, assessment of risk in driving under the influence, and attitudes towards excessive drinking in general.

**Workpackage No.:** 1

**Author:** KRUSE, S. AND CHRISTOHPERSEN, A.S.

**Year:** 1994

**Title:** Driving under the influence of alcohol, drugs and narcotics

**Journal/Book Name:** Tidsskr Nor Laegeforen

**Volume:** 114, 4, 429-31

**ISBN/ISSN:** 0029-2001

**Keywords:** alcohol drinking, amphetamine, automobile driving, benzodiazepines, english abstract, ethanol, human, narcotics, Norway, substance related disorders, tetrahydrocannabinol

**Abstract:** The National Institute of Forensic Toxicology has registered a large increase in the number of samples from drivers suspected of driving under the influence of drugs other than alcohol. Illegal and prescribed drugs are detected in an increasing number of cases. In many of these cases, the drugs are combined with alcohol. The most frequent drugs detected in 1992 in addition to alcohol were tetrahydrocannabinol (the psychoactive compound in cannabis, and benzodiazepines, mostly detected at blood concentrations above therapeutic levels. Simultaneous use of different benzodiazepines and use of benzodiazepines in combination with illegal drugs are common. The number of samples containing amphetamine showed a significant increase in 1992 compared with 1991 (an increase of 80%).

**Workpackage No.:** 3

**Author:** KRYSTAL, J.H., KARPER, L.P., SEIBYL, J.P., FREEMAN, G.K., DELANEY, R., BREMNER, J.D., HENINGER, G.R., BOWERS, M.B. Jr. AND CHARNEY, D.S.

**Year:** 1994

**Title:** Subanesthetic effects of the noncompetitive NMDA antagonist, ketamine, in humans.

Psychotomimetic, perceptual, cognitive, and neuroendocrine responses.

**Journal/Book Name:** Archives of General Psychiatry

**Volume:** 51:3 199-214

**Keywords:** ketamine

**Abstract:** **BACKGROUND:** To characterize further behavioral, cognitive, neuroendocrine, and physiological effects of subanesthetic doses of ketamine hydrochloride in healthy human subjects. Ketamine, a phencyclidine hydrochloride derivative, is a dissociative anesthetic and a noncompetitive antagonist of the N-methyl-D-aspartate subtype of excitatory amino acid receptor. **METHODS:** Nineteen healthy subjects recruited by advertisements from the community participated in this randomized, double-blind, placebo-controlled study. Subjects completed three test days involving the 40-minute intravenous administration of placebo, ketamine hydrochloride (0.1 mg/kg), or ketamine hydrochloride (0.5 mg/kg). Behaviors associated with the positive and negative symptoms of schizophrenia were assessed by using the Brief Psychiatric Rating Scale. Changes in perception and behaviors associated with dissociative states were assessed by the Perceptual Aberration Subscale of the Wisconsin Psychosis Proneness Scale and the Clinician-Administered Dissociative States Scale. Cognitive function was assessed by using the (1) Mini-Mental State Examination; (2) tests sensitive to frontal cortical dysfunction, including a continuous performance vigilance task, a verbal fluency task, and the Wisconsin Card Sorting Test; and (3) tests of immediate and delayed recall. Plasma levels of cortisol, prolactin, homovanillic acid, and 3-methoxy-4-hydroxyphenethyleneglycol were measured. **RESULTS:** Ketamine (1) produced behaviors similar to the positive and negative symptoms of schizophrenia; (2) elicited alterations in perception; (3) impaired performance on tests of vigilance, verbal fluency,

and the Wisconsin Card Sorting Test; (4) evoked symptoms similar to dissociative states; and (5) preferentially disrupted delayed word recall, sparing immediate recall and postdistraction recall. Ketamine had no significant effect on the Mini-Mental State Examination at the doses studied. Ketamine also had no effect on plasma 3-methoxy-4-hydroxyphenylethylene glycol levels, although it blunted a test day decline in plasma homovanillic acid levels at the higher dose. It also dose dependently increased plasma cortisol and prolactin levels. Ketamine produced small dose-dependent increases in blood pressure. CONCLUSIONS: These data indicate that N-methyl-D-aspartate antagonists produce a broad range of symptoms, behaviors, and cognitive deficits that resemble aspects of endogenous psychoses, particularly schizophrenia and dissociative states.

**Workpackage No.:** 2

**Author:** KRYSTAL, J.H., KARPER, L.P., BENNETT, A., D'SOUZA, D.C., ABDARGHAM, A., MORRISSEY, K., ABI-SAAB, D, BREMNER, J.D., BOWERS, M.B. Jr., SUCOW, R.F., STETSON, P., HENINGER, G.R. AND CHARNEY, D.S.

**Year:** 1998

**Title:** Interactive effects of subanesthetic ketamine and subhypnotic lorazepam in humans.

**Journal/Book Name:** Psychopharmacology

**Volume:** 135:3 213-29

**Keywords:** ketamine

**Abstract:** Ketamine is an N-methyl-D-aspartate (NMDA) receptor antagonist with psychotogenic and dissociative effects in healthy humans. These cognitive and perceptual effects in humans are reportedly reduced by benzodiazepine premedication. This study assessed the interactive effects of a ketamine (i.v. bolus of 0.26 mg/kg followed by an infusion of 0.65 mg/kg per hour) and lorazepam 2 mg., PO, in humans. Twenty-three healthy subjects completed 4 test days involving the oral administration of lorazepam or matched placebo 2 h prior to the i.v. infusion of ketamine or placebo. Ketamine: 1) produced behaviors similar to the positive and negative symptoms of schizophrenia as assessed by the Brief Psychiatric Rating Scale (BPRS); 2) evoked perceptual alterations as measured by the Clinician-Administered Dissociative States Scale (CADSS); 3) impaired performance on the Wisconsin Card Sorting Test (WCST) and other tests sensitive to frontal cortical impairment; and 4) had amnestic effects. Lorazepam produced attention impairments, concrete proverb interpretations, and recall impairments. Lorazepam reduced ketamine-associated emotional distress and there was non-significant trend for it to decrease perceptual alterations produced by ketamine. However, it failed to reduce many cognitive and behavioral effects of ketamine, including psychosis. Further, lorazepam exacerbated the sedative, attention-impairing, and amnestic effects of ketamine. There was no evidence of pharmacokinetic interaction between these medications. These data suggest that subhypnotic lorazepam and ketamine show a spectrum of interactive effects, ranging from antagonism to potentiation.

**Workpackage No.:** 2

**Author:** KRIGER, H.P., SCHULZ, E. AND MAGERL, H.J.

**Year:** 1995/6

**Title:** The German Roadside Survey 1992-1994. Saliva Analyses from an Unselected Driver Population: Licit and Illicit Drugs

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** alcohol//drivers/saliva /marijuana /amphetamines/ opiates/ cocaine/ benzodiazepines/ barbiturates/toxicological analysis

**Abstract:** During the German Roadside Survey from 1992 to 1994, breath alcohol measurements were collected from more than 21,000 drivers. In addition, 13,122 drivers were asked for a saliva sample, and 12,213 (93.1%) agreed to participate. In 1992, samples (n = 3,027) were obtained for analysis, formarihuana, amphetamines, opiates, cocaine, benzodiazepines, and barbiturates. Due to insufficient saliva amounts for some of the samples, 2,234 samples were actually analyzed, with a total of 10,696 singleanalyses performed. After the results were adjusted to reflect a representative driving population, the following percentages of positives were found: benzodiazepines, 2.7%; opiates (including codeine), 0.7%; marihuana, 0.6%; barbiturates, 0.6%; amphetamines, 0.08%; cocaine, 0.01%. In addition, the saliva was analyzed for acetone and aliphatic alcohols, which have been discussed as markers for alcoholism.

**Workpackage No.:** 3

**Author:** KRIGER, H-P. AND BERGHAUS, G.

**Year:** 1995/6

**Title:** Behavioural effects of alcohol and cannabis: can equipotencies be established?

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** alcohol/cannabis/ control process / automatic processes/ performance/ social effects/ hazards

**Abstract:** In an extended review of the literature dealing with low alcohol effects, Krüger et al. (1990, 1994) introduced a new classification system for the study variables. Main characteristics of the new system were the ability to distinguish between automatic and control processes in performance areas and the explicit introduction of social effects (social moods, social behaviour). For each of the categories, hazard functions were calculated that showed loss of efficiency (and diminished performance) as alcohol concentration increases. Because the same classification system was used by Berghaus (1995) in his review of marihuana effects, it is now possible to compare hazard functions for both alcohol and marihuana effects and thus determine equipotential concentrations of alcohol and marihuana for the different classes of variables.

**Workpackage No.:** 1

**Author:** KRUGER, HP; BUD PERRINE, M.W; HUESSY, F.B. AND METTKE, M.

**Year:** 1999

**Title:** Illicit drugs in road traffic (Appendix).

**Publisher:** Council of Europe: Co-operation group to combat drug abuse and illicit trafficking in drugs (Pompidou Group). P-PG/Circout (98) 5.

**Keywords:** alcohol//drivers/saliva /marjuana /amphetamines/ opiates/ cocaine/ benzodiazepines/ barbiturates/toxicological analysis/ drug testing/ legislation

**Abstract:**

**Workpackage No.:** 4

**Author:** KUBITZKI, J.H.

**Year:** 1992/3

**Title:** Driving behaviour and personality in methadone patients

**Journal/Book Name:** Proceedings of the 14th International Conference on Alcohol, Drugs and Traffic Safety, Annecy.

**Volume:** 1, 391-397

**ISBN/ISSN:** 2-9511746-0-8

**Keywords:** methadone, drugs, driving, impairment, addiction, treatment, traffic

**Abstract:** The survey presented here was made in order to look for both psychomotor skills and the patients distance to addiction. Examinations enclosed laboratory testing, driving performance and anamnesis. An additional testing was made to prove the thesis that comorbidity is suggested between addiction and other (non-psychotic) psychic diseases, especially neuroses and personality disorders. There was a focus on driving tasks given by this study. However, performance skills, supporting the proof of psychomotor functions, cannot be fruitful for the question of "personal integrity", since German situation is as mentioned. The author considered driving performance as part of social behaviour. 22 methadone patients were given doses ranging from 14 to 120 mg. The duration of addiction ranged from 3.5 to 27 years and there was a range in the duration of treatment from one year up to 5 years. The final conclusion may be that a positive answer to the question of the methadone-user's participation in motorized traffic is possible. In fact, only a few single cases may remain to get attested a "personal integrity"

**Workpackage No.:** 2

**Author:** KUITUNEN, T., KSRKKSINEN, S. AND YLITALO, P.

**Year:** 1984

**Title:** Comparison of the acute physical and mental effects of ephedrine, fenfluramine, phentermine and prolintane.

**Journal/Book Name:** Methods Find Exp Clin Pharmacol

**Volume:** 6:5 265-70

**Keywords:** phentermine

**Abstract:** Physical and mental effects of a single oral dose of ephedrine (ephedrine HCl 30 or 40 mg), fenfluramine (fenfluramine HCl 15 or 20 mg), phentermine (7.5 or 11.25 mg) and prolintane (prolintane HCl 10 or 20 mg) were compared in a double-blind

placebo-controlled study. Each group consisted of 16-43 healthy volunteer medical students. The subjects fasted for at least 3 hr before drug administration and further until the end of the experiment. All the parameters were measured just prior to giving the drug, and 1.5 hr and 2.5 hr afterwards. Ephedrine significantly increased systolic blood pressure (p less than 0.05) and heart rate (p less than 0.01), whereas the other sympathomimetics affected these parameters only slightly or negligibly. None of the drugs markedly changed the tapping rate of the dominant hand. Mental activity was evaluated with a self-rating check list consisting of various mental modalities. None of the sympathomimetics significantly modified the mental activity. Memory, learning and concentration ability were evaluated with sign recording and digit span tests. In the digit span test no changes were obtained. In the sign recording test (for 3 min), phentermine increased significantly the recording score at both 1.5 hr (p less than 0.05) and 2.5 hr (p less than 0.005), and prolintane at 2.5 hr (p less than 0.05) after drug administration. The results suggest that in the doses given, which are commonly used in medical practice, ephedrine has the most pronounced cardiovascular effects, while phentermine and prolintane seem to be most active in the performance of some mental tasks.

**Workpackage No.:** 2

**Author:** KUITUNEN, T., SEPPÄLÄ, MATTILA, M.J. AND PIKKARAINEN

**Year:** 1995/6

**Title:** The Finnish Clinical Test for drunkenness in evaluating the effects of drugs on driving fitness

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** clinical test/ alcohol/ drugs/ motor, vestibular, mental and behavioural subtests/ psychomotor/ simulated driving/ digit symbol substitution/ divided attention/ critical flicker fusion/ benzodiazepines/ zopiclone/ sedative anti-depressants/ carbamazepine/ ebastine

**Abstract:** The Finnish clinical test for drunkenness is a medicolegal test developed to detect alcohol-induced impairment of driving fitness. This test comprises motor, vestibular, mental and behavioral subtests. The ability of the clinical test for drunkenness to reveal drug-effects on performance was compared with that of selected psychomotor laboratory tests. Psychomotor laboratory tests included simulated driving, digit symbol substitution, divided attention, critical flicker fusion, Maddox wing, body sway, memory and learning, and 'global' psychomotor laboratory test performance and subjective assessments with visual analogue scales and questionnaires on side-effects. The effects of alcohol, benzodiazepines (diazepam, triazolam, lorazepam), zopiclone, sedative antidepressant drugs (amitriptyline, mirtazepine), carbamazepine, and ebastine were studied in four double-blind, crossover and placebo-controlled studies with a total of 60 healthy volunteers. The relationships between blood alcohol concentrations and blood benzodiazepine concentrations, and psychomotor performance on the clinical test for drunkenness were studied in two field studies using medicolegal data files on a total of 387,770 Finnish drivers kept centrally by the National Public Health Institute. Psychomotor laboratory tests were sensitive in revealing the effects of drugs and

drug-drug combinations. Alcohol clearly impaired performance on the clinical test for drunkenness in both crossover and field studies. Single drugs alone had only minor effects on the clinical test for drunkenness, but this test detected effects of drug-drug and drug-alcohol combinations. Blood benzodiazepine concentrations were associated with impaired performance on the clinical test for drunkenness. This may in part be due to acute use of benzodiazepines, as suggested by the correlation of blood diazepam concentrations with impaired performance on the clinical test for drunkenness after acute use of diazepam. It is concluded that the clinical test for drunkenness reveals the effects of alcohol, drug-drug, and drug-alcohol combinations better than those of single drugs alone which, in turn, are easily detected with psychomotor laboratory tests.

**Workpackage No.:** 2

**Author:** KUNSMAN, G.W., MANNO, J.E., MANNO, B.R., KUNSMAN, C.M. AND PRZEKOP, M.A.

**Year:** 1992

**Title:** The use of microcomputer-based psychomotor tests for the evaluation of benzodiazepam effects on human performance - A review with emphasis on temazepam

**Journal/Book Name:** British Journal of Clinical Pharmacology

**Volume:** 34, 4, 289-301

**ISBN/ISSN:** 0306-5251

**Keywords:** benzodiazepines, tamazepam, human psychomotor performance

**Abstract:** 1 The literature relating to the effects of benzodiazepines in general, and temazepam in particular, on human psychomotor performance as assessed using microcomputer-based testing batteries is surveyed. 2 The adverse effects of central nervous system depressants on performance is an important medicolegal issue and frequently comes into question in on-the-road and on-the-job accidents. The use of microcomputer-based testing batteries allows for performance evaluation both in the laboratory and at-the-scene, as well as providing the opportunity to model a large number of different behaviours required in routine yet complex psychomotor tasks. 3 The conclusions in general are: (1) The benzodiazepines as a class of drugs impair both cognitive and motor performance. These effects are often subtle when low doses are involved or when testing occurs the morning following evening administration of the medication. (2) No single psychomotor task adequately simulates complex daily tasks such as automobile driving. A battery of tests that evaluates a number of the components of such tasks is necessary to determine adequately the full range of effects of these medications

**Workpackage No.:** 1

**Author:** KUNSMAN, G.W., LEVINE, B., COSTANTINO, A. AND SMITH, M.L.

**Year:** 1997

**Title:** Phencyclidine blood concentrations in DRE cases.

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 21:6 498-502

**Keywords:** PCP

**Abstract:** Phencyclidine (PCP) concentration was measured in blood obtained from 259 individuals over a two-year period subsequent to Drug Recognition Expert (DRE) evaluation by the Maryland State Police. The purpose of this study was to evaluate the accuracy of the DRE in the identification of PCP-related impairment using the presence of PCP in blood to confirm drug use and to test for a correlation between PCP concentrations in blood and impairment as indicated by DRE evaluation. Of the 259 cases evaluated, 124 were identified as positive for PCP based on DRE evaluation, 130 were positive for PCP based on toxicological analysis, and 56 of the 124 were identified as positive for PCP only by DRE and subsequently confirmed to contain only PCP. The mean PCP concentration for those cases in which only PCP was identified by both DRE and toxicology was 51 ng/ml (standard deviation, 26 ng/mL) with a range of values of 12-118ng/mL. Although no correlation was determined between PCP concentration and behavior, it is clear that, even at concentrations as low as 12 ng/mL, PCP-induced behavioral effects are measurable by DRE evaluation. This study also revealed that despite a low false-positive rate (3%) of detection of PCP use by the DRE, the false-negative rate of 8% supports the conclusion that the toxicological analysis of blood specimens for PCP provides the necessary, objective corroboration of the DRE's opinion concerning impairment.

**Workpackage No.:** 3

**Author:** KVALSETH, T.O.

**Year:** 1977

**Title:** Effects of marijuana on human reaction time and motor control

**Journal/Book Name:** Perceptual and Motor Skills

**Volume:** 45, 935-39

**Keywords:** marijuana, reaction time, motor control, linear and rotary serial arm movements, motor movements

**Abstract:** In this research were analysed the effects of marijuana on human reaction time and on performance for motor responses involving both linear and rotary serial arm movements aimed at a target. A total of six experienced marijuana users served as subjects and three drug conditions (dose levels) were used, i.e. 0, 6.5, and 19.5-26.0 mg ?THC. The results showed that (a) (simple and complex) reaction time was not significantly affected by marijuana or by the interaction between drug conditions and the amount of information transmitted during the task, (b) linear movement time was significantly reduced after smoking marijuana, while rotary movement time was not significantly affected, (c) interaction between drug conditions and task complexity was insignificant in the case of both linear and rotary movements, and (d) error rates for the two types of motor movements increased significantly and especially for linear movements a the dose level increased.

**Workpackage No.:** 2

**Author:** KOFERSTEIN, H.

**Year:** 1995/6

**Title:** Quantitative determination of drugs in blood



**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** drugs/ blood concentration/ driving/ THC

**Abstract:** The quantitative determination of drugs in blood becomes more and more important. One reason is that threshold values for "driving under the influence of drugs" are in the discussion. Several points e.g. the differences between blood and serum or active and inactive stereoisomers must be taken into consideration. The available methods are able to determine drugs with a SD of about 10% which is much higher than for the determination of alcohol in blood. It is additionally necessary to lower the limits of detection especially for THC into a range of about 0.5ng/ml with a signal/noise ratio of more than five at this concentration. It is not necessary to prescribe specific methods but internal and external quality control programs are essential elements in quantitative determination of drugs.

**Workpackage No.:** 1

## L

**Author:** LADEWIG, D. AND HOBI, V.

**Year:** 1969

**Title:** Effects of Marihuana and Alcohol on simulated driving performance

**Journal/Book Name:** The Medical Journal of Australia

**Volume:** 2, 15, 732

**Workpackage No.:** 2

**Author:** LADEWIG, D. AND HOBI, V

**Year:** 1973

**Title:** The Effects of ?9-THC on simulated driving performance

**Journal/Book Name:** In Ban, T.A. et al., ed. Psychopharmacology, sexual disorders and drug abuse. Amsterdam, North-Holland.

**Volume:** pp.693-8

**Keywords:** drugs, driving, simulated drivign, THC

**Workpackage No.:** 2

**Author:** LANDAUER, A.A.

**Year:** 1986

**Title:** Drugs and driving: historical perspectives, methodological principles and current problems

**Journal/Book Name:** In: 'Drugs and Driving', O'Hanlon, J.F. and de Gier, J.J. (Eds.) pp.17-28.

**Keywords:** methodology; drugs; alcohol

**Author:** LANG, E. AND STOCKWELL, T

**Year:** 1991

**Title:** Drinking locations of drink-drivers: a comparative analysis of accident and nonaccident cases.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 23(6), 573-83

**ISBN/ISSN:** 0001-4574

**Keywords:** Accidents, Traffic SN ; Adult ; Alcohol Drinking EP/LJ/PX ; Automobile Driving PX/SN ; Comparative Study ; Environment \*; Female ; Human ; Male ; Risk Factors ; Sex Factors ; Western Australia EP

**Abstract:** This study utilizes data collected by the Perth (Australia) Traffic Police on the last drinking location of persons arrested for drink-driving either as a consequence of their being involved in a road traffic accident or as a result of failing a roadside breath test. A comparison of these data has found that significantly more persons involved in

traffic accidents had been drinking at unlicensed locations, that is at private residences or in public places such as parks, than at licensed premises. It was also found that accident cases were more likely to involve males under 25 years; for those involved to have, on average, significantly higher blood alcohol levels than was the case for nonaccident drink-driving cases; and for most accidents to occur late at night and early morning. The significance of these findings were confirmed by logistic regression. A surprise incidental finding was that considerably more women had been arrested for drink-driving than had been previously reported in other studies, both in Australia and overseas.

**Workpackage No.:** 3

**Author:** LANGE, T.J. AND GREEN, E

**Year:** 1990

**Title:** How judges sentence DUI offenders: an experimental study.

**Journal/Book Name:** Am Journal of Drug and Alcohol Abuse

**Volume:** 16(1-2), 125-33

**ISBN/ISSN:** 0095-2990

**Keywords:** Accidents, Traffic ; Alcoholism ; Colorado ; Criminal Law Ethanol ; Human ; Jurisprudence ; Support, Non-U.S. Gov't.

**Abstract:** This study examined the impact of 1) a DUI offender's blood alcohol level at the time of arrest and 2) the number of prior drunken driving convictions on judges' sentencing patterns. These variables were manipulated using vignettes that were presented to all judges who sentence drunken drivers in Colorado. Judges were asked to determine appropriate amounts of jail time, fines, public service hours, and alcohol education course work. Results indicated that they gave more severe sentences to offenders with prior records and to those with higher blood alcohol levels. The effects were generally stronger for the first variable, prior record. These findings suggest that judges may perceive of and sentence repeat offenders differently than first-time offenders, regardless of the level of intoxication at arrest.

**Workpackage No.:** 3

**Author:** LATIES, V.G. AND WEISS, B.

**Year:** 1967

**Title:** Performance enhancement by the amphetamines: A new appraisal. Neuropsychopharmacology.

**Journal/Book Name:** Proceedings of the 5th international congress of the Collegium Internationale Neuro-psycho-pharmacologium. Washington DC 1966. Ed. H. Brill. International Congress Series no. 129. Excerpta Medical Foundation, NY.

**Keywords:** amphetamines

**Workpackage No.:** 2

**Author:** LAURELL, H. AND TORNROS, J.

**Year:** 1986

**Title:** The carry-over effects of triazolam compared with nitrazepam and placebo in acute emergency driving situations and in monotonous simulated driving.

**Journal/Book Name:** Acta Pharmacol Toxicol

**Volume:** 58(3), 182-6

**ISBN/ISSN:** 0001-6683

**Keywords:** Automobile Driving; Human; Nitrazepam PD; Time Factors; Triazolam PD

**Abstract:** Eighteen healthy volunteers of both sexes, aged 20-34, were tested in the morning while undertaking real car driving avoidance manoeuvres and during monotonous simulated driving after 1 and 3 nights of medication with triazolam 0.25 mg, nitrazepam 5 mg or placebo. The study was a double-blind, randomized, cross-over study, where a minimum of 7 days wash-out separated the 3 treatment periods. Nitrazepam was found to impair performance in the simulated task after 1 but not after 3 nights of medication. Performance in the triazolam condition was not significantly different from the other conditions on this task on either day. However, after one night of medication triazolam tended to score worse than placebo but better than nitrazepam. In real car driving a tendency was noted for nitrazepam to score worst, whereas the difference between placebo and triazolam was hardly noticeable. The same tendency appeared on both days.

**Workpackage No.:** 2

**Author:** LAW, B.

**Year:** 1981

**Title:** Cases of cannabis abuse detected by analysis of body fluids.

**Journal/Book Name:** Journal of the Forensic Science Society

**Volume:** 21, 31-39.

**Workpackage No.:** 4

**Author:** LEARY, BF

**Year:** 1991

**Title:** Court-ordered emergency visitations for DUI offenders (see comments)

**Journal/Book Name:** Journal of Emergency Medicine

**Volume:** 9 Suppl 1, 15-9

**ISBN/ISSN:** 0736-4679

**Keywords:** Visitation programs, adolescence, adult, alcohol drinking, alcoholic intoxication, alcoholism, attitude to health, automobile driving, emergency service, hospital, ethanol, female, health education, human, male, prospective studies, recurrence, retrospective studies, social behaviour, time factors

**Abstract:** Emergency department (ED) and morgue visits to view the results of accidents have recently been instituted as an alternative sentence for adolescents convicted of driving under the influence of alcohol (DUI). Although many DUI offenders are alcoholic, and educational programs intended to reduce recidivism in adults are generally not effective, scant data exist on adolescent offenders. Initial assessment of 59 of our

program participants diagnosed 41% as alcoholic. This finding prompted further participant evaluation to define our population. Fifty-four participants evaluated by self-administered diagnostic questionnaire revealed an alcoholism rate of 54%. Additionally, recidivism rates for alcohol-related moving violations for 176 program participants and matched controls were 28% and 23%, respectively. The significance of these findings represents the serious alcohol problems faced by the study population and indicates that visitation programs are not effective for addressing the problems of alcoholic offenders or in reducing recidivism.

**Workpackage No.:** 3

**Author:** LEIRER, V.O., YESAVAGE, J.A. AND MORROW, D.G.

**Year:** 1991

**Title:** Marijuana carry-over effects on aircraft pilot performance

**Journal/Book Name:** Aviation, Space, and Environmental Medicine, Aerospace Medical Association, Washington DC

**Volume:** pp.221-227

**Keywords:** marijuana, performance, aircraft simulator, drugs

**Abstract:** This study finds evidence for 24-h carry-over effects of a moderate social dose of marijuana on a piloting task. In separate sessions, nine currently active pilots smoked one cigarette containing 20mg of delta 9 THC and one placebo cigarette. Using an aircraft simulator, pilots flew just before smoking, and 0.25, 4, 8, 24, and 48 h after smoking. Marijuana impaired performance at 0.25, 4, 8 and 24 h after smoking. While seven of the nine pilots showed some degree of impairment at 24h after smoking, only one reported any awareness of the drug's effects. The results support our preliminary study and suggest that very complex human/machine performance can be impaired as long as 24 h after smoking a moderate social dose of marijuana, and that the user may be unaware of the drug's influence.

**Workpackage No.:** 2

**Author:** LEMOINE, P. AND O'HAYON, M.

**Year:** 1996

**Title:** Abuse of psychotropic drugs during driving

**Journal/Book Name:** Encephale

**Volume:** 22, 1, 1-6

**ISBN/ISSN:** 0013-7006

**Keywords:** accidents, traffic, attention, cross-sectional studies, drug interactions, France, human, incidence, metabolic clearance rate, psychotropic drugs, reaction time, risk factors, substance-related disorders

**Abstract:** The responsibility of psychotropic drugs as a cause of road traffic accidents remains difficult to evaluate with precision. Different studies performed in many countries provide a certain precision in relation to percentage of injured drivers whose blood contained psychotropic substances (8 to 10% according to studies). On the other hand, it is practically impossible to really know either these products were or were not the cause of the accidents because underlying or associated pathologies can equally create

problems such as lack of attention and other vigilance deficits. There is also a possibility of suicidal or aggressive tendencies. A certain number of circadian and other chronobiological parameters also complicate the problem since the schedule (hour) as well as the day of the week or even the season can considerably modify vigilance and reaction time. Available medications able to create such problems are numerous and their mechanisms of action varied. They can influence vision, impulsiveness and vigilance. They can act either by direct mechanisms of sedation or, on the contrary, by raising inhibition through secondary mechanisms: delay in drug elimination or provoked insomnia. For the most part, incriminated medications belong to the different classes of sedative medicines: benzodiazepines, antiepileptics, some antihistaminic agents, some antidepressants, some thymo-regulators and some anti-hypertensives. Also included are desinhibitors or stimulant classes: amphetamines and related drugs, caffeine and codeine. Some of them can be used for their psychodysleptic properties: codeine and anticholinergic drugs. Finally, drug and medicinal associations can have unforeseen effects: for example, anticholinergics + alcohol + valpromide, etc. If it appears methodologically impossible that research could ever precisely quantify the share of responsibility of psychotropic drugs in causing road traffic accidents, this relation remains highly probable. It is therefore necessary that in the course of university and post-academic training, potential prescribers might regularly be advised of these risks. Lastly, public needs to be constantly informed

**Workpackage No.:** 1

**Author:** LEMOINE, P. AND OHAYON, M.

**Year:** 1996

**Title:** Misuse of Psychotropic Drugs and Driving

**Secondary Author:** Driving, Misuse of Psychotropic Drugs and

**Journal/Book Name:** Encephale-Revue De Psychiatrie Clinique Biologique et Therapeutique

**Volume:** 22, 1, 1-6

**ISBN/ISSN:** 0013-7006

**Keywords:** accidents, car driving, psychotropic drugs, sedation, road accidents, depression

**Abstract:** The responsibility of psychotropic drugs as a cause of road traffic accidents remains difficult to evaluate with precision. Different studies performed in many countries provide a certain precision in relation to percentage of injured drivers whose blood contained psychotropic substances (8 to 10% according to studies). On the other hand, it is practically impossible to really know either these products were or were not the cause of the accidents because underlying or associated pathologies can equally create problems such as lack of attention and other vigilance deficits. There is also a possibility of suicidal or aggressive tendencies. A certain number of circadian and other chronobiological parameters also complicate the problem since the schedule (hour) as well as the day of the week or even the season can considerably modify vigilance and reaction time. Available medications able to create such problems are numerous and their mechanisms of action varied. They can influence vision, impulsiveness and vigilance. They can act either by direct mechanisms of sedation or, on the contrary, by raising

inhibition through secondary mechanisms : delay in drug elimination or provoked insomnia. For the most part, incriminated medications belong to the different classes of sedative medicines: benzodiazepines, antiepileptics, some antihistaminic agents, some antidepressants, some thymic regulators and some anti-hypertensives. Also included are desinhibitors or stimulant classes : amphetamines and related drugs, caffeine and codeine. Some of them can be used for their psycho-dysleptic properties : codeine and anticholinergic drugs. Finally, drug and medicinal associations can have unforeseen effects : for example, anticholinergics + alcohol + valpromide, etc. If it appears methodologically impossible that research could ever precisely quantify the share of responsibility of psychotropic drugs in causing road traffic accidents, this relation remains highly probable. It is therefore necessary that in the course of university and post-academic training, potential prescribers might regularly be advised of these risks. Lastly, public needs to be constantly informed

**Workpackage No.:** 1

**Author:** LI, J., STOES, S.A. AND WOECKENER, A.

**Year:** 1998

**Title:** A tale of novel intoxication: a review of the effects of gamma-hydroxybutyric acid with recommendations for management.

**Journal/Book Name:** Ann Emerg Med

**Volume:** 31:6 729-36

**Keywords:** GB; side-effects

**Abstract:** STUDY OBJECTIVE: We describe seven patients presenting with combination substance abuse involving gamma-hydroxybutyric acid (GHB). METHODS: During a 3 month period, we identified consecutive patients with GHB ingestion confirmed by urine mass spectrometry presenting to a high-volume urban emergency department. RESULTS: All patients presented with acute delirium and transient but severe respiratory depression. With supportive care, including intubation and mechanical ventilation in four cases, normal mentation and respiratory function returned within 2 to 6 hours. None of these patients had documented seizures, and none of the four patients who received naloxone had a reversal response. This clinical observation supports previous experimental work in GHB-intoxicated human subjects demonstrating neither epileptiform changes on electroencephalography nor reversal with naloxone. Two findings are remarkable in this series. The first is the observation of a peculiar state of violent aggression present on stimulation of the GHB-intoxicated patient despite near or total apnea. The fact that patients fully recovered from this state may be the result of a previously demonstrated GHB hypoxia-sparing effect. The second is the observation of ECG abnormalities in several cases, including U waves in five patients. CONCLUSION: Emergency physicians should be alerted to this agent, its characteristic effects, and its potential for serious sequelae including respiratory arrest and death.

**Workpackage No.:** 3

**Author:** LILLSUNDE, P., PORTMAN, M., SEPPALA, T., MERIRINNE, E., SCHULZ, E., BARDY, T., KORTE, R., LINDBOHM, R. AND PIKKARAINEN, J.

**Year:** 1992/3

**Title:** Drugs in road traffic accident drivers with low blood alcohol concentrations

**Journal/Book Name:** Proceedings of the Twelfth International Conference on Alcohol, Drugs and Traffic Safety, Cologne, Germany.

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** drugs, driving, benzodiazepines, cannabis, amphetamine, barbiturates, blood analysis, police requests

**Abstract:** The authors studied the drug use of drivers whose blood alcohol concentration (BAC) was less than the mandatory limit and who were involved in non-fatal road traffic accidents. Alcohol and drug determinations of all Finnish drunken drivers are centered in the authors' department. Police requested 30,839 analyses from cases in which driving under the influence (DUI) of alcohol and/or drugs was suspected in 1991. After exclusion of other than motor car accidents, non-drivers, cases with no blood sample as well as cases where drinking was claimed to have taken place after driving 21,723 cases were left. 18% (3,910) of these drivers had been involved in an accident and 6.3% (247) had a BAC less than 0.50 per mille at the time of the accident. The drugs were analysed in 206 (83.4%) of these cases. The results showed that drivers involved in road traffic accidents had higher BACs compared to all car drivers. While drug abuse was indicated in 28% (n=57) of samples of the accident involved drivers a therapeutic use of drugs was most probable in 25% (n=51). Almost half of the accident drivers had not used drugs (47%, n=98). A multi-drug use occurred in 75% (42) and 59% (30) in drug abuse and therapeutic groups, respectively. The single vs. multi-use of drugs of the two groups of drivers did not differ significantly.

**Workpackage No.:** 3

**Author:** LILLSUNDE, P., MICHELSON, L., FORSSTROM, T., KORTE, T., SCHULTZ, E., ARINIEMI, K., PORTMAN, M., SIHVONEN, M-J. AND SEPPALA, T.

**Year:** 1996

**Title:** Comprehensive drug screening in blood for detecting abused drugs or drugs potentially hazardous for traffic safety

**Journal/Book Name:** Forensic Science International

**Volume:** 77, 3, 191-210

**ISBN/ISSN:** 0379-0738/96

**Keywords:** drug screening, drug abuse, traffic safety, blood analysis

**Abstract:** A comprehensive drug screening procedure for detecting drugs in the blood samples of car drivers suspected of driving under the influence of drugs, is presented. Amphetamines, cannabinoids, opioids, cocaine, and benzodiazepines were screened by an immunological EMIT ETS system after acetone precipitation. gas chromatographic methods were used to screen and quantitate basic, neutral and acidic drugs. The free amino groups of basic drugs were derivatized with heptafluorobutyric anhydride. Analysis was performed by a dual channel gas chromatograph combined with a nitrogen phosphorus and an electron capture detector. Phenyltrimethylammonium hydroxide was used as a methylating agent for acidic substances before analysis with a gas chromatograph connected to a nitrogen phosphorus detector. A gas chromatography/mass spectrometry was used as a common confirmation method.



Tetrahydrocannabinol was quantitated after bis(trimethylsilyl)trifluoroacetamide derivatization, opiates after pentafluoropropionic anhydride derivatization and benzoylecgonine after pentafluoropropionic anhydride and pentafluoropropanol derivatization. Excluding benzodiazepines, which were confirmed with a gas chromatograph connected to a nitrogen phosphorus and an electron capture detector, the other basic drugs as well as the acidic drugs were confirmed after the same derivatization procedures as in the screening methods. Alcohols were quantitated in triplicate by gas chromatography using three different kinds of columns. Although urine is the most important specimen for screening abused drugs, it has only limited use in forensic toxicology. The described system is most useful for analyzing a wide range of substances, including illicit drugs, benzodiazepines, barbiturates, antidepressants and phenothiazines in forensic samples when urine is not available.

**Workpackage No.:** 4

**Author:** LILLSUNDE, P., KORTE, T., MICHELSON, L., PORTMAN, M., PIKKARAINEN, J. AND SEPPALA

**Year:** 1996

**Title:** Drugs usage of drivers suspected of driving under the influence of alcohol and/or drugs. A study of one week's samples in 1979 and 1993 in Finland.

**Journal/Book Name:** Forensic Science International

**Volume:** 77, 119-129

**ISBN/ISSN:** 0379-0738/96

**Keywords:** driving, alcohol, drugs, Finland

**Abstract:** The extent of drug use among drivers suspected of driving under the influence of alcohol and/or drugs in Finland was studied. All blood samples submitted to the laboratory during 1 week in two study periods, in 1979 (n=298) and 1993 (n=332), were analyzed for alcohol and psychotropic drugs. Drugs classified as hazardous to traffic safety were detected in 7.0% of the samples in 1979 and 26.8% in 1993. Benzodiazepines were the most frequently found drugs in both years: 6.0% of the cases in 1979 and 22.9% in 1993. Illegal drugs were found in 4% of the cases in 1993. Of the samples tested, 296 in 1979 and 317 in 1993 were from drivers suspected of driving under the influence of alcohol only. In 1979 every fourteenth and in 1993 every fourth of these suspected drunken drivers had drugs in their blood. Drugs, other than alcohol, were found six times more often than expected by the police. The results indicate that the trend of drug use, multidrug use and drug abuse is increasing among cases suspected of driving under the influence of alcohol/drugs.

**Workpackage No.:** 3

**Author:** LILLSUNDE, P.

**Year:** 1998

**Title:** Commentary: Alcohol/drug users and traffic accidents - A review of epidemiological studies

**Journal/Book Name:** Journal of Traffic Medicine

**Volume:** 26, 1-2, 5-10

**Keywords:** drugs, alcohol, driving, traffic safety, DUI, statistics, accidents

**Abstract:** The author Workpackage No. the increases of road traffic accidents in industrialized countries. Alcohol plays an increasing role in accidents, as accident severity increases. Although accidents caused by DUI of alcohol have been decreasing, driving under the influence of drugs has shown increasing trends. Driving under the influence of drugs is difficult to recognise as there are no road-side tests to detect drugs rapidly. Epidemiological research on the incidence of alcohol and drugs in traffic safety is reviewed. Statistics for drug use among drivers in various countries are provided.

**Workpackage No.:** 1

**Author:** LINNAVUO, M; YLILAAKKOLA, P; MATTILA, MJ; MAKI, M. AND SEPPALA, T

**Year:** 1987

**Title:** A new device to measure drug-induced changes on reactive and coordinative skills of human performance.

**Journal/Book Name:** Pharmacol Toxicol

**ISBN/ISSN:** 0901-9928

**Keywords:** reaction time, drugs driving, computerised driving programme

**Abstract:** A computerized device for simultaneous measurement of coordinative and reactive skills related to driving was developed and tested in two consecutive trials of psychoactive agents in healthy volunteers. The test system comprises a vehicle, a driving computer (Sinclair QL), and the programming and measurement computer (IBM-PC). The computerized driving programme projects to the colour-TV screen a winding road, and the driver has to keep the car on the road by turning the steering wheel. The driving proceeds at a fixed, fairly rapid rate for 5 min., and the numbers of tracking errors (deviations from the road) as well as the tracking percentage (relative length of the track driven off the road) were computed separately for both halves of the track. During the latter half of the track 60 visual or/and sound stimuli were given in random order, and the driver had to respond or not respond to them by pressing a button or by pushing a foot pedal. The number of reaction errors and the cumulative reaction time were recorded. The programme also provides a histogramme that relates the number of deviations from the road to their duration, enabling a visual judgement of the severity of errors. Matched versions (mirror image, reverse direction) of tracks of varying severity were offered to reduce learning effect during the trial. When testing the device in two placebo-controlled double-blind and cross-over trials, a considerable practice effect on tracking and reaction strategies took place, but after proper training the baselines remained reasonably stable

**Workpackage No.:** 2

**Author:** LINNOILA, M

**Year:** 1974

**Title:** Effect of drugs and alcohol on psychomotor skills related to driving

**Journal/Book Name:** Annals of Clinical Research

**Volume:** 6, 7-18

**Workpackage No.:** 1

**Author:** LINNOILA, M. AND SEPPALA, T.  
**Year:** 1985  
**Title:** Anti-depressants and driving  
**Journal/Book Name:** Accident Analysis and Prevention  
**Volume:** 17, 4, 297-301  
**ISBN/ISSN:** 0001-4575/85

**Keywords:** drugs, driving, anti-depressants

**Abstract:** According to the authors the impact of antidepressants on traffic safety is presently unknown. According to laboratory tests antidepressants can have both beneficial and untoward effects on skills required for driving. Studies in healthy volunteers and patients suggest that antidepressants free of sedative effects should be used in active outpatients. Successful treatment of depression probably reduces the accident risk of a depressed driver. An interaction between antidepressants and alcohol as well as the effect of untreated depression may be more important for traffic safety than drug effects alone.

**Workpackage No.:** 1

**Author:** LITTLE, G.L., ROBINSON, K.D. AND BURNETTE, K.D.

**Year:** 1991

**Title:** Treating drunk drivers with moral recondition therapy: a three year report

**Journal/Book Name:** Psychological Reports

**Volume:** 69, (3 Pt 1), 953-4

**ISBN/ISSN:** 0033-2941

**Keywords:** adult, alcoholism, automobile driving, cognitive therapy, follow-up studies, human, male, morals, prisons

**Abstract:** 115 DWI-convicted male inmates were treated with the cognitive behavioral system of Moral Recondition Therapy during their incarceration. Three years after their release, subjects' postrelease arrest and reincarceration records were collected. In the treated group, 24 subjects participated in an extended aftercare program and were compared to a control group of 65 DWI-convicted inmates who did not enter treatment due to limited bed space. Analysis showed reincarceration rates of 36.9% for the 65 controls, 22.6% of the 115 treated subjects, and only 16.7% of the 24 aftercare clients.

**Workpackage No.:** 3

**Author:** LOGAN, B.K., GULLBERG, R.G. AND ELENBAAS, J.K.

**Year:** 1994

**Title:** Isopropanol interference with breath alcohol analysis: a case report

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 39, 4, 1107-11

**ISBN/ISSN:** 0022-1198

**Keywords:** acetone, adult, alcoholic intoxication, automobile driving, breath tests, case report, ethanol, false positive reactions, human, male, mass fragmentography, sensitivity and specificity, I-Propanol

**Abstract:** The presence of interfering substances, particularly acetone, has historically been a concern in the forensic measurement of ethanol in human breath. Although modern infrared instruments employ methods for distinguishing between ethanol and acetone, false-positive interferant results can arise from instrumental or procedural problems. The case described gives the analytical results of an individual arrested for driving while intoxicated and subsequently providing breath samples in two different BAC Verifier Datamaster infrared breath alcohol instruments. The instruments recorded ethanol results ranging from 0.09 to 0.17 g/210 L with corresponding interferant results of 0.02 to 0.06 g/210 L over approximately three hours. Breath and venous blood specimens collected later were analyzed by gas chromatography and revealed in the blood: isopropanol 0.023 g/100 mL, acetone 0.057 g/100 mL and ethanol 0.076g/100 mL. Qualitative analysis of the breath sample by GCMS also showed the presence of all three compounds. This individual had apparently consumed both ethanol and isopropanol with acetone resulting from the metabolism of isopropanol. An important observation is that the breath test instruments detected the interfering substances on each breath sample and yet they did not show tendencies to report false interferences when compared with statewide interferant data.

**Workpackage No.:** 2

**Author:** LOGAN, B.K.

**Year:** 1996

**Title:** Methamphetamine and driving impairment

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 41, 457-464

**ISBN/ISSN:** 0022-1198

**Keywords:** forensic science, forensic toxicology, methamphetamine, driving, driving impairment, accidents

**Abstract:** Following a review of the effects of methamphetamine on human-performance, actual driving and behaviour were evaluated in 28 cases in which drivers arrested or killed in traffic accidents had tested positive for methamphetamine. The circumstances surrounding the arrest or accident were examined, together with any observations by the arresting officer regarding behavioural irregularities. The investigators also made a determination of culpability. Most of the arrests resulted from accidents in which the driver was determined to be culpable. Typical driving behaviours included drifting out of the lane of travel, erratic driving, weaving, speeding, drifting off the road, and high speed collisions. Behavioural or confused speech, rapid pulse, agitation, paranoia, dilated pupils, violent or aggressive attitude. Combined alcohol and methamphetamine use was uncommon, however, use of marijuana was evident in about one third of cases. In addition to impairing judgment and increasing risk taking, the effects of withdrawal from methamphetamine use including fatigue, hypersomnolence, and depression are likely contributors to many of these accidents. A consideration of the

literature and the cases discussed here, leads to the conclusion that methamphetamine at any concentration is likely to produce symptoms that are inconsistent with safe driving.

**Workpackage No.:** 3

**Author:** LOGAN, B.K. AND SCHWILKE, E.W.

**Year:** 1996

**Title:** Drug and alcohol use in fatally injured drivers in Washington State

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 41, 3, 505-510

**Keywords:** forensic science, forensic toxicology, alcohol, drugs, fatality, death, driving, blood, urine

**Abstract:** Blood and/or urine from fatally injured drivers in Washington State were collected and tested for the presence of drugs and alcohol. Drug and/or alcohol use was a factor in 52% of all fatalities. Among single vehicle accidents, alcohol use was a factor in 61% of cases versus 30% for multiple vehicle accidents. Drugs most commonly encountered were marijuana (11%), cocaine, amphetamines (2%), together with a variety of depressant prescription medications. Trends noted included an association of depressant use with higher blood alcohol levels, while marijuana use was associated with lower blood alcohol levels. Marijuana use was noted to be the most prominent in the 15-30 year age group, stimulant use in the 21-40 year old group, and prescription depressants use was more prevalent in the 45+ age group. Drug use demographics in this population are consistent with those noted in other jurisdictions.

**Workpackage No.:** 3

**Author:** LOGAN, B.K., FLIGNER, C.L. AND HADDIX, T.

**Year:** 1998

**Title:** Cause and manner of death in fatalities involving methamphetamine

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 43, 1, 28-34

**ISBN/ISSN:** 0022-1198

**Keywords:** accidents, traffic, adult, cause of death, central nervous system, stimulants, female, homicide, human, male, mass fragmentography, methamphetamine, middle age, retrospective studies, suicide

**Abstract:** We reviewed a series of deaths in which methamphetamine was detected in the decedent's blood. Analysis of postmortem whole blood was performed by gas chromatography/mass spectrometry with a limit of quantitation of 0.05 mg/L. Methamphetamine was detected in 146 cases; 52 were drug caused, i.e., a death in which the direct toxic effects of the drug caused or contributed to the death, 92 were classified as drug related, i.e., a death in which the drug was demonstrated in the blood, but did not directly cause death. A large proportion of the deaths resulted from homicidal (27%) or suicidal (15%) violence. An examination of methamphetamine concentrations in drug related deaths (n = 92), suggests that the range of concentrations in the recreational abusing population is substantial (0.05-9.30 mg/L) but with a median concentration of 0.42 mg/L, and with 90% of that population having concentrations less than 2.20 mg/L.

There was substantial overlap in methamphetamine concentration between drug related deaths and drug caused deaths, although the highest concentrations were seen in the unintentional (accidental or undetermined) drug caused deaths. Methamphetamine related traffic deaths (n = 17) showed patterns of driving behavior consistent with reports elsewhere, and showed blood methamphetamine concentrations ranging from 0.05-2.60 mg/L (median 0.35 mg/L). The data show that most methamphetamine deaths occur with blood concentrations greater than 0.5 mg/L, but can occur with levels as low as 0.05 mg/L, though usually in conjunction with other drugs or significant natural disease. Neither apparently toxic nor therapeutic concentrations should be used in isolation to establish conclusively whether a death was caused by methamphetamine; proper classification of deaths involving methamphetamine requires complete death investigation, including investigation of the scene and circumstances of death, and a complete autopsy.

**Workpackage No.:** 3

**Author:** LOUWERENS, J.W., BROOHUIS, K.J. AND O'HANLON, J.F.

**Year:** 1983

**Title:** Antidepressant effects upon actual driving performance.

**Journal/Book Name:** Traffic Research Center, University of Groningen, The Netherlands, Tech. Rep. VK 83-05.

**Keywords:** antidepressants; driving

**Workpackage No.:** 2

**Author:** LOXLEY, W; HOMEL, R; BERGER, D. AND SNORTUM, J

**Year:** 1992

**Title:** Drinkers and their driving: compliance with drinking-driving legislation in four Australian states.

**Journal/Book Name:** J Stud Alcohol

**Volume:** 53(5), 420-6

**ISBN/ISSN:** 0096-882X

**Keywords:** Accidents, Traffic LJ ; Adult ; Alcohol Drinking ; Australia ; Automobile Driving; Female ; Human ; Male ; Questionnaires ; Safety ; Sex Factors

**Abstract:** This study replicates work in Norway and the United States in investigating the extent to which Australian drivers attempt to comply with drinking-driving legislation. In a four-state survey of 1,133 drinkers, it was found that people were aware of the need to control their alcohol input before driving, and derived estimates of blood alcohol after a recent away-from-home drinking occasion demonstrated that the amount people drank was influenced by whether or not they were driving. Drivers reported drinking less than nondrivers and were also those who usually consumed less alcohol. These findings were also true of people with different levels of normal consumption. Although these results are encouraging, it is suggested that there is need for further modification of sanctions, and that the community needs more information about the alcohol content of drinks and drink sizes if people are to moderate effectively their drinking before driving.

**Workpackage No.: 3**

**Author:** LOXLEY, W; LO, SK; HOMEL, R; BERGER, DE. AND SNORTUM, JR

**Year:** 1992

**Title:** Young people, alcohol, and driving in two Australian states.

**Journal/Book Name:** International Journal of Addiction

**Volume:** 27(9), 1119-29

**ISBN/ISSN:** 0020-773X

**Keywords:** Traffic accidents, adolescence, adult, age factors, alcohol drinking, alcoholic intoxication, Australia, automobile driving, breath tests, female, human, male, support, Non U.S. Gov't

**Abstract:** Road traffic accidents are the single largest cause of death in Australia among people aged 15-24. The proposition that a broadly based deterrence measure, such as random breath testing (RBT), would be sufficient to change the behaviour of young drivers was tested in a comparison of young drivers in New South Wales (NSW), which has had RBT for 6 years, with young drivers in Western Australia (WA), where there was no RBT. The results demonstrated that NSW young drivers were less likely to drink and drive and more likely to believe their peers would disapprove of drink-driving than were their counterparts in WA. It was concluded that RBT had altered the drink-driving behaviour and possibly the beliefs about drink-driving of young people in NSW.

**Workpackage No.: 1**

**Author:** LUND, A.K., PREUSSER, D.F., BLOMBERG, R.D. AND WILLIAMS, A.F.

**Year:** 1988

**Title:** Drug use by tractor-trailer drivers

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 33, 3, 648-661

**Keywords:** toxicology/ motor vehicle operation/ marijuana/ alcohol/ cocaine/ truck drivers/ stimulants/ vehicle operation

**Abstract:** Blood or urine samples or both were obtained from 317 of 359 randomly selected tractor-trailer drivers asked to participate in a driver health survey conducted at a truck weighing station on Interstate 40 in Tennessee. Altogether, 29% of the drivers had evidence of alcohol, marijuana, cocaine, prescription or nonprescription stimulants, or some combination of these, in either blood or urine. Cannabinoids were found in 15% of the drivers' blood or urine; nonprescription stimulants such as phenylpropanolamine were found in 12%; prescription stimulants such as amphetamine were found in 5%; cocaine metabolites were found in 2%; and alcohol was found in less than 1%. These results provide the first objective information about the use of potentially abusive drugs by tractor-trailer drivers. The extent of driver impairment attributable to the observed drugs is uncertain because of the complex relationship between performance and drug concentrations.

**Workpackage No.: 3**

**Author:** LUND, A.K., PREUSSER, D.F., BLOMBERG, R.D. AND WILLIAMS, A.F.  
**Year:** 1988  
**Title:** Drug use by tractor trailer drivers.  
**Journal/Book Name:** Journal of Forensic Sciences  
**Volume:** 33(3), 648-61.  
**Workpackage No.:** 3

**Author:** LUND, A.K. AND WOLFE, A.C.  
**Year:** 1991  
**Title:** Changes in the incidence of alcohol-impaired driving in the United States, 1973-1986.  
**Journal/Book Name:** J Stud Alcohol  
**Volume:** 52(4), 293-301  
**ISBN/ISSN:** 0096-882X  
**Keywords:** accidents, traffic, adolescence, adult, aged, alcohol drinking, alcoholic intoxication, alcoholism, automobile driving, breath tests, cross-sectional studies, ethanol, female human, incidence, male, middle age, support, Non U.S. Gov't, United States  
**Abstract:** Studies of motor vehicle fatality data have indicated that alcohol involvement in fatal crashes has declined substantially in the United States since 1980. To determine the actual incidence of alcohol-impaired drivers on U. S. roads, a national roadside survey using portable breath-testing devices was carried out in 32 localities in the spring of 1986. The same sampling design and survey procedures used in a 1973 national roadside survey were followed as much as possible. The 1986 survey found 3.1 % of the late-night weekend drivers to have a blood alcohol concentration (BAC) of 0.10% or more, compared to 4.9% of drivers in 1973. Similarly, 8.3 % of the 1986 drivers were at or above 0.05% BAC, compared to 13.5% in 1973. The data indicate that the incidence of alcohol-impaired driving on weekend nights has fallen by one-third or more in the United States since 1973 and that the decline affected most population subgroups.  
**Workpackage No.:** 3

**Author:** LUNDBERG, G.D. WHITE, J.M. AND HOFFMAN, K.I.  
**Title:** Drugs (other than or in addition to ethyl alcohol) and driving behaviour: A collaborative study of the California Association of Toxicologists  
**Journal/Book Name:** Journal of Forensic Sciences  
**Keywords:** drugs, driving, pooled data, toxicology, psychoactive drugs, alcohol barbiturates, diazepam, methaqualone, chlordiazepoxide, meprobamate and ethchlorvynol  
**Abstract:** This study consists of a compilation of pooled data from many laboratories and many observers and scientists. The test group comprised 836 cases. The control group was small but consisted of subjects with comparable problems without identified drugs. The presence of psychoactive drugs other than, or in addition to, ethyl alcohol in persons with driving behaviour problems was found to be common in California and Nevada. Major objective alterations in sensory-motor capabilities headed by impaired balance and coordination, slurred speech, and staggering were common in drivers in whose blood psychoactive drugs were found. Serious observed driving behaviour problems headed by



weaving, driving without due care, and accidents were common in such groups. The typical person in this study who was driving with a psychoactive drug present in the blood or urine and who experienced a driving problem was a white male under 30 years of age. The commonly found drugs were barbiturates, diazepam, methaqualone, chlordiazepoxide, meprobamate and ethchlorvynol. More than half the time when at least one drug was found at least one other drug (including ethyl alcohol) was also present. The arresting officer's ability correctly to predict which drug the suspect had in his body was approximately 50%, based on his own suspicion or on the finding of a drug in the subject's possession. The presence of a detectable psychoactive drug was statistically associated with accident at a highly significant range in comparison with a control group. Females driving with a detectable psychoactive drug in their blood were statistically more likely to have an accident than were males at a significant level and were statistically more likely than males to have a fatal accident at a highly significant level. The addition of ethly alcohol to another psychoactive drug appears significantly to increase the likelihood of a fatal accident.

**Workpackage No.: 3**

## M

**Author:** MAATZ, K.R.

**Year:** 1995

**Title:** Legal requirements for medical findings in determining driving capacity in driving under the influence of drugs - discussion of establishing limit values for absolute incapacity

**Journal/Book Name:** Blutalkohol

**Volume:** 32, 2, 97-108

**ISBN/ISSN:** 0006-5250

**Keywords:** alcohol, drugs, automobile driving, dose-response relationship, detection

**Abstract:** Legally, alcohol and "other intoxicating substances" are given the same treatment (sections 315 c para. 1 letter a, 316 StGB). This implies that the findings of the German Public Health Office with regard to alcohol on the road should serve as methodical guidelines for medical findings when judging driver fitness after drug use. Therefore limits for "absolute" driver incapability after drug use can only be decided on after special consideration of the outcome of attempts to drive. In addition, the basis of simultaneous results of the same rank of the biological-medical as well as the statistical research of the different psychotropic substances have to be taken into consideration. There is still a lack of proven results about the relation between dose, blood concentration and effect, which enabled the determination of limits. Therefore the emphasis of the medico-toxicological examination lies in the interpretation of the psycho-physical state of the driver at the time of being stopped and of the blood examination, as well as the blood active substances-concentration with regard to the "relative" driver incapability.

**Workpackage No.:** 1

**Author:** MACBAY, A.J.

**Year:** 1977

**Title:** Marijuana: current assessment

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 22, 3, 493-9

**ISBN/ISSN:** 0022-1198

**Keywords:** automobile driving, chemistry, expert testimony, health, human legislation, drug, tetrahydrocannabinol, time factors, United States

**Workpackage No.:** 1

**Author:** MACDONALD, S. AND PEDERSON, L.

**Year:** 1988

**Title:** Occurrence and patterns of driving behavior for alcoholics in treatment

**Journal/Book Name:** Drug Alcohol Depend

**Volume:** 22, 1-2, 15-25

**ISBN/ISSN:** 0376-8716

**Keywords:** Accidents, Traffic LJ ; Adult ; Aged ; Alcohol Drinking PX ; Alcoholic Intoxication CO ; Alcoholism Co/RH ; Automobile Driving ; Cross-Sectional Studies ; Female ; Human ; Male ; Middle Age ; Ontario ; Probability ; Retrospective Studies ; Support, Non-U.S. Gov't ; Temperance

**Abstract:** The purpose of this study was to investigate the driving behaviors of male alcoholics. Two hundred and fifty-eight male alcoholics receiving treatment for alcoholism completed a self-administered questionnaire about their driving behaviour and official driver records were accessed. On average, the surveyed individuals drank and drove about 8.6 days per month at the legal level of impairment in Canada (i.e., 80 mg%). Evidence showed that about 88.3% of the sample had driven while impaired. The probability of being arrested for impaired driving was estimated to be about one in 1168 impaired driving events. People were divided into three groups according to their number of Driving While Impaired (DWI) arrests in the previous 10 years, as determined by self-reports and official driving records: zero DWI arrests, one DWI arrest, and multiple DWI arrests. Those with multiple DWI arrests drove while impaired more frequently and with more risky styles of driving than people with zero arrests. Those with two or more arrests also reported that they enjoyed driving under a greater variety of situations as compared to those with zero arrests. Multiple offenders had significantly more total collisions than zero time offenders; however, there were no significant differences among the three DWI groups for collisions without alcohol involvement or other types of traffic violations. Results showed that the number of DWI arrests was generally not related to worse driving when sober.

**Workpackage No.:** 3

**Author:** MACDONALD, S AND DOOLEY, S

**Year:** 1993

**Title:** A case-control study of driving-while-impaired offenders.

**Journal/Book Name:** Drug Alcohol Depend

**Volume:** 33(1), 61-71

**ISBN/ISSN:** 0376-8716

**Keywords:** adolescence, adult, aged, alcoholic intoxication, attitude, automobile driving, case-control studies, female, human, male, middle age, motivation, risk factors, social environment, temperance

**Abstract:** A case control approach was used to identify variables associated with driving while impaired (DWI). Data utilized for this study were obtained from interviews with individuals in a representative sample of 9943 Canadians. Individuals convicted for DWI were matched with control subjects (i.e. no DWI convictions) by gender, age, province of residence, education, income, and recent drinking behaviour. During the matching process, 39 current abstainers were found among the DWI offenders and were treated as a separate group for statistical purposes. Three groups were compared: 78 DWI cases, 78 matched controls, and 39 DWI current abstainers. Statistical analyses were used to detect significant differences among these three groups for 81 variables within the following categories: (a) attitudes, knowledge and behaviour related to drinking and driving; (b) driving behaviour; (c) drinking behaviour and drug use; (d) social issues; and (e) attitudes towards different policy approaches to reducing drinking and driving. DWI cases were

significantly different from control subjects for only 10 variables. A high proportion of differences found between these two groups related to attitudes regarding drinking and driving behaviour. For example, DWI cases were more likely than controls to believe that some people drive better after drinking, that it takes more alcohol to be legally impaired, and that there is an excuse for DWI. DWI cases were more likely to drink due to sadness or loneliness, and reported higher cannabis use over previous years. Little evidence was found to support the hypothesis that DWI offenders are less likely to perceive deterrents to DWI. However, evidence does support the notion that many DWI offenders do not believe that they have a drinking problem. Implications of the findings are discussed.

**Workpackage No.:** 3

**Author:** MACPHERSON, R.D., PERL, J. AND STARMER, G.A.

**Year:** 1984

**Title:** Self-reported drug usage and crash incidence in breathalyzed drivers

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 16, 2, 139-148

**Keywords:** drug usage, crash incidence, BAC, breathalysed, males, analgesics, CNS depressants

**Abstract:** Replies to a question on the medication usage of a large population of drivers subjected to evidential breath analysis were examined, and related to the age, sex and BAC of the driver, and to whether or not he was breath analysed after a crash. In an initial analysis, medications were classified into 13 major groups (including a drug negative, or control, group) and a log-linear analysis carried out on the cross-tabulation of age (five categories) by BAC (five categories) by drug (13 categories) by crash/no crash. (Analysis was restricted to males, since the number of females was very small). A reduced model was obtained, and the ratio of the odds of a crash in each drug group to the odds of a crash in the appropriate drug negative group computed. In a second stage of analysis, the analgesic and CNS depressant categories were expanded to individual agents, and odds ratios again computed. A number of individual drug and drug groups were associated with an elevated crash risk. These included CNS depressants (diazepam, oxazepam, anti-depressants), analgesics (d-propoxyphene) and drugs for the treatment of diabetes. In general, effects were most marked at low BACs.

**Workpackage No.:** 3

**Author:** MADDUX, J.F., WILLIAMS, T.R. AND ZIEGLER, J.A.

**Year:** 1977

**Title:** Driving records before and during methadone maintenance

**Journal/Book Name:** Am J Drug Alcohol Abuse

**Volume:** 4, 1, 91-100

**ISBN/ISSN:** 0095-2990

**Keywords:** automobile driving, female, heroin dependence, human, male, methadone

**Abstract:** We compared the motor vehicle driving records of 104 former heroin users during 1 year of heroin use before admission to methadone maintenance with their records during 1 year after admission while they were maintained on methadone. We

found a statistically significant increase in convictions for speeding from the year on heroin to the year on methadone, but no significant change in convictions for negligent collision, other moving violations, driving without a license, and in accidents. The results suggest that heroin users have slightly better driving records on heroin than they do on methadone, possibly because on heroin they drive with special care to avoid arrest. The frequency with which our subjects were involved in accidents did not differ significantly from that of all Texas licensed drivers. On the basis of this study we recommend no restriction of the driving privilege of persons maintained on methadone.

**Workpackage No.:** 3

**Author:** MAGHSOODLOO, S., BROWN, D. AND GREATHOUSE, P.

**Year:** 1988

**Title:** Impact of the revision of DUI legislation in Alabama

**Journal/Book Name:** Am J Drug Alcohol Abuse

**Volume:** 14(1), 97-108

**ISBN/ISSN:** 0095-2990

**Keywords:** Accidents, Traffic \*PC ; Alabama; Alcoholism \*PC; Criminal Law\*; Cross-Sectional Studies ; Human; Jurisprudence \*; Opioid-Related Disorders \*PC ; Support, Non-U.S Gov't

**Abstract:** On May 19, 1980, a major revision in the Alabama DUI laws went into effect which gave judges greater discretion in sentencing. This revision resulted in an increase in the proportion of DUI convictions, a reduction in the number of DUI citations reduced to reckless driving, a reduction in the proportion of offenders acquitted and/or dismissed, an increase in the proportion of revocations, and an increase in court referrals to an educational program on the first offense. However, the 1980 revision was accompanied by a significant increase in the percentage of alcohol-related accidents. Consequently, the Alabama legislature revised the 1980 law on July 29, 1983, the revision taking effect immediately. The more stringent penalties in the new law apparently had a positive effect on all six alcohol-related measures cited above. Most importantly, the latest revision was accompanied by a significant decrease (2.80%) in the proportion of alcohol-related accidents.

**Workpackage No.:** 1

**Author:** MAIER, R.D., ERKENS, M., HOENEN, H. AND BOGUSZ, M.

**Year:** 1992

**Title:** Screening for common drugs of abuse in whole blood by means of EMIT-EIS and FPIA-ADX urine immunoassays

**Journal/Book Name:** International Journal of Legal Medicine

**Volume:** 105, 2, 115-119

**Keywords:** cannabinoids, benzodiazepines, benzoylecgonine, ETS (EMIT) and ADx (FPIA) analyzers

**Abstract:** The purpose of the paper was to compare the performance of ETS (EMIT) and ADx (FPIA) analyzers for screening blood samples for drugs of abuse after 2 alternative pretreatment procedures (acetone precipitation and ultrafiltration). Cannabinoids,

benzodiazepines and benzoylecgonine were not detectable with both assays after ultrafiltration. The detectability of morphine in blood infiltrates was distinctly lower than after acetone precipitation. The comparison of results obtained with ETS and ADx after acetone precipitation showed that ETS assay is slightly more sensitive but ADx is slightly more reproducible. Both assays may be used for blood examination with similar cut-off values. The ETS analyzer gave much better analytical performance (speed, flexibility) and lower reagent costs than ADx analyzer.

**Workpackage No.:** 2

**Author:** MALHOTRA, A.K., PINALS, D.A., ADLER, C.M., ELMAN, I., CLIFTON, A., PICKAR, D. AND BREIER, A.

**Year:** 1997

**Title:** Ketamine-induced exacerbation of psychotic symptoms and cognitive impairment in neuroleptic-free schizophrenics.

**Journal/Book Name:** Neuropsychopharmacology

**Volume:** 17:3 141-50

**Keywords:** ketamine

**Abstract:** The N-methyl-d-aspartate (NMDA) receptor has been implicated in the pathophysiology of schizophrenia. We administered subanesthetic doses of the NMDA receptor antagonist ketamine in a double-blind, placebo-controlled design to 13 neuroleptic-free schizophrenic patients to investigate if schizophrenics will experience an exacerbation of psychotic symptoms and cognitive impairments with ketamine. We also examined whether schizophrenics experienced quantitative ,or qualitative differences in ketamine response in comparison to normal controls. Schizophrenics experienced a brief-ketamine-induced exacerbation of positive and negative symptoms with further decrements in recall and recognition memory. They also displayed greater ketamine-induced impairments in free recall than normals. Qualitative differences included auditory hallucinations and paranoia in patients but not in normals. These data indicate that ketamine is associated with exacerbation of core psychotic and cognitive symptoms in schizophrenia. Moreover, ketamine may differentially affect cognition in schizophrenics in comparison to normal controls.

**Workpackage No.:** 2

**Author:** MANCINO, M., CUNNINGHAM, M.R., DAVIDSON, P. AND FULTON, R.L.

**Year:** 1996

**Title:** Identification of the motor-vehicle accident victim who abuses alcohol

**Journal/Book Name:** Journal of Studies on Alcohol

**Volume:** 57, 6, 652-658

**Keywords:** alcohol abuse, traffic accidents, responsibility, drugs, driving

**Abstract:** Objective: We hypothesized that a poor driving history, and alcohol abuse, evident in a large number of people injured in automobile accidents, contribute to repeated injury, and that treatment for alcohol abuse may reduce vehicular trauma. Method: Patients (N = 150) admitted to the emergency surgical service because of injury sustained in a motor vehicle accident (MVA) were tested for their blood alcohol

concentrations, and they responded to a questionnaire concerning their prior driving and medical histories. Results: Contrary to the assumption that motor vehicle injuries are isolated episodes, 68% of MVA patients had experienced a prior accident, and 43% had been injured in an MVA before the present event. Prior MVAs were associated with having been previously arrested for driving while intoxicated (DWI), with illegal drug use and with prior hospitalization. Of the MVA patients, 37% were intoxicated (blood alcohol concentration [BAC] greater than or equal to 100 mg/dl). Elevated BAC was associated with having been stopped for drinking, having a restricted license, having a DWI arrest, using illegal drugs and having a previous admission to a hospital. Prior MVAs, prior DWIs, elevated BAC and male gender formed the Louisville Alcohol Abuse Predictor Checklist and were independent predictors of alcohol abuse diagnosis, based on the patient's self-report of problems with alcohol. Forty-two percent of MVA patients were diagnosed as alcohol abusers. The alcohol abuser had a significantly higher rate of recurrent MVAs, DWIs and injuries than did nonabusers. Conclusions: Surgical service may present an opportunity for assessment of alcohol abuse among MVA victims, and treatment for alcoholism might reduce vehicular trauma.

**Workpackage No.:** 3

**Author:** MANN, R.E., ANGLIN, L., VINGILIS, E.R. AND LARKIN, E.

**Year:** 1992/3

**Title:** Self-reported driving risks in a clinical sample of substance users

**Journal/Book Name:** Proceedings of the Twelfth International Conference on Alcohol, Drugs and Traffic Safety, Cologne, Germany.

**Volume:** 2, 860-878

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** marijuana, alcohol, stimulants, amphetamines, driving licence, accidents, risk taking, substance abusers

**Abstract:** The present study was designed to examine the traffic accident risks of a clinical sample of substance abusers. Possible effects of substances used, the patterns of use, and demographic and personality factors were also examined. Participants were 144 volunteers from among individuals in treatment, or being assessed for treatment, for a substance abuse problem. All the subjects were male, between the ages of 21 and 40, with a driving licence (for at least 5 years) and had a problem (self-identified) with one or two of alcohol, cannabis and/or stimulants (e.g. amphetamines, cocaine). The study found that the self-reported accident rates of male substance abusers in treatment were about twice that observed in the Ontario male population of similar age. Research participants estimated that 50% of their accidents in the past five years occurred while under the influence of alcohol or drugs. A second observation was that self-reported accidents which occur while under the influence of alcohol and/or drugs and those which occur while substance-free appear to be different types of accidents, in that they are influenced by different factors. More frequent use of a substance or substances, regardless of the substance, was associated with more accidents. Finally, higher levels of sensation seeking were associated with more accidents.

**Workpackage No.:** 3

**Author:** MANN, R.E., ANGLIN, L., RAHMAN, S., BLESSING, A.A., VINGILIS, E.R. AND LARKIN, E.

**Year:** 1995/6

**Title:** Does treatment for substance abuse improve driving safety? A preliminary evaluation

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** traffic safety/ substance abuse/ alcohol/ cannabis/ stimulants/ driving

**Abstract:** There appears to be a growing consensus that rehabilitative programs for convicted drivers can improve traffic safety outcomes. However, there is little evidence on the more general question of whether or not treatment for abuse of alcohol and other substances can reduce traffic safety risks. In order to provide some preliminary information on this question, we obtained driving record information on 137 males between the ages of 21 and 40 who underwent treatment for substance abuse at the Clinical Institute of the Addiction Research Foundation. These individuals were volunteers from the general clinical stream, that is, they were not specifically referred because of an impaired driving conviction. About 1/3 of the sample reported problems solely with alcohol, 1/3 reported problems with alcohol and one other substance (Cannabis, Stimulants), and 1/3 reported problems with one or two substances other than alcohol. Yearly rates of accidents, drinking-driving charges and moving violations were compared for the five years immediately preceding treatment entry and a post-treatment follow-up interval ranging from 6 to 36 months. The results demonstrated significant reductions on all three driving related measures following treatment. Further analyses will explore whether different substances of abuse are associated with different outcomes.

**Workpackage No.:** 3

**Author:** MANNO, J.E., IPLINGER, G.F., SCHULZ, N. AND FORNEY, R.B.

**Year:** 1971

**Title:** The influence of alcohol and marihuana on motor and mental performance.

**Journal/Book Name:** Clin. Pharmacol. Therapeut.

**Volume:** 12, 202-211.

**Keywords:** alcohol; marihuana; experimental

**Workpackage No.:** 2

**Author:** MARKS, V.

**Year:** 1982

**Title:** Drugs and Driving

**Journal/Book Name:** R.S.H.

**Volume:** 5, 205-210

**Keywords:** human factors; alcohol; legislation

**Workpackage No.:** 1



**Author:** MARQUET, P., DELPLA, P.A., KERGUÉLEN, S., BREMOND, J., FACY, F., GARNIER, M., GUÉRY, B., LHERMITTE, M., MATHE'E, D., PELISSIER, A.L., RENAUDEAU, C., VEST, P. AND SEGUELA, J.P.

**Year:** 1998

**Title:** Prevalence of drugs of abuse in urine of drivers involved in road accidents in France: a collaborative study.

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 43, 4, 806-11

**ISBN/ISSN:** 0022-1198

**Keywords:** accidents, traffic, adolescence, adult, amphetamines, cannabinoids, case-control studies, cocaine, female, fluorescence Polarization immunoassay, forensic medicine, france, human, male, mass fragmentography, narcotics, prevalence, street drugs, substance abuse detection, substance-related disorders

**Abstract:** The collaborative, anonymous, case-control study was intended to determine the prevalence of opiates, cocaine metabolites, cannabinoids and *amphetamines* in the urine of drivers injured in road accidents and to compare these values with those of non-accident subjects ("patients") in France. Recruitment was performed nationwide in the emergency departments of five hospitals and comprised 296 "drivers" aged 18 to 35 and 278 non-traumatic "patients" in the same age range. Females represented 28.4% of "drivers" and 44.2% of "patients." Screening for drugs in urine was performed by fluorescence polarization immunoassays in each center. Each positive result was verified using gas chromatography-mass spectrometry (GC-MS), in a single laboratory. Statistical analysis comprised single-step logistic regression and simultaneously took account of confounding factors and the final differences in prevalence values between the two populations or different subgroups. Cannabinoids were found in 13.9% of drivers (16.0% of males and 8.3% of females,  $p < 0.05$ ) and 7.5% of patients (12.3% of males, 1.6% of females,  $p < 0.0001$ ); only in females was this prevalence higher in injured drivers than in patients ( $p < 0.05$ ). Opiates were present in 10.5% of drivers' and 10.4% of patients' urine samples (NS), and were more frequent in urine samples positive for cannabinoids, in drivers ( $p < 0.01$ ) as well as in patients ( $p < 0.001$ ). The prevalence of cocaine metabolites in drivers and patients was 1.0 and 1.1% and that of *amphetamines* 1.4 and 2.5%, respectively. No causal relationship between drugs and accidents should be inferred from this retrospective study. Nevertheless, the high prevalence of cannabis and opiate (licit or illicit) use in young people, whether injured drivers or patients, has potential implications for road traffic safety in France. Cocaine and *amphetamines* did not appear to be a major problem, unlike the experience in other countries.

**Workpackage No.:** 3

**Author:** MASCORD, D.J., GIBSON, D.J., SPRINGALL, G.A., STARMER, G.A. AND CHRISTIE, M.J.

**Year:** 1992/3

**Title:** Comparison of five commonly abused stimulants which are used to reduce fatigue

**Journal/Book Name:** Proceedings of the 14th International Conference on Alcohol, Drugs and Traffic Safety, Annecy.

**Volume:** 1, 99-104

**ISBN/ISSN:** 2-9511746-0-8,

**Keywords:** ephedrine, pseudoephedrine, phentermine, diethylpropion, stimulants, fatigue, performance, drugs, driving, blood pressure

**Abstract:** The effects of five stimulants, which are commonly used by long distance truck drivers, were evaluated to compare their ability to reduce fatigue. The stimulants were caffeine (200 mg), ephedrine hydrochloride (60 mg), pseudoephedrine hydrochloride (60 mg), phentermine (30 mg) and diethylpropion hydrochloride (75 mg). The comparison data were derived from three experiments which were carried out in our laboratory and shared a common methodology (Gibson et al, 1995; Dean et al, 1996 and Springall, 1996). No significant differences in performance were found among the five drug treatments on the 4th hour of a 3-way divided attention task or during a post-testing session (2-way divided attention, digit symbol coding, critical flicker fusion frequency). Systolic blood pressure and oral temperature were not differentially affected by the drugs but a significant ( $p < 0.01$ ) treatment difference was found for diastolic blood pressure. Pseudoephedrine caused the greatest increase diastolic blood pressure, when compared with diethylpropion and phentermine. Ephedrine produced the second largest increase, which significantly exceeded that after diethylpropion. Heart rate (HR) was found to be significantly lower after caffeine ( $p < 0.01$ ) than after ephedrine, pseudoephedrine, phentermine or diethylpropion. Heart rate variability (s.d. of HR) was found to be significantly ( $p < 0.01$ ) greater after ephedrine than after phentermine or diethylpropion. Caffeine was significantly ( $p < 0.001$ ) less likely than ephedrine, pseudoephedrine, phentermine or diethylpropion to cause a reduction in the spectral power of the blood pressure component (0.08-0.15 Hz) of the cardiac frequency signal. These results suggest that none of the five stimulants, when taken in normal therapeutic doses, differ greatly in their capacity to improve performance and that differences among the drugs are mainly related to their effects on the cardiovascular system.

**Workpackage No.:** 2

**Author:** MASON, A.P. AND MCBAY, A.J.

**Year:** 1984

**Title:** Ethanol, marijuana and other drug use in 600 drivers killed in single vehicle crashes in North Carolina, 1978-1981

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 29, 4, 987-1026

**Keywords:** ethanol, marijuana, driving safety, fatalities, single-vehicle crashes

**Abstract:** Although the use of ethanol, marijuana, and other drugs may be detrimental to driving safety, this has been established by direct epidemiological evidence only for ethanol. In this study, the incidences of detection of ethanol (and other volatile substances), delta-9-tetrahydrocannabinol (THC), barbiturates, cocaine and benzoylecgonine, opiates, and phencyclidine were determined in an inclusive population of 600 verified single-vehicle operator fatalities that occurred in North Carolina in 1978 to 1981. The incidence of detection of amphetamines and methaqualone were

determined for drivers accepted for study during the first two years (n=340) and the last year (n=260), respectively. Blood concentrations of 11-nor-delta-9-tetrahydrocannabinol-9-carboxylic acid (9-carboxy-THC) were determined in THC positive drivers. EMIT cannabinoid assays were performed on blood specimens from all drivers accepted for study during the third year, and the feasibility of using the EMIT cannabinoid assay as a screening method for cannabinoids in forensic blood specimens was investigated. The incidence of detection of ethanol (79.3%) was far greater than the incidences determined for THC (7.8%), methaqualone (6.2%) and barbiturates (3.0%). Other drugs were detected rarely, or were not detected. Blood ethanol concentrations (BECs) were usually high; 85.5% of the drivers whose bloods contained ethanol and 67.8% of all drivers had BECs greater than or equal to 1.0g/L. Drug concentrations were usually within or were below accepted therapeutic or active ranges. Only a small number of drivers could have been impaired by drugs, and most of them had high BECs. Multiple drug use (discounting ethanol) was comparatively rare. Ethanol was the only drug tested for that appears to have a significantly adverse effect on driving safety

**Workpackage No.:** 3

**Author:** MATHIAS.

**Year:** 1996

**Title:** Marihuana impairs driving-related skills and workplace performance.

**Journal/Book Name:** NIDA Workpackage No.

**Volume:** 11(1), p.6 and 8.

**Workpackage No.:** 2

**Author:** MATTILA, M.J., VANAKOSKI, J., KALSKA, H. AND SEPPALA, T.

**Year:** 1998

**Title:** Effects of alcohol, zolpidem and some other sedatives and hypnotics on human performance and memory

**Journal/Book Name:** Pharmacol Biochem Behav

**Volume:** 59, 4, 917-23

**ISBN/ISSN:** 0091-3057

**Keywords:** adult, central nervous system depressants, comparative study, cross-over studies, double-blind method, equilibrium, ethanol, female, human, hypnotics, sedatives, male, memory, psychomotor performance, pyridines, reaction time

**Abstract:** Zolpidem (Zol), an omega 1 -agonist, acts via GABA(A) receptors but may differ qualitatively from diazepam (Dz) and other benzodiazepines (BZDs). We conducted a placebo-controlled, randomized, double-blind, and crossover study to compare the psychomotor and cognitive effects of 15 mg Zol with those of 15 mg Dz, 30 mg oxazepam (Ox), 7.5 mg zopiclone (Zop), and ethanol (EOH; 0.65 + 0.35 g x kg(-1)) given to 12 subjects at 1-week intervals. Psychomotor tests (symbol digit substitution, simulated driving, flicker fusion, body sway) were done before and 1, 3.5, and 5 h after intake; immediate and delayed memory were measured between 1.5 and 3.5 h. The plasma concentrations of drugs were measured by gas chromatography and by radioreceptor assay (RRA). The mean values of EOH in blood at 1.5, 4, and 5.5 h were

0.82, 0.88, and 0.6 g x 1(-1), and the mean values of RRA-assayed plasma Dz were 470, 330, and 21 0 microg x 1(-1), respectively. The corresponding values of other hypnosedatives, in Dz equivalents (microg x 1(-1)), were 550, 750, and 3 3 0 for Ox; 3 50, 270, and 70 for Zol; and 160, 21 0, and 70 for Zop. The standard RRA graph for Zol was significantly flatter than those for other hypnotics. Zol impaired coordinative, reactive, and cognitive skills at 1 and 3.5 h more clearly than the other agents did, the most sensitive performance (tracking) still being impaired by Zol at 5 h. Dz and Zop were less active than Zol objectively; subjective sedation after Dz and Zol was stronger than after Zop. Compared to placebo, all active agents tended to impair learning and memory, their decremental effects, in declining order, being Zol, Dz > EOH, Ox > Zop. During the delay, Dz and Zol caused similar losses of material that had been learned. When separating "true" delayed memory from immediate memory (attention important), Dz and Zol had equieffects on delayed memory and were more detrimental than Zop. When contrasting that against the impaired psychomotor performances, it is possible that 15 mg Zol impairs memory relatively less than 15 mg Dz does.

**Workpackage No.:** 2

**Author:** MAYHEW, D.P., DONELSON, A.C. AND SIMPSON, H.B.

**Year:** 1987

**Title:** Alcohol and cannabis among fatally injured motorcyclists

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam, Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 0 444 809031

**Workpackage No.:** 1

**Author:** MÆRLAND, J., BEYLICH, K-M., BJÆRNEBOE, A. AND CHRISTOPHERSEN, A.S.

**Year:** 1995/6

**Title:** Driving under the influence of drugs: An increasing problem

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** driving/ drugs/ alcohol/ blood sampling/ psychoactive drugs/ THC, amphetamine/ benzodiazepines

**Abstract:** The Norwegian road traffic act prohibits driving under the influence of alcohol (A) and/or other psychoactive drugs (PD). In practice police officers refer the suspected driver to blood sampling without or with a clinical examination depending on suspicion of A or PD involvement, respectively. All blood samples are analyzed at one national institute. In PD cases written expert witness statements are accompanying the result of the clinical examination and blood concentration determinations, which together give the basis for sentences by the courts in a large percentage of the positive cases. A dramatic change has been observed over the last 10 years with respect to A- and PD-cases. A-cases

have declined from about 10 500 in 1983 to 5 500 in 1993, while PD-cases have increased from 800 to 3000 during the same period. In 1993 52% of the A-cases had BACs between 0,05 and 0,15 per cent, and 41% higher than 0,15 per cent. 63% of the PD-cases contained PD, most often THC, amphetamine and benzodiazepines, the latter often in combination with other drugs or in high concentrations, 26% had BACs between 0,05 and 0,15 per cent, and 17% higher than 0,15 per cent. Additional analyses for PD in all A-samples during two months revealed such drugs in approximately 15% of the cases. Combination of our data gave the total picture in the whole national sample of drivers apprehended under the suspicion of drunken or drugged driving: A only (above 0,05 per cent) 51%, PD only 18%, A+PD 14% and 18% contained neither A nor PD. PD were present in 39% of cases with positive analytical results. This study appears to be the first conducted on a total national material focusing on PD and revealed a high prevalence of drugged driving.

**Workpackage No.:** 3

**Author:** Mc LINDEN, V.J.

**Year:** 1987

**Title:** Experiences in relation to drugs/driving offences

**Journal/Book Name:** Forensic Science Society

**Volume:** 27, 73-80

**ISBN/ISSN:** 0015-7368

**Keywords:** drugs, drivers, cannabis, drivers, heroin, benzodiazepines, substance related disorders

**Abstract:** Since March 1983, police in Western Australia have had the power to request blood and urine samples from suspected drug-affected drivers. The work carried out by the Government Chemical Laboratories is discussed, and a review shows that there is a significant problem, mainly with cannabis, the benzodiazepines and heroin. Evidence is presented which indicates that cannabis can seriously impair driving ability.

**Workpackage No.:** 1

**Author:** McBAY, A.J.

**Year:** 1980

**Title:** Marihuana: a forensic problem

**Journal/Book Name:** Legal Medicine

**Volume:** 111-20

**ISBN/ISSN:** 0197-9981

**Keywords:** marihuana, safety, automobile driving, body fluids, cannabinal, cannabinoids, cannabinal, drug and narcotic control, forensic medicine, health, human legislation, medical, marijuana abuse, research, tetrahydrocannabinol, United States

**Abstract:** Early and unfounded stories concerning marihuana led to many sanctions being placed on the drug. They have also brought about the requirement that the drug be proved safe beyond any reasonable doubt for any consideration to be given to removing restrictive sanctions. Some of the misinformation has been dispelled by controlled studies of its effects. Present available research does not support the thesis of permanent damage,

either physical or mental. Yet there appears to be no ongoing research that will adequately demonstrate the safety or the dangers of the drug

**Workpackage No.:** 1

**Author:** McBAY, A.J., OWENS, S.M.

**Year:** 1981

**Title:** Marijuana and driving

**Journal/Book Name:** National Institute on Drug Abuse (NIDA) National Institute on Drug Abuse (NIDA) Research Monographs

**Volume:** 34, 257-63

**ISBN/ISSN:** 1046-9516

**Keywords:** accidents, traffic, cannabinoids, cannabis, ethanol, glucuronates, human, support, non U.S. Gov't, tetrahydrocannabinol

**Workpackage No.:** 1

**Author:** McBAY, A.J.

**Year:** 1987

**Title:** Drug concentrations and traffic safety

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 0 444 809031

**Keywords:** alcohol, marijuana, diazepam, cocaine

**Workpackage No.:** 1

**Author:** McCARDLE, L. AND FISHBEIN, D.H.

**Year:** 1989

**Title:** The self-reported effects of PCP on human aggression.

**Journal/Book Name:** Addict Behav

**Volume:** 14:4 465-72

**Keywords:** pcp

**Abstract:** The elicitation of violent or psychotic behavior by phencyclidine (PCP) administration is well documented. There are indications, however, that behavioral responses to PCP may differ among PCP users as a function of background or personality characteristics. The present study examined 35 male jail inmates with histories of PCP use.

**Workpackage No.:** 3

**Author:** McCURDY, HH; SOLOMONS, ET. AND HOLBROOK, JM

**Year:** 1981

**Title:** Incidence of methaqualone in driving-under-the-influence (DUI) cases in the state of Georgia.

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 5(6), 270-4

**ISBN/ISSN:** 0146-4760

**Keywords:** Automobile Driving\*; Diazepam BL; Ethanol BL; Female; Georgia; Human; Male; Methaqualone \*BL/PO

**Abstract:** A retrospective study was undertaken to assess the range of blood methaqualone levels, which should be considered sufficient to produce deterioration of driving ability. Data from 974 driving-under-the influence (DUI) cases were subdivided into five major categories based on whether drugs other than methaqualone were discovered during the analytical procedures. The range of blood methaqualone levels, which appear to cause significant motor skill impairment, are discussed for each category. Also included are data from 20 of these cases indicating the symptoms of methaqualone intoxication which were reported by arresting officers.

**Workpackage No.:** 3

**Author:** McLAUGHLIN, J.G., SMITH, R.J., MATTICE, C.R. AND SCHOLTEN, D.J.

**Year:** 1993

**Title:** Hospitalization and injury influence on the prosecution of drunk drivers

**Journal/Book Name:** Am Surg

**Volume:** 59 (8), 484-8

**ISBN/ISSN:** 0003-1348

**Keywords:** Accidents, Traffic ; Adult ; Age Factors ; Alcoholic Intoxicatin ; Automobile Driving; Cohort Studies ; Ethanol BL ; Female ; Hospitalizatin ; Human ; Injury Severity Score ; Length of Stay ; Male ; Michigan ; Records ; Seat Belts ; Sex Factors ; Time Factors ; Wounds and Injuries

**Abstract:** The influence that injury and hospitalization from alcohol-related motor vehicle crashes may have on subsequent prosecution for drunk driving was studied utilizing concurrent controls consisting of three cohorts of drivers. The cohorts were drunk and injured drivers, drunk and not injured drivers, and sober and injured drivers. Even though the majority of intoxicated drivers were identified by police as having been drinking, evidentiary testing was not uniform. Culpability for the crash was high in the drunk cohorts compared with the sober drivers, and yet there was a statistically significant difference in the conviction rate of injured drunk drivers (59%) compared with uninjured drunk drivers (1 00%). Injury and hospitalization for drunk drivers after motor vehicle crashes affords protection from prosecution, and may enable ongoing risk-taking behavior by the drunk driver.

**Workpackage No.:** 2

**Author:** McLEAN, S., PARSONS, R.S., CHESTERMAN, R.B., DINEEN, R., JOHNSON, M.G. AND DAVIES, N.W.

**Year:** 1987

**Title:** Drugs, alcohol and road accidents in Tasmania

**Journal/Book Name:** Medical Journal of Australia

**Volume:** 147, 1, 6-11

**ISBN/ISSN:** 0025-729X

**Keywords:** accidents, traffic, age factors, alcohol drinking, Australia, cannabinoids, chromatography gas, comparative study, ethanol, human, mass fragmentography, mortality, radioimmunoassay, sex factors, substance related disorders, support, non U.S. Gov't

**Abstract:** Drug analyses were performed on 200 blood samples that were taken for alcohol analysis from road users in Tasmania. Alcohol at a concentration of above 0.5 g was found in 75% of the samples, and other drugs were found in 17% of the samples. Cannabis was the most prevalent of these other drugs: it was detected in 6% of road users; benzodiazepine drugs were detected in 5% of road users; and barbiturate drugs were detected in 2% of road users. Alcohol was found in 50% and other drugs were found in 25%, of drivers, riders and pedestrians who were involved in road accidents that were serious enough to cause death or injury. In addition to alcohol, other drugs may be making a significant contribution to road accidents because all the drugs that were identified are capable of impairing psychomotor performance. Of particular concern is the prevalence of cannabis, which is an illegal drug, and barbiturate drugs, which are now prescribed rarely. A well-controlled study is required to quantitate the contribution of drugs other than alcohol to road accidents. In the meantime, drivers should be warned that drugs that depress the central nervous system can be expected to impair driving ability and to increase the risk of an accident.

**Workpackage No.:** 3

**Author:** McLEISH

**Year:** 1998

**Title:** Road side testing devices to be trailed by Strathclyde Police

**Keywords:** accidents, road side tests, drivers, victims

**Abstract:** Figures for the first 15 months of a three year study in Great Britain on the incidence of drugs in road accident victims. Specimens from 619 fatalities were analysed; 284 of these were drivers, 125 riders (include. 21 pedal cycles), 126 passengers and 84 pedestrians. The figures show that among all road users, medicinal drugs were present in 6%, illicit drugs (mainly cannabis) in 16% and alcohol above the legal limit for drivers in 23%. Among drivers, 4% had taken medicinal drugs, 18% illicit drugs and 22% alcohol over the legal limit. The figures do not show how many of these fatal accidents were caused by drug taking.

**Workpackage No.:** 3

**Author:** McLELLAN, BA; VINGILIS, E; LARKIN, E; STODUTO, G; MACARTNEY-FILGATE, M. AND SHARKEY, PW

**Year:** 1993

**Title:** Psychosocial characteristics and follow-up drinking and non-drinking drivers in motor vehicle crashes.

**Journal/Book Name:** J Trauma

**Volume:** 35(2), 245-50

**ISBN/ISSN:** 0022-5282



**Keywords:** Motor vehicle crashes, Blood alcohol, adolescence, adult, aged 80 and over, alcohol drinking, automobile driver examination, automobile driving, female, follow-up studies, human, injury severity score, licensure, male, middle age, patient admission, prospective studies, questionnaires, referral and consultation, risk factors, seat belts, support, Non U.S. Gov't, support U.S. Gov't, trauma centres

**Abstract:** Eight hundred fifty-four consecutive motor vehicle crash (MVC) victims admitted from August 1, 1986, through August 31, 1989, were prospectively assessed including measurement of blood alcohol concentration (BAC). One hundred six in-hospital interviews were conducted on competent consenting drivers  $\geq 18$  years old; 22.9% ( $n = 22$ ) of those who were BAC tested ( $n = 96$ ) were positive for alcohol on admission. The blood alcohol concentration positive [BAC(+)] and the BAC negative (-) drivers differed significantly on the following variables; driver education [BAC(-)  $>$  BAC(+):  $p < 0.011$ , license suspension  $\leq 2$  years before admission [BAC(+)  $>$  BAC(-):  $p < 0.011$ , frequency of self-reported intoxication in month before crash [BAC(+)  $>$  BAC(-):  $p < 0.051$ , driving within 2 hours of drinking  $\leq 1$  month before admission [BAC(+)  $>$  BAC(-):  $p = 0.011$  and self-reported driving with BAC  $> 17$  mmol/L  $\leq 1$  month before admission [BAC(+)  $>$  BAC(-):  $p < 0.01$ ]. Follow-up interviews ( $n = 106$ ) were conducted 1 year after discharge; drivers originally testing BAC(+) were more likely to drive within 2 hours of drinking ( $p < 0.05$ ), and were more likely to admit to driving with a BAC  $> 17$  mmol/L ( $p < 0.01$ ). Original BAC(+) drivers were also more likely to report a subsequent NWC in the year following discharge (not statistically significant). There is a need to develop an assessment system to identify high crash-risk drivers and establish rehabilitation programs to reduce crash recidivism.

**Workpackage No.:** 3

**Author:** McMILLEN, DL; PANG, MG; WELLS-PARKER, E. AND ANDERSON, BJ  
**Year:** 1992

**Title:** Alcohol, personality traits, and high risk driving: a comparison of young, drinking driver groups.

**Journal/Book Name:** Addict Behav

**Volume:** 17(6), 525-32

**ISBN/ISSN:** 0306-4603

**Keywords:** Driver groups, adolescence, adult, alcohol drinking, automobile driving, comparative study, female, human, male, personality, personality inventory, risk taking

**Abstract:** Four types of drinking driver groups were compared with each other and also with two nondrinking driver groups on sensation seeking, social responsibility, and hostility. Groups were also compared on traffic violations, accidents, alcohol consumption, frequency of driving after drinking, frequency of driving impaired, and perception of driving risk taking after drinking. Drivers under the influence apprehended in conjunction with an accident or moving violation had significantly greater alcohol consumption, frequency of driving after drinking, frequency of driving impaired, traffic violations, accidents, and self rating of risk taking after drinking in comparison with other groups.

**Workpackage No.:** 3

**Author:** McMILLIAN DL, SMITH SM. AND WELLS-PARKER, E

**Year:** 1989

**Title:** The effects of alcohol, expectancy, and sensation seeking on driving risk taking

**Journal/Book Name:** Addict Behav

**Volume:** 14(4), 477-83

**ISBN/ISSN:** 0306-4603

**Keywords:** Adult; Alcohol Drinking PX ; Alcoholic Intoxication PX ; Arousal \*DE ; Automobile Driving \* ; Dose-Response Relationship, Drug, Female ; Human ; Male ; Personality Tests ; Risk-Taking \*DE ; Set (Psychology)

**Abstract:** Using a cover story of the effects of alcohol on perceptual and motor abilities, two levels of alcohol consumed (moderate and none), two levels of alcohol expectancy (moderate and none), and two levels of sensation seeking (high and low) were combined to determine their effect on risk taking in a driving simulator. Ninety-six subjects were randomly assigned to eight conditions. Dependent variables were lane changes-cars passed and time at maximum speed. Results on lane-changes-cars passed indicated greater risk-taking in driving by high sensation seekers. Interaction of alcohol expectancy and sensation seeking indicated high sensation seekers took more risks when they believed they had consumed alcohol. Low sensation seekers became more cautious in driving when they believed they had consumed alcohol. Alcohol consumed did not produce a significant main effect or interaction.

**Workpackage No.:** 2

**Author:** MEHLFELD, G. AND BLEICHERT, A

**Year:** 1986

**Title:** The effect of anticholinergic drugs on the inner eye muscles

**Journal/Book Name:** Graefes Arch Clin Exp Ophthalmol

**Volume:** 224(1), 92-5

**ISBN/ISSN:** 0721-832X

**Keywords:** Accommodation, Ocular DE; Adult; Butylscopolammonium Bromide \*PD; Female; Heart Rate DE; Human; Light; Male; Models; Biological; Oculomotor Muscles \*DE; Parasympatholytics \*PD; Pupil DE/RE; Scopolamine Derivatives \*PD; Visual Acuity DE

**Abstract:** Using 12 healthy volunteers, we tested the para-sympatholytic effects on the eye. In a randomized crossover double-blind trial, hyoscine-N-butylbromide was tested against saline. Before (20 or 40 mg IV) and up to 45 min after the injection, pupillar light reaction, accommodation, visual acuity, and nyctometer values were measured. The range of accommodation diminishes according to dosage: 9-15 min after the injection, the inhibition is maximum; 45 min after the injection, only a small effect remains, even using the 40 mg dosage. Pupillary reaction is little affected by either dosage, and the pupil diameters at the end of the reaction are only slightly greater after the injection of either dosage than after placebo injection. The time constant of the reaction remains unchanged. Visual acuity and nyctometer values remain unchanged under the influence of hyoscine-N-butylbromide. The results are discussed with respect to the potential ability of a patient to meet the requirements of modern traffic. According to our findings, there are no

ophthalmologically-based reasons for an emmetropic person to assume impaired driving abilities after a single injection of hyoscine-N-butylbromide of up to 40 mg. If the accommodative capacity of a patient is impaired whose hyperopia is not fully corrected, the ability to drive in modern traffic may be impaired. After a single dose of 20 mg hyoscine-N-butylbromide (i.e., 1 ampule Buscopan), the impairment of even these patients does not last longer than about 45 min.

**Workpackage No.:** 2

**Author:** MELTZER, E.O.

**Year:** 1990

**Title:** Performance effects of antihistamines

**Journal/Book Name:** J Allergy Clin Immunol

**Volume:** 86, 4 Pt 2, 613-9

**ISBN/ISSN:** 0091-6749

**Keywords:** automobile driving, awareness, central nervous system, drug combinations, electroencephalography, histamine antagonists, human, neuropsychological tests, psychomotor performance, reaction time, sleep, sleep stages, tranquilizing agents, visual acuity

**Abstract:** In 1988 an estimated 30 million Americans spent more than \$500 million for single-entity antihistamines. Classic first-generation antihistamines, which are available without prescription, can cross the blood-brain barrier and have been reported to produce various central nervous system effects. Sedation, the most common adverse effect of these agents, occurs in 10% to 25% of antihistamine users. Drowsiness has been attributed to the blockade of central histaminergic receptors; antagonism of other brain receptors, such as serotonergic, cholinergic, and central alpha-adrenergic receptors, has also been proposed. The newer second-generation H<sub>1</sub>-receptor antagonists are typically large, lipophobic molecules with a charged side chain and are extensively bound to albumin. Consequently, these agents have difficulty entering the brain, and they appear no more likely to induce sedation than does placebo. The effects of antihistamines on psychomotor reflexes and driving, antihistamine-induced drowsiness, and interaction of antihistamines with alcohol and tranquilizers have been studied with numerous methodologies. The centrally acting first-generation agents commonly cause greater performance decrements as compared with the newer, non-sedating, second-generation antihistamines.

**Workpackage No.:** 1

**Author:** MERCER, G.W. AND JEFFERY, W.K.

**Year:** 1995

**Title:** Alcohol, drugs and impairment in fatal traffic accidents in British Columbia

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 27, 3, 335-343

**ISBN/ISSN:** 0001-4575(94)

**Keywords:** alcohol, drug, traffic, impairment

**Abstract:** Blood samples and accident records of 41 female and 186 male fatally injured drivers were examined. Analyses suggested that drugs other than alcohol are causally related to fatal traffic accidents in British Columbia. Toxicologies showed: 37% alcohol only, 11% alcohol and drugs, and 9% drugs only. The most frequently found drugs were: 48% alcohol, 13% tetrahydrocannabinol or its metabolites (THC/THCCOOH), 4% cocaine, and 5% diazepam. In addition, alcohol-only impairment was missed by investigating police officers in many cases, impairment by alcohol and drugs was mistakenly identified as alcohol only impairment, and drug only impairment was misclassified as "driving without due care and attention".

**Workpackage No.:** 3

**Author:** MERCIER-GUYON, C.

**Year:** 1994

**Title:** Medicaments, drogues et comportement au volant

**Secondary Author:** behaviour, Drugs and drivers'

**Journal/Book Name:** Bull.Acad.Natle.Med

**Volume:** 178, 6, 1111-1122

**Keywords:** mots-cles, accident circulation, consommation alcool, stupefiants, psychoanaleptiques, france, conduite, automobile, accidents, traffic, automobile driving, alcohol drinking, psychotropic drugs, narcotics

**Abstract:** Consumption of illicit drugs is generally underestimated as cause of road accidents. French legislation does not give the police authority to carry out their detection at once. If the regulation concerning driving and drinking is on the way of an hardening, a debate comes into being about the suppression of the penalization for consumption of some drugs whereas their involvement in road fatalities seems to be important. The influence of medicinal drugs on driver's behaviour forms the subject matter of many experimental studies, but the lack of a common methodology should include tests for the evaluation of risk taking and not only test for the detection of sedative effects. If self-prescription and misuse of some medicinal drugs is often involved, if the prescription of some others should be allowed only for non-drivers, it should be suitable to take into account the notions of therapeutical benefits and of preservation of social and professional integrity by the way of driving.

La prise de drogues illicites est un facteur tres sous-estime d'accidents de la route. Si la legislation sur l'alcool au volant est en voie de durcissement, les recherches epidemiologiques sur le role de la drogue dans les accidents sont encore embryonnaires en France a l'heure ou un debat sur la depenalisation de l'usage de certaines drogues se fait jour. Le role des medicaments fait l'objet de nombreux travaux mais l'absence d'une methodologie commune fait obstacle a une necessaire categorisation des medicaments en fonction de leur risque pour la conduite. Si l'auto-prescription ou le mesusage de certains produits peut etre nocif, si certains produits devraient etre reserves au non conducteurs, la notion de benefice therapeutique y compris en terme de securite routiere, ne doit cependant pas etre ignoree.

**Workpackage No.:** 1

**Author:** MICHEL, C.H. AND BATTIG, K.

**Year:** 1989

**Title:** Separate and combined psychological effects of cigarette smoking and alcohol consumption.

**Journal/Book Name:** Psychopharmacology

**Volume:** 97, 65-73.

**Keywords:** alcohol; experimental

**Workpackage No.:** 2

**Author:** MICHIELS, W., THUY NGUYEN, T.T. AND SCHNEIDER, P.A.

**Title:** Rehabilitating drug addicts aged 18-24 as drivers in Geneva

**Journal/Book Name:** In Young Drivers Impaired by Alcohol and Drugs. Edited by T. BENJAMIN, International Congress and Symposium Series, No. 116, Royal Society of Medicine Services Limited.

**Keywords:** driving, drug addiction, therapy

**Abstract:** All drivers, suspected of drug addiction, whose licences are withdrawn, must undergo medical and psychological investigation before they are allowed to drive again. In our examination of these drug addict drivers over the last 8 years, the means used by individuals to cure their addiction (methadone therapy, psychological therapy, placement in a therapeutic community, self-help) were taken into account. A follow-up study has been conducted for all those persons examined in 1979, 1980 and 1981. The different data enabled us to consider the role played by the medical-psychological team, whose task was to judge driving ability, in the therapeutic process itself.

**Workpackage No.:** 3

**Author:** MILLAR-CRAIG, MW; MANN, S; BALASUBRAMANIAN, V; CASHMAN, P. AND RAFTERY, EB

**Year:** 1981

**Title:** Effects of chronic beta-blockade on intra-arterial blood pressure during motor car driving

**Journal/Book Name:** British Heart Journal

**Volume:** 45(6), 643-8

**ISBN/ISSN:** 0007-0769

**Keywords:** Adult; Automobile Driving\*; Blood Pressure \*DE; Exertion; Human; Hypertension PP; Male; Middle Age; Oxprenolol \*TU

**Abstract:** Continuous intra-arterial blood pressure recordings during motor car driving were performed in 15 patients with untreated essential hypertension, using the "Oxford recording technique. Each subject was an experienced driver who used his car every day, and for the study drove from his work place to the hospital during the later afternoon. This drive took place in urban traffic and the average duration was 20.9 minutes. Blood pressure during car driving was remarkably stable, and the average systolic and diastolic pressures were similar to the mean daytime pressure. After 16 weeks of treatment with oxprenolol each patient was restudied. Blood pressure during driving had dropped from 176/107 to 160/93 mmhg, but the blood pressure response to driving and blood pressure

variation during driving (expressed as the coefficient of variation) were unchanged. After treatment, the mean daytime systolic pressure was lower than the mean pressure during driving, but the relative antihypertensive effect during driving was similar to that observed in the same patients during dynamic exercise on a bicycle ergometer. No drug-induced side effects occurred and there were no apparent effects on driving ability. Chronic treatment with oxprenolol reduced blood pressure during car driving without affecting the normal blood pressure response to driving.

**Workpackage No.:** 2

**Author:** MILLER, TR. AND BLINCOE, LJ

**Year:** 1994

**Title:** Incidence and cost of alcohol-involved crashes in the United States.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 26(5), 583-91

**ISBN/ISSN:** 0001-4575

**Keywords:** Highway crashes, accidents, traffic, alcohol drinking, costs and cost analysis, ethanol, health care costs, health education, human, incidence, population surveillance, quality of life, support, Non U.S. Gov't, United States, wounds and injuries

**Abstract:** The incidence of alcohol-involved highway crashes (those in which a driver or nonoccupant had been drinking) was estimated from federal data bases. The estimates were adjusted for police underreporting of alcohol involvement. In 1990, 22% of motor vehicle crash victims--1.2 million--were injured in crashes involving alcohol. Over 22,000 of these victims were killed. The comprehensive cost of alcohol-involved crashes was \$148 billion in 1990, including \$46 billion in monetary costs and \$102 billion in lost quality of life. This represents \$1.09 per drink of alcohol consumed. Crashes where blood alcohol concentration (BAC) exceeded .10% accounted for 32% of comprehensive crash costs, and crashes with lower positive BAC accounted for another 8%. Excluding drunk drivers and drunk nonoccupants, alcohol-involved crashes caused 8,500 deaths and left 21,000 people permanently disabled and another 605,000 less seriously injured. Averaged across all drinks, other people collectively pay \$0.63 in crash costs every time someone takes a drink. A combination of increased public awareness and strong legal sanctions has been effective in reducing the incidence of alcohol-involved driving. The proportion of injuries in crashes that police reported were alcohol-involved dropped by 37% between 1982-1984 and 1990.

**Workpackage No.:** 1

**Author:** MILLER BA, WHITNEY R. AND WASHOUSKY , R

**Year:** 1984

**Title:** The decision to recommend alcoholism treatment for SWI offenders

**Journal/Book Name:** Am J Drug Alcohol Abuse

**Volume:** 10(3), 447-59

**ISBN/ISSN:** 0095-2990

**Keywords:** Adult ; Alcoholic Intoxication DI ; Alcoholism DI/PX\*TH ; Automobile *Driving* \* ; Decision Making ; Ethanol BL ; Female ; Human ; Liver Function Tests ; Male ; Models, Psychological ; Support, Non-U.S. Gov't

**Abstract:** The decision to recommend alcoholism treatment for convicted drinking drivers is examined for a treatment program in Western New York. A total of 2,061 client files were abstracted for these analyses. The Mortimer-Filkins score and the blood alcohol concentration at the time of arrest were the two best discriminating variables in the decision to recommend treatment in these analyses. When these scores were high, additional information was not needed. However, when these scores were in the low or midranges, other variables became crucial to the decision-making process. Further investigation of variables not available in these analyses is needed to determine the decision-making process for clients with low or midrange Mortimer-Filkins and BAC scores.

**Workpackage No.:** 1

**Author:** MILNER, GERALD.

**Year:** 1973

**Title:** Drug, Abuse, Alcohol and Marijuana Problems Errors, Costs and Concepts

**Journal/Book Name:** The Medical Journal of Australia

**Volume:** 2,6, 285-290

**Workpackage No.:** 1

**Author:** MILNER, G.

**Year:** 1977

**Title:** Marijuana and driving hazards

**Journal/Book Name:** Medical Journal of Australia

**Volume:** 1, 7, 208-11

**ISBN/ISSN:** 0025-729X

**Keywords:** accidents, traffic, alcohol drinking, animal, automobile driving, cannabis, dose response relationship, drug, human, tetrahydrocannabinol, United States

**Abstract:** Recent research indicates that cannabis use is positively associated with the road toll. In controlled laboratory studies it has also been shown to adversely affect perception skills, coordination, braking time and other motor skills, mood, judgement, and so on. In driving studies (in both controlled areas and ordinary traffic) marijuana adversely affected driving safety. The literature on cannabis is diffused over international journals covering a wide range of specialities--this paper draws together the evidence from 22 scientifically valid reports. A report on a 1975 conference on drugs and driving is described.

**Workpackage No.:** 1

**Author:** MILNER, G.

**Year:** 1977

**Title:** The case against "pot"

**Journal/Book Name:** Australian Family Physician

**Volume:** 6, 11, 1370-80

**ISBN/ISSN:** 0300-8495

**Keywords:** aggression, animal, Australia, automobile driving, cannabis, human, legislation, drug, risk, substance-related disorders, tetrahydrocannabinol

**Abstract:** There has been much ill-informed debate about cannabis and the fallacy has come to be accepted that little or nothing of scientific value is known about the effects of the drug. This paper presents definitive evidence concerning the hazards of cannabis use, particularly in terms of intoxication effects, driving hazards, progression to other drug use and interaction with other commonly taken drugs.

**Workpackage No.:** 1

**Author:** MINISTERE DE L'INTERIEUR.

**Year:** 1998

**Title:** Usage et trafic de stupefiants - Statistiques 1997

**Journal/Book Name:** Octris, Paris

**Keywords:** ecstasy; new synthetic drugs

**Workpackage No.:** 3

**Author:** MITCHELL, MC

**Year:** 1985

**Title:** Alcohol-induced impairment of central nervous system function: behavioral skips involved in driving

**Journal/Book Name:** J Stud Alcohol Suppl

**Volume:** 100, 109-16

**ISBN/ISSN:** 0363-468X

**Keywords:** Alcohol Drinking \* ; Alcoholism CO ; Attention DE ; Automobile Driving \* ; Cenral Nervous System \*DE ; Cognition DE ; Drug Tolerance ; Ethanol BL ; Human ; Psychomotor Performance DE ; Reaction Time DE

**Abstract:** Several points emerge from the large body of data on the effects of alcohol on CNS function. First, the degree of impairment is dose related, but not identical or strictly linear for all behaviors. Alcohol-related impairment of behavioral skills involved in driving is greatest for those tasks that require cognitive functioning; simple perception alone is least affected. Impairment of cognitive functioning, which includes information processing and decision making under conditions of divided attention, is evident at BALs above 50 mg/dl and is markedly affected above 1 00 mg/dl. Above a BAL of 1 00 mg/dl, almost all behavioral skills are impaired by alcohol. Most studies have employed only one or at most two doses of alcohol in testing for impairment. The limited range of BALs studied makes determination of the overall shape of the dose-response curve difficult. Second, alcohol-related impairment of CNS functions cannot be demonstrated at low BALS. There is no consistent evidence that BALs below 50 mg/dl impair any behavior in most individuals. Youth and the elderly, groups not typically studied in the laboratory, may represent exceptions to this general observation. Nonetheless, these findings are more consistent with a threshold effect for impairment than for impairment at all levels of



BAL. Third, for most behavioral skills, the decrement in performance after alcohol is slight, rarely exceeding 35-50% of the control period. In many studies, changes of only 8-10% are reported to be statistically significant. Whether these small statistically significant decrements in performance are an explanation for increased crash risk remains uncertain.

**Workpackage No.:** 1

**Author:** MOELLER, M.R., BIRO, G. AND WAGNER, H.J.

**Year:** 1981

**Title:** Alcohol and drugs driving ability

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T80 8th International Conference. Sweden, Graphic Systems, Goteborg. Edited by L. Goldberg.

**ISBN/ISSN:** 91-22-00425-4

**Keywords:** alcohol, drugs, driving

**Abstract:** Following a research program (sponsored by BAST and ADAC) regarding individuals suspected of driving under the influence of alcohol and/or drugs, representative sampling of blood specimens (453 from 3492) have been analysed for the presence of drugs. For this purpose radioimmunological analysis (RIA) have been employed for the detection of barbiturates, benzodiazepines, butyrophenones, opiates and methaqualone. Positive results were found in 17.9% of the cases examined. In 7.6% of these cases significant concentrations (in the pharmacologically active range) were noted. In addition to RIA, gas-chromatographic and massspectrometric analysis were performed for further detection of drugs, which cannot be identified by RIA. From those cases completed to date (n=90) the data appear to confirm that the percentage of the traffic participants who are under the combined influence of alcohol and/or drugs is within the range of 15-20%

**Workpackage No.:** 3

**Author:** MOELLER, M.R. AND HARTUNG, M.

**Year:** 1997

**Title:** Ecstasy and related substances - serum levels in impaired drivers.

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 21, p.591.

**Workpackage No.:** 3

**Author:** MONROE, J.

**Year:** 1997

**Title:** How marijuana affects driving

**Journal/Book Name:** Current Health

**Volume:** 2, 23, 9, p22

**Keywords:** drugs, driving, marijuana, short-term memory, reaction time, concentration, judgement, impairment

**Abstract:** Marijuana impairs judgement, concentration and reaction time, increasing the risk of having an auto accident. Use also affects short-term memory, motivation and energy. A urine test can detect marijuana's active chemical several days after use.

**Workpackage No.:** 1

**Author:** MOORE, R.H.

**Year:** 1994

**Title:** Underage female dui offenders - personality characteristics, psychosocial stressors, alcohol and other drug-use, and driving risk

**Journal/Book Name:** Psychological Reports

**Volume:** 74, 2, 435-445

**Keywords:** drinking behaviour, women, accidents

**Abstract:** 164 underage female DUI offenders were evaluated on measures of personality, driving-risk, psychosocial stressors, alcohol and other drug use, alcohol abuse, and symptoms of depression. Empirical classification of 10 groups represented five distinct types. 31 youth who were classified as Antisocial exhibited highest rates of alcohol misuse, other drug use, deviant driving behavior, traffic offenses and accidents, and psychosocial stressors. About 56% or 92 appeared to experience impaired functioning serious enough to warrant interventions more intense than educational classes. A measure of driving-risk developed and used in studies of male adults, the Donovan Research Questionnaire, did not appear to differentiate driving-risk among the young women. In contrast to male drivers, who often expressed anger or aggression through driving, most subjects appeared to react to emotion-eliciting stimuli with feelings of low self-worth or dysphoric affect rather than anger. Specialized screening suitable for young female DUI offenders should be considered

**Workpackage No.:** 3

**Author:** MOROWITZ, L.A.

**Year:** 1995

**Title:** Drug arrests and driving risk

**Journal/Book Name:** Alcohol, Drugs and Driving

**Volume:** 11, 1, 1-22

**Keywords:** drug offenses, narcotics, marijuana, driving, impairment, accidents, California, safety risk, culpability

**Abstract:** This study compared the driving records of 106, 214 persons arrested for drug offenses in 1989 with 41, 493 drivers drawn from the general driving population. The drug arrestees were grouped according to the six summary offense categories used by the California Department of Justice, which were felony narcotics, marijuana, dangerous drugs, other drugs and misdemeanor marijuana and other drugs. Time periods examined were one year pre-arrest, one year post-arrest and two years post-arrest. Each drug arrestee group had significantly more traffic violations and total accidents than control group except for two-year post-arrest accidents for the felony narcotics group. Measures of accident culpability showed drug arrestees to be more responsible for accidents in

which they were involved than was the general driving population. Individuals arrested for drug offenses clearly pose an elevated traffic safety risk.

**Workpackage No.:** 3

**Author:** MOSER, L

**Year:** 1985

**Title:** Effect of astemizole on psychophysical performance

**Volume:** 60, 1, 56-8

**ISBN/ISSN:** 0301-0481

**Keywords:** Alcohol Drinking; Arousal DE; Automobile Driving; Benzimidazoles AE, Clinical Trials; Diazepam AE; Double-Blind Method; Drug Synergism; English Abstract; Histamine H1 Antagonists AE HISTAMINE ANTAGONISTS H001; Human; Ketotifen AE; Psychomotor Performance DE; Reaction Time DE

**Abstract:** Within four partial clinical trials of Astemizole versus placebo it has been proved, that no differences regarding the driving ability and the safe operation of machinery could be detected. Furthermore it could be observed, that there was no disadvantageous efficacy concerning subjective behaviour and that Astemizole did not potentiate Diazepam and alcohol.

**Workpackage No.:** 2

**Author:** MOSER, L.

**Year:** 1990

**Title:** Effect of flutoprazepam on skills essential for driving motor vehicles

**Journal/Book Name:** Arzneimittelforschung

**Volume:** 40, 5, 533-5

**ISBN/ISSN:** 0004-4172

**Keywords:** adult, anti-anxiety agents, benzodiazepine, PD ANTIANXIETY AGENTS, BENZODIAZEPINE, automobile driving, benzodiazepinones, cognition, dose-response relationship, drug, double-blind method, human, psychomotor performance, random allocation

**Abstract:** The effects of the 1,4-benzodiazepine derivative flutoprazepam on the skills essential for driving motor vehicles were tested 2.5 h after intake of 1 x 2 mg and 1 x 4 mg, comparing with placebo. 18 healthy subjects who had homogeneous results in psychological/physical tests took part in the study. The study had a double-blind, randomized crossover design with 7-day washout periods. 2.5 h after intake of 4 mg flutoprazepam, the ability to drive was impaired. Only a very slight reduction in skill was found at the same time under the influence of 2 mg of the drug.

**Workpackage No.:** 2

**Author:** MOSKOWITZ, H., SHARMA, S. AND McGLOTHLIN, W.

**Year:** 1972

**Title:** Effect of marijuana upon peripheral vision as a function of the information processing demands in central vision

**Journal/Book Name:** Perceptual and Motor Skills

**Volume:** 35, 3, 875-82

**ISBN/ISSN:** 0031-5125

**Keywords:** marijuana, peripheral vision, information processing, central vision

**Abstract:** Detection of peripheral light stimuli was examined with 12 subjects under 4 treatment levels of smoked marijuana. Marijuana severely impaired detection performance and the decrement was linearly related to dose. Information-processing demands from the central fixation light did not affect the degree of impairment

**Workpackage No.:** 2

**Author:** MOSKOWITZ, H.

**Year:** 1981

**Title:** Alcohol - drug interactions

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T80 8th International Conference. Sweden, Graphic Systems, Goteborg. Edited by L. Goldberg.

**ISBN/ISSN:** 91-22-00425-4

**Workpackage No.:** 1

**Author:** MOSKOWITZ. AND H; SMILEY, A

**Year:** 1982

**Title:** Effects of chronically administered buspirone and diazepam on driving related skills performance.

**Journal/Book Name:** J Clin Psychiatry

**Volume:** 43(12 Pt2), 45-55

**ISBN/ISSN:** 0160-6689

**Keywords:** Adult; Anti-Anxiety Agents \*PD Antianxiety Agents; Automobile Driving\*; Diazepam \*PD; Dose-Response Relationship, Drug; Ethanol BL/PD; Female; Human; Male; Placebos; Psychomotor Performance \*DE; Pyrimidines \*PD

**Abstract:** The effects on driving skills of buspirone and diazepam, singly and in combination with alcohol, were examined. Three groups of 16 subjects each (8 men and 8 women) received either 20 mg of buspirone, 15 mg of diazepam, or placebo daily for 9 days. On day 9, they also received alcohol (men, 0.85 g/kg; women, 0.72 g/kg). On days 1, 8, and 9, subjects were tested on a driving simulator and given four sessions of divided attention tasks examining tracking and visual search performance. Extensive evidence of performance impairment associated with diazepam contrasted with improved performance under chronic buspirone treatment. Alcohol effects were additive.

**Workpackage No.:** 2

**Author:** MOSKOWITZ, H. AND PETERSEN, R.

**Year:** 1982

**Title:** Marijuana and Driving - A Review

**Journal/Book Name:** The American Council on Marijuana and Other Psychoactive Drugs, Inc. New York

**Keywords:** drugs, marijuana, driving, alcohol, impairment, combined effects

**Abstract:** There is scientific consensus that marijuana seriously impairs driving. The report examines the many sources of information that are the basis for this agreement regarding the driving hazards of marijuana ranging from the reports of users themselves to the objective study of driver behaviour using driving simulators, test courses and actual road tests in traffic. In addition, more specific subtests of various psychomotor skills known to be involved in driving have been done to determine the extent and ways in which marijuana affects performance. When used in combination with alcohol, it has been shown that the effects of these two drugs together is additive. The remainder of the monograph is devoted to a much more detailed discussion of the specific methods and the research that has been done.

**Workpackage No.:** 1

**Author:** MOSKOWITZ, H.

**Year:** 1984

**Title:** Attention tasks as skills performance measures of drug effects

**Journal/Book Name:** British Journal of Clinical Pharmacology

**Volume:** 18 Suppl 1, 51S-61S

**ISBN/ISSN:** 0306-5251

**Keywords:** accidents, traffic, attention, automobile driving, behaviour, caffeine, cannabis, cognition, diazepam, diphenhydramine, ethanol, flurazepam, human, perception, psychomotor performance, reaction time, time factors

**Abstract:** Both empirical epidemiological data on the causes of traffic accidents and conceptual models of skilled human performance stress the central role of perception and cognition. This paper examines the effects of drugs on two major components of cognitive perceptual performance, namely, concentrated attention or vigilance and divided attention. It is demonstrated that these two types of attention tasks are differentially affected by various drugs, so that sometimes one and sometimes another of these tasks is impaired. Various experimental paradigms to investigate these two attention functions are presented. It is demonstrated that attention tasks are frequently highly sensitive to drug effects, suggesting the importance of examining these functions when investigating the effects of drugs on skills performance.

**Workpackage No.:** 1

**Author:** MOSKOWITZ, H.

**Year:** 1985

**Title:** Adverse effects of alcohol and other drugs on human performance

**Journal/Book Name:** Alcohol World, Health and Research

**Volume:** 9, 4, 11-15

**Keywords:** alcohol, drugs, alcohol and drug interactions, driving, impairment, performance, central nervous system, behavioural effects

**Abstract:** There is compelling evidence that alcohol, alone and in combination with other drugs affects many kinds of performance that have serious implications for public safety. Investigators note that quite often alcohol and other drugs interact not only directly, in

terms of behavioural changes based on direct central nervous system (CNS) effects, but also indirectly by affecting the absorption, distribution, and metabolism of the drugs. This article discusses the effects of polydrug use and the combination of drugs and alcohol. Behavioural and physiological effects are discussed. The drug interactions considered include antianxiety (minor) tranquillizers, meprobamate, benzodiazepines, the antipsychotic (major) tranquillizers, morphine and its derivatives and marijuana.

**Workpackage No.:** 1

**Author:** MOSKOWITZ, H. AND ROBINSON, C.D.

**Year:** 1985

**Title:** Methadone maintenance and tracking performance

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety

**Volume:** 995-1004, U.S. Department of Transport, Washington

**Keywords:** methadone maintenance, heroin ex-addicts, driving, pursuit tracking tasks, critical tracking task

**Abstract:** In the present paper the authors review the importance of aspects of tracking skills for driver performance, and consider the implications of methadone maintenance treatment for compensatory, pursuit, and critical tracking performances. In the first experiment, 12 methadone-maintained patients and 12 drug-free ex-heroin addicts were tested on compensatory and pursuit tracking tasks. The results showed no difference between the groups. In the second experiment, 15 methadone-maintained patients, and 15 drug-free, ex-heroin addicts performed a critical tracking task, and again no difference between groups was found. We concluded that, for patients stabilized in methadone maintenance programs, this treatment did not produce any decrement in tracking performance. These findings are consistent with other evidence on the effects of methadone

**Workpackage No.:** 2

**Author:** MOSKOWITZ, H.

**Year:** 1985

**Title:** Special Issue - Drugs and Driving - Introduction

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 17, 4, 281-282

**Keywords:** drugs, driving, epidemiology, special issue, introduction

**Abstract:** This is an introduction to a special issue of the journal which focuses on drugs and driving. This issue arose out of concern for the increased use of licit and illicit behaviour-affecting drugs which may result in impaired driving. The majority of papers in the special issue address the legitimate use of prescribed medications and their effects on driving performance. In general, the papers conclude that there is experimental evidence that many classes of therapeutic drugs produce behavioural side effects which are likely to impair driving. One difficulty of the research is the tendency to use young and healthy volunteers rather than patient populations. The editor points out the difficulties of obtaining epidemiological data for drug effects on traffic accident rates. He suggests that perhaps we are at a level of knowledge and understanding of the drug-

driving problem that was available with respect to alcohol some 20 years ago. We are aware that we have a problem which contributes to increased accident frequency but its relative magnitude is yet to be fully uncovered.

**Workpackage No.:** 1

**Author:** MOSKOWITZ, H.

**Year:** 1985

**Title:** Marijuana and driving

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 17, 4, 323-345

**ISBN/ISSN:** 0001-4575/85

**Keywords:** marijuana, driving, tetrahydrocannabinol, psychomotor performance, experiemental, epidemiological, coordination, tracking, vigilance, perception

**Abstract:** A review was performed of the marijuana and driving literature, both epidemiological and experiemental. It was noted that epidemiological studies face considerable difficulties in obtaining estimates of risks involved for drivers utilizing marijuana due to the rapid decline in blood levels of tetrahydrocannabinol. On the other hand, experiemental studies examining the relationship between administered marijuana dose and performance have identiified many driving-related areas as exhibiting impairment. Areas impaired include coordination, tracking, perception, vigilance, and performance in both driving simulators and on the road. Other behavioural areas of lesser importance for driving also exhibited evidence of impairment by marijuana. Areas for further research are suggested

**Workpackage No.:** 1

**Author:** MOYNHAM, J. AND STARMER, G.

**Year:** 1992/3

**Title:** Stimulant abuse by drivers an occupational hazard

**Journal/Book Name:** Proceedings of the 14th International Conference on Alcohol, Drugs and Traffic Safety, Annecy.

**Volume:** 1, 97

**ISBN/ISSN:** 2-9511746-0-8

**Keywords:** stimulant abuse, driving, drugs, impairment, truck driver, toxicology, ephedrine, phentermine, diethylpropion

**Abstract:** In October, 1989 there was a serious motor vehicle crash involving a tourist bus and a large truck where twenty persons lost their lives, including the driver of the truck. Post mortem toxicology found that the driver of the truck has a blood ephedrine concentration which was approximately eighty times that of the normal therapeutic level. As a result of this tragedy, the issue of stimulant drug abuse by some long-distance heavy vehicle drivers was addressed by police. Stimulants known to be abused such as ephedrine, phentermine and diethylpropion were placed on a restricted schedule (Schedule N) so that they would be recognised as substances which potentially impaired driving ability. When ephedrine was subsequently removed from the non-prescription market, it was noted that there was an increase in the use of amphetamine and

methamphetamine by some heavy vehicle drivers. Since then, law enforcement campaigns have, from time to time, targeted very heavy vehicle drivers. The most recent trend has been the abuse of pseudoephedrine by some heavy vehicle drivers.

**Workpackage No.:** 3

**Author:** MULLER, A

**Year:** 1992

**Title:** Effect of alcohol as a cause of fatal traffic accidents: are official figures correct?

**Journal/Book Name:** Blutalkohol

**Volume:** 29(4), 242-50

**ISBN/ISSN:** 0006-5250

**Keywords:** accidents, traffic, adult, alcoholic intoxication, cause of death, cross-sectional studies, english abstract, ethanol, female, Germany, human, incidence, male, middle age

**Abstract:** Starting point is the question whether in the official records of fatal road accidents driving while intoxicated is adequately taken into account as a cause. A former investigation with accident data of 1976 yielded a considerable number of undetected and not registered cases. On the basis of the fatal road accidents of the Saarland region for the years 1988, 1989 and 1990 the former results could be confirmed on the whole. Only with 25 per cent of all persons involved in a fatal accident a breath or blood test for checking alcoholic impairment had been arranged. The assumption is well substantiated that the remaining 75 per cent include many impaired persons and that not only every fifth victim of traffic accidents is a result of alcoholic impairment but about 40 per cent. Proposals are made for getting in the future more reliable counts and a better basis for fighting against DWI-offences.

**Workpackage No.:** 1

**Author:** MURRAY, JB

**Year:** 1984

**Title:** Effects of valium and librium on human psychomotor and cognitive functions

**Journal/Book Name:** Genet Psychol Monogr

**Volume:** 109(2D Half), 167-97

**ISBN/ISSN:** 0016-6677

**Keywords:** Aged; Animal; Anxiety Disorders DT; Automobile Driving; Chlordiazepoxide AD/\*PD/TU; Cognition \*DE; Diazepam AD/\*PD/TU; Eye Movements DE; Female; Flicker Fusion DE; GABA PH; Human; Learning DE; Mathematics; Memory DE; Psychomotor Performance \*DE; Rats; Receptors; Cell Surface PH

**Abstract:** Research on the effect of the benzodiazepines, Valium, and Librium on human psychomotor and cognitive functions is reviewed. Benzodiazepines which are the most important antianxiety medications also have anticonvulsant, hypnotic-sedative, and muscle-relaxant properties. Research on the benzodiazepine hypnotic "hangover-effects on cognitive and motor behavior is cited. The benzodiazepines Valium and Librium probably interact with neurotransmitters, especially GABA and very likely have specific receptors in the brain and central nervous system. Absorption and elimination rate vary



with dosage, method of administration, and age. Valium and Librium have no gravely harmful side effects, little addictive potential; danger from overdosage is minimal. Although controlled studies of the impact of psychoactive drugs on psychomotor and cognitive performance are relatively recent, Valium and Librium apparently have little, if any, adverse effect on well established higher mental functions and may affect the speed with which simple repetitive motor actions are performed. None of their effects are irreversible. Benzodiazepines (BZ) have been remarkable drugs. They have virtually replaced all other forms of antianxiety medications (48, 95, 109, 225). All the BZ drugs additionally have anticonvulsant, sedative-hypnotic, and muscle-relaxant properties (4, 77, 88, 112, 252). Two of the BZ drugs, Valium (diazepam) and Librium (chlordiazepoxide) have been the best sellers of the BZ drug family and the most frequently prescribed drugs in the world (7, 15, 17, 77, 110, 137, 215, 257). The impact of Valium and Librium on human psychomotor and cognitive functions is the focus of this review of research. Since millions of people are using these drugs, how do Valium and Librium affect alertness and responsiveness, for example in driving a car to work, or operating a machine in a factory (240)? Tranquilizing drugs like Valium and Librium were hailed when they replaced sedatives like barbiturates because they did not cloud the mind. Is decision-making or mental alertness affected in those who use Valium or Librium (69)? In studying the impact of drugs on the central nervous system (CNS) and brain, animal subjects frequently are employed. However, the human condition of anxiety for which Valium and Librium are usually prescribed is hard to evaluate and human subjects vary greatly, so that this review of research has been limited for the most part to studies with human subjects (8, 26, 50, 107, 108, 262, 263, 264).

**Workpackage No.:** 1

**Author:** MURRAY, J.B.

**Year:** 1986

**Title:** Marijuana's effects on human cognitive functions, psychomotor functions, and personality

**Journal/Book Name:** J Gen Psychology

**Volume:** 113, 1, 23-55

**ISBN/ISSN:** 0022-1309

**Keywords:** attention, cognition, human, marijuana use, personality, psychomotor performance, reaction time, recall, research, substance related disorders, tetrahydrocannabinol

**Abstract:** Marijuana is complex chemically and not yet fully understood, but it is not a narcotic. Like alcohol, marijuana acts as both stimulant and depressant, but it lingers in body organs longer than alcohol. Smoking marijuana can injure mucosal tissue and may have more carcinogenic potential than tobacco. Research has indicated that marijuana intoxication definitely hinders attention, long-term memory storage, and psychomotor skills involved in driving a car or flying a plane. Expectations and past experience with marijuana have often influenced results more than pharmacological aspects have. Marijuana has triggered psychotic episodes in those more vulnerable. Psychological and some instances of physiological dependence on marijuana have been demonstrated. As a psychoactive drug, marijuana surely alters mental functioning. Although it is possible

that chronic use of marijuana produces irreversible damage to mind or brain areas, this has not been determined by research.

**Workpackage No.:** 1

**Author:** MUSSALO-RAUHAMAA, H; POIKOLAINEN K; K'ARKK'AINEN; P; AND LEHTO, J

**Year:** 1987

**Title:** Decreased serum selenium and magnesium levels in drunkenness arrestees

**Journal/Book Name:** Drug Alcohol Depend

**Volume:** 20(2), 95-103

**ISBN/ISSN:** 0376-8716

**Keywords:** Adolescence ; Adult ; Alcoholism \*BL/RH; Automobile *Driving* \*; Copper BL ; Ethanol BL ; Female ; Human ; Iron BL ; Magnesium \*BL ; Male ; Middle Age ; Selenium \*BL ; Zinc BL

**Abstract:** Serum levels of selenium magnesium, copper, zinc and iron were studied in chronic drunkenness arrestees and a healthy control group. The mean serum concentrations of selenium and magnesium were both significantly lower (P less than 0.01) in drunkenness arrestees than in the control subjects. The mean alcohol intake was 190 g of absolute alcohol daily in drunkenness arrestees and 14 g in controls. The erythrocyte glutathione peroxidase concentrations of the study groups did not support poor selenium intake as a principal cause of low selenium concentration in the serum.

**Workpackage No.:** 1

## N

**Author:** NAHAS, G.G. AND LATOUR, C.

**Year:** 1992

**Title:** Detection of cannabis and other drugs in 120 victims of road accidents

**Journal/Book Name:** Proceedings of the Second International Symposium organised by the National Academy of Medicine, with assistance of the City of Paris.

**Keywords:** driving, vehicular accidents, alcohol, cannabis, opiates, benzodiazepines

**Abstract:** Analysis of blood or urine to detect substances which impair psychomotor performance were performed in 120 victims of road accidents, admitted as emergencies in the medical centre of Metz-Thionville. 34% of samples were negative, 36% contained alcohol, 14% cannabis, 10% benzodiazepines and barbiturates and 1% opiates. Several drivers were polydrug users. This study illustrates the high incidence of previous drug consumption in drivers victims of road accidents. It calls for measures of information and prevention, as well as systematic detection among subjects victims of vehicular accident.

**Workpackage No.:** 3

**Author:** NAKAHARA, Y., TAKAHASHI, K., STIMAMINE, M. AND TAKEDA, Y.

**Year:** 1991

**Title:** Hair analysis for drug abuse. 1. determination of methamphetamine and amphetamine in hair by stable isotope dilution gas chromatography/mass spectrometry method

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 36, 1, 70-78

**Keywords:** gas chromatography/mass spectrometry, 2-methylamino-1-phenylpropane-2,3,3-d<sub>4</sub> and 2-amino-1-phenylpropane-2,3,3,3-d<sub>4</sub>, amphetamines, driving, drugs methamphetamine

**Abstract:** Determination of methamphetamine and amphetamine in hair was performed by gas chromatography/mass spectrometry using stable isotope-labeled internal standards, 2-methylamino-1-phenylpropane-2,3,3-d<sub>4</sub> and 2-amino-1-phenylpropane-2,3,3,3-d<sub>4</sub>. Extraction of hair with methanol/5M hydrochloric acid (20:1) using ultrasonication was chosen as the standard method. The calibration curves for amphetamines in the hair were linear from 1 to 100 ng/mg (r greater than 0.99). The detection limit was 0.5 ng/mg at the 95% confidence level. The coefficients of variation (CV) (n8) of analysis using the spiked hair with methamphetamine were from 0.7 to 6 per cent. The CV (n 8) of analysis of the methamphetamine abuser's hair was 17.5 %. Sectional analysis of monkey and human hair after methamphetamine ingestion suggested a good correlation between the duration of drug use and drug distribution in the hair

**Workpackage No.:** 4

**Author:** NAKAHARA, Y., TAKAHASHI, K., SAKAMOTO, T., TANAKA, A., HILL, V.A. AND BAUMGARTNER, W.A.

**Year:** 1997

**Title:** Hair analysis for drugs of abuse. XVII. Simultaneous detection of PCP, PCHP, and PCPdiol in human hair for confirmation of PCP use.

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 21:5 356-62

**Keywords:** pcp

**Abstract:** The paper reports the simultaneous detection hair of phencyclidine (PCP) and its two major metabolites,

1-(1-phenylcyclohexyl)-4-hydroxypiperidine (PCHP) and trans-1-(1-phenyl-4-hydroxycyclohexyl)-4'-hydroxypiperidine (t-PCPdiol) in human hair.

**Workpackage No.:** 4

**Author:** NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION.

**Year:** 1993

**Title:** Impact of the drug evaluation and classification program on enforcement and adjudication

**Journal/Book Name:** Traffic Tech NHTSA Technology Transfer Series

**Publisher:** Washington: National Highway Traffic Safety Administration

**Volume:** 58

**Keywords:** drugs, impaired driving, drug recognition experts

**Workpackage No.:** 1

**Author:** NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION.

**Year:** 1993

**Title:** Drugs in crashes and impaired driving arrests

**Journal/Book Name:** Traffic Tech, NHTSA Technology Series,

**Publisher:** Washington, National Highway Traffic Safety Administration

**Volume:** 56

**Keywords:** drugs, driving, impairment, vehicle crashes, alcohol

**Workpackage No.:** 1

**Author:** NATIONAL HIGHWAY SAFETY ADMINISTRATION.

**Year:** 1994B

**Title:** Traffic safety facts 1993: alcohol.

**Journal/Book Name:** U.S. Department of Transportation, National Center for Statistics and Analysis.

**Keywords:** alcohol; field

**Workpackage No.:** 3

**Author:** NATIONAL SAFETY COUNCIL.

**Year:** 1994

**Title:** Accident Facts. 1994 Edition.

**Journal/Book Name:** Itasca, IL: the Council.

**Keywords:** alcohol; prevalence; field

**Workpackage No.:** 3

**Author:** NATIONAL TRANSPORTATION SAFETY BOARD.

**Year:** 1990

**Title:** Safety study: fatigue, alcohol, other drugs, and medical factors in fatal-to-the-driver heavy truck crashes (volume 1)

**Keywords:** heavy trucks, truck driver, fatal-to-the-driver, fatal truck accidents, substance abuse, alcohol, other drugs, drug testing, workplace, safety, blood alcohol concentration, toxicological testing, fatigue, hours of service, medical condition, medical qualification, cardiac screening, pre-employment screening

**Abstract:** This report is an analysis of human factors involvement in fatal-to-the-driver, heavy truck accidents in eight states over a 1 year period, October 1, 1987 through September 30, 1988. Data presented are derived from in-depth investigation of 182 accidents which involved 186 heavy trucks and resulted in 207 fatalities. The accident investigations were conducted in California, Colorado, Georgia, Maryland, New Jersey, North Carolina, Tennessee, and Wisconsin. These accidents represent approximately 25 percent of this type of accident nationwide. Volume 1 (NTSB/SS-90/01) of the study includes an analysis of fatigue, alcohol, and other drug prevalence and medical factors in these accidents, presents findings, and makes recommendations to improve heavy truck safety. Volume 2 (NTSB/SS-90/02) contains the 182 case summaries that provided the data discussed in Volume 1.

**Workpackage No.:** 3

**Author:** NEUTEBOOM, W. AND ZWEIPFENNING, P.G.M.

**Year:** 1984

**Title:** Driving and the combined use of drugs and alcohol in the Netherlands

**Journal/Book Name:** Forensic Science International

**Volume:** 25, 93-104

**Keywords:** driving alcohol/ drugs/ benzodiazepines/ traffic safety/ behaviour

**Abstract:** The extent and nature of the use of medicinal drugs by drivers who had undergone a blood test on suspicion of driving under the influence of alcohol was ascertained by analysing some 40,000 case records in which the suspect had been questioned about the use of drugs. No chemical analyses were performed. 9.7% of the road users indicated that they used drugs in combination with alcohol, and more than 50% of the drugs used must be considered to have a negative impact on driving performance. The influence of the combined use of benzodiazepines and alcohol on behaviour was also investigated. The finding here was that drivers using these drugs should be warned against the consumption of alcohol.

**Workpackage No.:** 3

**Author:** NEUTEBOOM, W. AND JONES, A.W.

**Year:** 1990

**Title:** Disappearance rate of alcohol from the blood of drunk drivers calculated from two consecutive samples: what do the results really mean?

**Journal/Book Name:** Forensic Sci Int

**Volume:** 45(1-2), 107-15

**ISBN/ISSN:** 0379-0738

**Keywords:** Alcoholic Intoxication ; Automobile Driving ; Ethanol ; Human ; Reference Values

**Abstract:** Based on a large material (N = 2354) of double blood specimens from drunk drivers apprehended in The Netherlands, we selected 1314 cases for further evaluation. The difference BAC<sub>2</sub>-BAC<sub>1</sub> was used as index of alcohol elimination rate from the blood. The results ranged from below 0.10 to 0.64 mg/mh, with a mean of 0.22 mg/ml/h. At least about 2% of drivers were still absorbing alcohol as indicated by a rising BAC. Some likely mechanisms are discussed that might account for the wide range of alcohol elimination rates observed.

**Workpackage No.:** 3

**Author:** NEWCOMBE, R.

**Year:** 1993

**Title:** Second class citizens - How drug users are disadvantaged and discriminated against

**Journal/Book Name:** Druglink

**Volume:** March/April 10-13

**Keywords:** drugs, driving licences, laws

**Abstract:** Although this article is not specifically about drugs and driving it has a section entitled "your driving licence". The laws, and particularly the licencing laws, in Germany and the U.K. are referred to.

**Workpackage No.:** 1

**Author:** NEWMAN, D., SPEAKE, D.J., ARMSTRONG, P.J. AND TIPLADY, B.

**Year:** 1997

**Title:** Effects of Ethanol on Control of Attention

**Journal/Book Name:** Human Psychopharmacology-Clinical and Experimental, John Wiley & Sons Ltd.

**Volume:** 12, 3, 235-241

**Keywords:** reaction time/ ethanol/ attention/ psychomotor performance/ memory/ driving-related skills/ automatic processing/ control processing/ visual search

**Abstract:** In order to investigate the effect of ethanol on visual attention, 18 subjects aged 20-50 years took part in a three- period crossover study in which they received placebo (PL) and two doses of ethanol in random order. The higher dose (E2: 0.88 g/kg, maximum 66 g for males, 55 g for females) was calculated to produce blood ethanol concentrations of 60-80 mg/100 ml. The lower dose (E1) was 75 per cent of E2. Subjects

showed highly significant subjective drunkenness at both doses ( $p < 0.01$ ) and on the higher dose were slowed by 6-11 per cent on most speeded measures, in agreement with previous results. In a Four-Choice Reaction-Time Task, subjects responded for part of the time to a fixed, repetitive sequence, and at other times to a random sequence of stimuli. At the transition from repetitive to random sequences, subjects on ethanol showed a disproportionate slowing (60 per cent on the higher dose). This slowing may be of particular relevance to driving, as the time taken to engage control processing after a period of relatively automatic activity may be important in dealing with unexpected events on the road.

**Workpackage No.:** 2

**Author:** NICHOLSON, A.N.

**Year:** 1979

**Title:** Effect of the antihistamines, brompheniramine maleate and triprolidine hydrochloride, on performance in man.

**Journal/Book Name:** British Journal of Clinical Pharmacology

**Volume:** 8, 321

**Keywords:** antihistamines; experimental

**Workpackage No.:** 2

**Author:** NICHOLSON, A.N., SMITH, P.A. AND SPENCER, M.B.

**Year:** 1982

**Title:** Antihistamines and visual function: studies on dynamic visual acuity and the pupillary response to light.

**Journal/Book Name:** British Journal of Clinical Pharmacology.

**Volume:** 14, 683.

**Keywords:** antihistamines; experimental; vision

**Workpackage No.:** 2

**Author:** NICHOLSON, A.N. AND STONE, B.M.

**Year:** 1982b

**Title:** Performance studies with the H<sub>1</sub>-histamine receptor antagonists, astemizole and terfenadine.

**Journal/Book Name:** British Journal of Clinical Pharmacology.

**Volume:** 13, 199.

**Keywords:** antihistamines; experimental

**Workpackage No.:** 2

**Author:** NICKEL, W-R.

**Year:** 1996

**Title:** Medical screening and medical-psychological assessment as prerequisites for granting of licences: Summary of recommendations

**Journal/Book Name:** Alcohol and Alcoholism

**Volume:** 31 (6), 605-607

**Keywords:** alcohol/driving/ screening/ psychological assessment/driving-under-the-influence

**Abstract:** Presents a summary of a working group of the International Council on Alcohol, Drugs and Traffic Safety's recommended procedures for granting licenses to drivers who have had their licenses revoked for driving while alcohol impaired. The group proposes that all repeat offenders must submit to medical-psychological assessment prior to license reinstatement.

**Workpackage No.:** 1

**Author:** NIELSEN, SL; CHRISTENSEN, LQ. AND NIELSEN, LM

**Year:** 1989

**Title:** Analgesics, benzodiazepines and traffic

**Journal/Book Name:** Ugeskr Laeger

**Volume:** 151(28), 1822-5

**ISBN/ISSN:** 0041-5782

**Keywords:** Analgesics\*AE; Automobile Driving\*; Benzodiazepines\*AE; English Abstract; Human; Risk Factors

**Abstract:** A number of articles concerned with competence to drive motor vehicles under the influence of psychotropic agents were reviewed with the object of assessing the abilities of patients receiving treatment with pain-killing drugs to drive. The majority of psychotropic agents decreased the capacity to drive considerably, when the person concerned is not used to these drugs and even after habituation where benzodiazepines are concerned. Some investigations suggest that opioids such as methadone are only dangerous in traffic until the person concerned has become adjusted to a regular dosage. The methodological problems in the investigations are discussed with particular attention to the specificity of the method of measurement. Orienting driving tests are recommended compared with epidemiological investigations.

**Workpackage No.:** 1

**Author:** NIELSEN, L.M., NIELSEN, S.L., CHRISSETENSEN, L.Q., STEENTOFT, A. AND WORM, K.

**Year:** 1991

**Title:** Incidence of drugs and euphoretic agents among motorists on the roads of Denmark. A possible relationship to traffic safety.

**Journal/Book Name:** Ugeskr-Laeger

**Volume:** 153, 39, 2734-7

**ISBN/ISSN:** 0041-5782

**Keywords:** accidents, traffic, adult, aged, alcohol drinking, automobile driving, Denmark, Diazepam, english abstract, female, human, male, middle age, morphine derivatives, psychotropic drugs, substance related disorders

**Abstract:** All of the Medicolegal Committee's cases from the period 1981-1985 concerning the influence of drugs on motorized road-users were reviewed. Only cases



where a drug was demonstrated in blood and/or urine were included. A total of 442 cases were included in this investigation and 100 different agents, drugs and narcotics were demonstrated. In all of the cases the two drugs most frequently demonstrated were diazepam (46%) and morphine (19%). In the 46 cases where diazepam was demonstrated alone (blood alcohol concentration = 0, a significant correlation could be demonstrated between the sum of the blood concentration of diazepam and demethyldiazepam and the degree of intoxication as estimated by the clinical examination. In 87% of the cases, the road-users were men. Cannabis users had a lower age (21 years) than the road-users who had taken diazepam (28 years) or morphine (26 years) while individuals who had taken methadone had a higher average age (29 years) than those who had taken morphine. The frequencies of accidents in cases with morphine or methadone were lower than in the material as a whole while the frequency of accidents for dextropropoxyphen was higher compared with the other opioids and the material as a whole.

**Workpackage No.:** 3

**Author:** NOCHAJSKI, T, H., MILLER, B.A., AUGUSTINO, D.K. AND KRAMER, R.J.

**Year:** 1995/6

**Title:** Use of non-obvious indicators for screening of DWI offenders

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** alcohol/ drugs/ traffic safety/ driving/ screening instruments/ MAST/ RIASI (Research Institute on Addictions Self-Inventory)

**Abstract:** This study examined the effectiveness of non-obvious indicators for detecting individuals that may have potential problems with alcohol or drugs. The Research Institute on Addictions in conjunction with the New York State Department of Motor Vehicles and the Governor's Traffic Safety Committee has developed a screening instrument (RIASI) for use with the Drinking Driver Programs in New York State. The samples in this study consisted of DDP participants from Onondaga county, where all DDP participants are given clinical assessments prior to participation in the DDP. One sample consisted of 246 individuals that were administered the MAST, while the second sample consisted of 125 individuals that were administered the RIASI. Referral rates for clinical re-evaluation were basically the same for the MAST (56%) and RIASI (54%). However, the percent of false positives, those identified as potentially having alcohol or drug problems but not needing treatment, was significantly lower for the RIASI (25%) than for the MAST (41%). For the false negatives, individuals identified as needing treatment but missed by the screening procedure, the RIASI (6%) was again significantly lower than the MAST (38%). These results indicate that use of non-obvious indicators helped increase the accuracy of the screening procedure using the RIASI relative to the procedure using the MAST. Continued work on validation of subscales within the RIASI points toward even greater efficiency of the screening procedure in the DDPs.

**Workpackage No.:** 4

## O

**Author:** O'HANLON, J.F.

**Title:** Medications and the safety of the older driver

**Journal/Book Name:** Human Factors

**Keywords:** older driver, drugs, benzodiazepine anxiolytics

**Abstract:** The clinical relevance of the distinction between short- and long-acting benzodiazepine anxiolytics is discussed, and emphasis is placed on the persistence of these drugs' effects on functioning throughout a course of treatment. Nootropics (drugs that might benefit driving in older adults) are discussed. However, the evidence that any drug produces such positive benefits is currently weak

**Workpackage No.:** 1

**Author:** O'HANLON, JF; HAAK, TW; BLAAUW, GJ. AND RIEMERSMA, JB

**Year:** 1982

**Title:** Diazepam impairs lateral position control in highway driving

**Journal/Book Name:** Science

**Volume:** 217(4554), 79-81

**ISBN/ISSN:** 0036-8075

**Keywords:** Adult; Automobile Driving\*; Diazepam \*PD; Dose-Response Relationship, Drug; Double-Blind Method; Human; Laterality; Male; Motor Activity \*DE; Placebos

**Abstract:** Nine expert drivers operated an instrumented vehicle in tests over a highway at night after being treated with diazepam (5 and 10 milligrams), a placebo, and nothing. They reacted to 10 milligrams of diazepam with increased lateral position variability. Potentially dangerous impairment was inferred from the reactions of some subjects

**Workpackage No.:** 2

**Author:** O'HANLON, JF

**Year:** 1984

**Title:** Driving performance under the influence of drugs: rationale for, and application of, a new test.

**Journal/Book Name:** Br J Clin Pharmacol

**Volume:** 18 Suppl 1, 121S-129S

**ISBN/ISSN:** 0306-5251

**Keywords:** Adult; Antidepressive Agents PD; Automobile Driving\*; Female; Human; Hypnotics and Sedatives PD; Male; Middle Age; Psychomotor Performance \*DE; Psychotropic Drugs\*PD

**Abstract:** This paper offers the rationale for developing an over-the-road test for assessing drug effects on actual driving performance. It describes the development of such a method and results obtained in three separate experiments where the method was applied. The results support the claim that the test provides a valid measure of drug

effects on one type of actual driving performance. The test may eventually find a place in the screening of psychoactive drugs for licensing.

**Workpackage No.:** 4

**Author:** O'HANLON, J.F. AND DE GIER, J.J.

**Year:** 1986

**Title:** Drugs and Driving (Book)

**Keywords:** Theory, Methodology, History, Benzodiazepines, Antidepressants, Neuroleptics, Analgesics, Anticholinergics, Antihistamines, Testing

**Workpackage No.:** 1

**Author:** O'HANLON, J. F. AND VOLKERTS, E.R.

**Year:** 1986

**Title:** Hypnotics and actual driving performance

**Journal/Book Name:** Acta Psychiatr Scand Suppl

**Volume:** 33(2), 95-104

**ISBN/ISSN:** 0065-1591

**Keywords:** Adult; Attention DE; Automobile Driving' Clinical Trials; Comparative Study; Dose-Response Relationships, Drug; Double-Blind Method; Female; Human; Hypnotics and Sedatives AE/TU; Insomnia DT; Nitrazepam AE; Psychomotor Performance DE; Temazepam AE

**Abstract:** Several related studies of the residual effects of hypnotic drugs on actual driving performance have been conducted using a standard approach and the most recent is described in detail. In it, 12 female formerly diagnosed insomniacs and hypnotic users acted as subjects. They were treated in two separate series with placebo for 2 nights, then hypnotic medication for 8 nights followed by placebo again for 3 nights. In one series, the medication was nitrazepam (10 mg nocte) and in the other, temazepam (20 mg nocte). Eleven subjects completed both series in a double-blind, cross-over (with respect to drugs) design. Their driving performance was repeatedly tested on a 100 km primary highway circuit, in normal traffic, during both the morning and afternoon (10-11 hours and 16-17 hours after drug and placebo ingestion, respectively). Nitrazepam but not temazepam significantly impaired driving performance, the difference lasting throughout the active medication period. These results along with those obtained in the earlier studies are compared to show degrees of driving impairment which follow the use of various hypnotics.

**Workpackage No.:** 2

**Author:** O'HANLON, J.F

**Year:** 1988

**Title:** Antihistamines and driving safety.

**Journal/Book Name:** Cutis

**Volume:** 42(4A), 10-3

**ISBN/ISSN:** 0011-4162

**Keywords:** automobile driving, benzhydryl compounds, cyproheptadine, double-blind method, ethanol, histamine, antagonists, human, male, psychomotor performance, sleep stages

**Abstract:** The results of two placebo-controlled driving performance studies confirm laboratory data showing that the nonsedating antihistamine terfenadine does not influence the driving performance of users. The amplitude of vehicle weaving calculated for drivers who received this agent did not differ from control values. Neither terfenadine nor loratadine, another nonsedating antihistamine, potentiated the adverse effects of alcohol on driving performance.

**Workpackage No.:** 2

**Author:** O'HANLON, J.F., VERMEEREN, A., UITERWIJK, M.M., VAN VEGGEL, L.M. AND SWIJGMAN, H.F.

**Year:** 1995

**Title:** Anxiolytics' effects on the actual driving performance of patients and healthy volunteers in a standardised test. An integration of three studies.

**Journal/Book Name:** Neuropsychobiology

**Volume:** 31, 2, 81-8

**ISBN/ISSN:** 0302-282X

**Keywords:** anti-anxiety agents, anxiety disorders, attention, automobile driving, comparative study, cross-over studies, diazepam, dose response relationship, drug, double blind method, drug administration schedule, human, Imidazoles, lorazepam, middle age, Ondansetron, Piperazines, psychomotor performance, pyridines

**Abstract:** Effects of benzodiazepine (diazepam, lorazepam) and benzodiazepine-like anxiolytics (alpidem, suricione) and a 5-HT-3 antagonist (ondansetron) on actual driving performance were measured in three double-blind, placebo-controlled studies. Subjects were healthy volunteers in two and anxious patients in the third. Treatments lasted for 8 days. Standardized testing occurred within the first full day and on the last day of treatment. No important differences existed between volunteers' and patients' baseline and/or placebo performances and both groups responded similarly to comparable drugs/doses. Benzodiazepine and benzodiazepine-like anxiolytics produced marked and pervasive driving impairment, which lasted throughout treatment; but ondansetron, none.

**Workpackage No.:** 2

**Author:** O'HANLON, J.F. AND RAMAEKERS, J.G

**Year:** 1995

**Title:** Antihistamine effects on actual driving performance in a standard test: a summary of Dutch experience, 1989-94

**Journal/Book Name:** Allergy

**Volume:** 50, 3, 234-42

**ISBN/ISSN:** 0105-4538

**Keywords:** automobile driving, benzimidazoles, butyrophenones, cetirizine, clemastine, comparative study, diphenhydramine, dose response relationship, drug, histamine,

antagonists, human, loratadine, piperidines, psychomotor performance, support, non-U.S. Gov't, terfenadine, triprolidine

**Abstract:** The review summarizes the major results of eight double-blind, placebo-controlled, volunteer studies undertaken by three independent institutions for showing the effects on actual driving performance of "sedating" and "nonsedating" antihistamines (respectively, triprolidine, diphenhydramine, clemastine and terfenadine, loratadine, cetirizine, acrivastine, mizolastine, and ebastine). A common, standardized test was used that measures driving impairment from vehicular "weaving" (i.e., standard deviation of lateral position (SDLP)). Logical relationships were found between impairment and dose, time after dosing, and repeated doses over 4-5 days. The newer drugs were generally less impairing, but differences existed among their effects, and none was unimpairing at doses 1-2x the currently recommended levels. One or possibly two of the newer drugs possessed both performance-enhancing and -impairing properties, depending on dose, suggesting two mechanisms of action.

**Workpackage No.:** 2

**Author:** O'HANLON, J.F.

**Year:** 1996

**Title:** Antidepressant therapy and behavioural competence

**Journal/Book Name:** Br J Clin Pract

**Volume:** 50, 7, 381-5

**ISBN/ISSN:** 0007-0947

**Keywords:** activities of daily living, anti-depressive agents, behaviour, human, psychological tests

**Workpackage No.:** 1

**Author:** O'NEILL, W.M.

**Year:** 1994

**Title:** The cognitive and psychomotor effects of opioid drugs in cancer pain management

**Journal/Book Name:** Cancer Surv

**Volume:** 21, 67-84

**ISBN/ISSN:** 0261-2429

**Keywords:** adult, amphetamines, analgesics, opioid, buprenorphine, central nervous system stimulants, chronic disease, cocaine, codeine, cognition, comparative study, dopamine uptake inhibitors, human, methylphenidate, morphine, neoplasms, pain, propoxyphene, psychomotor performance, randomized controlled trials, reaction time, thiazoles

**Abstract:** The time has come to evaluate critically our practice of cancer pain management and the assumptions on which it is based. We owe it to our patients to maximize the quality of their lives and to provide evidence for them that is based on a scientific approach rather than anecdotal experience. From the information available, opioids do have effects on cognitive and psychomotor function, and although many of these effects diminish once the patient is on a stable dose, the evidence suggests that baseline pretreatment levels are not achieved. In addition, the relationship between

measurable effects and the performance of everyday tasks such as driving is unclear. The challenge we now face is to continue the improvements in cancer pain control achieved over the last 25 years. The management of the central adverse effects of opioids must be focused on accurate assessment and careful titration of opioids against pain. Adjuvant analgesic drugs and non-drug measures should be used whenever possible, and drugs should be chosen that will not contribute to existing difficulties. The appropriate use of psychostimulants has yet to be established as has the relative benefit of one opioid over another in cancer pain.

**Workpackage No.:** 1

**Author:** O'NEILL, D.

**Year:** 1996

**Title:** The Older Driver

**Journal/Book Name:** Reviews in Clinical Gerontology

**Volume:** 6(3), 295-302

**Keywords:** drivers/driving behaviour/health/independence/prescription drugs

**Abstract:** Discusses driving in the elderly focusing on the issues of independence and medical fitness. The literature suggests that doctors are unaware of the driving behaviors of their patients when prescribing drugs that may affect driving ability, are not aware of fitness to drive regulations, and patients who attend glaucoma, syncope or dementia clinics have not been advised appropriately. Core features of older driver assessment and priorities for the development of skills in assessing medical fitness to drive are provided.

**Workpackage No.:** 1

**Author:** OHTSUJI, M., OHSHIMA, T., TAKAYASU, T., NISHIGAMI, J., KONDO, T., LIN, Z. AND MINAMINO, T.

**Year:** 1995/6

**Title:** Screening of antihistamine agents (diphenhydramine) with blood and urine samples by REMEDI-HS system

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** diphenhydramine/ antihistamine/ drugs/ drivers/ traffic accidents/ sedation

**Abstract:** Diphenhydramine (Dip) is one of the antihistamine agents (Anti-His) which are often compounded in cold remedies in Japan. Because of its sedative effects, it is advisable for drivers not to take it. However, as cold remedies can be obtained without a doctor's prescription, Dip is frequently taken by all age groups in Japan. We sometimes experience the traffic accidents' autopsy cases in which the urine specimens of drivers were Anti-His positive. The noninvasive screening for Anti-His on drivers as well as alcohol seems, therefore, necessary in order to examine whether etiologically Anti-His was directly involved in the occurrence of traffic accident or not. Urine samples were collected from 5 male volunteers at 0, 1, 2, 3, 6, 9, 24, 36 and 50 hours after Dip intake (a single 30 or 60mg oral dose), and 1 ml of each urine sample was used for the analysis by REMEDI-HS® based on HPLC system. Dip and its 3 different kinds of metabolites,

which reached at their maximum concentrations at 3 hours, were detected until at 24 to 50 hours. Maximum concentration of Dip ranged from 0.53 to 4.15 µg/ml (mean value = 1.93 µg/ml. SD= 1.53). At 1 hour though Dip was often undetected probably because of its very low concentration, one specific metabolite, on the other hand, was detected in the urine. These results show that REMEDI-HS® is useful for the Dip screening in human urine samples and that the metabolite is an early index suitable for revealing Dip intake.

**Workpackage No.:** 2

**Author:** OLIVER, J. S.

**Year:** 1995/6

**Title:** Drugs and driving - The Scottish scene

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** drugs/ driving/ Scotland/ benzodiazepines/ tamazepam/ diazepam

**Abstract:** In relation to Alcohol, Drugs and Driving, there are two offences set out in the Road Traffic Act of 1988. A charge under Section 4 of the Act is one of impairment under the influence of drink or drugs. The Section 5 offence is one of driving with more than the prescribed limit of alcohol. Scotland has been relatively late in developing a problem with the misuse of drugs. In 1984, for example, there are only two recorded deaths from the misuse of Heroin in the Registrar Generals Report for Scotland. This figure has increased dramatically to 101 deaths in 1993, and, if present trends are followed, will exceed 120 deaths in the current year. Deaths in the late 1980s involved primarily Heroin but since then, the trend has been towards the use of benzodiazepines, primarily Temazepam, probably as a result of its widespread availability from prescription and, initially because of its ease of use by injection because of the liquid capsule centre. Consequently in 1992, 79% of all drug addict deaths involved a benzodiazepine drug. Temazepam was involved in 90% either alone or in combination with Diazepam. In 1993, 207 blood samples were received from Police Forces in Scotland. 130 were found to contain drugs. Of these, 97 contained Benzodiazepine drugs either alone or in combination with other drugs. This paper describes the analytical procedures used, presents the findings and compares them with the results of the investigations of the most recent deaths from the abuse of drugs.

**Workpackage No.:** 3

**Author:** ORSAY, E.M., DOANWIGGINS, L., LEWIS, R., LUCKE, R.. AND RAMAKRISHNAN, V.

**Year:** 1994

**Title:** The impaired driver - hospital and police detection of alcohol and other drugs of abuse in motor-vehicle crashes

**Journal/Book Name:** Annals of Emergency Medicine

**Volume:** 24, 1, 51-55

**Keywords:** driving, impairment, drugs, police detection, motor vehicle crashes

**Abstract:** Study objectives: To determine the incidence of drugs of abuse and alcohol use in admitted drivers involved in motor vehicle crashes (MVCs) and to determine the rate of police detection of alcohol and drug use in these motorists. Design: Retrospective chart review of hospitalized drivers involved in MVCs and review of corresponding police reports. Setting: Two Level I trauma centers in a large metropolitan region. Participants: All MVC drivers/motorcycle operators admitted to the trauma service from January 1, 1990, to December 31, 1990. Measurements and main results: The records of 634 injured motorists were reviewed; 200 (32% of the 625 patients with serum alcohol levels) were legally drunk (serum alcohol of 100 mg/dL or more), and 132 (22.6% of the 585 urine drug screens) had positive urine drug screens. Cocaine was the most prevalent drug of abuse, present in 51 patients (8.7%). Two hundred eighty-five patients (45.0%) were considered impaired (alcohol of 100 mg/dL or more and/or positive drug screen), representing almost half of all motorists admitted. The impaired motorists were younger, more often male, less likely to use a seat belt or helmet, and had higher Injury Severity Scores than their unimpaired counterparts. Police reports were available for 446 patients, 139 (31.2%) of whom were legally drunk and 67 (15%) of whom had positive drug screens, yielding an overall impairment rate of 46.2%. Only 34 (16.5%) patients were cited for driving under the influence. Conclusion: An exceedingly high rate of impairment existed in his population of seriously injured motorists in a metropolitan region, the majority of whom were not charged by the police. Although alcohol is the most prevalent source of driver impairment, other drugs of abuse are also important contributors to his problem

**Workpackage No.:** 3

**Author:** OWENS, S.M., MCBAY, A.J. AND COOK, C.E.

**Year:** 1983

**Title:** The use of marijuana, ethanol and other drugs among drivers killed in single vehicle crashes

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 28, 2, 372-379

**ISBN/ISSN:** 0022-1198

**Keywords:** toxicological analysis, marijuana, alcohol, drugs, crashes, motor vehicle accidents, automobile driving, barbiturates, narcotics, tetrahydrocannabinol

**Abstract:** Marijuana, ethanol and other drugs are considered by many to be detrimental to the safe operation of motor vehicles. However direct epidemiological evidence for this belief exists only for ethanol. The goal of this investigation was to determine the incidence of the psychoactive ingredient marijuana D9-tetrahydrocannabinol (THC), along with ethanol and other drugs in blood specimens from a carefully defined population of dead drivers. Although THC and other drugs were present in a small number.

**Workpackage No.:** 3

**Author:** OWENS, S.M., MCBAY, A.J. AND COOK, C.E.

**Year:** 1983



**Title:** The use of marihuana, ethanol, and other drugs among drivers illed in single-vehicle accidents.

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 28(2), 372-79.

**Workpackage No.:** 3

## P

**Author:** PALVA, E.S., LINNOILA, M., SAARIO, I. AND MATTILQA, M.J.

**Year:** 1979

**Title:** Acute and subacute effects of diazepam on psychomotor skills: interaction with alcohol.

**Journal/Book Name:** Acta Pharmacologia Toxicologia

**Volume:** 44, 217.

**Keywords:** alcohol; experimental

**Workpackage No.:** 2

**Author:** PARLIAMENTARY OFFICE OF SCIENCE AND TECHNOLOGY (UK).

**Year:** 1996

**Title:** Common Illegal Drugs and their Effects (Report).

**Keywords:** cannabis; ecstasy; amphetamines

**Workpackage No.:** 1

**Author:** PARROTT, A.C., LEES, A., GARNHAM, N.J., JONES, M. AND WESNES,.

**Year:** 1998

**Title:** Cognitive performance in recreational users of MDMA of 'ecstasy': evidence for memory deficits.

**Journal/Book Name:** Journal of Psychopharmacology

**Volume:** 12, 1, 79-83.

**Keywords:** ecstasy; experimental

**Workpackage No.:** 2

**Author:** PATAT, A., STUBBS, D., DUNMORE, C., ULLIAC, N., SEXTON, B., ZIELENIUK, I., IRVING, A. AND JONES, W.

**Year:** 1995

**Title:** Lack of interaction between two anti-histamines, mizolastine and cetirizine, and ethanol in psychomotor and driving performance in healthy subjects

**Journal/Book Name:** European Journal of Clinical Pharmacology

**Volume:** 48, 2, 143-50

**ISBN/ISSN:** 0031-6970

**Keywords:** adult, benzimidazoles, cetirizine, dose-response relationship, drug, double blind method, drug interactions, ethanol, histamine, antagonists, human, male, psychomotor performance, task performance and analysis, voluntary workers

**Abstract:** The pharmacodynamic interaction between mizolastine, a new H1 antihistamine, and ethanol was assessed in a randomized, double-blind, three-way crossover, placebo-controlled study. Eighteen healthy young male volunteers received

mizolastine 10 mg, or cetirizine 10 mg or placebo once daily for 7 days with a 1-week wash-out interval. An oral dose of ethanol or ethanol placebo, given 2 h after dosing on days 5 or 7 of each treatment period, was administered to achieve a peak blood alcohol concentration (BAC) of 0.7 g/l then maintained for 1 h by two further doses of ethanol. Driving ability and psychomotor performance were evaluated using actual and simulated driving tests, critical flicker fusion threshold (CFF), adaptive tracking and divided attention (DAT) tasks. Ethanol produced a significant decrement in all tasks up to 5.5 h after administration: an increase in steering movements of 4.6, in lateral deviation of 0.45 m, in braking reaction time of 80 ms, in driving test and DAT performance of + 3.2; and a decrease in CFF and in tracking speed of 2.6 m.s<sup>-1</sup>. Neither mizolastine nor cetirizine significantly impaired driving ability or arousal (CFF) compared with the placebo. However, both drugs significantly impaired DAT performance 6:00 h post-dose (increase of + 2.1 for mizolastine and + 2.4 for cetirizine). The tracking speed was significantly decreased 7:50 h after mizolastine administration (- 1.3 m.s<sup>-1</sup>) and more consistently from 1:30 to 7:50 h after cetirizine administration (-1.4 m.s<sup>-1</sup>). No significant adverse interaction, i.e. potentiation, occurred between ethanol and either antihistamine

**Workpackage No.:** 2

**Author:** PEACOCK, C

**Year:** 1992

**Title:** International policies on alcohol-impaired driving: a review.

**Journal/Book Name:** International Journal of Addiction

**Volume:** 27(2), 187-208

**ISBN/ISSN:** 0020-773X

**Keywords:** Alcohol-impaired, alcoholic intoxication, automobile driving, breath tests, comparative study, cross-cultural comparison, ethanol, human, international cooperation, public policy, support Non, U.S. Gov't, Gov't

**Abstract:** A review is presented of policies to curb alcohol-impaired driving. The principal measure applied against drinking and driving in most industrial countries is the implementation of laws limiting the amount of alcohol which can be legally consumed by a person who subsequently takes charge of a motor vehicle on a public road. This strategy seems to have been the most effective to date, although national variations in legislation, rigor of application, and the extent of public knowledge are reflected in the range of outcomes reported. The effectiveness of "random breath testing appears to be related to the degree to which drivers believe that the law is enforced". Other strategies aimed at the reduction of drinking and driving are education, publicity, and exhortation; the rehabilitation of convicted offenders; and restrictions on the availability of alcohol. However, due to factors such as the lack of evaluation, or limited scope, or nonspecificity to drinking and driving, these measures appear to have been less successful in curbing alcohol-impaired driving than the application of legal powers.

**Workpackage No.:** 1

**Author:** PEEKE, S.C., JONES, R.T. AND STONE, G.C.

**Year:** 1976

**Title:** Effects of practice on marihuana-induced changes in reaction time.

**Journal/Book Name:** Psychopharmacology

**Volume:** 48, 159-163.

**Keywords:** marihuana; experimental; reaction time

**Workpackage No.:** 2

**Author:** PEEL, H.W., PERRIGO, B.J. AND MIKAEL, N.Z.

**Year:** 1984

**Title:** Detection of drugs in saliva of impaired drivers

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 29, 1, 185-189

**ISBN/ISSN:** 0022-1198

**Keywords:** EMIT, enzyme multiple immunoassay technique, temperature programmed gas chromatography, mass spectrometry (GC/MS), cannabinoids, volatiles, benzodiazepines, saliva

**Abstract:** This study examined the feasibility of detecting drugs using saliva samples obtained from impaired drivers. Screening procedures on 1- to 2-mL samples were for cannabinoids, volatiles, benzodiazepines, and other acidic/neutral/basic drugs. Methodology consisted of enzyme multiple immunoassay technique (EMIT®) and temperature programmed gas chromatography with confirmation by gas chromatography/mass spectrometry (GC/MS). Fifty-six samples were obtained from drivers arrested for suspicion of impaired driving. Other than alcohol, the major drugs detected were cannabinoids and diazepam. Cocaine was found in one case.

**Workpackage No.:** 4

**Author:** PEEL, H.W. AND JEFFREY, W.K.

**Year:** 1990

**Title:** A report on the incidence of drugs and driving in Canada

**Journal/Book Name:** Canadian Society of Forensic Science Journal

**Volume:** 23, 2&3

**Keywords:** tetrahydrocannabinol (THC), benzodiazepines, diazepam, narcotics, codeine, cocaine, barbiturates, alcohol, driving, drugs

**Abstract:** A drugs and driving database, maintained by the Canadian Society of Forensic Science, includes cases from across Canada in which drug testing occurred over a period of about 3.5 years and comprises of a majority of fatalities and related driving accidents, and all the drug impaired driving cases. From this limited sample, certain trends are indicated. The most common drugs (or groups) are tetrahydrocannabinol (THC), benzodiazepines (mainly diazepam), narcotics (mainly codeine), cocaine and barbiturates. Alcohol was also present in many of these cases. In drug involved cases, it was most common to encounter a single drug - alone or in combination with alcohol. In impaired driving cases, other than alcohol, the drug substances found were THC, diazepam, codeine and cocaine.

**Workpackage No.:** 3

**Author:** PELISSER, A.L., L'EONETTI, G., KERGUÉLEN, S., BREMOND, J., BOTTA, A., CIANFARANI, F. AND GARNIER, M.

**Year:** 1996

**Title:** Urinary screening of drugs of abuse among drivers involved in road accidents

**Journal/Book Name:** Ann Biol Clin

**Volume:** 54, 10-11, 365-71

**ISBN/ISSN:** 0003-3898

**Keywords:** accidents, traffic, adult, automobile driving, female, fluorescence, polarization immunoassay, france, human, male, mass fragmentography, mass screening, prospective studies, psychotropic drugs, street drugs

**Abstract:** Driving under the influence of drugs is a growing cause of traffic injuries. Therefore the Abbott Laboratories established a study to estimate the consumption of Opiates, cannabinoids, cocaine and amphetamines among young adults involved in a road accident and to compare with a control group. Analytical procedure chosen include an anonymous collection of urines. Drugs are screened by fluorescence polarization immunoassay. Positive samples are confirmed by gas chromatography/mass spectrometry. Results do not show any difference between the two groups.

**Workpackage No.:** 3

**Author:** PENTTILA, A., KARHUNEN, P.J., KAUPPILA, R., LIESTO, K., TIANEN, E AND PIKKARAINEN, J.

**Year:** 1987

**Title:** Young drunken drivers in Helsinki: 1. Driving events

**Journal/Book Name:** In Young Drivers Impaired by Alcohol and Drugs. Edited by T. BENJAMIN, International Congress and Symposium Series, No. 116, Royal Society of Medicine Services Limited.

**Keywords:** youth, drink-drivers, alcohol, risk-taking, alcohol-impaired

**Abstract:** Interviews were conducted with young drunken drivers and control group on social background, details of the actual offence, and general driving habits. A nonchalant attitude towards driving after consumption of alcohol, associated with a spontaneous driving offence and deliberate risk-taking with alcohol-impaired friends, was the characteristic profile of young DWI offenders.

**Workpackage No.:** 3

**Author:** PEREZ-REYES, M., HICKS, R.E., BUMBERRY, J., JEFFCOAT, A.R. AND COOK, C.E.

**Year:** 1988

**Title:** Interaction between marijuana and ethanol: effects on psychomotor performance

**Journal/Book Name:** Alcohol Clin Exp Res

**Volume:** 12, 2, 268-76

**ISBN/ISSN:** 0145-6008

**Keywords:** adult, drug interactions, ethanol, heart rate, human, male, marijuana smoking, psychomotor performance, random allocation, reaction time, support, U.S. Gov't, tetrahydrocannabinol

**Abstract:** This is a report of the results of a placebo-controlled study in which the effects of the interaction between ethanol and marijuana on drug plasma concentrations, subjective ratings of intoxication, heart rate acceleration, and psychomotor performance were investigated. Six healthy, male, paid volunteers, moderate users of ethanol and marijuana, participated in the study. Ethanol (0.42 g/kg, 0.85 g/kg, or placebo) was administered over a 30-min interval. Fifteen minutes later the subjects smoked, in their customary manner, NIDA cigarettes containing 2.4% or 0.0004% (placebo) delta-9-tetrahydrocannabinol (THC). Each subject was tested in a single-blind, latin-square crossover design with the following six conditions: placebo ethanol/placebo marijuana; low dose ethanol/placebo marijuana; high dose ethanol/placebo marijuana; placebo ethanol/marihuana; low dose ethanol/marihuana; and high dose ethanol/marihuana. The variables measured in the study were: (a) subjective rating of ethanol and/or marihuana intoxication; (b) heart rate; (c) accuracy and latency of response in the Simulator Evaluation of Drug Impairment (SEDI) task; (d) blood ethanol concentration by gas chromatography; and (e) plasma concentration of THC by radioimmunoassay. The results indicate that the decrements due to ethanol in performance of skills necessary to drive an automobile were significantly enhanced by marihuana in an additive and perhaps synergistic manner. The administration of ethanol prior to marihuana smoking did not produce significant effects on the subjective rating of "high, heart rate acceleration, or THC plasma concentration.

**Workpackage No.:** 2

**Author:** PEREZ-REYES, M., WHITE, W.R., MCDONALD, S.A. AND HICKS, R.E.

**Year:** 1992

**Title:** Interaction between ethanol and dextroamphetamine: effects on psychomotor performance

**Journal/Book Name:** Alcoholism: Clinical and Experimental Research

**Volume:** 16, 1, 75-81

**ISBN/ISSN:** 0145-6008/92/1601-0075

**Keywords:** ethanol, dextroamphetamine, drug interaction, psychomotor performance, humans

**Abstract:** The objective of this study was to investigate the interaction between ethanol and dextroamphetamine with regard to psychomotor performance. Twelve healthy, male, paid volunteers, moderate users of ethanol and amphetamines, participated in this study. Ethanol (0.85 g/kg or placebo) was administered over a 30-min interval. Five minutes before the termination of ethanol or placebo ingestion, dextroamphetamine elixir (0.09 mg/kg, 0.18 mg/kg or placebo) diluted in 50ml of orange juice was administered. Subjects were tested in a single-blind, latin square, cross-over design with each of the following six conditions: placebo ethanol/ placebo dextroamphetamine; placebo ethanol/low-dose dextroamphetamine; placebo ethanol/high dose dextroamphetamine; ethanol/placebo dextroamphetamine; ethanol low-dose dextroamphetamine; and ethanol/high dose dextroamphetamine. The variables measured in this study were

subjective rating of ethanol and dextroamphetamine intoxication, accuracy and latency of response in the Simulator Evaluation of Drug Impairment (SEDI task), blood ethanol concentration by breath analyzer, and plasma concentrations of dextroamphetamine by gas chromatography. Results indicate ethanol induced decrements in performance of the skills necessary to drive an automobile were significantly decreased by dextroamphetamine in a dose-response fashion. The administration of dextroamphetamine did not decrease the subjective ratings of ethanol intoxication.

**Workpackage No.:** 2

**Author:** PERL, J., MASCORD, D.J., MOYNHAM, A.F. AND STARMER, G.A.

**Year:** 1995/6

**Title:** Drug usage by persons suspected of driving under the influence of a drug

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** breath-test/alcohol/road trauma/drug-impaired driving/ skills performance/ traffic safety/

**Abstract:** Random breath testing in New South Wales has had a successful impact on alcohol-related road trauma. While the precise extent of drug-impaired driving on traffic safety has not been established there is a perceived problem based on the extent of drug usage in drivers and on the demonstrable impairment of skills performance by drugs with the central nervous system activity. This perception of drug involvement in traffic safety prompted the New South Wales Government to amend legislation to enable the taking of blood and urine samples from drivers suspected of being drug impaired. This paper presents the procedures adopted in the taking of blood samples, the incidence of various drugs in apprehended and accident-involved drivers, a description of the population of suspected drug-impaired drivers and the reason for coming to police notice. Results are presented for the period since the implementation of the legislation in 1987 and up to 1993. The impact of various procedural changes during that period will be discussed.

**Workpackage No.:** 3

**Author:** PFAFFEROTT, I

**Year:** 1993

**Title:** Drinking and driving with various alcohol limit values in Europe

**Journal/Book Name:** Blutalkohol

**Volume:** 30 (1), 21-8

**ISBN/ISSN:** 0006-5250

**Keywords:** Alcohol Drinking BL/LJ ; Alcoholic Intoxicatin BL/PC ; Attitude ; Automobile Driving LJ ; Breath Tests ; Comparative Study ; Cross-Cultural Comparison ; English Abstract ; Ethanol PK ; Europe ; Human

**Abstract:** Within the framework of a comparative cross-national study led by INRFTS, France, in 1991/92, representative surveys of drivers were conducted in 15 European countries. The survey covered a wide spectrum of biographical driver data as well as opinions and attitudes to practically all subjects of road traffic. In this context, the

"drinking and driving" subject was of special interest. A comparison was made between drivers from 10 countries with a legal BAC limit of 0.08% and drivers from 5 countries with a legal BAC limit of or under 0.05%. Drivers from countries with a legal BAC limit below 0.08% state more often that they never drive after drinking even a small amount of alcohol; have been stopped and breathalysed by the police on at least one occasion; expect to be stopped and breathalysed by the police on a typical journey. They further advocate more breath tests by the police in their country and harsher penalties for drivers found to be over the limit. Where low legal BAC limits are in force, they are accepted in most cases. The extent to which these basically positive attitudes may also be relevant on the traffic scene, cannot be answered based on this survey alone. It is common knowledge that opinions and attitudes represent only one determining factor of a whole complex of factors influencing behaviour.

**Workpackage No.:** 3

**Author:** PFENNINGER, E., BAIER, C., CLAUS, S. AND HEGE, G.

**Year:** 1994

**Title:** Psychometric changes as well as analgesic action and cardiovascular adverse effects of ketamine racemate versus s-(+)-ketamine in subanaesthetic doses.

**Journal/Book Name:** Anaesthesist

**Volume:** 43 Suppl 2: S68-75

**Keywords:** ketamine

**Abstract:** The intravenous anaesthetic ketamine is widely used in subanaesthetic doses as a potent analgesic in emergency and disaster medicine. At present, ketamine is commercially available only in its racemic form, although the S(+)-isomer has proved to be approximately three times as potent than the R(-)-isomer. In first clinical trials in Germany, S(+)-ketamine was reported to be markedly advantageous with regard to analgesia in anaesthetized patients. We therefore evaluated ketamine's analgesic and psychotropic effects in subanaesthetic doses given to healthy volunteers. **MATERIALS AND METHODS.** After institutional approval of the study by the university's Ethics Committee, 16 volunteers received ketamine racemate (1 mg/kg) and S(+)-ketamine (0.5 mg/kg) i.m. with 1-week intervals between injections in a randomized, double-blind fashion. Analgesia (electric pain stimulation of the median nerve), long-term memory, anterograde amnesia (recognition of simple pictures), motor coordination (Trieger test), immediate recall (short test of general intelligence) and concentration capacity (CI test: recognition of a preselected symbol among several symbols) were measured over a 60-min period and mean arterial pressure, heart rate, and ketamine plasma levels in venous blood samples were determined. Values were calculated as means and data were analysed by Wilcoxon's paired test for group comparison. **RESULTS.** Within 15 min, both agents induced a measurable degree of analgesia. After ketamine racemate, the level of pain tolerated increased from 38.8 +/- 14.0 to 57.0 +/- 13.7 mA and after S(+)-ketamine, from 36.9 +/- 10.5 to 53.3 +/- 15.2 mA. Ketamine racemate did not exert measurable effects on long-term memory, whereas anterograde amnesia was observed in 46% and 54% of the study subjects after 15 and 30 min, respectively. However, after S(+)-ketamine, only 8% of the volunteers demonstrated anterograde amnesia ( $P < 0.05$ ). Immediate recall also declined in both groups (baseline: 5 points, after 15 min: 3.5 points for ketamine



racemate, 4 points for S(+)-ketamine), whereas concentration capacity worsened from 14.5 +/- 3.8 s to 35.9 +/- 18.6 s after ketamine racemate and significantly less, from 14.8 +/- 2.5 s to 22.9 +/- 7.6 s, after S(+)-ketamine (P < 0.01). Furthermore, after 15 min, ketamine racemate induced an increase in heart rates from 73 +/- 15 b/min to 97 +/- 11 b/min, while S(+)-ketamine raised heart rates from 74 +/- 13 b/min to 89 +/- 11 b/min only (P < 0.05). Mean arterial pressure increased from 97 +/- 11 mmHg to 111 +/- 9mmHg after ketamine racemate and from 92 +/- 11 mmHg to 110 +/- 13 mmHg after S(+)-ketamine (not significantly different). CONCLUSION. S(+)-Ketamine at half-dose of ketamine-racemate is as potent as ketamine-racemate in subanaesthetic doses with powerful analgesic properties. The (+)-isomer exerts less adverse effects on measurable cerebral functions and induces a significantly smaller increase in heart rate. Since states of impaired consciousness and disorientation are especially disturbing under emergency conditions, further investigations should be carried out to define S(+)-ketamine's position as a potent analgesic for therapeutic use in emergency and disaster medicine.

**Workpackage No.:** 2

**Author:** PHILIPS, L. AND VOTEY JR., H.L.

**Year:** 1987

**Title:** Drug abuse and the serious traffic offender

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam, Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 0 444 809031

**Keywords:** cannabis, heroin, crime, cocaine

**Abstract:** This study analyzes several questions about the relationship between involvement with drugs and risk of conviction for serious traffic offences. In addition, the question of whether prior sanctions by the criminal justice system affects the subsequent probability of conviction for serious traffic offenders is also examined. The data set is the Youth Cohort of the National Longitudinal Survey, collected by Ohio State University. The information on deviant behaviour and on contact with the criminal justice system is based on self report data. Questions were asked of 12, 686 youths aged fourteen through 22 in 1979, and excepting 54f5 individuals, these youths were interviewed again in 1980, the Youth Cohort is a national sample, approximately one half male and one quarter black

**Workpackage No.:** 3

**Author:** PICKWORTH, W.B., ROHRER, M.S. AND FANT, R.V.

**Year:** 1997

**Title:** Effects of abused drugs on psychomotor performance

**Journal/Book Name:** Experimental and Clinical Psychopharmacology

**Volume:** 5, 3, 235-241

**ISBN/ISSN:** 1064-1297

**Keywords:** marijuana, amphetamine, alcohol, behaviour, vigilance, drugs, driving, performance

**Abstract:** Some abused drugs have been reported to alter performance on naturalistic tasks such as driving and also on laboratory tasks. The performance effects of several drug classes were examined using a repeated measures design. Eight volunteers were administered 2 doses of ethanol, marijuana, amphetamine, hydromorphone, pentobarbital, or placebo on separate days. The larger dose of each increased subjective drug strength; however, only ethanol and pentobarbital impaired performance on circular lights, digit symbol substitution, and serial math tasks. Both ethanol and pentobarbital impaired performance on card-sorting tasks; impairment was evident at lower doses as the cognitive load increased. Results illustrate differences among drugs in producing performance impairment at doses that cause subjective effects. Increasing cognitive requirements uncovered performance impairment at lower doses

**Workpackage No.:** 2

**Author:** PIDETCHA, P., CONGPUONG, P., PUTRIPRAWAN, T., REKAKANAKUL, R., SUWANTON, L. AND TANTRARONGROJ, S.

**Year:** 1995

**Title:** Screening for urinary amphetamine in truck drivers and drug addicts

**Journal/Book Name:** J Med Assoc Thai

**Volume:** 78, 10, 554-8

**ISBN/ISSN:** 0125-2208

**Keywords:** amphetamine, automobile driving, central nervous system stimulants, human immunoenzyme techniques, male, mass screening, sensitivity and specificity, substance abuse detection, substance related disorders

**Abstract:** Sixty-two urine samples from truck drivers and drug addicts were analysed by TDx (Abbott Laboratories) for amphetamines. Eighteen samples were found to be positive while the rest were negative. The eighteen samples were simultaneously determined for amphetamines by EMIT (Syva Company). Sixteen samples were found to be positive and 2 of negative samples had amphetamines levels of 0.48-0.85 micrograms/mL. When the same samples were subjected to qualitative screening and some were found false negative as follows: 7 cases in Color Test by using test solution kits amphetamine in urine (the Department of Medical Science, Ministry of Public Health), 8 cases by Albuscreen Ontrax for amphetamine (Roche Diagnostic System), 5 cases by amphetamine Double Antibody 1251-RIA (Diagnostic Products Corporation-DPC) and 3 cases by the method of Ten-One (DPC) respectively. But when forty four samples which gave negative results by TDx were subjected to Testing by EMIT and Ontrax. The results of both EMIT and Ontrax were negative. Some of forty four samples were false positive by the Color Test solution kit amphetamines in urine and amphetamine Double Antibody 1251-RIA. Reliability of results reported not only depends on the methodology or principle but also the sensitivity of the method.

**Workpackage No.:** 2

**Author:** PIKKARAINEN, J. AND PENTTIL A, A

**Year:** 1990

**Title:** Occasion and risk for detecting driving in alcoholic intoxication.

**Journal/Book Name:** Beitr Gerichtl Med

**Volume:** 48, 193-9

**ISBN/ISSN:** 0067-5016

**Keywords:** Intoxication, accidents, adolescence, alcoholic intoxication, automobile driving, cross-sectional studies, english abstract, ethanol, female, Finland, human, incidence, male

**Abstract:** Detection of offenders driving while intoxicated (DW) (mandatory BAC limit at 0.50%) in Finland was investigated. Almost every fifth offender was detected at road blocks and every tenth of them because of abnormal driving. Compared to the local police the national traffic police had arrested much more offenders for traffic violation (38% vs. 11%) but much less because of accidents (12% vs. 23%). The reason of detection was in a significant way dependent on the following variables: BAC, stage of inebriation, vehicle, day of week and hour of day. The risk of detection is very low, i.e. about 1 to 300. However, the risk has doubled from 1979 to 1984, but thereafter slightly declined. The study provides information for the strategy of the police in traffic supervision.

**Workpackage No.:** 3

**Author:** PODOLSKY, D.M.

**Year:** 1985

**Title:** Alcohol, other drugs, and traffic safety

**Journal/Book Name:** Alcohol World, Health and Research,

**Volume:** 9, 4, 16-23

**Keywords:** accidents, safety, drugs, alcohol, DUID

**Abstract:** This article considers the effects of alcohol and other drugs on traffic accidents. Although the magnitude of the effects of alcohol and traffic accidents has been well documented, the role of other drugs has not been adequately determined. Preliminary accident data indicate that between 5 and 15 percent of seriously injured and fatally injured drivers had used other drugs, usually in combination with alcohol, at the time of the accident. Preliminary information suggests that the drugs most threatening to highway safety are (in order of the extent to which they are used) alcohol, marijuana, diazepam and other tranquillizers, and barbiturates. The author highlights the problems of detection of DUID and enforcing the law. Statistics on alcohol involvement accidents are provided.

**Workpackage No.:** 1

**Author:** POKLIS, A., MAGINN, D. AND BARR, J.L.

**Year:** 1987

**Title:** Drug findings in 'Driving Under the Influence of Drugs' cases: a problem of illicit drug use

**Journal/Book Name:** Drug Alcohol Depen

**Volume:** 20, 1, 57-62

**ISBN/ISSN:** 0376-8716

**Keywords:** automobile driving, cannabinoids, drug combinations, human, phencyclidine, street drugs, substance related disorders

**Abstract:** Drug findings in 137 drug positive cases of Driving Under the Influence of Drugs (DUID) occurring in St. Louis, Missouri, U.S.A. from June 1983 through May 1986 are presented. Thirty-two different drugs were detected. A single agent was detected in only 34% (47/137) of cases. The most frequently encountered drugs, expressed as percent of positive cases, were: phencyclidine, 47%; marijuana, 47%; benzodiazepines, 22%; barbiturates, 15%; opiates, 11%; and cocaine, 9%. Most multiple drug cases involved popular illicit drug mixtures, such as cocaine and morphine (speedballs) or phencyclidine on marijuana (whack). All the drivers in this survey had displayed inappropriate or impaired operation of a motor vehicle to the extent that a law enforcement officer had stopped and charged them for DUID. In at least 81% of the drug positive cases, persons impaired in the operation of a motor vehicle from a drug or drugs other than alcohol, were impaired not as the result of side effects of therapeutic drug use, but as the result of deliberate self intoxication with illicit or controlled substances.

**Workpackage No.:** 3

**Author:** POKLIS, A., GRAHAM, M., MAGINN, D., BRANCH, C.A. AND GANTNER, G.E.

**Year:** 1990

**Title:** Phencyclidine and violent deaths in St. Louis, Missouri: a survey of medical examiners' cases from 1977 through 1986.

**Journal/Book Name:** Am J Drug Alcohol Abuse

**Volume:** 16:3-4 265-74

**Keywords:** pcp

**Abstract:** A survey of 104 deaths involving phencyclidine (PCP) occurring from 1981 through 1986 in metropolitan St. Louis, Missouri, is presented.

**Workpackage No.:** 3

**Author:** POOLE, H.

**Year:** 1989

**Title:** Substance abuse and driving: the physician's role

**Journal/Book Name:** Canadian Medical Association Journal

**Volume:** 141, 12, 1218

**Keywords:** physician, drug-taking, alcohol, driving, responsibility

**Abstract:** This is a letter which responds to a June 1989 publication "Substance Abuse and Driving: A CMA Review". The author Workpackage No. that it omits the role of the physician in identifying problem drinkers and substance abusers, who frequently are also problem drivers. Physicians who suspect someone of drinking/drug-taking and driving can ask the patient pertinent questions and remind the patient of his/her responsibility not to drive if a substance has been taken.

**Workpackage No.:** 1

**Author:** POPE, H.G., GRUBER, A.J. AND YURGELUNTODD, D

**Year:** 1995

**Title:** The residual neuropsychological effects of cannabis- the current status of research

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 38, 1, 25-34

**Keywords:** cannabis, marijuana, neuropsychological effects, residual effects, aircraft pilot performance, chronic marijuana use, cognitive functions, dependence, tolerance, patterns, smoking, plasma

**Abstract:** Evidence for the residual neuropsychological effects of cannabis must first be separated from evidence regarding (i) the acute effects of the drug, (ii) attributes of heavy cannabis users, and (iii) actual psychiatric disorders caused or exacerbated by cannabis. The remaining evidence must then be subdivided into (a) data supporting a 'drug residue' effect during the 12-24 h period immediately after acute intoxication and (b) data suggesting a more lasting toxic effect on the central nervous system which persists even after all drug residue has left the system. We reviewed the literature, comparing both 'drug-administration' studies in which known amounts of cannabis were administered to volunteers, and 'naturalistic studies' in which heavy marijuana users were tested after some period of abstinence. The data support a 'drug residue' effect on attention, psychomotor tasks, and short-term memory during the 12-24 h period immediately after cannabis use, but evidence is as yet insufficient to support or refute either a more prolonged 'drug residue' effect, or a toxic effect on the central nervous system that persists even after drug residues have left the body. We describe possible study designs to address these latter questions

**Workpackage No.:** 1

**Author:** POPKIN, CL

**Year:** 1991

**Title:** Drinking and driving by young females.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 23(1), 37-44

**ISBN/ISSN:** 0001-4575

**Keywords:** Implementation, Deterrence, Enforcement, Rehabilitation, accidents, traffic, adult, alcoholic drinking, alcoholic intoxication, automobile driving, female, human, male, North Carolina, sex factors

**Abstract:** Recent research indicates that women are drinking and driving more often and that the proportion of female drivers involved in fatal crashes is increasing. U. S. Fatal Accident Reporting System data (Fell 1987) suggest that although overall alcohol involvement rates in fatal crashes have been declining for the past four years, the rates for females aged 21-24 have not, and their alcohol involvement rate in late-night single vehicle (SV) crashes, a surrogate measure of alcohol-related (A/R) crashes, is almost as high as that of male drivers. This paper examines the involvement of North Carolina (NC) female drivers who are less than 35 years of age for the period of 1976 through 1985 and reports on trends in driver licensing, arrests for drinking and driving, SV nighttime and AIR crashes, and measured blood alcohol levels in fatalities. It identifies

an emerging driving-while-impaired (DWI) problem for younger women, particularly those 21 to 24 years of age. Significant trends pertaining to the involvement of women will have implications for the design and implementation of educational, deterrence, enforcement, and rehabilitation programs.

**Workpackage No.:** 3

**Author:** POPKIN, CL. AND COUNCIL FM

**Year:** 1993

**Title:** A comparison of alcohol-related driving behaviour of white and nonwhite North Carolina drivers.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 25(4), 355-64

**ISBN/ISSN:** 0001-4575

**Keywords:** Fatal crashes, accidents, traffic, adolescence, adult, age factors, alcohol drinking, automobile driving, blacks, comparative study, ethanol, female, human, male, middle age, North Carolina, prejudice, whites

**Abstract:** This paper broadens the knowledge of drinking driving behaviour by examining the involvement of North Carolina (NC) nonwhite drivers in alcohol-related (AIR) crashes and fatal crashes involving alcohol for the period of 1980 through 1988. The study identifies an AIR crash involvement problem for nonwhites, particularly nonwhite males above the age of 25 and nonwhite females above the age of 54. For ages 25 and higher, the AIR crash rates per licensed nonwhite male are at least twice those of white (Euro-caucasian) males. In addition, the driving while intoxicated (DWI) arrest rates per driver are approximately twice as high for nonwhite males as for white males of the same age. Through analysis of other data related to arrests for drinking and driving, single-vehicle nighttime (SVNT) crashes, breath alcohol concentration (BAC) levels of those arrested for DWI, and those involved in AIR crashes, and blood alcohol concentration of those involved in fatal crashes, a series of alternative explanations for this nonwhite involvement are examined. It is concluded that while nonwhite males and females may be involved in more crashes than whites at the same BAC level (as hypothesized by other researchers), there is also evidence that nonwhites appear to drive more often after drinking and also drive at slightly higher levels of BAC.

**Workpackage No.:** 3

**Author:** PRADHAN, S.N.

**Year:** 1984

**Title:** Phencyclidine (PCP): some human studies.

**Journal/Book Name:** Neurosci Biobehav Rev

**Volume:** 8:4 493-501

**Keywords:** pcp

**Abstract:** Studies on the effects of PCP have been conducted in volunteers in the Army Laboratories and elsewhere and in illicit users. The present review has summarized the observations of many investigators which showed that the acute effects of PCP following several routes of administration were shown to be dose-related.

**Workpackage No.: 3**

## R

**Author:** RAFAELSEN, O.J., BECH, P., CHRISTIANSEN, J., CHRISTRUP, H., NYBOE, J. AND RAFAELSEN, L.

**Year:** 1973

**Title:** Cannabis and alcohol: effects on simulated car driving

**Journal/Book Name:** Science

**Volume:** 179, 76, 920-3

**ISBN/ISSN:** 0036-8075

**Keywords:** drugs, driving, cannabis, alcohol, comparison, experimental study

**Abstract:** The effects of cannabis and alcohol on simulated car driving was studied. Cannabis resin containing 4 percent  $\Delta^9$ -tetrahydrocannabinol was administered orally in three doses equivalent to 8, 12, and 16 milligrams of that component. Alcohol was given orally in one standard dose of 70 grams. Both cannabis and alcohol increased the time required to brake and start, whereas alcohol increased while cannabis decreased the number of gear changes. An effective dosage on response was observed with cannabis.

**Workpackage No.:** 2

**Author:** RAFAELSEN, LISE; CHRISTRUP, HENRIETTE; BECH, PER. AND RAFAELSEN, OLE, J.

**Year:** 1973

**Title:** Effects of Cannabis and Alcohol on Psychological Tests

**Journal/Book Name:** Nature

**Volume:** 242, 117-118

**Workpackage No.:** 2

**Author:** RAFAELSEN, O.J., BECH, P. AND RAFAELSEN, L.

**Year:** 1973

**Title:** Simulated car driving influenced by cannabis and alcohol

**Journal/Book Name:** Pharmakopsychiatr Neuropsychopharmakol

**Volume:** 6, 2, 71-83

**Keywords:** cannabis, THC, alcohol, dose-response, simulated car driving, time, distance

**Abstract:** Simulated car driving was studied with oral administration of cannabis resin containing 4% THC in three doses equivalent to 8, 12, and 16 mg THC. Alcohol was given orally in one standard dose of 70 g

Both cannabis and alcohol increased brake time and start time, whereas alcohol increased, while cannabis decreased, the number of gear changes. Mean speed was unchanged, but bigger variations in actual speed was observed with both drugs. Cannabis showed a much stronger effect than alcohol on the estimation of time and distance. The effect of cannabis was more marked on the 'subjective' than on the 'objective' estimation.



A dose-response type of effect was seen on cannabis both behaviourally and phenomenologically. It seems justified to draw the following three conclusions:

1. Cannabis and alcohol produce two different kinds of intoxication phenomenologically.
2. Dose-response effects of cannabis is seen both behaviourally and phenomenologically.
3. Cannabis has pronounced effects on some skills and judgements essential for driving

Nach oraler Verbreichung von Cannabis-Harz (mit 4% THC) in Dosen von 8,12 und 16 mg THC wurde das Fahrverhalten auf einem Simulator geprüft.

Der Alkohol wurde in einer Standarddosis con 70 g gegeben.

Sowohl durch Alkohol als auch durch Cannabis wurden die Brems- und die Startzeit erhöht, während die Anzahl de Schalthebelbetatigungen durch Alkohol erhöht, durch cannabis aber herabgesetzt wurde. Obwohl die mittlere Geschwindigkeit gleich blieb, wiesen bei beiden Drogen die Momentangeschwindigkeiten grobere Streuung auf.

Cannabis zeigte gegenüber Alkohol eine viel grobere Wirkung auf das Zeit -und Distanzenschatzen. Die Cannabiswirkung war beim 'subjektiven'. Schätzen deutlicher als beim 'objektiven'.

Sowohl im Verhalten als auch phanomenologisch war eine Dosisabhängigkeit der Cannabis wirkung festzustellen.

Es scheint berechtigt, die folgenden drei Schlusse zu ziehen.

1. phanomenologisch bewirken Cannabis und Alkohol zwei verschiedene Intoxikationen.
2. Cannabis zeigt sowohl im Verhalten als auch phanomenologisch eine dosisabhängige Wirkung.]
3. Cannabis beeinflubt deutlich einige fur das Fahren eines Motorwagens wichtige Fahigkeiten und Entschwidungen

**Workpackage No.:** 2

**Author:** RAINEY, PETRIE, M

**Year:** 1995

**Title:** Testing Reckless Drivers for Substance Abuse

**Journal/Book Name:** The New England Journal of Medicine

**Volume:** .332, 13, 893-893

**Abstract:** Letter talks about urine tests for cocaine and marijuana designed specifically to recognise the metabolites rather than the parent compounds, because the metabolites can be detected longer after drug use, thus increasing the sensitivity of the test for detecting any abuse. (AS32)

**Workpackage No.:** 1

**Author:** RAMAEKERS, J.G., SWIJGMAN, H.F. AND OHANLON, J.F.

**Year:** 1992

**Title:** Effects of Moclobemide and Mianserin on Highway Driving, Psychometric Performance and Subjective Parameters, Relative to Placebo

**Journal/Book Name:** Psychopharmacology

**Volume:** 106, S, S62-S67

**Keywords:** moclobemide, mianserin, driving performance, psychometric performance, subjective assessments

**Abstract:** The acute and sub-chronic effects of moclobemide and mianserin on driving and psychometric performance were compared to those of placebo in a double-blind, cross-over study involving 17 healthy volunteers. Mianserin, moclobemide and placebo were administered for 8 days. Subjects' performance was measured on days 1 and 8 of each treatment series; subjective sleep parameters, mood, and possible side-effects were recorded each treatment day on questionnaires or visual analog scales. Mianserin affected most of the performance measures, while moclobemide affected none; mianserin also impaired driving and tracking performance and decreased CFF. Whilst receiving mianserin, subjects reported depressed levels of alertness, calmness, and contentment; the quality of their sleep was unaffected, but its duration increased, together with feelings of drowsiness and fatigue during the day. No statistical interactions between the factors Drugs and (Treatment) Days were found, indicating that little pharmacological tolerance developed over time during mianserin treatment. Mianserin's sedative properties are held responsible for all performance and subjective effects of the drug. It is concluded that moclobemide 200 mg b.i.d. has no important sedative properties.

**Workpackage No.:** 2

**Author:** RAMAEKERS, J.G., UITERWIJK, M.M., AND O'HANLON, J.F.

**Year:** 1992

**Title:** Effects of loratidine and cetirizine on actual driving and psychometric test performance, and EEG during driving

**Journal/Book Name:** Eur J Clin Pharmacol

**Volume:** 42, 4, 363-9

**ISBN/ISSN:** 0031-6970

**Keywords:** adult, automobile driving, comparative study, cyprophetadine, double-blind method, electroencephalography, ethanol, female, histamine, antagonists, human, hydroxyzine, male, psychological tests, psychometrics, psychomotor performance

**Abstract:** Sixteen healthy male and female volunteers took part in a 6-way, double-blind cross-over trial to compare the effects of single doses of cetirizine 10 mg, loratidine 10 mg and placebo, with and without alcohol (0.72 g.kg<sup>-1</sup>, lean body mass). Performance was measured in two repetitions of a psychometric test battery, and a standard, over-the-road driving test. EEG was also measured during driving. Alcohol significantly affected almost every performance measure and altered the EEG energy spectrum during driving whilst the blood concentrations declined from 0.37 to 0.20 mg.ml<sup>-1</sup>. The effects of cetirizine on driving performance resembled those of alcohol. It caused the subjects to operate with significantly greater variability in speed and lateral position ('weaving' motion). The effects of alcohol and cetirizine appeared to be additive. Certain cetirizine-placebo differences in subjective feelings and test battery performance were also significant. Loratidine had no significant effect on any performance parameter. It was concluded that cetirizine, but not loratidine, generally caused mild impairment of performance after a single 10 mg dose.

**Workpackage No.:** 2

**Author:** RAMAEKERS, J.G. AND O'HANLON, J.F.

**Year:** 1994

**Title:** Acrivastine, terfenadine and diphenhydramine effects on driving performance as a function of dose and time after dosing

**Journal/Book Name:** Eur J Clin Pharmacol

**Volume:** 47, 3, 261-6

**ISBN/ISSN:** 0031-6970

**Keywords:** administration, oral, adult, automobile driving, comparative study, cross-over study, diphenhydramine, dose-response relationship, drug, drug interactions, drug therapy, combination, ephedrine, female, human, infant, newborn, middle age, single-blind method, terfenadine, triprolidine

**Abstract:** The study was conducted according to a nine-way, observer- and subject-blind, cross-over design. Its purpose was to compare the single-dose effects of the following drugs on driving performance: acrivastine (8, 16 and 24 mg); the combination of acrivastine (8 mg) with pseudoephedrine (60 mg); terfenadine (60, 120 and 180 mg); diphenhydramine-HCl (50 mg); and placebo. The subjects were 18 healthy female volunteers. Drug effects were assessed in two repetitions of two driving tests (highway driving and car-following) after each treatment. Acrivastine's impairing effects in both driving tests were similarly dose-related. The 8-mg dose had a small, but significant, effect on highway driving in the first trial. The 16-mg and 24-mg doses significantly impaired driving in both tests during the first trial and the 24-mg dose did so again during the second trial. Neither the combination of acrivastine with pseudoephedrine nor terfenadine caused any significant impairment of performance. Diphenhydramine significantly impaired driving in both tests during every trial. In conclusion, the normal therapeutic dose of acrivastine (8 mg) had little effect on driving performance, and virtually none when that dose was given in combination with pseudoephedrine (60 mg). Higher doses of acrivastine severely impaired driving performance. Terfenadine had no significant effect on driving performance after any dose while diphenhydramine strongly impaired every important driving parameter.

**Workpackage No.:** 2

**Author:** RAMAEKERS, J.G., MUNTJEWERFF, N.D. AND O'HANLON, J.F.

**Year:** 1995

**Title:** A comparative study of acute and subchronic effects of dothiepin, fluoxetine and placebo on psychomotor and actual driving performance

**Journal/Book Name:** British Journal of Clinical Pharmacology

**Volume:** 39, 4, 397-404

**ISBN/ISSN:** 0306-5251

**Keywords:** adult, attention, automobile driving, chromatography, high pressure liquid, comparative study, cross-over studies, dothiepin, double-blind method, female, fluoxetine, human, male, middle age, multivariate analysis, psychomotor performance, questionnaires, sleep

**Abstract:** 1. The acute and subchronic effects of dothiepin 75-150 mg and fluoxetine 20 mg on critical, fusion frequency (CFF), sustained attention and actual driving performance were compared with those of placebo in a double-blind, cross-over study

involving 18 healthy volunteers. Drugs and placebo were administered for 22 days in evening doses. Fluoxetine doses were constant but dothiepin doses increased on the evening of day 8. Performance was assessed on days 1, 8 and 22 of each treatment series. Subjective sleep parameters and possible side effects were recorded on visual analogue scales on alternate treatment days. 2. Dothiepin reduced sustained attention on day 1 by 6.7% (95% confidence interval (C I): - 1 2.0 to - 1.3%) and CFF on day 22 by 1. 1 (CI: - 2.2 to -0. 1) Hz. Fluoxetine reduced sustained attention days 1, 8 and 22 of treatment by 7.4, 6.7 and 6.5% respectively (CI: -1 1.3 to -3.6; -14.3 to -1.5 and -9.5 to -3.4). CFF decreased linearly over days during fluoxetine treatment and significantly differed from placebo on day 22 with 1.2 Hz (CI: -2.3 to -0.2). Neither drug significantly affected driving performance. Whilst receiving dothiepin, subjects complained of drowsiness on days 1-3 of treatment (mean rank 5.6; CI: 2.0 to 9.2) and slept 43 min longer (CI: 8.2 to 76.2).

**Workpackage No.:** 2

**Author:** RAMAEKERS, J.G., ANSSEAU, M., MUNTJEWERFF, N.D, SWEENS, J.P. AND O'HANLON, J.F.

**Year:** 1997

**Title:** Considering the P450 cytochrome system as determining combined effects of antidepressants and benzodiazepines on actual driving performance of depressed outpatients

**Journal/Book Name:** International Clinical Pharmacology

**Volume:** 12, 3, 159-69

**ISBN/ISSN:** 0268-1315

**Keywords:** adolescence, adult, aged, anti-anxiety agents, benzodiazepine, anti-depressive agents, automobile driving, benzamides, cytochrome P-450. depressive disorder, double blind method, drug interactions, drug therapy, combination, female, fluvoxamine AE/TU, human, male, middle age, monamine oxidase inhibitors, psychiatric status rating scales, psychomotor performance, support, Non-U.S. Gov't, time factors

**Abstract:** Parallel groups of depressed (DSM III-R) outpatients received moclobemide (n @ 22) and fluoxetine (n = 19), double blind, for 6 weeks. Respective starting doses were 150 mg twice a day and 20 mg q.a.m. These could be doubled after 3 weeks for greater efficacy. Chronic users of benzodiazepine anxiolytics continued taking them as comedication. Therapeutic and side effects were assessed using conventional rating scales. Actual driving performance was assessed during the week before therapy and at 1, 3 and 6 weeks thereafter using a standardized test that measures standard deviation of lateral position (SDLP). Similar remissions in depressive symptoms and side effects occurred in both groups. Patients drove with normal and reliable ( $r = 0.87$ ) SDLPs before treatments. Most continued to do so but a few drove with progressively rising SDLPs and the overall trends were significant in both groups ( $p < 0.03$ ). A post-hoc multiple regression analysis was applied for identifying factors that correlated with SDLP in separate tests after the beginning of therapy. At 3 and 6 weeks there were significant ( $p < 0.03$ ) relationships involving the same factor; patients who drove with progressively higher SDLPs appeared to be those using benzodiazepines that are metabolized by a P450 isozyme subject to inhibition by their particular antidepressant.

**Workpackage No.: 2**

**Author:** RAMAEKERS, J.G.

**Year:** 1998

**Title:** Behavioural toxicity of medicinal drugs. Practical consequences, incidence, management and avoidance

**Journal/Book Name:** Drug Safety

**Volume:** 18, 3, 189-208

**ISBN/ISSN:** 0114-5916

**Keywords:** accidental falls, accidents, occupational, traffic, behaviour, drug therapy, human, pharmaceutical preparations

**Abstract:** Behavioural toxicity is relatively common among medicinal drug users and evidence shows that drugs frequently produce adverse effects that prevent their users from performing everyday operations in a normal manner. Epidemiological research generally indicates that the use of sedative drugs is associated with an increased risk of becoming involved in injurious accidents. Empirical studies have also demonstrated adverse effects of sedative drugs on the performance of healthy volunteers and patients in laboratory tests designed to measure psychomotor and cognitive function, and in real life-tests measuring on-the-road driving performance. Empirical studies also indicate that behavioural toxicity can vary widely between individual drugs depending on differences in dose, dosing regimen, duration of treatment, pharmacokinetics or mechanisms of actions. Besides sedation, other CNS adverse effects such as aggression, paranoia, social withdrawal or lack of motivation may disrupt or prevent the initiation of normal performance, thus imposing a burden on the ability of the patients to function in a normal manner. Emotional disturbances are rare as indicated by the small number of case reports that mention their existence. Yet these disturbances sometimes involve severe reactions that are more debilitating than sedation. Behavioural toxicity can be minimised by avoidance of pharmacodynamic and pharmacokinetic drug interactions, adjustment of dosage regimens to a patient's individual response to a drug, nocturnal administration of drugs that are expected to produce sedation and patient education on the potential risks of the drugs they receive. Much of this information can be gained from experimental literature comparing the effect of individual drugs on performance. Unfortunately this is presently incomplete, since most research on behavioural toxicity has been confined to psychiatric drugs. Yet, in the interest of the patient, it should be the responsibility of drug manufacturers and regulators to always identify problematic drugs.

**Workpackage No.: 1**

**Author:** RAY, W.A., FOUGHT, R.L. AND DECKER, M.D.

**Year:** 1992

**Title:** Psychoactive-drugs and the risk of injurious motor-vehicle crashes in elderly drivers

**Journal/Book Name:** American Journal of Epidemiology

**Volume:** 136, 7, 873-883

**Keywords:** accidents, traffic, analgesics, addictive, antidepressive agents, benzodiazepines, histamine H-I receptor blockaders, psychotropic drugs

**Abstract:** To determine whether commonly used psychoactive drugs increase the risk of involvement in motor vehicle crashes for drivers <65 years of age, the authors conducted a retrospective cohort study. Data were obtained from computerized files from the Tennessee Medicaid program, driver's license files, and police reports of injurious crashes. Cohort members were Medicaid enrollees 65-84 years of age who had a valid driver's license during the study period 1984-1988 and who met other criteria designed to exclude persons unlikely to be drivers and to ensure availability of necessary study data. There were 16,262 persons in the study cohort with 38,701 person-years of follow-up and involvement in 495 injurious crashes. For four groups of psychoactive drugs (benzodiazepines, cyclic antidepressants, oral opioid analgesics, and antihistamines), the risk of crash involvement was calculated with Poisson regression models that controlled for demographic characteristics and use of medical care as an indicator of health status. The relative risk of injurious crash involvement for current users of any psychoactive drug was 1.5 (95% confidence interval (CI) 1.2-1.9). This increased risk was confined to benzodiazepines (relative risk = 1.5; 95% CI 1.2-1.9) and cyclic antidepressants (relative risk = 2.2; 95% CI 1.3- 3.5). For these drugs, the relative risk increased with dose and was substantial for high doses: 2.4 (95% CI 1.3-4.4) for greater-than-or-equal-to 20 mg of diazepam and 5.5 (95% CI 2.6-11.6) for greater-than-or-equal-to 125 mg of amitriptyline. Analysis of data for the crash-involved drivers suggested that these findings were not due to confounding by alcohol use or driving frequency

**Workpackage No.:** 3

**Author:** RAY, W.A., GURWITZ, J., DECKER, M.D. AND KENNEDY, D.L.

**Year:** 1992

**Title:** Medications and the safety of the older driver: is there a basis for concern?

**Journal/Book Name:** Human Factors

**Volume:** 34, 1, 33-47

**ISBN/ISSN:** 0018-7208

**Keywords:** accidents, traffic PC, aged, automobile driving, brain, drug therapy, human, psychotropic drugs, risk factors, safety, support, Non U.S. Gov't, support, U.S. Gov't

**Abstract:** Medications with central nervous system (CNS) effects, including benzodiazepines, cyclic antidepressants, antihistamines, narcotic analgesics, and hypoglycemics, have been thought to have the potential to impair driving. These drugs impair performance in younger drivers and some have been linked to an increased risk of motor vehicle crashes. Even though persons 65 years of age and older frequently take these drugs and are more susceptible to CNS effects, no direct data exist regarding whether or not medications adversely affect driving safety in this population. Thus there is an urgent need for further research in this area.

**Workpackage No.:** 1

**Author:** RAY, W.A., THAPA, P.B. AND SHORR, R.I.

**Year:** 1993

**Title:** Medications and the older driver

**Journal/Book Name:** Clin Geriatr Med

**Volume:** 9, 2, 413-38

**ISBN/ISSN:** 0749-0690

**Keywords:** aged, antidepressive agents, automobile driving, benzodiazepines, epidemiologic methods, human, pharmaceutical preparations, psychomotor performance, support, Non U.S. Gov't , support, U.S. Gov't P.H.S. United States

**Abstract:** Table 4 provides a summary of the evidence that specific medications adversely affect the safety of the older driver. The preponderance of evidence suggests that benzodiazepines adversely affect the safety of the older driver, particularly for high doses and long half-life compounds. This conclusion is based upon the very consistent psychomotor function data showing pronounced dose-related impairment, the more limited epidemiologic data on crash involvement, epidemiologic data associating benzodiazepines with other types of injuries, and the fact that the reasons for most benzodiazepine use are not plausible confounders. This conclusion thus reinforces the need to prescribe benzodiazepines cautiously, including assessment of nonpharmacologic alternatives, use of the lowest possible dose for the shortest possible time, and avoidance of the very long half-life compounds. As more new nonbenzodiazepine anxiolytics and hypnotics become available, their effects on the safety of the elderly driver need to be determined. There is some evidence that cyclic antidepressants, currently the mainstay for treatment of depression in the elderly population, adversely affect driving safety; however, because of the paucity of experimental and epidemiologic data concerning the effects of depression per se on driving, further research is needed. Nevertheless, the existing data reinforce the need for careful prescribing of antidepressants, particularly avoidance of agents with high side-effect profiles (such as amitriptyline and imipramine) in the older driver. For hypoglycemics, although there is sufficient evidence of driving impairment to create a basis for concern, there are many unresolved questions. Currently, diabetic patients should be advised concerning the risk and management of hypoglycemia. For other sedating drugs, it always is prudent to advise patients concerning potential effects on driving. Unlike younger drivers, the typical older driver is a medication-taker. There now is a substantial body of evidence that commonly used medications can interfere with driving safety. Because many questions remain unanswered, there is a pressing need for further research that more fully elucidates how patient characteristics, disease, and drugs interact to affect driving safety; however, sufficient data are available to reinforce an underlying theme in geriatric medicine that is not yet fully implemented in practice: the need for caution in pharmacotherapy, with selection of a drug, dose, and regimen suitable for the unique characteristics of this population.

**Workpackage No.:** 1

**Author:** REEVE, V.C.

**Year:** 1979

**Title:** Incidents of marihuana in a California impaired driver population.

**Journal/Book Name:** California State Department of Justice, Sacramento, CA.

**Keywords:** marihuana; field

**Workpackage No.: 3**

**Author:** REEVE, V.C., GRANT, J.D., ROBERTSON, W., GILLESPIE, H.K. AND HOLLISTER, L.E.

**Year:** 1983

**Title:** Plasma concentrations of delta -9-Tetrahydrocannabinol and impaired motor function

**Journal/Book Name:** Drug and Alcohol Dependence

**Volume:** 11, 2, 167-175

**ISBN/ISSN:** 0376-8716/83

**Keywords:** tetrahydrocannabinol, sobriety test, plasma concentrations

**Abstract:** Fifty nine volunteer subjects were allowed to smoke marijuana cigarettes until a satisfactory level of 'high' was obtained. They then had blood samples taken 5, 30, 90, and 150 min following smoking after which they were tested with the roadside sobriety test. Attempts to correlate passing or failing on three coordination tests with plasma concentrations of  $\Delta$ -9-tetrahydrocannabinol (THC) showed that if concentrations measured at 5 min were ignored, failures were almost inevitably associated with plasma concentrations of THC above 25-30 ng/ml. Overall, 94% of subjects failed to pass the test 90 min after smoking and 60% after 150 min, despite the fact that by then plasma concentrations were rather low. It would seem that establishing a clear relation between THC plasma concentrations and clinical impairment will be much more difficult than it has been for alcohol.

**Workpackage No.: 2**

**Author:** REEVE, V.C., ROBERTSON, W.B., GRANT, J., SOARES, J.R., ZIMMERMAN, E.G., GILLESPIE, H.K. AND HOLLISTER, L.E.

**Year:** 1983

**Title:** Hemolyzed blood and serum levels of delta 9-THC: effects on the performance of roadside sobriety tests.

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 28, 4, 963-71

**ISBN/ISSN:** 0022-1198

**Keywords:** adult, alcoholic intoxication, automobile driving, behaviour, female, human, male, marijuana abuse, middle age, support, non U.S. Gov't, tetrahydrocannabinol, time factors

**Abstract:** A pilot study was conducted to ascertain the range of induced hemolyzed blood/serum delta 9-tetrahydrocannabinol (delta 9-THC) concentrations in 58 human subjects. Subjects were tested within 5 min of smoking a delta 9-THC cigarette and then at half-hour intervals to 150 min. The subjects initially demonstrated a broad range of delta 9-THC hemolyzed blood levels, which settled within an hour to levels comparable to those measured in California drivers who had been stopped for impaired driving, arrested, and tested for delta 9-THC. Serum levels, when correlated with performance or roadside sobriety tests, demonstrated a broad range (5 to 183 ng/mL) of delta 9-THC levels and an "adaptation effect in the subjects' perception of their own impairment.



Although this preliminary study was not a double-blind placebo experiment, the overall performance of human subjects demonstrated the "adaptation effect, which may be a significant factor in making judgments while performing such complex tasks as driving. Also, the effects of the drug extended beyond the period of elevated delta 9-THC blood levels, perhaps because of TUC metabolites that may contribute to impairment or the persistence of TUC in the central nervous system. This pilot study will lay the groundwork for a program designed to determine the epidemiology and behavior correlates of marijuana use in motorists.

**Workpackage No.:** 2

**Author:** REUBEN, DB; SILLIMAN, RA. AND TRAINES, M

**Year:** 1988

**Title:** The aging driver. Medicine, policy and ethics.

**Journal/Book Name:** J Am Geriatr Soc

**Volume:** 36(12), 1135-42

**ISBN/ISSN:** 0002-8614

**Keywords:** Aged; Aging \*PH; Automobile Driving\*; Ethics, Medical; Human; Licensure LJ; Public Policy; \*TD; Risk; United States

**Abstract:** With the graying of America, more older persons will be driving. Physiological changes

associated with normal aging and diseases that commonly affect the elderly may compromise their ability to drive safely. Although all states have regulations governing driving licensure, few offer specific guidelines regarding older persons. Accordingly, much of the responsibility for determining medical competence to drive and counseling patients in this regard is left to physicians. Normal physiologic changes may limit sensory information, particularly visual, available to the driver. In addition, chronic diseases in older persons including coronary artery disease, dementia and other neurologic disorders, diabetes mellitus, and drug use may increase the risk of crashes while driving. Once the question of competence to operate an automobile has been raised, ethical dilemmas must be addressed regarding the benefit of continued driving for the individual versus the risk to that person and society as a whole. In this article, we review the medical grounds for determining competence to drive, discuss ethical implications, and report current legal regulations for physicians and aging drivers. Future directions and possible areas for further research are outlined.

**Workpackage No.:** 1

**Author:** RICHARDSON, J.

**Year:** 1992/3

**Title:** The effects of drugs (other than alcohol) on road safety in Victoria

**Journal/Book Name:** Proceedings of the 14th International Conference on Alcohol, Drugs and Traffic Safety, Annecy.

**Volume:** 1, 21-28

**ISBN/ISSN:** 2-9511746-0-8

**Keywords:** drugs, driving, impairment, testing, blood analysis, alcohol, police observation

**Abstract:** Evidence is now available in Australia to demonstrate that the number of people killed or injured after taking an illicit or licit drug is approaching that of alcohol. Significant successful countermeasures have reduced drink driving and speeding but the effects of drugs on each individual are so diverse that the issue has been very difficult to resolve. Unlike alcohol, no simple roadside testing device is available to test the levels of impairment caused by drugs used in the many millions of possible combinations by drivers. The Victorian Road Safety Committee has proposed a package of countermeasures based on prevention, detection, action such as re-education and research. The detection, action such as re-education and research. The detection of persons impaired by drugs other than alcohol will be based on the principle of driver impairment. Drivers who fail a blood alcohol test but are still obviously impaired based on police observation would undertake two prescribed steps, one of which is video recorded. Blood or urine tests are only proposed when the decision is made to prosecute a drug impaired person

**Workpackage No.:** 1

**Author:** RISSER, D., STICHENWIRTH, M., KLUPP, N., SCHNEIDER, B., STIMPFL, T., VYCUDILIK. AND W., BAUER, G.

**Year:** 1998

**Title:** Drugs and driving in Vienna, Austria

**Journal/Book Name:** Journal of Forensic Science

**Volume:** 43, 4, 817-20

**ISBN/ISSN:** 0022-1198

**Keywords:** adolescence, adult, Austria, Automobile driving, female, fluorescence polarization, immunoassay, forensic medicine, human, male, mass fragmentography, retrospective studies, street drugs, substance abuse detection, substance related disorders

**Abstract:** Drugs that affect the central nervous system are generally assumed to have the potential to impair driving ability. In a retrospective survey, police files and the results of toxicological urine analysis from drivers suspected of driving under the influence of drugs in Vienna from 1993 to 1996 were investigated. Decisive for police intervention was "unsafe driving" (swerving, hesitating, going too slowly, etc.), driving at high speed within the city limits, driving through red lights or stop signs, and driving at night without lights. In one-fifth of the cases drivers caused a traffic accident. Casting suspicion on driving under influence of drugs was mainly caused by impaired coordination of movements, bloodshot eyes, slurred speech, drowsiness, conspicuous behavior, and changed pupils. In the majority of the study population more than two symptoms were recorded by police. In 94% of the cases police suspicions could be confirmed by toxicological urine analysis

**Workpackage No.:** 3

**Author:** ROBBE, H.W.J. AND O'HANLON, J.F.

**Year:** 1992/3

**Title:** Marijuana's effect on actual driving: summary of a 3-year experimental program  
**Journal/Book Name:** Proceedings of the Twelfth International Conference on Alcohol, Drugs and Traffic Safety, Cologne, Germany.

**Volume:** 2, 490-496

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** marijuana, dose-response relationship, driving performance, studies, impairment, USA, THC

**Abstract:** A program was set up to determine the dose-response relationship between marijuana and objectively and subjectively measured aspects of real world driving; and, to determine whether it is possible to correlate driving performance impairment with plasma concentrations of the drug or a metabolite. A variety of driving tasks were employed, including; maintenance of a constant speed and lateral position during uninterrupted highway travel, following a leading car with varying speed on a highway, and city driving. The purpose of applying different tests was to determine whether similar changes in performance under the influence of THC occurs in all thereby indicating a general drug effect on driving safety. As the report has not been completed at the time of the conference the results could not be reported although the methodologies are presented.

**Workpackage No.:** 1

**Author:** ROBBE, H.W. AND OHANLON, J.F.

**Year:** 1995

**Title:** Acute and subchronic effects of paroxetine 20 and 40 mg on actual driving, psychomotor performance and subjective assessments in healthy volunteers.

**Journal/Book Name:** European Neuropsychopharmacology

**Volume:** 5, 1, 35-42

**ISBN/ISSN:** 0924-977X

**Keywords:** adult, amitriptyline, human, male, paroxetine, psychiatric, psychiatric status rating scales, psychomotor performance, questionnaires, sleep, support, non U.S. Gov't, time factors

**Abstract:** The effects of paroxetine (20 and 40 mg/day) and amitriptyline (75 mg/day, used as an active control) on car driving and psychomotor function were compared with those of placebo in a double-blind, crossover study employing 16 healthy subjects. Performance testing occurred on the first and last day of each 8-day treatment series. Side-effects, sleep duration and sleep quality were rated daily. Amitriptyline produced severe drowsiness and strikingly impaired performance on nearly every test on the first day but its effects were practically gone after 1 week of treatment. Paroxetine 20 mg, the usual antidepressant dose, had no effect on performance. Paroxetine 40 mg did not affect road tracking but slightly impaired performance in some psychomotor tests in a persistent manner. Paroxetine had no effect on sleep following the 20 mg dose but reduced quality following the 40 mg dose. Side-effects that the administered drugs have in common were milder during paroxetine than amitriptyline treatment. However, some dose-related side-effects (e.g. nausea and delayed ejaculation) were only reported during paroxetine treatment.

**Workpackage No.:** 2

**Author:** ROBBE, H.W.J.

**Year:** 1995/6

**Title:** Marijuana's effects on actual driving performance

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** marijuana/driving performance/ car following/alcohol impaired

**Abstract:** Marijuana's effects on actual driving performance were assessed in a series of three studies wherein dose-effect relationships were measured in actual driving situations that progressively approached reality. The first was conducted on a highway closed to other traffic. Subjects (24) were treated on separate occasions with THC 100, 200 and 300 µg/kg, and placebo. They performed a 22-km road tracking test beginning 30 and 90 minutes after smoking. Their lateral position variability increased significantly after each THC dose relative to placebo in a dose-dependent manner for two hours after smoking. The second study was conducted on a highway in the presence of other traffic. Subjects (16) were treated with the same THC doses as before. They performed a 64-km road tracking test preceded and followed by 16-km car following tests. Results confirmed those of the previous study. Car following performance was only slightly impaired. The third study was conducted in high-density urban traffic. Separate groups of 16 subjects were treated with 100 µg/kg THC and placebo; and, ethanol (mean BAC .034g%) and placebo. Alcohol impaired performance relative to placebo but subjects did not perceive it. THC did not impair driving performance yet the subjects thought it had. These studies show that THC in single inhaled doses up to 300 µg/kg has significant, yet not dramatic, dose-related impairing effects on driving performance.

**Workpackage No.:** 2

**Author:** ROBERTSON, M.D. AND DRUMMER, O.H.

**Year:** 1994

**Title:** Responsibility analysis - A methodology to study the effects of drugs in driving

**Name:** Accident Analysis and Prevention

**Volume:** 26, 2, 243-247

**Keywords:** alcohol, culpability, driving, drugs, responsibility

**Abstract:** In order to study the role of drugs in driving, a responsibility analysis was developed to allow an assessment to be made of the driver's culpability or responsibility in an accident. Factors possibly mitigating drivers' responsibility in each accident were identified and scored. Factors considered were: condition of road, condition of vehicle, driving conditions, accident type, witness observations, road law obedience, difficulty of task, and level of fatigue. If a sufficient number of mitigating factors were identified a driver would be found to be either partly or totally exonerated from blameworthiness and scored either as a contributory or nonculpable driver. If drugs present in a driver contributed to accident causation, it would be expected that they would be overrepresented in culpable drivers, i.e. those drivers not exonerated from blame. A total of 341 driver fatalities occurring in Victoria were analysed for blood alcohol content

(BAC). Twenty nine percent had a BAC over .05% (the legal limit in Victoria). Alcohol positive drivers were statistically over-represented in the culpable group ( $P<.001$ ), in single-vehicle accidents ( $P<.05$ ) and those accidents in which vehicles left the road for no apparent reason ( $P<.001$ ). Odds-ratio estimation of relative risk of culpable and nonculpable drivers showed that the relative risk rose diproportionatetely to BAC

**Workpackage No.:** 3

**Author:** ROBINSON, C.D. AND MOSKOWITZ, H.

**Year:** 1985

**Title:** Methadone maintenance treatment and aspects of skilled performance

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety, U.S. Department of Transport, Washington

**Volume:** 1145-1157

**Keywords:** methadone maintenance, driving, drugs, skilled performance, divided attention, tracking, information processing, studies, treatment, short-term memory, visual acuity, rate of accommodation, peripheral vision, visual search performance

**Abstract:** Analyses of complex skills such as driving indicate 2 general areas where performance decrements could be expected as a consequence of methadone maintenance treatment: information processing and divided attention performance, and tracking performance. We describe 2 experiments; the first, an investigation of the effects of methadone maintenance treatment on visual functioning, and the second, a study of the effects of this treatment on information processing and performance under divided attention conditions. We found that subjects in methadone maintenance treatment programs showed a slower rate of information processing from immediate to short term memory, but the treatment showed no effects on visual acuity, rate of accommodation, peripheral vision, or visual search performance. We discuss these findings in terms of existing evidence and recommended replication

**Workpackage No.:** 2

**Author:** ROEHRS, T; BEARE, D; ZORICK, F. AND ROTH, T

**Year:** 1994

**Title:** Sleepiness and ethanol effects on simulated driving.

**Journal/Book Name:** Alcohol Clin Exp Res

**Volume:** 18(1), 154-8

**ISBN/ISSN:** 0145-6008

**Keywords:** Sleepiness, Ethanol, Simulated driving, adult, alcohol drinking, attention, automobile driving, human, male, polysomnography, psychomotor performance, sleep deprivation, support, Non U.S. Gov't, support U.S. Gov't, wakefulness

**Abstract:** Twelve healthy young men were assessed in each of four experimental conditions presented in a Latin Square design: 8-hr time in bed (TIB) and placebo, 4-hr TIB and placebo, 8-hr TIB and ethanol, and 4-hr TIB and ethanol. After consuming ethanol (0.6 g/kg) or placebo (0900-0930 hr) with 20% supplements at 1030 and 1100 hr, subjects were tested for sleepiness (Multiple Sleep Latency Test at 1000, 1200, 1400, and 1600 hr) and divided attention (1030 hr) performance on day 1, and for simulated

driving and divided attention (1000-1200 and 1400-1600 hr) performance on day 2. In the morning testing, with breath ethanol concentrations (BECS) averaging 0.049%, sleepiness was increased, divided attention reaction times increased (on both days), and simulated driving performance was disturbed in the ethanol and 4-hr TIB relative to placebo. Similarly in the afternoon, with BECs averaging 0.013%, the ethanol and 4-hr TIB condition increased sleepiness and disrupted divided attention and simulated driving performance. The results show that sleepiness and low-dose ethanol combine to impair simulated automobile driving, an impairment that extends beyond the point at which BEC reaches zero. They provide a possible explanation for the incidence of alcohol-related automobile accidents at low BECS.

**Workpackage No.:** 2

**Author:** ROHRICH, J., SCHMIDT, K.. AND BRATZKE. H.

**Year:** 1995

**Title:** Detection of amphetamine derivatives in chemical toxicological studies 1987-1993 in the greater Frankfurt area

**Journal/Book Name:** Blutalkohol

**Volume:** 32, 1, 42-9

**ISBN/ISSN:** 0006-5250

**Keywords:** amphetamines, automobile driving, cross-sectional studies, english abstract, Germany, incidence, mass screening, substance abuse detection, substance related disorders, urban population

**Abstract:** Chemical-toxicological testing during the period from 1987 to 1993 revealed a remarkable increase in amphetamine positive cases in the greater Frankfurt area. Amphetamine abuse is particularly worrying in car drivers, where the proportion of amphetamine positive cases increased from 0.49% in 1987 to 9.40% in 1993. Considering the fact, that the only samples tested were the ones of drivers exhibiting an impaired driving performance, the number of cases remaining undetected is most certainly higher. This study also demonstrated that amphetamine derivatives are rarely consumed on their own. In most cases (80%) they are consumed in conjunction with cannabis. The additional use of tranquillisers occurred more often than that of cocaine. It seems that amphetamine abuse plays only a minor role with heroin users. This is emphasised by the low number of drug fatalities

**Workpackage No.:** 3

**Author:** ROSS, HL

**Year:** 1993

**Title:** Prevalence of alcohol-impaired driving: an international comparison.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 25(6), 777-9.

**ISBN/ISSN:** 0001-4575

**Keywords:** Alcohol-impaired driving, Australia, automobile driving, comparative study, Europe, human, North America, prevalence, retrospective studies

**Abstract:** This paper reports international differences in the extent of alcohol-impaired driving. These differences are then interpreted in the light of inducements and disincentives to drink and to drive.

**Workpackage No.:** 1

**Author:** ROSSLER, H., BATTISTA, H.J., DEISENHAMMER, F., GUNTHER, V., POHL, P., PROKOP, L. AND RIEMER, Y.

**Year:** 1993

**Title:** Methadone-substitution and driving ability

**Journal/Book Name:** Forensic Science International

**Volume:** 62, 1, 63-66

**ISBN/ISSN:** 0379-0738/93

**Keywords:** methadone-substitution, driving, drugs, therapy, rehabilitation, driving ability

**Abstract:** A general statement about the driving ability of HIV-positive as well as HIV-negative addicts undergoing methadone- substitution treatment cannot be made with certainty. Even isolated observations are not significant; only an individually performed assessment, free of prejudice and conscientiously done is decisive. The formal assertion that addiction equals driving-inability, which is largely practised at present, is inadmissible and therefore harmful to the therapeutic efforts for rehabilitation

**Workpackage No.:** 1

**Author:** ROTH, T. AND ROEHRS, T.

**Year:** 1985

**Title:** Determinants of residual effects of hypnotics

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 17, 4, 291-296

**ISBN/ISSN:** 0001-4575/85

**Keywords:** hypnotics, nighttime/daytime effects, performance, chronic use

**Abstract:** Studies of hypnotics have generally focused on the effects the drugs have on sleep. It is now clear that they also have effects which can extend beyond the usual sleep period. These residual effects of hypnotics are assessed by studying the effects of these drugs on performance. This paper discusses the issues critical to evaluating studies of the effects of hypnotics on performance. Dose and half-life are important variables in determining the degree to which these daytime effects occur following nighttime use. However, a number of issues have yet to be clarified. Whether residual effects persist with chronic use is not clear. Whether any specific skill may be more or less sensitive to residual effects cannot be determined from the available information. Finally, the degree to which the decrements occur in different populations is not well understood

**Workpackage No.:** 1

**Author:** ROTHENBERG, S., SCHOTTENFELD, S., MEYER, R.E. AND KRAUSS, K.

**Year:** 1977

**Title:** Performance differences between addicts and non-addicts.

**Journal/Book Name:** Psychopharmacology  
**Volume:** 52, 299-306.  
**Keywords:** methadone; experimental; addicts; non-addicts  
**Workpackage No.:** 2

**Author:** ROTHENBERG, S., SCHOTTENFELD, S., GROSS, K. AND SELKOE, D.  
**Year:** 1980a  
**Title:** Specific oculomotor deficit after acute methadone, 1. Saccadic eye movements.  
**Journal/Book Name:** Psychopharmacology  
**Volume:** 67, 221-227  
**Keywords:** methadone; experimental  
**Workpackage No.:** 2

**Author:** ROTHENBERG, S., SCHOTTENFELD, S., SELKOE, D. AND GROSS, K.  
**Year:** 1980b  
**Title:** Specific oculomotor deficit after acute methadone, 2. Smooth pursuit movements.  
**Journal/Book Name:** Psychopharmacology  
**Volume:** 52, 299-306.  
**Keywords:** methadone; experimental; vision  
**Workpackage No.:** 2

**Author:** ROTHENGATTER, J.A. AND DE BRUIN, R.A., (Eds.)  
**Year:** 1988  
**Title:** Road Users Behaviour: Theory and Research (Book)  
**Keywords:** accident analysis, risk models, driver stress, alcohol and drugs, road safety  
**Abstract:** This book is a compilation of papers that were initially presented at the Second International Conference of Road Safety held in Groningen, the Netherlands, in August 1987. The book is divided into 15 sections covering topics that include accident analysis, risk models, driver stress, alcohol and drugs, and road safety in developing countries among other pertinent topic areas.  
**Workpackage No.:** 1

**Author:** ROTHENGATTER, T.  
**Year:** 1997  
**Title:** Psychological Aspects of Road User Behaviour  
**Journal/Book Name:** Applied Psychology: An International Review  
**Volume:** 46 (3), 223 - 234  
**Keywords:** Driving behaviour; theory; models  
**Abstract:** Discusses models of road user behaviour and the attempts to modify driver behaviour.  
**Workpackage No.:** 1



**Author:** ROYAL PHARMACEUTICAL SOCIETY OF GREAT BRITAIN.

**Year:** 1998

**Title:** Cannabis

**Keywords:** cannabis; field; experimental

**Workpackage No.:** 1

**Author:** RUDELL, E. AND RUDELL, O

**Year:** 1991

**Title:** Does the highest judicial ordinance from a new limit value for absolute driving incapacity (BGH 4 SrR 297/90, Beschl. v. 28 June 1990) allow unequal treatment of alcohol intoxicated drivers?

**Journal/Book Name:** Blutalkohol

**Volume:** 28(4), 252-5

**ISBN/ISSN:** 0006-5250

**Keywords:** Accidents, Traffic LJ ; Alcohol Drinking BL/LJ ; Alcoholilic Intoxication BL; Automobile Driving LJ ; English Abstract ; Ethanol PK ; Germany ; Human ; Predictive Value of Tests

**Abstract:** The jurisdiction in the BRD knows a threshold value of the blood alcohol concentration from which on the actual absolute driving unfitness without any further evidence will be assumed. This threshold value has been lowered by the highest German criminal court (BGH) from so far 1.3% to now 1.1 g%. As the determination of the alcohol content takes place in two different procedures as a mean value out of four or five single values, the highest court orders a dispersion control--the standard deviation from 0.03 g% or 0.04 g%. The authors prove that therefore a dissimilar treatment of motor traffic participants under the influence of alcohol may be possible. The reason is to be traced in the different distributions of a single values around the mean value and in the incorrect application of the standard deviation.

**Workpackage No.:** 1

**Author:** RUUD, J. AND GJERDE, H

**Year:** 1992

**Title:** Alcohol consumption among convicted drivers.

**Journal/Book Name:** Tidsskr Nor Laegeforen

**Volume:** 112(25), 3216-20

**ISBN/ISSN:** 0029-2001

**Keywords:** Gamma-glutamyltransferase, adult, alcohol drinking, alcoholism, automobile driving, english abstract, human, male, middle age, Norway, prisoners, questionnaires

**Abstract:** 150 males imprisoned for drunken driving were assessed by means of a questionnaire and medical examination. The objectives were to study alcohol consumption and frequency of alcohol-related problems. Half of the assessed persons were less than 30 years of age. 62% had a blood alcohol concentration > 1.50%. 36% had previously been convicted for drunken driving. Average alcohol consumption was 58 gram per day. 40% of the convicted persons reported a consumption of more than 40

gram alcohol per day. Corrected for under-reporting the consumption was even higher. The CAGE questionnaire was positive in 54%, indicating an alcohol-related problem. GGT (gamma-glutamyltransferase) was elevated in 23% and CDT (carbohydrate deficient transferring in 35%. This study indicates that 50-60% of convicted drunken drivers were excessive drinkers or/and had alcohol-related problems. Imprisonment and fines seem to have a limited impact on occurrence of drunken driving. Other strategies are discussed.

**Workpackage No.: 3**

## S

**Author:** SAARIALHO-KERE, U; JULKUNEN, H; MATTILA, MJ. AND SEPPALA, T  
**Year:** 1988

**Title:** Psychomotor performance of patients with rheumatoid arthritis: cross-over comparison of dextropropoxyphene, dextropropoxyphene plus amitriptyline, indomethacin and placebo.

**Journal/Book Name:** Pharmacol Toxicol

**Volume:** 63(4), 286-92

**ISBN/ISSN:** 0901-9928

**Keywords:** Adult; Aged; Amitriptyline \*AD/BL; Arthritis, Rheumatoid \*DT/PP; Clinical Trials; Comparative Study; Drug Therapy, Combination; Female; Human; Indomethacin PD/\*TU; Male; Middle Age; Propoxyphene \*AD/BL/PD; Psychomotor Performance \*DE; Support, Non-U.S. Gov't

**Abstract:** Actions on performance of dextropropoxyphene (DXP) alone and in combination with amitriptyline (AMI), indomethacin (IN), and placebo were compared in 15 patients with rheumatoid arthritis. The patients were on their prescribed maintenance regimen excluding analgesics. In four randomized test sessions at two-week intervals, they received double blind and crossover single oral doses of DXP 130 mg, IN 50 mg, DXP 65 mg + AMI 25 mg or placebo, each after two days pretreatment with the same drug. Objective and subjective effects were measured at baseline and 2 and 4 hours after drug administration. DXP impaired critical flicker discrimination, symbol copying and body balance without modifying tracking, choice reactions or attention. It rendered the subjects elated, muzzy, mentally slow and calm. Actions of AMI + DXP were about the same. IN impaired body balance and critical flicker recognition. Plasma concentrations of DXP were moderate to high whilst those of IN and AMI were fairly low. We conclude that therapeutic doses of DXP and IN are relatively safe in regard to driving skills. Small doses of AMI may not enhance the mild psychomotor effects of DXP. Earlier single dose studies carried out with healthy volunteers might have overestimated the decremental effects of analgesics on psychomotor performance.

**Workpackage No.:** 2

**Author:** SANDERS, A.F.

**Year:** 1986

**Title:** Drugs, driving and the measurement of human performance

**Journal/Book Name:** In: 'Drugs and Driving', O'Hanlon, J.F. and de Gier, J.J. (Eds.) pp.3-16.

**Keywords:** human performance; methodology

**Workpackage No.:** 1

**Author:** SARVELA, P.D., PAPE, D.J., ODULANA, J. AND BAJRACHARYA, S.M.

**Year:** 1990

**Title:** Drinking, drug use, and driving among rural midwestern youth

**Journal/Book Name:** Journal of School Health

**Volume:** 60, 5, 215-9

**ISBN/ISSN:** 0022-4391

**Keywords:** adolescence, age factors, alcohol drinking, automobile driving, female, human, Illinois, male, prevalence, risk factors, rural population, substance related disorders

**Abstract:** Data concerning self-reported driving after drinking or using other drugs were collected from 3,382 junior and senior high school students in rural central and southern Illinois. Drinking, drug use, and driving increased steadily with age, with 42% of the 12th grade class indicating they had driven a car at least one time in the past six months after drinking or using other drugs. Riding with a driver who had been drinking also increased with age; 20% of the seventh grade sample had ridden in a car with a drinking driver, while 58% of the 12th grade sample reported having done so. Slightly more females had ridden in a car with a driver who had been drinking than males, while males reported higher rates of driving after drinking or using other drugs than females. Correlation analyses indicated 22 variables related significantly to drinking, drug use, and driving. Forward stepwise multiple regression analysis showed that 11 variables related significantly to riding as a passenger with a drinking driver. Thirteen variables were related significantly to driving after drinking or using other drugs. Frequency of alcohol use variables were the most powerful indicators of self-reported driving after drinking or using other drugs in this sample

**Workpackage No.:** 3

**Author:** SARVELA, P.D., PAPE, D.J., ODULANA, J. AND BAJRACHARYA, S.M.

**Year:** 1990

**Title:** Drinking, drug use, and driving among rural midwestern youth.

**Journal/Book Name:** Journal of School Health

**Volume:** 60(5), 215-219

**Workpackage No.:** 3

**Author:** SCHEPENS, P.J., PAUWELS, A., VAN DAMME P., MUSUKU A., BEAUCOURT, L. AND SELALA, M.I.

**Year:** 1998

**Title:** Drugs of abuse and alcohol in weekend drivers involved in car crashes in Belgium

**Journal/Book Name:** Ann Emerg Med

**Volume:** 31, 5, 633-7

**ISBN/ISSN:** 0196-0644

**Keywords:** adult, age distribution, alcohol drinking, automobile driving, Belgium, emergency service, hospital, ethanol, female, human, male, mass screening, middle age, population surveillance, substance abuse detection, substance-related disorders, support, non U.S. Gov't, time factors

**Abstract:** STUDY OBJECTIVE: To determine levels of alcohol and drugs of abuse in weekend drivers injured in car crashes. METHODS: This study was the first systematic drug and alcohol testing of blood and urine samples of drivers injured in weekend car crashes in Belgium. Five collaborating hospitals in Flanders participated. All injured weekend drivers admitted to the emergency units from July 1, 1994, to June 30, 1995, were included in the study sample. Sampling times were from Friday at 8 PM to Monday at 8 AM. RESULTS: Of the 211 injured drivers, 47.9% had positive test results for screenings for drugs or alcohol; 35.5% only for alcohol, 6.6% only for drugs, and 5.7% had positive results for both alcohol and drugs. Of the 87 weekend drivers with positive alcohol test results, 8% had a blood alcohol concentration (BAC) level below 80 mg/dl, 25.3% had a concentration between 150 and 190 mg/dL, and 39% had a BAC of 200 mg/dL or greater. There seems to be a consistent association between the consequences of the weekend crashes and the use of alcohol, drugs, or both. More than 50% of those who had negative results for drugs and alcohol could leave the hospital within 24 hours after their car crash. For the majority of those with positive findings for alcohol only or for drugs and alcohol (respectively, 72% and 78%), hospitalization in a general hospital unit or ICU was necessary. CONCLUSION: The results suggest that testing drivers for use of alcohol alone is insufficient

**Workpackage No.:** 3

**Author:** SCHIWYBOCHAT, K.H., BOGUSZ, M., VEGA, J.A. AND ALTHOFF, H.

**Year:** 1995

**Title:** Trends in occurrence of drugs of abuse in blood and urine of arrested drivers and drug traffickers in the border region of Aachen.

**Journal/Book Name:** Forensic Science International

**Volume:** 71, 1, 33-42

**Keywords:** drug smuggling, drivers, drugs in body fluids, cannabinoids, accidents, marijuana, alcohol

**Abstract:** The region of Aachen is located in a triangle on the German, Dutch and Belgian borders and is heavily exposed to drug traffic, due to the differences in national drug policies. The analysis of toxicological casework in the Institute of Forensic Medicine in Aachen was undertaken for the period 1987-1993, i.e. 6 years before and 1 year after the partial suspension of the border control due to the Maastricht Treaty; 2653 cases were registered, among them 988 automobile drivers. The profile of the casework has changed after the opening of the border: up to 1992 most cases were obtained from the customs. In 1993 the prevalence of police samples was noticed. In the population of drivers, blood samples were only taken in 30% of all the cases. In other cases, concerning mainly motorized drug smugglers, only urine samples or seized drugs have been sent for examination. The urine samples in this group were mostly drug-positive. Drug-smuggling drivers appeared to be a risk-generating group for road traffic safety. The analyses of blood and urine samples revealed multiple drug use in most of the cases. Since 1992, a steep increase in the frequency of cocaine-positive blood samples among drivers was noticed. The results of the study indicate that the abolition of the border control affected the road traffic safety in the region of Aachen

**Workpackage No.:** 3

**Author:** SCHMIDT, P., SCHEER, N. AND BERGHAUS, G.

**Year:** 1995

**Title:** Marijuana use and driving - simulated and actual driving tests for determination of the influence of Marijuana - Literature review

**Journal/Book Name:** Kriminalistik

**Volume:** 49, 4, 241-246

**Keywords:** alcohol, marijuana, cannabis

**Abstract:** As driving under the influence of illicit drugs, especially marijuana, is assumed to become a serious problem in most western countries, traffic medicine is demanded to provide scientific knowledge of the effects of cannabinoids on driving performance. Thus all available data on the influence of cannabinoids on psychomotor skills relevant to driving behaviour from about 150 studies were analysed using a metaanalytic approach. With the help of a systematic questionnaire the most important were extracted: number, age sex and user behaviour of the subjects, manner of drug treatment, time between drug intake and tests, tasks presented and the experimental findings concerning the drug effects. The data on the selected 4 flying simulator, 7 driving simulator and 12 on road experiments presented here were subsequently examined by the means of vote counting. The subjects tested in most studies were between 20 and 30 years of age and had a history of moderate marijuana use. Doses between 1,4 and 22,5 mg delta-THC were with 1 exception administered by smoking and produced a subjective "high". Most experiments were carried out within the first 2 hours after treatment and revealed significant impairment of driving performance mainly within the first hour after having smoked marijuana. Extended effects of marijuana were only shown in flying simulator experiments confronting the subjects with the most complex tasks.

**Workpackage No.:** 1

**Author:** SCHOCH, H.

**Year:** 1997

**Title:** Alcohol, street drugs and therapeutic drugs in street traffic

**Journal/Book Name:** Fortschr Med

**Volume:** 115, 7, 39-42

**ISBN/ISSN:** 0015-8178

**Keywords:** accidents, traffic, alcohol drinking, alcoholic intoxication, drug therapy, english abstract, germany, human, psychotropic drugs, risk factors, street drugs, substance related disorders

**Abstract:** While the rigorous prosecution of drunken drivers in Germany has resulted in a decrease in alcohol related accidents since the 1990s, the relevant risks of legal or illegal drugs are still receiving too little attention, and legal proceedings are rare. A study carried out at the beginning of the 1990s and data from a roadside survey in two distinct regions of Germany (Franken and TW'uringen) show that the effect of illegal drugs and medications is almost equally as important as those of alcohol. A new bill proposes a general ban on driving under the influence of drugs, both legal and illegal. A major problem, however, is the need to show drug/medication misuse and recognize the specific

symptoms in the individual case-only then successful use can be made of already existing legal remedies.

**Workpackage No.:** 3

**Author:** SCHOKNECHT, G; KOPHAMEL-RODER, B. AND FLECK, K.

**Year:** 1991

**Title:** Recommendation for a legally valid breath alcohol measurement

**Journal/Book Name:** Blutalkohol

**Volume:** 28(4), 210-23

**ISBN/ISSN:** 0006-5250

**Keywords:** Alcohol Drinking ; Alcoholic IntoxicationI ; Automobile Driving ; Breath Tests ; Carbon Dioxide ; English Abstract ; Ethanol ; Human

**Abstract:** Evidential breath-alcohol analysis requires measuring devices which cannot yet be obtained from industrial manufacturers. In order to avoid the influence of environment and breath techniques and to relate the breath-alcohol concentration to a standard temperature of 34 degrees C it is necessary to measure the breath temperature with a special device. The required reliability of measured results can only be obtained with two measuring systems operating independently from each other. When two measuring systems of different analytical specificity towards interfering substances are used, the infrared method allows a widely selective determination of ethanol. This is a prerequisite for the legal calibration of breath-alcohol analysers.

**Workpackage No.:** 4

**Author:** SCHUSTER, R; SCHEWE, G; LUDWIG, O; FRIEDEL, L. AND HELLWEGE, J

**Year:** 1991

**Title:** Automobile driving studies to determine alcohol-induced driving insecurity after dark.

**Journal/Book Name:** Blutalkohol

**Volume:** 28(5), 287-301

**ISBN/ISSN:** 0006-5250

**Keywords:** Alcohol-induced driving, adult, alcohol drinking, alcoholic intoxication, automobile driving, dark adaptation, english abstract, ethanol, female, human, male, psychomotor performance, support Non U.S. Gov't

**Abstract:** To further elucidate the question whether the criteria for assessing alcohol-induced unfitness to drive should be stricter for night-time than for day-time driving (cf. Schewe et al., 1977) 64 test persons performed automobile driving tests in daylight and in darkness while being sober and while under the influence of alcohol. The first set of tests was done in daylight. A test course of approx. 600 m involving six everyday driving maneuvers had to be covered, first in the sober state and then at blood alcohol concentrations (BAC) of 1.1 g % and 1.4 g %. The driving tests in the dark were performed on the same test course, first in the sober state and then at a BAC of 1.1 g%. In both test series the errors were counted and the driving times measured. Statistical evaluation of the test results was done parametrically (t-test for dependent random

samples) and distribution-free (Wilcoxon's test for paired comparison). In the sober state 2.1 errors were made on average during the day and 3.2 errors, i.e. one error more, at night. At 1.1 g %, 4.3 errors occurred during the day but 8.0 errors at night (i.e. 3.7 errors more than during the day). The differences were statistically significant. With 8 errors during night-time driving at 1.1 g % the number of errors was still higher than the average number of 6.8 errors made during day-time driving at 1.4 g %. The average driving times required in the sober state were 241 s during the day and 256 s at night. At 1.1 g %, 243 s were needed during the day and 272 s at night, i.e. on average 17 s more than for day-time driving at 1.4 g % for which 255 s were needed. For an orienting comparison of driving performance it can be assumed that "performance in the sense meant here is reciprocally proportional to the number of errors and reciprocally proportional to the time required, i.e. on the whole reciprocally proportional to the product from number of errors and time. The deterioration of performance can be illustrated best by assuming performance in the sober state during the day to be 100% and relating the other "performances thereto.(ABSTRACT TRUNCATED AT 250 WORDS)

**Workpackage No.:** 2

**Author:** SCHUTZ, H. AND WEILER, G.

**Year:** 1993

**Title:** Determination of limit values for safe driving in street traffic with reference to centrally active drugs from the pharmacokinetic and pharmacodynamic viewpoint

**Journal/Book Name:** Blutalkohol

**Volume:** 30, 3, 137-57

**ISBN/ISSN:** 0006-5250

**Keywords:** adult, aged, aged 80 and over, alcohol drinking, automobile driving, diazepam, dose-response relationship, drug, english abstract, ethanol, female, human, male, metabolic clearance rate, middle age, psychotropic drugs

**Abstract:** When establishing threshold values for "driving under the influence of centrally acting compounds" it must be considered that many parameters have an important influence on the pharmacokinetic properties (e.g. volume of distribution, the elimination half-life, and the drug concentration in body fluids) and the pharmacodynamic action (e.g. impairment of skills related to driving). This article describes these inter-and intraindividual parameters from the pharmacokinetic (influence of body weight, age, gender, genetics, diseases, other compounds as ethanol and antacids, enzyme induction, enzyme inhibition, first-pass effects, pharmacokinetic interaction, chronopharmacokinetics, mode of application) and pharmacodynamic (tolerance, pharmacodynamic interaction, pharmacogenetic, chronopharmacodynamic, pathological alterations) point of view. The large variabilities clearly indicate, that preliminary threshold values should be chosen high enough to prevent prejudice of traffic participants. A "consensus value" could be established and continuously monitored by a commission. Beside this the high relevance of valid analytical investigations must be regarded.

**Workpackage No.:** 1



**Author:** SCHWARTZ, R.H.

**Year:** 1987

**Title:** Marijuana: an overview

**Journal/Book Name:** Pediatr Clin North America

**Volume:** 34, 2, 305-17

**ISBN/ISSN:** 0031-3955

**Keywords:** adolescence, adult, cannabinoids, cannabis, human, marijuana abuse, substance related disorders

**Abstract:** Marijuana is a crude, intoxicating drug that has become much more potent in the past decade. Adolescents intoxicated from marijuana suffer from impairment of short-term memory and automobile driving skills. The drug is easily detected in users by means of immunoassay analysis of urine specimens. Frequent use by young adolescents can impede normal maturation and cause or contribute to an amotivational syndrome

**Workpackage No.:** 1

**Author:** SCOTT, W.E.

**Year:** 1994

**Title:** Marijuana effects on actual driving performance

**Journal/Book Name:** Traffic Tech, NHTSA Technology Transfer Series, Washington, National Highway Traffic Safety Administration, number 62, February 1994

**Keywords:** marijuana, driving, impairment

**Workpackage No.:** 1

**Author:** SEPPALA, T., LINNOILA, M. AND MATTILA, M.J.

**Year:** 1979

**Title:** Drugs, alcohol and driving

**Journal/Book Name:** Drugs

**Volume:** 17, 5, 389-408

**ISBN/ISSN:** 0012-6667

**Keywords:** alcohol drinking, analgesics, anti-anxiety agents, anti-inflammatory agents, anticonvulsants, antidepressive agents, antiparkinson agents, antipsychotic agents, automobile driving, cannabis, cardiovascular agents, central nervous system stimulants, drug interactions, epidemiologic methods, hallucinogens, histamine, antagonists, human, hypnotics and sedatives, hypoglycemic agents, lithium, motor skills, muscle relaxants, central PD, parasympatholytics, substance related disorders

**Abstract:** Driving a car is a complex psychomotor and perceptual task which is subject to impairment by many factors. Several workers have studied the potential effects of drugs and alcohol in crash production by epidemiological and laboratory studies. Both types of studies have yielded useful data but their limitations must be borne in mind when applying the results in practice. Alcohol is obviously the most common single cause of traffic accidents. A progressively increased risk with increasing blood alcohol levels is well documented; fatigue and/or drugs increase this risk. Drugs are related much more infrequently to traffic accidents although on the basis of statistics, there is a potential risk with drug use. However, drugs alone are not as important as alcohol. The most significant

drugs as regards driving risk are obviously certain antianxiety agents, hypnotics, stimulants, hallucinogens, marihuana, lithium and narcotic analgesics, as well as ganglionic blocking agents, insulin and sulphonylurea derivatives. Patients should not drive after taking these drugs until they are objectively fully alert and capable. Anticholinergics, antihistamines, antidepressants, antipsychotics, phenylbutazone, indomethacin, alpha-methyldopa, and beta-blockers may in some cases cause central side effects (e.g. drowsiness) strong enough to affect driving performance. After starting therapy with these drugs, or after a significant change in dose, driving should be avoided until it is known that unwanted effects do not occur. Psychotropic drugs may enhance the deleterious effect of alcohol, and with most hypnotics there is still an effect the next morning. Some drugs (e.g. anticonvulsants or antiparkinsonian drugs) may make driving safer, but the disease (epilepsy, Parkinsonism, cardiovascular diseases, psychic disorders, etc.) often precludes driving. Clinicians should warn their patients about an impairment of driving skills if this is likely to occur due to the drug or the illness concerned.

**Workpackage No.:** 1

**Author:** SEPPALA, T, PALVA, E; MATTILA, MJ; KORTTILA K. AND SHROTRIYA, RC

**Year:** 1980

**Title:** Tofisopam, a novel 3,4-benzodiazepine: multiple-dose effects on psychomotor skills and memory. Comparison with diazepam and interactions with ethanol.

**Journal/Book Name:** Psychopharmacology

**Volume:** 69(2), 209-18

**Keywords:** Administration, Oral; Adult; Anti-Anxiety Agents, Benzodiazepine AD/\*PD; Antianxiety Agents; Benzodiazepine; Benzodiazepines AD/\*PD; Clinical Trials; Comparative Study; Diazepam \*PD; Dose-Response Relationship Drug; Double-Blind Method; Drug Interactions; Ethanol \*PD; Human; Male; Memory; \*DE; Motor Activity \*DE; Placebos

**Abstract:** Twelve healthy male volunteers were treated (double-blind crossover design) with tofisopam (a new 3,4-benzodiazepine), diazepam, or placebo, on 2 consecutive days each. Psychomotor skills were impaired after a single dose of diazepam (10 mg) given on day 1. Measurements on day 2 showed that some tolerance had developed to the diazepam-induced impairment of reactive and coordinative skills, but not to its effects on flicker fusion or on the extraocular muscle balance. Tofisopam failed to impair performance both as a single dose (100 mg) and after repeated doses (100 + 50 + 50 + 100 mg). The subjects felt more fatigue, dizziness, calmness, and passiveness after diazepam than after tofisopam. When either drug was given together with 0.8 g/kg ethanol on day 2, the breath ethanol concentrations were 0.7--1.0 mg/ml and all psychomotor skills were impaired. Diazepam + ethanol particularly impaired memory and learning as well. After this combination the subjects were classified (time anticipation test) as 'disqualified drivers' more often than after placebo. It is concluded that diazepam, as well as either benzodiazepine with ethanol, may reduce the ability to drive vehicles or operate machinery.

**Workpackage No.:** 2

**Author:** SEPPALA, T. AND LINNOILA, M.

**Year:** 1980

**Title:** Effects of zimeldine and other antidepressants on skilled performance: A comprehensive review.

**Journal/Book Name:** Acta Psychiatria Scandanavica

**Volume:** 68, (S 308), 135-140.

**Keywords:** antidepressants; experimental

**Workpackage No.:** 2

**Author:** SEPPALA, T. AND LINNOILA, M

**Year:** 1983

**Title:** Effects of zimeldine and other antidepressants on skilled performance: a comprehensive review

**Journal/Book Name:** Acta Psychiatr Scand Suppl

**Volume:** 308, 135-40

**ISBN/ISSN:** 0065-1591

**Keywords:** Antidepressive Agents \*AE; Antidepressive Agents, Tricyclic AE; Automobile Driving; Drug Interactions; Ethanol PD; Human; Mianserin AE; Nomifensine AE; Outpatients; Psychomotor Performance \*DE; Viloxazine AE; Zimeldine \*AE

**Abstract:** Existing data suggest that amitriptyline, doxepin, mianserin, viloxazine and imipramine impair the performance of skilled psychomotor tasks. The degree of impairment, as well as the degree of interaction with alcohol, is closely related to the sedative potency of the drug, the adverse effects on psychomotor skills are however, mainly limited to the first 10 days of treatment. In contrast, nortriptyline, clomipramine, desipramine, protriptyline, nomifensine and zimeldine have much less marked effects on skilled performance. Despite its being relatively new antidepressant, the effects of zimeldine on psychomotor skills have already been extensively investigated. It has been shown to be without stimulant or sedative effects, and there does not appear to be any additive effect between zimeldine and ethanol. The lack of detrimental effects on skills related to such tasks as driving, makes zimeldine suitable for use in out-patient populations.

**Workpackage No.:** 1

**Author:** SHARMA, S. AND MOSKOWITZ, H.

**Year:** 1972

**Title:** Effect of marijuana on the visual autokinetic phenomenon

**Journal/Book Name:** Perceptual and Motor Skills

**Volume:** 35, 3, 891-4

**ISBN/ISSN:** 0031-5125

**Keywords:** marijuana, visual autokinetic phenomenon

**Abstract:** The effects of 4 dose levels of marijuana upon the visual autokinetic phenomenon were examined in 12 subjects. The amount of apparent movements was

greatly increased under the two highest doses. Possible hazards associated with vehicle operation at night under marijuana are noted.

**Workpackage No.:** 2

**Author:** SHARMA, S. AND MOSKOWITZ, H.

**Year:** 1975

**Title:** Marihuana effects on a critical tracking task.

**Journal/Book Name:** In: Proceedings, 81st Annual Conference, APA

**Volume:** 1035-1036.

**Keywords:** marihuana; experimental; tracking

**Workpackage No.:** 2

**Author:** SHERWOOD, N.

**Year:** 1998

**Title:** A critical review of the effects of drugs other than alcohol on driving.

**Journal/Book Name:** Automobile Association (UK) Report.

**Keywords:** methodology; antidepressants; tranquillizers; amphetamines; cocaine; benzodiazepines; marihuana

**Workpackage No.:** 1

**Author:** SIMPSON, H.M.

**Year:** 1986

**Title:** Epidemiology of Road Accidents involving marijuana

**Journal/Book Name:** Alcohol, Drugs, Driving

**Volume:** 2 (3-4), 15-30

**Keywords:** road accidents, marijuana, epidemiology,

**Abstract:** The point of departure for this paper is captured in the contrast afforded by two quotations that summarize the state of knowledge concerning marijuana and traffic safety in 1977:

"All these studies indicate that cannabis is, as should have been anticipated, a hazardous drug for the road user...Judgement, perception, mood, coordination and attentiveness are all affected...At this point in time marijuana and other cannabis intoxication effects would seem to be a very real hazard in our community, especially in terms of the road toll". (Milner, 1977, p.2). "At the present time there is no evidence that marijuana is a significant public safety problem or is about to become one. The effects of marijuana reported in these studies are such that it is unlikely that a person driving erratically and recklessly would do so because of the influence of the drug." (McBay, 1977, p.97). These disparate views illustrate that unanimity of opinion regarding the issue of marijuana and traffic safety had certainly not been achieved less than a decade ago. The present paper, which focuses principally on epidemiological research since that time, is intended to determine whether the burden of evidence now weighs more heavily in one or the other direction. The purpose of this review is, therefore, to identify what is known about the

magnitude of the problem of marijuana in road crashes and the level of risk it poses for traffic safety, insofar as can be determined from epidemiological research.

**Workpackage No.:** 1

**Author:** SIMPSON, H.M.

**Year:** 1987

**Title:** Community-based approaches to highway safety: health promotion and drinking-driving.

**Journal/Book Name:** Drug Alcohol Depend

**Volume:** 20, 1, 27-37

**ISBN/ISSN:** 0376-8716

**Keywords:** Accidents, Traffic PC ; Alcoholic Intoxication \*PC; Automobile Driving; Consumer Participation ; Health Promotion MT ; Human ; Life Style ; Social Change

**Abstract:** Traditional preventive tactics in road safety have emphasized technology, legislation and

regulation. There is growing awareness and evidence that these methods need to be complemented with alternative approaches, particularly those that acknowledge the importance of life style as a determinant of risky driving. Accordingly, new approaches are emerging that emphasize the need for long-term, individual and community-based approaches in road safety, particularly as a tactic for addressing complex problems, like drinking-driving, that are determined by psychosocial and life style factors.

**Workpackage No.:** 1

**Author:** SIMPSON, H.

**Year:** 1987

**Title:** Young drivers' alcohol and drug impairment.

**Journal/Book Name:** In Young Drivers Impaired by Alcohol and Other Drugs Edited by T. Benjamin, International Congress and Symposium Series, No. 16, Royal Society of Medicine Services Ltd.

**Keywords:** alcohol, drugs, driving, impairment, youth

**Abstract:** Summarises literature on young drivers and alcohol and drug use and driving. At the time of writing author claimed that studies on drugs and driving were rare and usually focused on marijuana or on multiple drug use. The main findings are (i) multiple drug (polydrug) use (excluding alcohol) is not characteristic of young drivers who are killed or injured in road crashes; (ii) the drug, other than alcohol, that appears more frequently in young adults who are killed or injured in road accidents is marijuana; (iii) the importance of this drug is difficult to assess because its role is masked by the fact that in the vast majority of cases, it is detected in combination with alcohol. For example, in a recent study, when tetrahydrocannabinol (TCH) was detected in the blood of traffic victims (indicating recent use), in 85% of the cases, alcohol was found at reasonably high levels; (iv) alcohol is the most frequently detected substance, even among the young.

**Workpackage No.:** 1

**Author:** SIMPSON, H.M.

**Year:** 1987

**Title:** Epidemiological and laboratory studies on alcohol, drugs and traffic safety

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam. Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 0 444 809031

**Workpackage No.:** 2

**Author:** SIMPSON, H.

**Year:** 1992

**Title:** Epidemiology of Alcohol and Drugs in Transportation in Canada

**Journal/Book Name:** Alcohol, Drugs and Driving

**Volume:** 8, i3-4, 185-205

**ISBN/ISSN:** 0891-7086

**Keywords:** epidemiological analysis alcohol/ drug use/ surface transportation drivers/ empirical data

**Abstract:** To explore the relationship between substance abuse & traffic accidents, examined are integrated findings from several Canadian government-commissioned studies & a regional British Columbia study of alcohol & drug use among commercial truck & bus drivers. Data are drawn from questionnaire-based surveys & infrequent alcohol & drug testing. Data are discussed in relation to previously documented information on substance abuse among surface transportation drivers since 1974. Results show increased use of alcohol in collision-involved drivers. Evidence also suggests common use of impairing substances in at least a subset of drivers

**Workpackage No.:** 3

**Author:** SIMPSON, D., BRAITHWAITE, R.A., JARVIE, D.R., STEWART, M.J., WALKER, S., WATSON, I.W. AND WIDDOP, B.

**Year:** 1997

**Title:** Screening for drugs of abuse (II): Cannabinoids, lysergic acid diethylamide, buprenorphine, methadone, barbiturates, benzodiazepines and other drugs

**Journal/Book Name:** Ann Clin Biochem

**Volume:** 34, 5, 460-510

**ISBN/ISSN:** 0004-5632

**Keywords:** barbiturates, benzodiazepines, buprenorphine, cannabinoids, cyclizine, drug combinations, fentanyl, human, ketamine, lysergic acid, diethylamide, methadone, pentazocine, propoxyphene, substance abuse detection

**Abstract:** Requirements for the provision of an efficient and reliable service for drugs of abuse screening in urine have been summarized in Part 1 of this review. The requirements included rapid turn-around times, good communications between requesting clinicians and the laboratory, and participation in quality assessment schemes. In addition, the need for checking/confirmation of positive results obtained for preliminary

screening methods was stressed. This aspect of the service has assumed even greater importance with widespread use of dip-stick technology and the increasing number of reasons for which drug screening is performed. Many of these additional uses of drug screening have possible serious legal implications, for example, screening school pupils, professional footballers, parents involved in child custody cases, persons applying for renewal of a driving licence after disqualification for a drug-related offence, doctors seeking re-registration after removal for drug abuse, and checking for compliance with terms of probation orders; as well as pre-employment screening and work-place testing. In many cases these requests will be received from a general practitioner or drug clinic with no indication of the reason for which testing has been requested. This also raises the serious problems of a chain of custody, provision of two samples, stability of samples, and secure and lengthy storage of samples in the laboratory-samples may be requested by legal authorities several months after the initial testing. The need for confirmation of positive results is now widely accepted but it may be equally important to confirm unexpected negative results. Failure to detect the presence of maintenance drugs may lead to the patient being discharged from a drug treatment clinic and, if attendance at the clinic is one of the terms of continued employment, to dismissal. It seems likely that increasing abuse of drugs and the efforts of regulatory authorities to control this, will lead to the manufacture of more designer drugs. Production of substituted phenethylamines was facilitated by the drug makers' cook book, 'PIHKAL'(Phenethylamines I Have Known And Loved) by Dr Alexander Shulgin and Ann Shulgin, and production of substituted tryptamines is promised in their next book, TIHKAL. Looking to the future, laboratories will need to ensure that they can detect and quantitate an ever-increasing number of drugs and related substances. The question of confidence in results of drugs of abuse testing raised in 1993 by Watson has assumed even greater importance as a result of attention focused on the OJ Simpson trial in Los Angeles. Toxicological investigations are likely to be challenged more frequently in the future. Even if analyses have been performed by GC-MS, there is a need to establish the level of match between the spectrum of the unknown substance and a library spectrum which is considered acceptable for legal purposes. It will also be essential to ensure that computer libraries contain spectra for all substances likely to be encountered in drugs of abuse screening.

**Workpackage No.:** 1

**Author:** SIVAK, M.

**Year:** 1997

**Title:** Recent psychological literature on driving behaviour: what, where, and by whom?

**Journal/Book Name:** Applied Psychology: an International Review

**Volume:** 46, (3), 303 - 310

**Keywords:** literature review; driving behaviour;

**Abstract:** Study analysed listings in the PsycINFO database for articles on driver behaviour over 25 years.

**Workpackage No.:** 1

**Author:** SJOGREN, H., BJORNSTIG, U. AND ERIKSSON, A

**Year:** 1997

**Title:** Comparison between blood analysis and police assessment of drug and alcohol use by injured drivers

**Journal/Book Name:** Scandinavian Journal of Social Medicine

**Volume:** 25, i3, 217-223

**ISBN/ISSN:** 0300-8037

**Keywords:** drugs/ alcohol/ crashes/ police/ injuries/ fatally-injured/ official statistics/ inebriation

**Abstract:** Official statistics for alcohol/drug use by drivers can influence the introduction of intervention measures against impaired driving. Thus, the validity of official statistics is important. Since official statistics are based on police assessment of inebriation, the present study was aimed at investigating this issue by comparing blood analysis with the rate of police detection of alcohol/drug use by injured drivers. All injured motor vehicle drivers who were hospitalized (HD) (Umea: n = 104) and all fatally-injured drivers (FD) who were autopsied (Umea, Northern Sweden: n = 110; Gothenburg, Western Sweden: n = 133) from May 1991 through Dec 1993 were tested for alcohol and both licit and illicit drugs. The findings of the blood analyses were compared with police assessment of inebriation. In the HD, the police suspected inebriation in 13% (n = 13) whilst blood analyses showed drug and/or alcohol in 18% (n = 19) of the drivers (sensitivity 69%; specificity 97%). In the FD, the police suspected inebriation in 7% (n = 16) of the drivers whilst blood analyses showed drug and/or alcohol in 23% (n = 57) of the drivers (sensitivity 53%; specificity 100%). The blood alcohol-positive HD who the police suspected to be inebriated had significantly higher mean blood alcohol concentrations than those not suspected. To avoid biased statistics, official statistics on inebriation of injured drivers should be based on blood analysis of drug/alcohol and not on police assessment

**Workpackage No.:** 4

**Author:** SKEGG, D.C.G.

**Year:** 1979

**Title:** Minor tranquillisers and road accidents.

**Journal/Book Name:** British Medical Journal

**Volume:** 1, 917-919

**Keywords:** benzodiazepines; tranquillisers

**Workpackage No.:** 3

**Author:** SKURTVEIT, S, CHRISTOPHERSEN, A.S. AND MORLAND, J.

**Year:** 1995

**Title:** Female drivers suspected for drunken or drugged driving

**Journal/Book Name:** Forensic Science International

**Volume:** 75, 139-148

**ISBN/ISSN:** 0379-0738/95

**Keywords:** driving, alcohol, drugs, female



**Abstract:** The National Institute of Forensic Toxicology in Oslo receives blood and urine samples from all Norwegian drivers apprehended on suspicion of driving under the influence of alcohol or drugs. In this study, sex differences in use of alcohol and drugs among Norwegian drunken and drugged drivers were presented. In 1992 and 1993, the institute received samples from 11 970 and 5642 suspected drunken and drugged drivers respectively. Women were underrepresented among both suspected drunken (7.6%) and drugged (10.9%) drivers. There were not observed dramatic gender differences in frequency and finding of drugs. The most frequent drugs in addition to alcohol were tetrahydrocannabinol, benzodiazepines and amphetamine. The data suggest that benzodiazepines are found relatively more often in blood from female than from male drugged drivers. Lower proportion of women with blood ethanol concentration over the legal limit was observed.

**Workpackage No.:** 3

**Author:** SKURTVEIT, S., CHRISTOPHERSEN, A.S. AND MORLAND, J.

**Year:** 1995

**Title:** Driving under the influence of benzodiazepines. Sex differences in the counties are reflected among drivers suspected of driving under the influence of a drug

**Journal/Book Name:** Tidsskr Nor Laegeforen

**Volume:** 115, 2, 200-3

**ISBN/ISSN:** 0029-2001

**Keywords:** alcohol drinking, automobile driving, benzodiazepines, comparative study, drug utilization, english abstract, human, Norway, substance abuse detection, substance-related disorders

**Abstract:** This study was based on all blood samples taken from drivers suspected of being influenced by alcohol and or drugs and sent to the National Institute of Forensic Toxicology in 1992. Benzodiazepines were among the most frequently detected drugs. The ratio between samples containing benzodiazepines and the total number of samples was compared with the sales of benzodiazepines in the different Norwegian provinces. In 95% of the benzodiazepine positive samples, either a combination with other drugs or a concentration significantly higher than usually found after ordinary therapeutic use was observed. These results indicated that the fraction of samples positive on benzodiazepines probably representing drug abuse or misuse correlated with the total prescription of benzodiazepines in the different Norwegian provinces.

**Workpackage No.:** 3

**Author:** SMART, R.G., SCHMIDT, W. AND BATEMAN, K.

**Year:** 1969

**Title:** Psychoactive drugs and traffic accidents.

**Journal/Book Name:** J. Safety Res.

**Volume:** 1, 67-73.

**Workpackage No.:** 3

**Author:** SMART, R.B.

**Year:** 1974

**Title:** Marihuana and driving risk among college students.

**Journal/Book Name:** Journal of Safety Research

**Volume:** 6, 155-291.

**Keywords:** marihuana; field; students

**Workpackage No.:** 3

**Author:** SMART, RG

**Year:** 1987

**Title:** Changes in alcohol problems as a result of changing alcohol consumption: a natural experiment

**Journal/Book Name:** Drug Alcohol Depend

**Volume:** 19(1), 91-7

**ISBN/ISSN:** 0376-8716

**Keywords:** Age Factors; Alberta; Alcohol Drinking \*; Alcoholism \*EP/MO ; Automobile Driving ; Comparative Study ; Human ; Liver Cirrhosis MO ; Ontario ; Quebec

**Abstract:** Alcohol consumption declined by about 10.5% in Quebec and 2.5% in Ontario but increased by 9.5% in Alberta in the years 1974-1983. This created a 'natural experiment' in which the effects of various changes in alcohol consumption on alcohol problems could be assessed. Declines in rates of most alcohol problems were found in Quebec and Ontario despite their different rates of decrease in consumption. However, there were declines in alcoholism rates, and deaths from liver disease and the alcohol dependency syndrome in Alberta. Some problems such as impaired driving and toxic or accidental deaths from alcohol increased in Alberta, probably because of its relatively youthful population compared to Ontario and Quebec. Changes in alcohol consumption appeared to be an unreliable indicator of how various problems are changing.

**Workpackage No.:** 1

**Author:** SMILEY, A.M., MOSKOWITZ, H. AND ZIEDMAN, K.

**Year:** 1981

**Title:** Driving simulator studies of marihuana alone and in combination with alcohol.

**Journal/Book Name:** In: Proceedings of the 25th Conference of the American Association for Automotive Medicine

**Volume:** 285-291.

**Keywords:** marihuana; experimenta;; simulator

**Workpackage No.:** 2

**Author:** SMILEY, A. AND MOSKOWITZ, H

**Year:** 1986

**Title:** Effects of long-term administration of buspirone and diazepam on driver steering control. **Journal/Book Name:** Am J Med

**Volume:** 80(3B), 22-9

**ISBN/ISSN:** 0002-9343

**Keywords:** administration, oral, adult, automobiles, comparative study, diazepam, drug interactions, ethanol, female, human, male, motor skills, MMPI, pyrimidines, random allocation, support, Non U.S. Gov't

**Abstract:** The effects of buspirone, diazepam, and placebo on tracking control were investigated over a nine-day period, using three groups of subjects, each with eight females and eight males. Subjects were tested using an interactive, computer-based driving simulator on days one, eight, and nine of the treatment period. On day nine, subjects received alcohol with their drug treatment. Measures of steering control were derived from car-driver transfer functions. Tracking performance was also measured. Diazepam was found to adversely affect steering control measures in comparison with placebo. This was true both after doses on the first as well as the eighth day of treatment. Thus, there was no evidence of behavioural tolerance to diazepam. In contrast, buspirone was not found to have any adverse effects on steering control; in fact, some evidence of improved tracking control was found. When alcohol was added to each treatment on the ninth day, differences between the drug treatment groups were less pronounced but in the same direction as on the first and eighth days.

**Workpackage No.:** 2

**Author:** SMILEY, A.

**Year:** 1986/7

**Title:** The effects of marijuana alone and in combination with alcohol on driving performance

**Journal/Book Name:** Proceedings of the 10th International Conference on Alcohol, Drugs and Traffic Safety, Amsterdam, Excerpta Medica, Elsevier Publications B.V.

**Volume:** 203-206

**ISBN/ISSN:** 0 444 809031

**Workpackage No.:** 1

**Author:** SMILEY, A

**Year:** 1987

**Title:** Effects of minor tranquilizers and antidepressants on psychomotor performance.

**Journal/Book Name:** J Clin Psychiatry

**Volume:** 48 Suppl, 22-8

**ISBN/ISSN:** 0160-6689

**Keywords:** Anti-Anxiety Agents PD ANTIANXIETY AGENTS; Antidepressive Agents PD; Attention DE; Human; Psychomotor Performance DE; Reaction Time DE

**Abstract:** Results of laboratory and epidemiologic studies have raised concern that psychotropic drugs may contribute to accidents. This article reviews studies of the effects of minor tranquilizer and antidepressant drugs on psychomotor performance. Data clearly demonstrate that the most commonly prescribed tranquilizer, diazepam, impairs many aspects of psychomotor performance for several hours after dosing, and there is no evidence that behavioural tolerance develops with continued drug use or that patients are

differently affected than nonpatients. Lorazepam similarly impairs psychomotor performance. Other frequently prescribed benzodiazepine drugs have not been sufficiently examined to warrant conclusions about their psychomotor effects. A newly marketed nonbenzodiazepine anxiolytic, buspirone, has been shown to have few effects on performance skills. Only one antidepressant, amitriptyline, has been studied thoroughly enough to conclude that it impairs psychomotor performance. The few studies of other, newer antidepressants suggest they may cause less impairment; however, more research is needed to confirm this.

**Workpackage No.:** 1

**Author:** SMITH, A.M.

**Year:** 1996

**Title:** Patients taking stable doses of morphine may drive

**Journal/Book Name:** British Medical Journal

**Volume:** 312, 7022, 56-57

**ISBN/ISSN:** 0959-8138

**Keywords:** drugs, morphine, narcotic analgesics, driving, impairment, stabilisation, sedation

**Abstract:** This letter discusses the issue of whether patients receiving narcotic analgesics such as morphine should drive. While a guide for medical practitioners published by the Medical Commission on Accident Prevention "Medical Aspects of Fitness to Drive" suggests that patients should not drive, experience in palliative care indicates that symptoms occur at the start of treatment with morphine generally resolve within a few days. It is commonly believed, therefore, that patients taking a stable dose may drive without hazard to themselves or other road users. There are, however, few objective data confirming this belief.

**Workpackage No.:** 2

**Author:** SMYTHE, M.

**Year:** 1995/6

**Title:** Alcohol, drugs and driving - A federal perspective

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** alcohol/drugs/ driving/ Federal Office of Road Safety (FORS)

**Abstract:** This paper will discuss the role of the Federal Office of Road Safety (FORS) in countering drink and drug driving in Australia, through its activities in research and public education, contributions to governmental policy planning, and relationships with a range of organisations. Examples of FORS' recent research and public education activities relating to drink driving, will be described. This will include the "Rethink Your Third Drink" and "Smart Card" campaigns, which relate to how much drivers may drink and still remain within the legal blood alcohol limits, as well as the "Light Right" advertisement, which encourages the substitution of low alcohol beer. The research

performed by FORS and other key players that instigated the campaigns will be outlined, as well as the results of evaluations/monitoring activities

**Workpackage No.:** 1

**Author:** SNOW, R.W. AND LANDRUM, JW

**Year:** 1986

**Title:** Drinking locations and frequency of drunkenness among Mississippi DUI offenders

**Journal/Book Name:** Am J Drug Alcohol Abuse

**Volume:** 12(4), 389-402

**ISBN/ISSN:** 0095-2990

**Keywords:** Adolescence ; Adult; Aged, 80 and over; Alcohol Drinking PX ; Alcoholic Intoxication PC/\*PX ; Automobile Driving ; Human ; Middle Age ; Risk ; Social Environment \*

**Abstract:** Using data collected from convicted drunken drivers, relationships between self-reported frequency of drunkenness, frequency of drinking in seven types of drinking places, and sociodemographic characteristics are examined. Drunk drivers who are young, White, and who infrequently attend worship services are more likely than others to report a high frequency of drunkenness. Self-reported frequency of drunkenness is found to be more strongly related to drinking locations than to sociodemographic characteristics, however. The best predictors of the frequency of drunkenness are the frequency of drinking in automobiles and the frequency of drinking in bars or lounges. These relationships remain strong after the effects of sociodemographic characteristics have been controlled. The findings suggest that drunk drivers who drink in automobiles may represent an especially dangerous subgroup, and that policy makers need to give careful consideration to countermeasures designed to curtail drinking in automobiles.

**Workpackage No.:** 1

**Author:** SODERSTROM, C.A., TRIFILLIS, A.L., SHANKAR, B.S., CLARK, W.E. AND COWLEY, R.A.

**Year:** 1988

**Title:** Marijuana and Alcohol Use Among 1023 Trauma Patients

**Journal/Book Name:** Archives of Surgery

**Volume:** 123, 733-737

**Keywords:** marijuana, drugs, driving, trauma patients, alcohol

**Abstract:** 1023 trauma patients presenting to the Shock Trauma Center

\* 33% had positive BAC levels

\* 35% were positive for cannabis

The incidence of cannabis use was similar among traffic and non-traffic trauma victims.

**Workpackage No.:** 3

**Author:** SODERSTROM, CA; BIRSCHBACH, JM. AND DISCHINGER, PC

**Year:** 1990

**Title:** Injured drivers and alcohol use: culpability, convictions, and pre and post crash driving history.

**Journal/Book Name:** J Trauma

**Volume:** 30(10), 1213-4

**ISBN/ISSN:** 0022-5282

**Keywords:** Culpability, Convictions, accidents, traffic, alcoholic intoxication, automobile driving, demography, ethanol, human, United States, wounds and injuries

**Abstract:** The culpability, crash-related traffic convictions, and pre- and post-crash driving records of a group of injured impaired (blood alcohol level greater than 80 mg/dl) drivers (N = 58) who were admitted to a Level 1 trauma centre were compared with a group of admitted unimpaired drivers (N = 92). Both groups of drivers were 21 years of age or older, sustained moderate injuries (defined as having no injury of the brain, spinal column or cord, extremity, or pelvis with an Abbreviated Injury Score of greater than 2), and were discharged home. In the 140 crashes in which culpability was clearly defined, the impaired drivers caused a significantly greater percentage of their crashes (92.7%) compared to unimpaired (64.7%) drivers (p less than 0.001). Of the 55 unimpaired drivers who were considered culpable of causing their crashes, 12.7% received a traffic conviction compared with 39.2% of the 51 culpable impaired drivers. The mean number of total pre-crash traffic violations was higher for impaired drivers than for unimpaired drivers (p less than 0.01). While the mean number of total post-crash convictions for unimpaired and impaired was not significantly different, the mean number of pre- and post-crash alcohol convictions was significantly higher for impaired drivers compared to unimpaired drivers (p less than 0.02). The data suggest that injury protects from legal prosecution and does not alter impaired driving practices.

**Workpackage No.:** 3

**Author:** SODERSTROM, CA; DISCHINGER, PC; Ho, SM. AND SODERSTROM, MT

**Year:** 1993

**Title:** Alcohol use, driving records and crash culpability among injured motorcycle drivers.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 25(6), 711-6

**ISBN/ISSN:** 0001-4575

**Keywords:** Culpability, Injured, accidents, traffic, adult, alcohol drinking, automobile driving, criminal law, ethanol, human, motorcycles, retrospective studies, support, non U.S> Gov't, United States

**Abstract:** Alcohol use, driving records, crash culpability, and crash conviction rates for 165 injured motorcycle drivers (MTCDS) were studied. Of the 165 MTCDS, 53.3% tested positive for alcohol (BAC+). Culpability determinations (n = 150) revealed that 83% of BAC+ and 46% of BAC-MTCDS caused their crashes (p < 0.001). Driving records (n = 145) revealed the following prevalence of one or more convictions for BAC+ and BAC-MTCDS: impaired driving (29% vs. 7%, p < 0.001); speeding (74% vs. 58%, p < 0.05); and reckless driving (68% vs. 44%, p < 0.002). Of the surviving culpable impaired MTCDS (n = 48), 16.7% received crash-related convictions, 12.5% received

alcohol-related convictions. The reasons for the low conviction rates are probably multifactorial.

**Workpackage No.:** 3

**Author:** SODERSTROM, C.A., DISCHINGER, P.C., KERNS, T.J. AND TRIFILLIS, A.L.

**Year:** 1995

**Title:** Marijuana and other drug use among automobile and motorcycle drivers treated at a trauma center

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 27, 1, 131-135

**ISBN/ISSN:** 0001-4575

**Keywords:** injured drivers, alcohol use, patterns, ethanol

**Abstract:** Serum from injured automobile and motorcycle drivers treated at a trauma center was tested for delta-9- tetrahydrocannabinol activity to determine precrash marijuana use. From June 1990 to March 1991, samples from approximately 20 automobile drivers per month and all motorcycle drivers were available for testing. Also, toxicology screens were performed for ethyl alcohol, cocaine, and phencyclidine (PCP) among the driver groups. Six (2.7%) of the 225 automobile (AUT) drivers and 34 (32.0%) of the 106 motorcycle (MTC) drivers were THC + ( $p < .001$ ). Compared with a prior study, the THC + rate decreased significantly from 31.8% among AUT drivers ( $p < .001$ ) but had not changed significantly from the 38.6% rate among MTC drivers. Positive toxicology rates were higher among the 261 MTC drivers compared to the 1,077 AUT drivers tested for ETOH, CO, and PCP, being 47.1% vs 35.2% ( $p < .001$ ), 5.0% vs 8.0% ( $p < .08$ ), and 1.5% vs 3.1% (NS), respectively

**Workpackage No.:** 3

**Author:** SOLARZ, A

**Year:** 1982

**Title:** Driving under the influence of drugs other than alcohol

**Journal/Book Name:** Bull Narc

**Volume:** 34(1), 13-22

**ISBN/ISSN:** 0007-523X

**Keywords:** Accidents, Traffic ; Age Factors ; Automobile Driving \*, Human ; Motivation ; Sex Factors ; Substance-Related Disorders\*/PK

**Abstract:** This paper illustrates different aspects of the problem of driving under the influence of medicine and is based on a survey carried out in 1976 on three groups of drivers: (a) drivers consuming prescription drugs and alcohol; (b) drivers consuming prescription drugs only; and (c) drivers consuming alcohol only. Traffic accidents and traffic accident risks are approximately equal for all three groups, although the author points out that the frequency of traffic accidents and traffic accident risks involving prescription drug intoxicated drivers is probably larger than indicated by the study, as the sample was drawn from persons suspected of drunken driving. The author recommends epidemiological studies of the problem which would be facilitated if the law permitted

blood and urine samples to be taken from any driver stopped on the road. He also suggests that formation of interdisciplinary groups to investigate specific aspects of the problem and closer co-operation between interested countries

**Workpackage No.:** 3

**Author:** SOLBERG CHRISTOPHERSEN, A, GJERDE, H, BJÆRNEBOE, SAKSHAUG, J. AND MÆRLAND, J

**Year:** 1990

**Title:** Screening for drug use among Norwegian drivers suspected of driving under the influence of alcohol or drugs

**Journal/Book Name:** Forensic Science International

**Volume:** 45, 5-14.

**ISBN/ISSN:** 0379-0738/90

**Keywords:** screening/ drugs/ alcohol/ driving/ toxicology

**Abstract:** Two hundred and seventy blood samples were selected at random from Norwegian drivers apprehended on the suspicion of drunken or drugged driving were screened for the presence of amphetamine, benzodiazepines, cannabinoids, tetrahydrocannabinol (THC) and cocaine. Of the samples tested, 223 were from drivers suspected of driving under the influence of alcohol only (A cases). In the rest (n=47) of the cases, the police also suspected drugs as a possible reason for driving impairment (D cases). In the A cases, benzodiazepines, were found in 17%, cannabinoids in 26%, THC in 13% and amphetamine in 2% of the blood samples. One or more drugs besides ethanol were found in 38% of the A-samples. In the D-cases, benzodiazepines were found in 53%, cannabinoids in 43%, THC in 43%, amphetamine in 13% and 77% of these samples contained one or more drugs. Cocaine was not detected in any sample. Blood alcohol concentrations (BAC) above the legal limit of 0.05% were found in 80% of drug positive A-cases and in 28% of the drug positive d-cases. The frequency of drug detection in A-samples was similar (40%) in samples with BAC above and below 0.05%, while this frequency was much higher (above 90%) in D-samples with BAC below 0.05% than in D-samples with BAC above 0.05% (53%). Benzodiazepines were most frequently found among drivers above 25 years of age, while cannabinoids were most frequently found among drivers below 35 years. For about 15-20% of the A-cases with BAC below 0.05%, other drugs were detected at concentrations which may cause driving impairment. It was concluded that analysis of alcohol only might often be insufficient in A-cases to reveal driving impairment.

**Workpackage No.:** 3

**Author:** SOLD, M., LINDNER, H. AND WEIS, K.H.

**Year:** 1983

**Title:** Effect of fentanyl, diazepam and flunitrazepam on memory function. A pharmacopsychologic study.

**Journal/Book Name:** Anaesthesist

**Volume:** 32:11 519-24



**Abstract:** This study was designed to differentiate possible amnesic effects of diazepam, flunitrazepam and fentanyl into impairment of storage, retention or retrieval of information and to correlate them with alterations in a vigilance task. 4

**Workpackage No.:** 2

**Author:** SOLOWIJI, N., MICHIE, P.T. AND FOX, A.M.

**Year:** 1995

**Title:** Differential impairments of selective attention due to frequency and duration of cannabis use

**Journal/Book Name:** Biological Psychiatry

**Volume:** 37, 10, 731-739

**Keywords:** cannabis, long-term effects, selective attention, cognitive event-related potentials, processing negativity, P300, aircraft pilot performance, rat-brain, receptor, alcohol

**Abstract:** The evidence for long-term cognitive impairments associated with chronic use of cannabis has been inconclusive, We report the results of a brain event-related potential (ERP) study of selective attention in long-term cannabis users in the unintoxicated state. Two ERP measures known to reflect distinct components of attention were found to be affected differentially by duration and frequency of cannabis use, The ability refocus attention and filter out irrelevant information, measured by frontal processing negativity to irrelevant stimuli, was impaired progressively with the number of years of use but was unrelated to frequency of use. The speed of information processing, measured by the latency of parietal P300, was delayed significantly with increasing frequency of use but was unaffected by duration of use, The results suggest that a chronic buildup of cannabinoids produces both short- and long-term cognitive impairments

**Workpackage No.:** 2

**Author:** SOYKA, M., DITTERT, S., GARTENMEIER, A. AND SCHAFER, M.

**Year:** 1998

**Title:** Driving fitness in therapy with antidepressive drugs

**Journal/Book Name:** Versicherungsmedizin

**Volume:** 50, 2, 59-66

**ISBN/ISSN:** 0933-4548

**Keywords:** adult, adverse drug reaction reporting systems, aged, antidepressive agents, attention, automobile driving, cognition, comparative study, depressive disorder, english abstract, female, human, male, middle age, psychomotor performance, reaction time

**Abstract:** The driving ability of patients under therapy with antidepressives is seen less restrictive than some years ago. The inhibition of psychomotor performance is of special interest. Some empirical studies point at antidepressives increasing the risk for accidents at least in elderly patients. Different groups of antidepressants apparently show different effects. Tricyclic antidepressants were shown to worsen cognitive and psychomotor performance in some patients while serotonin reuptake inhibitors and some other new antidepressants may cause less behavioral toxicity. Methodological problems in assessing driving ability and some recent findings are discussed.

**Workpackage No.: 1**

**Author:** STAAK, M. AND IFFLAND, R

**Year:** 1992

**Title:** Alcoholism detection markers in blood samples of road users

**Journal/Book Name:** Arukoru Kenkyuto Yakubutsu Ison

**Volume:** 27(1), 42-9

**ISBN/ISSN:** 0389-4118

**Keywords:** gamma-Glutamyltransferase BL ; Accidents, Traffic PC ; Adolescence ; Adult ; Alcoholism BL/DI; Automobile Driving ; Biological Markers BL ; Germany ; Human ; Methanol BL ; Middle Age ; 1-Propanol BL PROPANOL 01

**Abstract:** Alcoholics as participants in road traffic are an international problem. In Germany a confiscated driving licence is only given back by the road traffic authorities to suspected alcoholics after a medico-psychological examination. The problem is: "How can alcoholics be detected among drunken road users. Traffic authorities use as a marker of alcoholism only the height of the blood alcohol concentration. The limit is a level of 1.6 g alcohol per kg blood, in some regions a level of 2.0 g/kg. Our studies show that the blood alcohol level is a very weak marker for alcoholism. Better markers are beside the GGT the alcohols methanol and isopropanol. They can be detected by congener alcohol analysis. Their concentrations are significantly elevated by long-lasting drinking like it is typical for alcoholics.

**Workpackage No.: 4**

**Author:** STAAK, M., KAFERSTEIN, H. AND STICHT, G.

**Year:** 1992/3

**Title:** Importance of quantitative estimation of opiate and cannabinoids for determination of driving performance

**Journal/Book Name:** Proceedings of the Twelfth International Conference on Alcohol, Drugs and Traffic Safety, Cologne, Germany.

**Volume:** pp 490-496

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** THC, cannabis, opiates, toxicological analysis, standardised methods, dose, road traffic, driving

**Abstract:** It is observed that in order to interpret whether an individual is driving under the influence of drugs, it is not only important to know whether a narcotic has been consumed or not, it is also essential to have objective data such as the dose administered and the interval that has passed between consumption and participation in road traffic. Such data can only be provided by quantifying the active substance and, possibly, the metabolites. The standardised conditions for measuring cannabis and opiates in urine and blood are described. It is concluded that epidemiological, experimental, pharmacological and clinical experience must be supported to the greatest extent possible by a differentiated chemical/toxicological analysis in order to evaluate driving safety and driving aptitude in an individual and realistic manner using the principles of traffic medicine and hence to make an important contribution to traffic safety in preventing the

occurrence of accidents. Purely qualitative verifications, which are only suitable for verifying the consumption of heroin or cannabis do not suffice for this purpose. Since matrix effects in urine are low, adequate reproducibility of the results can be attained with standardised methods.

**Workpackage No.:** 1

**Author:** STAAK, M., BERGHAUS, G., GLAZINSKI, R., HOHER, K., JOO, S. AND FRIEDEL, B.

**Year:** 1993

**Title:** Empirical studies of automobile driving fitness of patients treated with methadone-substitution

**Journal/Book Name:** Blutalkohol

**Volume:** 30, 6, 321-33

**ISBN/ISSN:** 0006-5250

**Keywords:** adult, automobile driver examination, automobile driving, english abstract, female, heroin dependence, human, male, methadone, personality inventory, substance abuse detection

**Abstract:** The aim of this experimental study was to gain an impression on the driver fitness of heroin addicts which were at the moment substituted by methadone especially within a methadone program sponsored by the government of NRW. 21 out of 34 patients investigated were unfit to drive because they were at the time the tests were conducted under the effect of at least one additional psychotropic substance other than methadone or because at prior blood tests within 3 months they had been found at least twice under the effect of psychotropic drugs or they were known as concomitant drug users. The remaining 13 methadone patients were matched with 13 control subjects of the same sex, education and-within a range of +/- 2 years-also the same age. Testing short term memory, tracking, decision and reaction behavior, perception, sustained attention, speed estimation, peripheral attention with simultaneous central task, reactive loading, personality questionnaires including traffic specific questions and psychopathologic characteristics the patients yielded significantly poorer results compared with the control group. When selecting 6 very good patients according to the decision of the physicians the significant differences concerning performance measures vanished but some differences concerning personality traits still remained. The results confirm the expert's opinion-called "disease and motor traffic"-that in general methadone substituted patients are unfit to drive. The driver fitness of the very few optimal patients depends on the amount of the personality disorders.

**Workpackage No.:** 2

**Author:** STACY, AW; NEWCOMB, MD. AND BENTLER, PM

**Year:** 1991

**Title:** Personality, problem drinking, and drunk driving: mediating, moderating, and direct-effect models.

**Journal/Book Name:** Journal of Personality and Social Psychology

**Volume:** 60(5), 795-811

**ISBN/ISSN:** 0022-3514

**Keywords:** Personality, problem drinking, drunk driving, adult, alcohol drinking, alcoholic intoxication, automobile driving, female, gender identity, human, male, models, psychological, personality assessment, personality development, risk factors, social environment, support, U.S. Gov't P.H.S.

**Abstract:** Three different general explanations of the effect of personality on problems from drinking alcohol were investigated. One general explanation involved mediating effects. The 2nd explanation involved direct effects of personality. The 3rd general personality process held that alcohol consumption and personality interact as moderating effects on drinking problems. Results provided support for each of the 3 general explanations of personality effects, although certain effects were found primarily for only 2 of the 6 personality constructs investigated (sensation seeking and cognitive motivation). These findings helped delimit the personality processes associated with drinking problems and demonstrated the viability of several specific processes that go beyond traditional assumptions about personality and problem drinking.

**Workpackage No.:** 1

**Author:** STAPLETON, J.M., GUTHRIE, S. AND LINNOILA, M.

**Year:** 1986

**Title:** Effects of alcohol and other psychotropic drugs on eye movements: relevance to traffic safety

**Journal/Book Name:** J Stud Alcohol

**Volume:** 47, 5, 426-32

**ISBN/ISSN:** 0096-882X

**Keywords:** accidents, traffic, barbiturates, diazepam, ethanol, eye movements, human, psychotropic drugs, pursuit, smooth, risk, saccades, tetrahydrocannabinol

**Abstract:** The effects of alcohol and other psychotropic drugs on eye movements are reviewed with particular attention to the possible relevance of these effects for traffic safety. Alcohol has been shown to have diverse effects, including reduction of the velocity of both saccadic and smooth pursuit eye movements, increased saccadic latency, impairment of convergence and induction of nystagmus. These effects probably contribute to impaired visual information processing, which reduces driving ability. Barbiturates have been reported to produce effects similar to alcohol, and the effects of benzodiazepines and opioids seem to be more limited but still substantial. Marijuana has relatively little effect on eye movements.

**Workpackage No.:** 1

**Author:** STARMER, G

**Year:** 1985

**Title:** Antihistamines and highway safety

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 17(4), 311-7

**ISBN/ISSN:** 0001-4575

**Keywords:** Automobile Driving\*; Cimetidine ME/\*PD; Drug Interactions; Histamine H1 Antagonists ME/\*PD Histamine Antagonists H001; Human; Ranitidine ME/PD

**Abstract:** Available evidence that antihistamine-induced impairment of human psychomotor performance constitutes a traffic hazard is reviewed against a set of criteria which could theoretically h% applied to any drug or group of ~ Two distinct classes of histamine antagonists, which act at different receptors (H1 and H2) are now available and they should be considered separately. H1 -Antagonists are freely available to the public and are consumed in enormous quantities. They are a rather heterogeneous group of drugs which share the common property of antagonising some of the effects of histamine. Other effects, particularly sedation, are prominent with many of the older members of the group and these drugs can be shown to impair performance in laboratory tasks and to interact additively with alcohol and other central nervous system depressant drugs. Despite this potential for impairment of driving ability, they are seldom suggested as causative factors in traffic crashes. This may, of course, be due to inadequacy of reportage. A number of new histamine H1 -antagonists have been developed recently which only gain limited access to the central nervous system and appear to be less likely to cause impairment of performance skills. Histamine H2-antagonists have a much more restricted and closely supervised use in medicine and of the two agents currently available (cimetidine and ranitidine), only cimetidine appears to pose traffic safety problems largely because of its ability to interfere with the metabolism of other drugs which depress the central nervous system. Appropriate prescribing should eliminate this problem

**Workpackage No.:** 1

**Author:** STARMER, G.A.

**Year:** 1986

**Title:** A review of the effects of analgesics on driving performance

**Journal/Book Name:** In: 'Drugs and Driving', O'Hanlon, J.F. and de Gier, J.J. (Eds.) pp.251-269.

**Keywords:** methadone; analgesics; experimental

**Workpackage No.:** 2

**Author:** STEEN, T. AND GJERSTAD, L.

**Year:** 1993

**Title:** Driver's licences and medicine. A review of legal requirements and practice

**Journal/Book Name:** Tidsskr Nor Laegeforen

**Volume:** 113, 18, 2277-80

**ISBN/ISSN:** 0029-2001

**Keywords:** accidents, traffic, age factors, aged, automobile driver examination, automobile driving, chronic disease, disabled persons, english abstract, human, Norway, physician's role, substance-related disorders

**Abstract:** There are health requirements for acquiring and renewing a driver's license. Physicians are legally obliged to inform the local health authorities when a patient no longer meets these health requirements. This paper describes the current Norwegian

legislation, formalities of administration, and practice of traffic medicine. Visual acuity, field of vision, seizures, heart disease, diabetes mellitus, abuse of alcohol and drugs, psychiatric disorders, aging and dysfunction of the locomotor system are discussed in brief.

**Workpackage No.:** 1

**Author:** STEEN, T.W., HAGESTAD, K., HAGERUP-JENSSEN, T. AND WROLDSSEN, A.

**Year:** 1997

**Title:** Measures against driving under the influence of drugs - the county medical officer's role. A 2 year material from Vest-Agder

**Journal/Book Name:** Tidsskr Nor Laegeforen

**Volume:** 117, 21, 3093-6

**ISBN/ISSN:** 0029-2001

**Keywords:** accident prevention, accidents, traffic, adult, aged, automobile driving, drug utilization, english abstract, female, human, male, middle age, Norway, Physician's role, psychotropic drugs

**Workpackage No.:** 3

**Author:** STEER, R.A.

**Year:** 1983

**Title:** Retention of driving-under-the-influence offenders in alcoholism treatment

**Journal/Book Name:** Drug Alcohol Depend

**Volume:** 12(1), 93-6

**ISBN/ISSN:** 0376-8716

**Keywords:** Adult ; Age Factors ; Alcoholism PH; Automobile driving ; Employment ; Human ; Male ; Middle Age ; Pennsylvania ; Psychiatric Status Rating Scales

**Abstract:** The race, age, education, marital status, employment status, occupational level, prior treatment status, and SCL-90-R Global Severity Index scores of 244 men admitted to a 90-day outpatient treatment program for alcoholism, following their arrests for driving under the influence (DUI) of alcohol, were analysed to determine whether or not these psychosocial characteristics were related to completing treatment. A stepwise discriminant analysis indicated that age, the SCL-90-R Global Severity Index, and current employment differentiated between offenders who completed and did not complete treatment. Older employed men complaining of less intense symptoms were more likely to finish treatment than younger unemployed men complaining of more intense symptoms.

**Workpackage No.:** 1

**Author:** STEIN, A.C

**Year:** 1987

**Title:** A simulator study of the effects of alcohol and marijuana on driving behaviour

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 0 444 809031

**Workpackage No.:** 2

**Author:** STEPHENS, B.G. AND BASELT, R.C.

**Year:** 1984

**Title:** Driving under the influence of GHB

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 18, 1984

**Keywords:** ghydroxybutyrate (GHB). driving, psychomotor skill

**Abstract:** A driver was found asleep behind the steering wheel of his car, and the vehicle was at rest in a traffic lane with the engine running. His manifestations included horizontal and vertical gaze nystagmus, muscle flaccidity, and severe ataxia. He admitted injecting a white powder, which he identified as an amino acid, about 1 hour prior to discovery by the police. A urine specimen collected approximately 1 hour after the traffic stop contained 1975 mg/L of g- hydroxybutyrate (GHB). The authors tentatively concluded that GHB may cause impairment of the psychomotor skills required for safe operation of a motor vehicle

**Workpackage No.:** 1

**Author:** STEPHENS, B.G. AND BASELT, R.C.

**Year:** 1994

**Title:** Driving under the influence of GHB?

**Journal/Book Name:** Journal of Analytical Toxicology

**Volume:** 18:6 357-8

**Keywords:** GHB

**Abstract:** A driver was found asleep behind the steering wheel of his car, and the vehicle was at rest in a traffic lane with the engine running. His manifestations included horizontal and vertical gaze nystagmus, muscle flaccidity, and severe ataxia. He admitted ingesting a white powder, which he identified as an amino acid, about 1 hour prior to discovery by police. A urine specimen collected approximately 1 hour after the traffic stop contained 1975 mg/L of gamma-hydroxybutyrate (GHB). We tentatively conclude that GHB may cause impairment of the psychomotor skills required for safe operation of a motor vehicle.

**Workpackage No.:** 3

**Author:** STEVENSON, GW; PATHRIA, MN; LAMPING, DL; BUCK, L. AND ROSENBLOOM, D

**Year:** 1986

**Title:** Driving ability after intravenous fentanyl or diazepam. A controlled double-blind study.

**Journal/Book Name:** Invest Radiol

**Volume:** 21(9), 717-9

**ISBN/ISSN:** 0020-9996

**Keywords:** Adult; Automobile Driving\*; Clinical Trials; Diazepam\*AE; Double-Blind Method; Female; Fentanyl\*AE; Human; Male; Psychomotor Performance\*DE

**Abstract:** Uncomfortable or moderately painful radiologic diagnostic and therapeutic procedures are being performed increasingly on outpatients. If sedation and analgesia are used, patients cannot drive themselves home or return rapidly to normal activities. This study compares the effect of fentanyl (1 00 micrograms), diazepam (7.5 mg), and placebo on driving ability of young volunteers as measured by the thacometer. Speed and accuracy were impaired at 30 and 120 minutes by both drugs, and by fentanyl more than diazepam. This study design may be suitable for the assessment of whether patients can drive safely after other analgesic drugs.

**Workpackage No.:** 2

**Author:** STEVENSON, G.W., PATHRIA, M.N., LAMPING D..L, BUC, L. AND ROSENBLOOM, D.

**Year:** 1986

**Title:** Driving ability after intravenous fentanyl or diazepam. A controlled double-blind study.

**Journal/Book Name:** Invest Radiol

**Volume:** 21:9 717-9

**Abstract:** Uncomfortable or moderately painful radiologic diagnostic and therapeutic procedures are being performed increasingly on outpatients. If sedation and analgesia are used, patients cannot drive themselves home or return rapidly to normal activities. This study compares the effect of fentanyl (100 micrograms), diazepam (7.5 mg), and placebo on driving ability of young volunteers as measured by the thacometer.

**Workpackage No.:** 2

**Author:** STICHT, G., KAFERSTEIN, H. AND SCHMIDT, P.

**Year:** 1994

**Title:** Two traffic accidents after heroin consumption with fatal outcome

**Journal/Book Name:** Blutalkohol

**Volume:** 31, 4, 233-7

**ISBN/ISSN:** 0006-5250

**Keywords:** accidents, traffic, case report, cause of death, cocaine, codeine, diacetylmorphine, english abstract, fatal outcome, heroin dependence, human, morphine, substance-related disorders

**Abstract:** We report on 2 road accidents where 4 people--drivers and front-seat passengers--were injured so badly that they consequently died. All four had consumed heroin, in addition to which both passengers had also consumed cocaine and dihydrocodeine respectively. The blood samples of one of the drivers was only taken



after the onset of intensive medical treatment including infusions and transfusions. Nevertheless the result of the analysis clearly showed that the driving ability had been impaired by heroin. In the remaining cases the opiate concentrations were so high that they could have justified a fatal intoxication in themselves. This applies especially to one of the passengers who displayed an unconjugated morphine blood concentration of 0.96 M/l. However, also in this case at the time of the accident the blood circulation and heartbeat did not stop immediately.

**Workpackage No.:** 1

**Author:** STODUTO, G., VINGILIS, E., KAPUR, B.M., SHEU, V-J., McLELLAN, B.A. AND LIBAN, C.B.

**Year:** 1993

**Title:** Alcohol and drug use among motor vehicle collision victims admitted to a Regional Trauma Unit: Demographic, injury and crash characteristics

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 25, 4, 411-420

**ISBN/ISSN:** 0001-4575/93

**Keywords:** alcohol, drugs, driving, crash victims, injury severity

**Abstract:** This study examined the incidence of alcohol and drugs in a sample of seriously injured motor vehicle collision victims, and differences related to pre-crash use of alcohol and/or other drugs on demographic variables, injury severity measures, and crash variables. The sample selected were all motor vehicle collision admissions to the Regional Trauma Unit at the Sunnybrook Health Science Centre in Toronto, Ontario over a 37 month period (n=854). Prospective demographic and injury-related information were collected from hospital charts, and crash data were collected from motor vehicle collision police reports. Blood samples were routinely collected on admission and tested for blood alcohol concentration (BAC). We found 32.0% of the BAC-tested motor vehicle collisions and 35.5% of drivers tested positive for blood alcohol. The drivers' mean BAC on admission was found to be 145.2mg/100ml and the mean estimated BAC at crash time was 181mg/100ml. Drug screens were performed on a two year subsample (n=474), of whom 339 were drivers. Drug screens revealed that 41.3% of drivers tested positive for other drugs in body fluids and 16.5% were positive for alcohol in combination with other drugs. Other than alcohol, the drugs most frequently detected in the drivers were cannabinoids (13.9%), benzodiazepines (12.4%), and cocaine (5.3%). Investigation of differences on demographic, injury, and crash characteristics related to precrash use of alcohol and/or drugs yielded significant findings. In the drug screened sample we found sex, admission type, and occupant status were related to precrash alcohol use. Also, use of drugs was found to interact with admission type and mean BAC on admission. Elapsed time was found to be significantly different for BAC by other drug use, with a greater length of elapsed time found for the subjects testing other drug positive but BAC negative. We found that BAC-positive drug-screened drivers were significantly more likely to be male, involved in a single vehicle collision, not wearing a seat belt, ejected from the vehicle, and travelling at higher speeds than BAC negative drivers. No significant differences were found between BAC and/or other drug use on injury severity measures.

**Workpackage No.: 3**

**Author:** STOMBERG, C. AND MATTILA, MJ

**Year:** 1985

**Title:** Acute and subacute effects on psychomotor performance of femoxetine alone and with alcohol

**Journal/Book Name:** Eur J Clin Pharmacol

**Volume:** 28(6), 641-7

**ISBN/ISSN:** 0031-6970

**Keywords:** Adult; Amitriptyline AD/BL/PD; Antidepressive Agents AD/\*PD; Automobile Driving; Double-Blind Method; Drug Interactions; Ethanol AD/BL/\*PD; Female; Human; Kinetics; Male; Piperidines AD/BL/\*PD; Psychomotor Performance \*DE; Serotonin BL

**Abstract:** Seventy Kuwait alcohol and drug-dependent inpatients at Kuwait Psychiatric Hospital were compared with a matched group of 40 abstinent inpatients on a surgical ward in a general hospital in order to find out the drugs abused, pattern of consumption, the effect of prohibition and sanctions, motives, personality type, social complications, religious attitudes and family history. The majority abused alcohol (62%) followed by hypnotics. The reason most frequently stated for starting consumption was to relieve boredom (39%). Gamma type drinking was prominent at an early stage. The addicts showed a greater proportion of abnormal personalities. Prohibition and sanction had little effect but led to a shift to more toxic substances. The most common legal involvement was driving offenses. Compared with the control group there was higher marital instability and a higher incidence of alcohol and/or drug addicts in the families of the experimental group, and they were also less religious. The role of cultural and religious factors is discussed in detail.

**Workpackage No.: 2**

**Author:** SUGRUE, M., SEGER, M., DREDGE, G., DAVIES, D.J., IERACI, S., BAUMAN, A., DEANE, S.A. AND SLOANE, D.

**Year:** 1995

**Title:** Evaluation of the prevalence of drug and alcohol abuse in motor vehicle trauma in south western Sydney

**Journal/Book Name:** Australia New Zealand Journal of Surgery

**Volume:** 65 (12), 853-856

**Keywords:** drugs, alcohol, motor vehicle trauma, Sydney

**Abstract:** Study on 164 non-fatally injured drivers

\* 17% BAC levels > 0.08g/100ml

\* 15% were positive for cannabis

**Workpackage No.: 3**

**Author:** SUTHERLAND, R.

**Year:** 1992

**Title:** Mandatory drug testing: Boon for public safety or launch of a witch-hunt?

**Journal/Book Name:** Canadian Medical Journal

**Volume:** 146, 7, 1215-1220

**Keywords:** drugs, alcohol, occupational testing, employees

**Abstract:** This article reviews the demand for mandatory random drug testing for employees whose potential for drug abuse could affect public safety. Opponents say that mandatory testing would be a witch-hunt. It would not only be intrusive, they say, but also ineffective and unnecessary. At the centre of the debate is a giant multinational oil company. Testing became a condition of employment for all employees and it was strongly opposed by many such as the Canadian Civil Liberties Association.

**Workpackage No.:** 1

**Author:** SUTTON, L.R.

**Year:** 1983

**Title:** The effects of alcohol, marijuana and their combination on driving ability

**Journal/Book Name:** Journal of Studies on Alcohol

**Volume:** 44, 3, 438-499

**ISBN/ISSN:** 0096-882X

**Keywords:** alcohol, marihuana, driving ability, teenagers, obstacle course, psychomotor performance, automobile driving

**Abstract:** Prior to this study, there have been only a few on-road studies which examined the effect of marijuana on driving. One of those driving studies compared marijuana intoxication with alcohol intoxication, but none examined the joint consumption of marihuana and alcohol. This study was undertaken to examine the effects of varying levels of alcohol and marihuana consumption and their combined effect on driving performance. Driving performance was measured in a controlled obstacle course which closely paralleled actual driving situations. The combination of marihuana and alcohol yielded significant impairment during a driving test but neither drug alone did.

**Workpackage No.:** 2

**Author:** SUTTON, L.R.

**Year:** 1987

**Title:** The effects of alcohol, tetrahydrocannabinol, and/or cocaine on real life driving; preliminary results

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam, 0 444 809031, Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). , Excerpta Medica.

**ISBN/ISSN:** 0 444 809031

**Workpackage No.:** 2

**Author:** SUTTON, L.R.

**Year:** 1987

**Title:** The alcohol/drug impaired driver: what he looks like and how he is apprehended  
**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T86 10th International Conference. Amsterdam, 0 444 809031, Elsevier Publications B.V. 9-12, Sept 1986, Noordizj, P.C., Roszbach, R., de Gier, J.J. Neuteboom, w., Zweiptenning (Eds). Excerpta Medica.

**ISBN/ISSN:** 0 444 809031

**Keywords:** alcohol, tetrahydrocannabinol, barbiturates, amphetamines, PCP, impaired driving, blood analysis, accident victims

**Abstract:** This study compares the differences between convicted driving impaired drivers in two cities, Pittsburg and Atlanta, in terms of alcohol and drug use. Drugs included delta-9-tetrahydrocannabinol, cocaine, barbiturates, amphetamines, and PCP. This study also compares the blood analysis of accident victims for the presence of drugs and alcohol and compares these results with those of the convicted alcohol/drug impaired driver. It will further attempt to provide knowledge on the effects of specific drugs and/or drug interactions with alcohol. Data will be presented identifying the characteristics of the road users as found in Pittsburg and Atlanta.

**Workpackage No.:** 3

**Author:** SUTTON, L.R. AND PAEGLE, I

**Year:** 1992

**Title:** The drug impaired driver. Detection and forensic specimen analysis

**Journal/Book Name:** Blutalkohol

**Volume:** 29(2), 134-8

**ISBN/ISSN:** 0006-5250

**Keywords:** Adolescence ; Adult ; Alcoholic Intoxication ; Automobile Driving ; Ethanol ; Female ; Human ; Male ; Middle Age ; Psychotropic Drugs ; Substance-Related Disorders ; United States

**Abstract:** Whole blood samples were collected from arrested D. U. 1. subjects in two locations, by the U. S. Park Police (USPP) in and around Washington, D. C. and through a suburban police department (MLMP), for the purpose of detecting illicit drug use. All blood samples were screened using an adapted Abuscreen RIA to non-urine (blood) procedure for the following drugs: THC, Cocaine, PCP, and Opiates. Forensic samples were confirmed through GCIMS. Results and characteristics of drug offenders are presented. It was found that 39 percent of sampled offenders from the MLMP showed measurable levels of cannabinoids. 9.5 percent of sampled offenders from the USPP showed measurable levels of Phencyclidine. Recommendations are made for the processing of suspected drug impaired drivers.

**Workpackage No.:** 3

**Author:** SUTTON, L.R. AND PAEGLE, I.

**Year:** 1992

**Title:** The drug impaired driver. Detection and forensic specimen analysis

**Journal/Book Name:** Blutalkohol

**Volume:** 29, 2, 134-8

**ISBN/ISSN:** 0006-5250

**Keywords:** adolescence, adult, alcoholic intoxication, automobile driving, ethanol, female, human, male, middle age, psychotropic drugs, substance-related disorders, United States

**Abstract:** Whole blood samples were collected from arrested D.U.I. subjects in two locations, by the U. S. Park Police (USPP) in and around Washington, D. C. and through a suburban police department (MLMP), for the purpose of detecting illicit drug use. All blood samples were screened using an adapted Abuscreen RIA to non-urine (blood) procedure for the following drugs: THC, Cocaine, PCP, and Opiates. Forensic samples were confirmed through GCIMS. Results and characteristics of drug offenders are presented. It was found that 39 percent of sampled offenders from the MLMP showed measurable levels of cannabinoids. 9.5 percent of sampled offenders from the USPP showed measurable levels of Phencyclidine. Recommendations are made for the processing of suspected drug impaired drivers

**Workpackage No.:** 3

**Author:** SWEEDLER, B. AND VINGILIS, E.

**Year:** 1992/3

**Title:** Alcohol and other drugs in transportation: research needs for the decade

**Journal/Book Name:** Proceedings of the 12th International Conference on Alcohol, Drugs and Traffic Safety, Cologne.

**Volume:** 2., pp.1088

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** workshop, discussions, drugs, driving, alcohol, marijuana, cocaine, prescription drugs, transportation

**Abstract:** The purpose of the workshop was to identify 1) progress in reducing the prevalence of alcohol and other drugs in transportation accidents in all modes, 2) gaps in the knowledge base, 3) opportunities and needs for future research and 4) to establish research needs and priorities for the next decade. The report presents highlights of the summary and synthesis of the issues and ideas put forth in the two and a half day workshop. In respect of impairment, the drugs discussed were alcohol, marijuana, cocaine and prescription drugs.

**Workpackage No.:** 1

**Author:** SWEEDLER, B.

**Year:** 1992/3

**Title:** Alcohol and other drug use in the railroad, aviation, marine and trucking industries-progress has been made.

**Journal/Book Name:** Proceedings of the Twelfth International Conference on Alcohol, Drugs and Traffic Safety, Cologne.

**Volume:** 2, pp.912-917

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** aviation, marine, trucking, railroad, industry, driving, crashes, drugs, alcohol, marijuana, cocaine, amphetamines, opiates, PCP, methamphetamines

**Abstract:** This paper discusses the role that alcohol and other drugs have played in transportation crashes in railroad, aviation, marine and trucking industries. The results of the first few years of testing under the Department of Transport rules, where progress has been made and what new steps are planned to address the problem are presented.

**Workpackage No.:** 1

## T

**Author:** TAGLIARO, F., SMITH, F.P., DE BATTISTI, Z., MANETTO, G. AND MARIGO, M.

**Year:** 1997

**Title:** Hair analysis, a novel tool in forensic and biomedical sciences: new chromatographic and electrophoretic/electrokinetic analytical strategies

**Journal/Book Name:** J Chromatography B Biomed Sci Appl

**Volume:** 689, 1, 261-71

**Keywords:** chromatography, electrophoresis, capillary, hair, human, immunologic techniques, pharmaceutical preparations

**Abstract:** Hair analysis for abused drugs is recognized as a powerful tool to investigate exposure of subjects to these substances. In fact, drugs permeate the hair matrix at the root level and above. Evidence of their presence remains incorporated into the hair stalk for the entire life of this structure. Most abusive drugs (e.g. opiates, cocaine, amphetamines, cannabinoids etc.) and several therapeutic drugs (e.g. antibiotics, theophylline, beta 2-agonists, etc.) have been demonstrated to be detectable in the hair of chronic users. Hence, hair analysis has been proposed to investigate drug abuses for epidemiological, clinical, administrative and forensic purposes, such as in questions of drug-related fatalities and revocation of driving licences, alleged drug addiction or drug abstinence in criminal or civil cases and for the follow-up of detoxication treatments. However, analytical and interpretative problems still remain and these limit the acceptance of this methodology, especially when the results from hair analysis represent a single piece of evidence and can not be supported by concurrent data. The present paper presents an updated review (with 102 references) of the modern techniques for hair analysis, including screening methods (e.g. immunoassays) and more sophisticated methodologies adopted for results confirmation and/or for research purposes, with special emphasis on gas chromatography-mass spectrometry, liquid chromatography and capillary electrophoresis.

**Workpackage No.:** 4

**Author:** TAGLIARO, F., BATTISTI, Z., LUBLI, G., NERI, C., MANETTO, G. AND MARIGO, M.

**Year:** 1997

**Title:** Integrated use of hair analysis to investigate the physical fitness to obtain the driving licence: a casework study

**Journal/Book Name:** Forensic Science International

**Volume:** 84, 1-3, 129-35

**ISBN/ISSN:** 0379-0738

**Keywords:** automobile driver examination, chromatography, high pressure liquid, comparative study, hair, human, Italy, licensure, narcotics, physical fitness,

radioimmunoassay, retrospective studies, substance abuse detection, substance related disorders

**Abstract:** According to the laws presently in force in Italy and the guidelines of the Driving Licence Enforcement Commission of Verona, applicants for the driving licence with a history of drug abuse undergo a medical examination, during which complete anamnestic and clinical data are recorded. On this occasion, a hair sample (50-200 mg) is collected and a urinalysis program is started consisting of EMIT controls for opiates, methadone, cocaine, barbiturates, amphetamines, cannabinoids, benzodiazepines and alcohol carried out on eight separate samples, collected at random over about 40 days under direct supervision. The positive results from urine immunoassays are confirmed by standardized GC/MS methods. The hair samples are screened for morphine and cocaine, the most abused illicit substances in our region, using commercial RIAs adopting cut-off levels of 0.1 ng/mg. All positive samples and about 10% of negative are confirmed by HPLC. In case of confirmed positive results, the applicant is informed: if the subject denies use of opiates or cocaine in the recent months, he or she has the chance of submitting for analysis a new hair sample, which is analyzed in parallel with the hair remaining from the previous assay. In case of persisting denial, claiming analytical interferences by other drugs or endogenous substances, further confirmation of results can be carried out by CE and/or by qualitative MSIMS. In addition, hair sampling from multiple sites (scalp, axillary, pubic hair) with different susceptibility to contamination from the external sources can be carried out to rule out the possibility of passive contamination. At present, we investigate more than 700 subjects per year. The results of this integrated diagnostic strategy are presented and discussed.

**Workpackage No.:** 4

**Author:** TASCHNER, K.L.

**Year:** 1991

**Title:** Driving capacity of drug addicts

**Journal/Book Name:** Versicherungsmedizin

**Volume:** 43, 6, 193-6

**ISBN/ISSN:** 0933-4548

**Keywords:** automobile driving, english abstract, human, psychotropic drugs, substance withdrawal syndrome, substance related disorders

**Abstract:** When deciding whether a person is fit to drive a vehicle whilst he is in a drug-induced delirious state of mind, we take into consideration the actual condition of the person at the time of driving a vehicle. As a rule, the mere presence of drugs in the urine or serum does not give a positive clue as to the ability to drive a vehicle. Here one has to take into consideration the effects of the respective drug consumed as a whole. In cases of chronic drug abuse or drug-dependence as well as dependence on methadone-substitutes we have two possibilities to judge by: Either we follow the guidelines of the report by the Federal Government on "Illness and Driving, in which case drug-dependence excludes driving on the whole or we orientate ourselves here again by the actual performance of the person at the time of driving, in which case many drug users would be declared fit and able to drive. However as far as the legal aspect of it goes, it



would be contradictory to the law as regards to drinking and driving. Naturally the law will decide in the end which of the two methods are legally applicable.

**Workpackage No.:** 1

**Author:** TEALE, D.AND MARKS, V.

**Year:** 1976

**Title:** A fatal motor car accident and cannabis use. Investigation by radioimmunoassay

**Journal/Book Name:** The Lancet

**Volume:** 1, 7965, 884-5

**ISBN/ISSN:** 0140-6736

**Keywords:** accidents, traffic, adult, automobile, autopsy, cannabis, case report, England, human, male, radioimmunoassay, tetrahydrocannabinol

**Abstract:** Impairment of driving skills by drugs is an important cause of traffic accidents. Alcohol is the most important, though far from the only, drug involved; and of 684 fatal accidents investigated by Woodhouse, 321 (47%) of the drivers had blood-alcohol levels greater than 100 mg/100 ml at the time of death. In 16 it exceeded 400 mg/100 ml. Unlike alcohol, cannabis has received little attention as a possible cause of traffic accidents, largely owing to the difficulty of proving cannabis use objectively. The recent development of a reliable and relatively simple method for detecting and measuring cannabis products in blood and urine may help to overcome this difficulty. As Milner has pointed out, the full effect of alcohol on driving competence was not appreciated until objective methods of measuring blood-alcohol levels became generally available. The same may be true of cannabis.

**Workpackage No.:** 1

**Author:** TEALE, J.D., CLOUGH, J.M., KING, L.J. MARKS, V., WILLIAMS, P.L. AND MOFFAT, A.C.

**Year:** 1977

**Title:** The incidence of cannabinoids in fatally injured drivers: an investigation by radioimmunoassay and high pressure liquid chromatography.

**Journal/Book Name:** J. Forens. Sci. Soc.

**Volume:** 17, 177-183.

**Workpackage No.:** 3

**Author:** TEO, R.K.C.

**Year:** 1975

**Title:** Alcohol, drugs and traffic accident risk.

**Journal/Book Name:** Traffic accident research unit, N.S.W. Department of Motor Transport, Sydney.

**Keywords:** antihistamine; field

**Workpackage No.:** 3

**Author:** THAPAR, P., ZACNY, J.P., CHOI, M. AND APFELBAUM, J.L.

**Year:** 1995

**Title:** Objective and subjective impairment from often-used sedative/analgesic combinations

in ambulatory surgery, using alcohol as a benchmark.

**Journal/Book Name:** Anesth Analg

**Volume:** 80:6 1092-8

**Keywords:** fentanyl

**Abstract:** Impairment caused by different sedative/analgesic combinations commonly used in ambulatory settings was compared to that of alcohol at blood alcohol concentrations (BACs) higher than or equal to 0.10%. Impairment was measured via subjective (mood) and objective (psychomotor performance) assays. Twelve healthy human volunteers (10 males and 2 females; age range 21-34 yr) participated in this prospective, double-blind, randomized, cross-over study. Each subject was exposed to five drug conditions across 5 wk. Each of the following drug conditions were adjusted for body weight (per 70 kg): fentanyl 50 micrograms and propofol 35 mg (FP), fentanyl 50 micrograms and midazolam 2 mg (FM), fentanyl 50 micrograms, midazolam 2 mg, and propofol 35 mg (FMP), alcohol 56 g (orally administered), and placebo (PLC). With the exception of alcohol, the other drugs were administered via the intravenous route. Tests for psychomotor performance, subjective effects, and short-term memory were done at baseline, and at different intervals until 240 min postinjection. Psychomotor impairment caused by alcohol at 15 min postingestion (at a BAC of 0.11% +/- 0.03% [mean +/- SE]) was used as a benchmark with which impairment caused by other sedative/analgesic combinations was compared. All the study drug combinations produced impairment (i.e., impairment greater than that seen with PLC), similar to that observed with alcohol at a BAC of 0.11%. We have demonstrated that some sedative/analgesic drug combinations used in anesthesia for ambulatory procedures produce impairment similar to or greater than that observed with a large dose of alcohol.

**Workpackage No.:** 2

**Author:** THOMAS, R.E.

**Year:** 1998

**Title:** Benzodiazepine use and motor vehicle accidents - systematic review of reported association

**Journal/Book Name:** Canadian Family Physician

**Volume:** 44, p.799

**ISBN/ISSN:** 0008-350X

**Keywords:** performance/ drug-use/ psycho-tropic drugs/ traffic accidents/ impaired driving/ road accidents/ alcohol/crashes/victims

**Abstract:** OBJECTIVE: To examine the relationship between benzodiazepine use (BZD) and motor vehicle accidents (MVAs). DATA SOURCES: MEDLINE was searched from 1980 to 1997 using key words traffic accidents or motor vehicle accidents and benzodiazepines (and alternative terms and outcomes) in English, German, French, or Italian. STUDY SELECTION Case-control studies of BZDs and MVAs; police or emergency studies of BZD use among travelers; driving tests with subjects taking BZDs.

Outcomes were impaired driving, accidents; mortality; postaccident medical attention, emergency ward care, or hospitalization. Quality criteria were whether all driving BZD users and non-users had an equal chance of entering the study; whether medication dosage and timing were ascertained; whether all kilometres driven by BZD users and non-users were studied; whether all types of accidents were controlled for. SYNTHESIS In case-control studies, the odds ratios for mortality and emergency medical treatment ranged from 1.45 to 2.4 in relation to time of use and quantity of drug taken. In police and emergency ward studies, BZD use was a factor in 1% to 65% of accidents (usually 5% to 10%). In two studies where subjects had blood alcohol concentrations less than the legal limit, BZDs were found in 43% and 65% of subjects. In one study with controls, 5% of drivers and 2% of controls in accidents had used BZDs. CONCLUSIONS Case-control studies suggest using BZDs approximately doubles the risk of motor vehicle accidents. The risk for drivers older than 65 of being involved in reported motor vehicle collisions is higher when they take longer-acting and larger quantities of BZDs

**Workpackage No.:** 2

**Author:** TOMASZEWSKI, C., KIRK, M., BINGHAM, E., SALTZMAN, B., COOK, R. AND KULIG, K.

**Year:** 1996

**Title:** Urine toxicology screens in drivers suspected of driving while impaired from drugs

**Journal/Book Name:** J Toxicol Clin Toxicol

**Volume:** 34, 1, 37-44

**ISBN/ISSN:** 0731-3810

**Keywords:** adolescence, adult, automobile driving, benzodiazepines, cannabinoids, cocaine, female, human, male, mass screening, middle age, predictive value tests, retrospective studies, substance-related disorders, support, non US Gov't

**Abstract:** OBJECTIVE: Police departments, in conjunction with the National Highway Traffic Safety Administration, have developed a standardized evaluation aimed at identifying drivers impaired by drugs other than ethanol. These evaluations are performed by specially trained police officers known as Drug Recognition Experts. METHODS: We retrospectively reviewed the evaluations of 242 drivers detained for driving while impaired in the City and County of Denver from January 1, 1988 to June 30, 1990. RESULTS: All drivers had urine toxicology screens performed, which were positive for a mean 1.2 +/- 0.9 SD (range zero to four) for drugs having the potential for causing driving impairment. The 193/242 urine screens (79.8%) testing positive showed the following drugs: cannabis 162 (66.9%), stimulants (including cocaine metabolites) 80 (33.1%), depressants (benzodiazepines and barbiturates) 24 (9.9%), narcotics 12 (5.0%), inhalants (toluene) 1 (0.4%), hallucinogens (LSD) 1 (0.4%), and other 3 (1.2%). Drug Recognition Experts, based on their initial evaluation, were able to predict correctly some or all of the drugs found on the urine screens in 178/242 (73.6%) of cases. Overall agreement between the Drug Recognition Experts opinions and urine screen results had a kappa value ( $p < 0.05$ ) of 0.41. CONCLUSIONS: There was a high rate (79.8%) of positive urine toxicology screens in drivers suspected of nonethanol drug impairment. In most cases, Drug Recognition Experts were able to reliably predict the results of these screens.

**Workpackage No.: 3**

**Author:** TOUBRO, S., ASTRUP, A.V., BREUM, L. AND QUAADE, F.

**Year:** 1993

**Title:** Safety and efficacy of long-term treatment with ephedrine, caffeine and an ephedrine/caffeine mixture.

**Journal/Book Name:** Int J Obes Relat Metab Disord

**Volume:** 17 Suppl 1: S69-72

**Keywords:** ephedrine

**Abstract:** In a randomized, placebo-controlled, double blind study, 180 obese patients were treated by diet (4.2 MJ/day) and either an ephedrine/caffeine combination (20mg/200mg), ephedrine (20mg), caffeine (200mg) or placebo 3 times a day for 24 weeks. 141 patients completed this part of the study.

**Workpackage No.: 2**

**Author:** TULEVSKI, IG

**Year:** 1989

**Title:** Michigan Alcoholism Screening Test (MAST) - its possibilities and shortcomings as a screening device in a pre-selected non-clinical population (published erratum appears in Drug Alcohol Depend 1990 Jun, 25(3):327)

**Journal/Book Name:** Drug Alcohol Depend

**Volume:** 24(3), 255-60

**ISBN/ISSN:** 0379-8716

**Keywords:** Adult; Alcoholism \*DI/EP; Human; Male; Mass Screening; Michigan EP; Sensitivity and Specificity

**Abstract:** A statistical analysis of the MAST scores obtained by its administration to industrial workers, hospitalized alcoholics and persons arrested driving while intoxicated has been performed. The author discusses the modalities and possibilities of improving the test reliability which will increase its efficiency in the screening of alcohol related disabilities. A further study of the inconsistencies in the administration of the MAST along with its validation is planned.

**Workpackage No.: 4**

**Author:** TUNBRIDGE, R.

**Year:** 1998

**Title:** Drugging and driving.

**Journal/Book Name:** in: G.B. Grayson (Ed.) Behavioural Research in Road Safety VIII. Crowthorne, Transport Research Laboratory, 43-48.

**Keywords:** legislation; drug testing

**Workpackage No.: 4**

## U

**Author:** ULRICH, L

**Year:** 1994

**Title:** Benzodiazepines in blood samples of alcohol intoxicated drivers.

**Journal/Book Name:** Blutalkohol

**Volume:** 31(3), 165-77

**ISBN/ISSN:** 0006-5250

**Keywords:** Metabolites, Benzodiazepines, Valium, Begesan, Tranzilium, Lexotanil, Seresta, adult, aged, alcoholic intoxication, anti-anxiety agents, benzodiazepine, automobile driving, comorbidity, cross-sectional studies, drug synergism, english abstract, ethanol, female, human, incidence, liability, legal, male, middle age, substance abuse detection, substance related disorders, Switzerland

**Abstract:** 1,000 blood samples from drivers tested for alcohol were screened specifically for active constituents and metabolises of medicines of the benzodiazepine class. 42 blood samples contained benzodiazepines and a total of eight different active constituents were detected. The active constituents of Valium, Vegesan or Tranxilium, Lexotanil and Scresta have to be dealt with primarily. In addition to benzodiazepine 35 samples showed an alcohol level of over 0.08%. This raised the question of whether the benzodiazepine level measured in the blood samples would intensify the effect of the alcohol. Four categories were formed in order to be able to compare the levels of the various benzodiazepines. According to this categorisation the benzodiazepine concentration was classed as very high in 4 cases., high in 7 cases, moderate in 26 cases and low in 10 cases.

**Workpackage No.:** 3

## V

**Author:** VAINIO, A., OLLILA, J., MATIKAINEN, E., ROSENBERG, P. AND KALSO, E.

**Year:** 1995

**Title:** Driving ability in cancer patients receiving long-term morphine analgesia

**Journal/Book Name:** The Lancet

**Volume:** 346, 8976, 667(4)

**ISBN/ISSN:** 0140-6736

**Keywords:** morphine, cancer patients, drugs, driving, impairment, slowness, balancing, reaction time, intelligence, concentration, motor reactions, body posture

**Abstract:** Morphine may only slightly impair driving ability of cancer patients. The tranquilizing effects of long-term pain medications, such as morphine, may also interfere with driving an automobile. Researchers conducted simulated driving tests combined with neurological evaluations among 24 cancer patients who took morphine regularly and 25 cancer patients not on pain medication. Daily morphine dosages concentrations ranged from 60 milligrams (mg) to 1,100 mg. Driving simulations and neurological examinations lasted about six hours. Testing results among morphine users indicated a certain slowness and more errors as well as difficulty balancing with closed eyes. Intelligence, concentration, motor reactions, and body posture with open eyes were equal in both groups. Since morphine was taken for only two weeks, longer periods of opioid use may cause difficulties with respect to traffic safety.

**Workpackage No.:** 2

**Author:** VALOIS, R. F

**Year:** 1986

**Title:** Student Drug Use and Driving: A University Sample

**Journal/Book Name:** Health Education

**Volume:** 1(1), 38-42

**Workpackage No.:** 3

**Author:** VAN LAAR, M.W., VOLKERTS, E.R. AND VAN WILLIGENBURG, A.P.

**Year:** 1992

**Title:** Therapeutic effects and effects on actual driving performance of chronically administered buspirone and diazepam in anxious outpatients

**Journal/Book Name:** Journal of Clinical Psychopharmacol

**Volume:** 12, 2, 86-95

**ISBN/ISSN:** 0271-0749

**Keywords:** adolescence, adult, affect, anxiety disorders, arousal, attention, automobile driver examination, automobile driving, buspirone, diazepam, dose-response relationship,

drug, female, human, male, metabolic clearance rate, middle age, personality assessment, psychomotor performance, single blind method

**Abstract:** Two groups of 12 outpatients each (six men and six women) with generalized anxiety disorder, participated in this study. Each patient was treated single-blind with placebo during the first 7 days (baseline), followed by a double-blind drug treatment period of 4 consecutive weeks (active) and ending again with 7 days single-blind placebo treatment (washout). One group received buspirone 5 mg three times a day in the first week and continued with 10 mg in the morning, 5 mg in the afternoon, and 5 mg in the evening during the second, third, and fourth weeks. The other group received diazepam 5 mg three times a day in all 4 weeks. On the evening of the seventh day of each treatment week the Hamilton Rating Scale for Anxiety and the Symptom Check List (90 items) were applied to assess the therapeutic effects, followed by an on-the-road driving test that started 1.5 hours after the last drug or placebo intake. The test consisted of operating an instrumented vehicle over a 100 kilometer highway circuit while attempting to maintain a constant speed and a steady lateral position within the right traffic lane. Two patients in the diazepam group were unable to complete their test after the first and second treatment week, respectively, because of serious sedative reactions. Both buspirone and diazepam were equally effective in reducing overall anxiety symptoms. The specific profiles showed that buspirone also reduced concomitant depressive symptoms and symptoms of interpersonal sensitivity and anger-hostility. In contrast, diazepam was found to be slightly more effective in reducing somatic symptoms and to positively affect sleep disturbances. Moreover, abrupt discontinuation of diazepam resulted in a relapse of psychic anxiety symptoms comparable with the placebo-baseline level and a partial relapse of somatic anxiety symptoms. Chronic treatment with buspirone had no significant effects on lateral position and speed control. In contrast, diazepam significantly impaired control of lateral position in the first 3 weeks of treatment. There was no significant impairment in the fourth treatment week and the placebo-washout week. Speed control was significantly impaired only in the first week. The relevance of the trend toward decreasing performance impairment during chronic treatment remains to be established.

**Workpackage No.:** 2

**Author:** VANLAAR, M.W., VOLKERTS, E.R. AND VANWILLIGENBURG, A.P.P.

**Year:** 1992

**Title:** Therapeutic effects and effects on actual driving performance of chronically administered buspirone and diazepam in anxious outpatients

**Journal/Book Name:** Journal of Clinical Psychopharmacology

**Volume:** 12, 2, 86-95

**Keywords:** diazepam, buspirone, driving performance, anxious outpatients

**Abstract:** The acute and subchronic effects of two dosages of a new serotonergic antidepressant, nefazodone, and those of the tricyclic imipramine were examined in a double-blind, crossover, placebo-controlled study. Twenty-four healthy subjects from two age groups (12 adults and 12 elderly from both sexes) received the four treatments (nefazodone, 100 and 200 mg twice daily; imipramine, 50 mg twice daily; and placebo) for 7 days with a 7-day washout period. Measurements were performed after the morning

doses on day 1 and day 7. These included a standard over-the-road highway driving test, a psychomotor test battery, and sleep latency tests. Blood samples were taken on both days and analyzed to determine concentrations of parent drugs and their major metabolites. The main results showed that the reference drug, imipramine, had a detrimental effect after a single dose on lateral position control in the driving test, primarily in the adult group, that diminished after repeated dosing. Minor impairment on psychomotor test performance was found with both days. On the other hand, a single administration of both doses of nefazodone did not impair highway driving performance (even showed some improvement) and had no or only minor effects on psycho-motor performance. After repeated dosing, nefazodone 200 mg twice daily (but not the 100-mg dose) produced slight impairment of lateral position control; dose-related impairment of cognitive and memory functions was found. The effects of nefazodone were generally in the same direction in both age groups. Significant correlations were found between steady-state concentrations of nefazodone in plasma (200-mg, twice-daily condition) as well as imipramine, and reaction time changes in a memory scanning task. Neither drug appeared to induce daytime sleepiness as measured by the sleep latency tests

**Workpackage No.:** 2

**Author:** VANLAAR, M.W., VANWILLIGENBURG, A.P.P. AND VOLKERTS, E.R.

**Year:** 1995

**Title:** Acute and Subchronic effects of nefazodone and imipramine on highway driving, cognitive functions, and daytime sleepiness in healthy adult and elderly subjects

**Journal/Book Name:** Journal of Clinical Psychopharmacology

**Volume:** 15, 1, 30-40

**ISBN/ISSN:** 0271-0749

**Keywords:** serotonin agonist, meta-chlorophenylpiperazine, human performance, antidepressants, placebo, psychomotor, volunteers, sertraline, responses, diazepam

**Abstract:** Two groups of 12 outpatients each (six men and six women) with generalized anxiety disorder, participated in this study. Each patient was treated single-blind with placebo during the first 7 days (baseline), followed by a double-blind drug treatment period of 4 consecutive weeks (active) and ending again with 7 days single-blind placebo treatment (washout). One group received buspirone 5 mg three times a day in the first week and continued with 10 mg in the morning, 5 mg in the afternoon, and 5 mg in the evening during the second, third, and fourth weeks. The other group received diazepam 5 mg three times a day in all 4 weeks. On the evening of the seventh day of each treatment week the Hamilton Rating Scale for Anxiety and the Symptom Check List (90 items) were applied to assess the therapeutic effects, followed by an on-the-road driving test that started 1.5 hours after the last drug or placebo intake. The test consisted of operating an instrumented vehicle over a 100 kilometer highway circuit while attempting to maintain a constant speed and a steady lateral position within the right traffic lane. Two patients in the diazepam group were unable to complete their test after the first and second treatment week, respectively, because of serious sedative reactions. Both buspirone and diazepam were equally effective in reducing overall anxiety symptoms. The specific profiles showed that buspirone also reduced concomitant depressive symptoms and symptoms of interpersonal sensitivity and anger-hostility. In contrast, diazepam was found to be



slightly more effective in reducing somatic symptoms and to positively affect sleep disturbances. Moreover, abrupt discontinuation of diazepam resulted in a relapse of psychic anxiety symptoms comparable with the placebo-baseline level and a partial relapse of somatic anxiety symptoms. Chronic treatment with buspirone had no significant effects on lateral position and speed control. In contrast, diazepam significantly impaired control of lateral position in the first 3 weeks of treatment. There was no significant impairment in the fourth treatment week and the placebo-washout week. Speed control was significantly impaired only in the first week. The relevance of the trend toward decreasing performance impairment during chronic treatment remains to be established

**Workpackage No.:** 2

**Author:** VENEZIANO, C. AND VENEZIANO, L.

**Year:** 1992

**Title:** Psychosocial characteristics of persons convicted of driving while intoxicated

**Journal/Book Name:** Psychological Reports

**Volume:** 70 (3 Pt 2), 1123-30

**ISBN/ISSN:** 0033-2941

**Keywords:** Adolescence ; Adult ; Aged ; Alcohol Drinking LJ/PX ; Alcoholic Intoxication PC/PX ; Automobile Driving LJ/PX; Depression PX ; Female ; Human ; Life Change Events ; Male ; Middle Age ; Personalitiy Assessment \* ; Substance-Related Disorders PX

**Abstract:** Psychosocial and sociodemographic characteristics were obtained on a sample of 498 Missouri DWI offenders. The information included problems associated with alcohol use, past treatment, arrest data, stressful life events, depression, and substance abuse. Descriptive results are discussed in terms of theoretical and practical implications.

**Workpackage No.:** 3

**Author:** VERMEEREN, A., DE GIER, J.J. AND O'HANLON, J.F.

**Year:** 1993

**Title:** Methodological guidelines for experimental research on medicinal drugs affecting driving performance an international expert survey

**Journal/Book Name:** Institute for Human Psychopharmacology, The Netherlands

**ISBN/ISSN:** 90-5147-021-5

**Keywords:** drugs, driving, methodology of experimental research, guidelines

**Abstract:** The objective of this study was to provide a preliminary set of guidelines, based on a consensus of scientific opinion, regarding methodology of experimental research on medicinal drugs affecting driving performance. A questionnaire was designed in the form of an intentionally provocative 'position paper' proposing a series of methodological guidelines, accompanied by arguments providing a background. Thirteen propositions referring to various aspects of design, procedures, testing methods, analysis and reporting were put forward. Forty one international experts in the field of drugs and driving research responded to the survey.

**Workpackage No.:** 1

**Author:** VERMEEREN, A. AND O'HANLON, J.F.

**Year:** 1998

**Title:** Fexofenadine's effects, alone and with alcohol, on actual driving and psychomotor performance

**Journal/Book Name:** J Allergy Clin Immunol

**Volume:** 101, 3, 306-11

**ISBN/ISSN:** 0091-6749

**Keywords:** adult, alcohol drinking, anti-allergic agents, automobile driving, clemastine AD.TU, cross-over studies, double-blind method, female, hay fever, histamine antagonists, human, male, psychomotor performance, support, non U.S. Gov't, terfenadine

**Abstract:** BACKGROUND: Fexofenadine is the hydrochloride salt of terfenadine's active metabolite. OBJECTIVE: Fexofenadine's effects on performance were assessed in this study for the purpose of determining its safety of use by patients who engage in potentially dangerous activities, especially car driving. METHODS: Fexofenadine was administered in daily doses of 120 or 240 mg, each in single and divided units given over 5 days. Two milligrams of clemastine given twice daily and placebo were given in similar series. Twenty-four healthy volunteers (12 men, 12 women; age range, 21 to 45 years) participated in a double-blind six-way crossover study. Psychomotor tests (critical tracking, choice reaction time, and sustained attention) and a standardized actual driving test were undertaken between 1.5 to 4 hours after administration of the morning dose on days 1, 4, and 5 of each series. On day 5, subjects were challenged with a moderate alcohol dose before testing. RESULTS: Fexofenadine did not impair driving performance. On the contrary, driving performance was consistently better during twice daily treatment with 120 mg fexofenadine than during treatment with placebo, significantly so on day 4. Both of the 240 mg/day regimen significantly attenuated alcohol's adverse effect on driving on day 5. Effects in psychomotor tests were not significant, with the exception of the critical tracking test in which the first single doses of fexofenadine, 120 and 240 mg, had significantly impairing effects. CONCLUSION: It was concluded that fexofenadine has no effect on performance after being taken in the recommended dosage of 60 mg twice daily

**Workpackage No.:** 2

**Author:** VESELIS, R.A., REINSEL, R.A., FESHCHENKO, V.A., WRONSKI, M., DNISTRAN, A., DUTCHERS, S. AND WILSON, R.

**Year:** 1994

**Title:** Impaired memory and behavioral performance with fentanyl at low plasma concentrations.

**Journal/Book Name:** Anesth Analg

**Volume:** 79:5 952-60

**Keywords:** fentanyl; experimental

**Workpackage No.:** 2

**Author:** VINE, J. AND WATSON T, R

**Year:** 1983

**Title:** Incidence of drug and alcohol intake in road traffic accident victims.

**Journal/Book Name:** Med J Aust

**Volume:** 1(13), 612-5

**ISBN/ISSN:** 0025-729X

**Keywords:** Accidents, Traffic; Alcohol Drinking; Anticonvulsants BL; Automobile Driving; Autopsy; Diazepam BL; Ethanol BL; Female; Human; Male; Pharmaceutical Preparations BL; Support, Non-US Gov't; Tranquilizing Agents BL

**Abstract:** The analysis of 425 samples of blood, taken from people killed in motor vehicle accidents,

showed that drugs were present in about 10% of samples, whereas alcohol was present in 51%. All drugs identified were available on prescription, and the most commonly found drug was

diazepam.

**Workpackage No.:** 3

**Author:** VINE, J. AND WATSON, TR

**Year:** 1983

**Title:** Incidence of drug and alcohol intake in road traffic accident victims

**Journal/Book Name:** Med J Aust

**Volume:** 1(13), 612-5

**ISBN/ISSN:** 0025-729X

**Keywords:** Accidents, Traffic \*; Alcohol Drinking; Anticonvulsants BL; Automobile Driving; Autopsy; Diazepam BL; Ethanol \*BL; Female; Human; Male; Pharmaceutical Preparations \*BL; Support; Non-U.S. Gov't; Tranquilizing Agents BL

**Abstract:** The analysis of 425 samples of blood, taken from people killed in motor vehicle accidents, showed that drugs were present in about 10% of samples, whereas alcohol was present in 51%. All drugs identified were available on prescription, and the most commonly found drug was diazepam.

**Workpackage No.:** 3

**Author:** VINGILIS, E., STODUTO, G. AND BHUSHAN, M, K.

**Year:** 1992/3

**Title:** The role of alcohol and other drugs in seriously injured traffic crash victims

**Journal/Book Name:** Proceedings of the Twelfth International Conference on Alcohol, Drugs and Traffic Safety, Cologne, Germany.

**Volume:** 2, 965-971

**ISBN/ISSN:** 3-8249-0131-5

**Keywords:** drugs, driving, alcohol, crashes, accidents, victims, BAC, cannabinoids, benzodiazepines, cocaine, morphine

**Abstract:** One aim of this large-scale study was to describe the role of alcohol and other drugs in seriously injured traffic crash victims, by examining the differences between

those testing positive for blood alcohol and/or other drugs and those testing negative, on demographic, injury, and crash characteristics. In order to allow for clearer analyses of associations between alcohol and/or drug consumption and study measures, and allow for comparisons with past research which has concentrated on the driver population, drivers were selected for investigation. The study sample included all MVC victims admitted to a regional trauma unit during a 3 year period. Blood was routinely drawn from all patients and analysed. In summary, the findings suggest that positive BACs among seriously injured traffic crash victims are prevalent. Among drivers, 35.5% were found to be positive for blood alcohol, with 65% of these drivers BACs on admission over the legal limit, and about 87% estimated to be over the limit at crash time. Because many of those admitted more than 4 hours after the collision would have metabolized the alcohol before being admitted to hospital, these data are more than likely underestimating the incidence of alcohol use. Drug screens revealed that 41.3% of drivers were positive for at least one drug, and that 16.5% were positive for at least one drug in combination with alcohol. Drugs most commonly used were cannabinoids, benzodiazepines, cocaine, and morphine.

**Workpackage No.:** 3

**Author:** VINGILIS, E; STODUTO, G; MACARTNEY-FILGATE, MS; LIBAN, CB. AND MCLELLAN, BA

**Year:** 1994

**Title:** Psychosocial characteristics of alcohol-involved and non-alcohol involved seriously injured drivers.

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 26(2), 195-206

**ISBN/ISSN:** 0001-4575

**Keywords:** Personality characteristics, accidents, traffic, adolescence, adult, alcohol drinking, attitude to health, comparative study, discriminant analysis, factor analysis, statistical, female, human, injury severity score, life style, male, middle age, patient admission, personality, population surveillance, sampling studies, substance-related disorders, support, non U.S. Gov't support U.S. Gov't, trauma centres, wounds and injuries

**Abstract:** This study compared two groups of alcohol-positive and alcohol-negative, seriously injured, crash-involved drivers on demographics, personality characteristics, driving-related attitudes, prior driving history, lifestyle, substance use, and antecedent driver condition. The study sample was drawn from motor vehicle accident admissions to the Sunnybrook Health Science Centre Regional Trauma Unit. One hundred and six interviews were completed between August 1986 and November 1989, with blood alcohol concentration (BAC) data available for 96 drivers. These data suggest no driving-related attitude differences between the two groups. Self-reported driving histories indicated significantly fewer graduates of driving schools and more licence suspensions for the BAC-positive group. The only consistently significant differences were found for the drinking-related variables, with a greater percentage of the BAC-positive group reporting: lower age of first intoxication; a greater self-perceived drinking problem; a greater frequency of intoxication in the month before the accident; and greater self-

reported drinking-driving in the month before the accident. Principal-components factor analysis revealed a four-factor solution labelled: Alcohol Use, Deviant/Illicit Drug Use, Aggression, and Neuroticism. Alcohol Use was the only factor found to contribute substantially to the discriminant function, together with the job-related stress item. These data suggest that seriously injured, alcohol-positive and alcohol-negative crashed drivers are similar except that the alcohol-positive drivers show more signs of an alcohol problem.

**Workpackage No.:** 3

**Author:** VINGILIS, E., LARKIN, E., STODUTO, G, PARKINSON-HEYES, A. AND MCLELLAN, B

**Year:** 1996

**Title:** Psychosocial sequelae of motor vehicle collisions: A follow-up study

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 28 (5), 637-645

**Keywords:** emotional adjustment,/ injuries/ social adjustment,/ motor-traffic-accidents/ drug-usage/empirical study follow-up

**Abstract:** One-hundred-and forty-nine motor vehicle collision trauma victims were interviewed one year after discharge from a Regional Trauma Unit. Follow-up data indicated major post trauma problems such depression, anxiety, family stress, financial problems and driving fears. Almost 40% reported drinking and driving after the crash with a greater proportion of alcohol (blood alcohol content; BAC) positive drivers engaging in drinking and driving than BAC negative drivers. Notably, almost 16% of the BAC positive and 13% of the BAC negative reported involvement in another crash in the year since discharge

**Workpackage No.:** 3

**Author:** VNURMAN, E.F., MUNTJEWERFF, N.D., UITERWIJK, M.M., VAN VEGGEL, L.M., CREVOISIER, C., HAGLUND, L., KINZING, M. AND O'HANLON, J.F.

**Year:** 1996

**Title:** Effects of mefloquine alone and with alcohol on psychomotor and driving performance

**Journal/Book Name:** Eur J Clin Pharmacol

**Volume:** 50, 6, 475-82

**ISBN/ISSN:** 0031-6970

**Keywords:** adult, antimalarials, central nervous system Depressants, comparative study, double-blind method, drug interactions, ethanol, female, human, male, mefloquine, middle age, psychomotor performance, support, non U.S. Gov't

**Abstract:** OBJECTIVE: To determine whether mefloquine, a quinoline antimalarial drug, affects psychomotor and actual driving performance when given in prophylactic regimen, alone or in combination with alcohol. METHODS: Forty male and female volunteers were randomly assigned in equal numbers to two groups, and were treated double-blind for one month with mefloquine and placebo. The medication was taken in a

250 mg dose on the evenings of Days 1, 2, 3, 8, 15, 22 and 29. Testing was done on Days 4, 23 and 30, the latter after repeated doses of alcohol sufficient to sustain a blood concentration of about 0.35 mg.ml<sup>-1</sup>. Two real driving tests were used to measure prolonged (1 h) road tracking and car following performance. Critical Flicker/Fusion Frequency (CFF), critical instability tracking and body sway were also measured in the laboratory. RESULTS: Mefloquine caused no significant impairment in any test at any time relative to placebo. It significantly improved road tracking performance on Day 4. A significant interaction between prior treatment and alcohol was found in the body sway test, as the alcohol-induced change was less after mefloquine than placebo. The sensitivity of the driving test and the CFF test were shown by the significant overall effect of alcohol which did not discriminate between the two prior treatments. CONCLUSION: Mefloquine did not impair driving performance but rather improved it in the longer test, suggesting that the drug may possess psychostimulating properties.

**Workpackage No.:** 2

**Author:** VOAS, R.B.

**Year:** 1997

**Title:** The effect of drinking and driving interventions on alcohol-involved traffic crashes within a comprehensive community trial

**Journal/Book Name:** Addiction

**Volume:** 92, Supplement 2, S221-S236

**ISBN/ISSN:** 065-2140/97

**Keywords:** drinking, driving, law enforcement, breathalyzer, checkpoints

**Abstract:** The Drinking and Driving Component, one of five elements of the Community Trials Project, involved the implementation of a special drink driving countermeasure in the three experimental communities, one in Northerh California, one in Southern California and another in South Carolina. This intensified enforcement of driving under the influence (DUI) was designed to deter potential drinking drivers by increasing their perception of the risk of being arrested leading to a reduction in the consumption of alcohol before driving. The evaluation found that media advocacy training and technical assistance resulted in increased DUI news coverage and that additional police officer hours for DUI enforcement, greater use of breathalyzer equipment, increased officer training and more checkpoints produced increased DUI enforcement. The combined effects of increased DUI news coverage and DUI enforcement yielded increased public perceived risk of arrest and subsequently less drinking and driving. Overall the evaluation found that alcohol-involved traffic crashes were reduced as a result of this component in the experimental communities with the matched comparison communities.

**Workpackage No.:** 1

**Author:** VOGEL-SPROTT, M., MARTECHNER, W. AND McCONNELL, D.

**Year:** 1989

**Title:** Consequences of behavior influence the effect of alcohol

**Journal/Book Name:** Journal of Substance Abuse

**Volume:** 1(4), 369-79

**ISBN/ISSN:** 0899-3289

**Keywords:** Adult; Alcohol Drinking \*AE/PX ; Alcoholic Intoxication \*PX ; Automobile *Driving* ; Drug Tolerance; Ethanol PK ; Human ; Male ; Motivation \* ; Psychomotor Performance \*DE ; Reaction Time DE ; Reinforcement Schedule ; Support, Non-U.S. Gov't

**Abstract:** Four groups of six male social drinkers learned a complex psychomotor task and then performed it 20 times after drinking a dose of 0.60 g alcohol/kg. Group C received money contingent on the display of nonimpaired performance under alcohol. Group 1 received a less valuable outcome (information only). Group R received money scheduled randomly with respect to compensatory performance, and group N received no outcome for performance under drug. A briefer duration of impairment, faster recovery at higher BACS, and less impairment during declining alcohol levels was displayed by group C, followed in order by 1, R, and N, which displayed least resistance to alcohol. These results are consistent with other evidence demonstrating that these particular treatments have a similar effect on chronic alcohol tolerance. Taken together, the findings imply that the learned expectation of some valuable consequence for drug compensatory performance enhances behavioral tolerance to single and repeated doses of alcohol.

**Workpackage No.:** 2

**Author:** VOLKERTS, E.R., VANLAAR, M.W., VANWILLIGENBURG, A.P.P. PLOMP, T.A. AND MAES, R.A.A.

**Year:** 1992

**Title:** A comparative study of on-the-road and simulated driving performance after nocturnal treatment with Lormetazepam 1 mg and Oxazepam 50mg

**Journal/Book Name:** Human Psychopharmacology-Clinical and Experimental

**Volume:** 7, 5, 297-309

**Keywords:** flurazepam, drugs

**Abstract:** The main purpose of this study was to compare the sensitivity of a driving simulator test model (TS2) with a standard on-the-road driving test, after one night treatment with lormetazepam 1 mg, oxazepam 50 mg (as a verum) and placebo. The secondary purpose was to measure the effects of the intended drugs and placebo in the same subject sample, after two treatment nights in the morning and in the afternoon, on on-the-road driving performance. Eighteen healthy male volunteers received the three treatments (2 consecutive nights each) according to a double-blind, three-way crossover design. Time of administration was set at 22.00 hours each night. An on-the-road driving test and a simulator driving test were conducted in the morning following the first night. After the second treatment night, on-the-road driving tests were performed in the morning and in the afternoon. The on-the-road driving test consisted of operating an instrumental automobile over a 100 km highway circuit at a constant speed (90 km/h) and constant steady lateral position between the right lane boundaries. Primary performance measure was the SD of lateral position (SDLP). The simulator test consisted of repeatedly performing 'curve-following' manoeuvres, which was the main tracking control task, while simultaneously reacting to secondary visual signs. Test parameters were the number of correctly executed manoeuvres (TC) and reaction time (RT). Oxazepam 50 mg seriously impaired, and lormetazepam 1 mg slightly impaired, on-the-road driving

performance in the morning, both after the first and second treatment night. The drugs produced no significant effects in the afternoon test following the second night. In contrast with these results, neither oxazepam 50 mg nor lorazepam 1 mg affected simulator tracking control after one night. No deterioration was found for reaction time. Correlational and multiple regression analyses were applied to determine relationships between SDLP, TC and RT. The major conclusion of this study was that the TS2 driving simulator test does not predict residual drug effects in the on-the-road driving test, and seems to be a less sensitive measure of sedative drug-induced impairment in contrast to the on-the-road driving test

**Workpackage No.:** 2

**Author:** VOLZ, H.P. AND STURM, Y.

**Year:** 1995

**Title:** Antidepressant drugs and psychomotor performance. A review.

**Journal/Book Name:** Neuropsychobiology

**Volume:** 31, 3, 146-55

**ISBN/ISSN:** 0302-282X

**Keywords:** animal, depressive agents, human, hypnotics and sedatives, psychomotor performance

**Abstract:** Nearly all antidepressants are tested psychometrically in order to detect side effects of these drugs. Based on a review of the relevant published data on critical flicker fusion frequency measurements, simple reaction time, complex reaction time, tracking, tapping, and car driving simulation measurements, the underlying principles of the different effects of these drugs in healthy volunteers are discussed. It seems that essentially the sedative properties of a compound are important rather than e.g. specific reuptake inhibiting properties or the chemical structure. This finding is discussed in the light of the usefulness of these test procedures for detecting side effects.

**Workpackage No.:** 1

**Author:** VUURMANN, E.F., UITERWIJK, M, M., ROSENZWEIG, P. AND O'HANLON, J.F.

**Year:** 1994

**Title:** Effects of mizolastine and clemastine on actual driving and psychomotor performance in healthy volunteers

**Journal/Book Name:** Eur J Clin Pharmacol

**Volume:** 47, 3, 253-9

**ISBN/ISSN:** 0031-6970

**Keywords:** adult, automobile driving, behaviour, benzimidazoles, clemastine, comparative study, cross-over studies, dose-response relationship, drug, double-blind method, female, histamine, antagonists, human, male, psychometrics, psychomotor performance, reaction time, sensitivity and specificity, support, Non U.S. Gov't

**Abstract:** The acute effect of doses of mizolastine 5, 10, 20 and 40 mg, an active control (clemastine 2 mg) and placebo on actual car driving and psychomotor performance have been compared. Twenty four healthy volunteers were treated according to a double-blind,



6-way cross-over design. In the driving test, lasting about 1 h, lateral position control and speed were continuously measured; the psychomotor test battery, lasting 50 min, comprised critical flicker-fusion frequency, critical instability tracking, divided attention, memory search and choice reaction time, and vigilance studies; and mood changes and possible adverse-effects were rated on visual analogue scales. The results showed a dose-response relationship: mizolastine 40 and 20 mg impaired driving and psychomotor performance. The effect of mizolastine 40 mg on driving was strongly correlated with that of clemastine ( $r = 0.78$ ) and was comparable to the effect of a blood ethanol level of  $0.8 \text{ mg}\cdot\text{ml}^{-1}$ . Mizolastine 5 mg and 10 mg did not have a significant effect on driving performance and psychomotor tests. It was concluded that at a 10 mg dose of mizolastine, the therapeutic dose, it could be considered a safe anti-histamine, although individual adverse reactions cannot be completely ruled out.

**Workpackage No.:** 2

## W

**Author:** WAGENAAR, A.C., ZOBECK, T.S., WILLIAMS, G.D. AND HINGSON, R.

**Year:** 1995

**Title:** Methods used in studies of drink-drive control efforts: A meta-analysis of the literature form 1960-1991

**Journal/Book Name:** Accident Analysis and Prevention

**Volume:** 27, 3, 307-316

**ISBN/ISSN:** 0001-4575 94000073-5

**Keywords:** alcohol, driving, meta-analysis, control policies, enforcement efforts, literature review

**Abstract:** We searched the drink-drive control literature over the past three decades, finding over six thousand documents. After detailed review of the abstracts and papers, 125 studies contained separate empirical evaluations of teh effects of 12 DWI control policies and enforcement efforts (administrative licence suspension, illegal *per se*, implied consent, preliminary breath test, mandatory jail sentence, mandatory community service, mandatory licence suspension, limits on plea bargaining, mandatory fines, selective enforcement patrols, regular police patrols, and sobriety checkpoints). The 125 studies contained 664 distinct analyses that formed the basis for meta-analysis. All of the DWI control efforts were associated with reductions in drink driving and traffic crashes. The DWI control literature is limited by the preponderance of weak study designs and reports that often fail to include basic data required for meta-analysis. Because of the poor quality of much extant research, we were limited to simple gain scores or percent change estimates in the current study. Further research that does not include appropriate research designs and analytic methods will be of limited utility. We recommend that all future reports include effect estimates and standard error estimates, minimum data required for effective meta-analysis

**Workpackage No.:** 1

**Author:** WALLER, P.F., BLOW, F.C., MAIO, R.F., HILL, E.M., SINGER, K. AND SCHAEFER, N.

**Year:** 1995/6

**Title:** Crash characteristics and injuries of drivers impaired by alcohol/drugs

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Abstract:** This study is based on a sample of 717 drivers presenting to two emergencydepartments for treatment of motor vehicle injury. Data were collected on presence of alcohol and drugs, demographic factors, history of alcohol anddrug abuse, crash characteristics, and measures of injury. Based on analyses of blood samples drawn within six hours of the crash, alcohol was found to be the major drug associated with injury. Marijuana, cocaine, and opiates were identified in slightly over 14 percent of the

drivers, but almost half of these also had elevated blood alcohol levels. Those patients testing positive for drugs but not alcohol had crashes that were very similar to those of drivers testing negative for both alcohol and drugs. These findings are not consistent with studies reporting that illicit drugs are a major factor in motor vehicle crashes.

**Workpackage No.:** 3

**Author:** WALSH, M., BUCHAN, B. AND LEAVERTON, P.E.

**Year:** 1997

**Title:** Detection of illicit drugs in drivers

**Journal/Book Name:** Proceedings of the 14th International Conference on Alcohol, Drugs and Traffic Safety, Annecy.

**Volume:** 2, 485-491

**ISBN/ISSN:** 2-9511746-0-8

**Keywords:** illegal drugs, driving, detection, blood, urine analysis, DUI

**Abstract:** The principal goals of this project were: 1) to determine the extent to which potentially impairing drugs are found in drivers who fail to pass a roadside sobriety test, 2) to conduct a field evaluation of rapid "on-site!" drug testing devices to determine the most accurate, efficient, and cost effective device available, and 3) to determine whether it was feasible to integrate this technology into police operations. Our aim was to obtain specimens from 300 DUI suspects and analyze them on several new immunoassay devices in a field study conducted in collaboration with law enforcement agencies in Hillsborough County, Florida. Urine specimens were collected by police officers from persons placed under arrest for suspicion of driving-under-the-influence who consented to provide a specimen. During the time period 16 December 1995 to 17 March 1996 voluntary urine specimens were collected from 305 DUI suspects (2 of which were unusable). The data indicated that overall 29% of the specimens collected (88/303) were confirmed positive in the HHS certified laboratory for one or more illegal drugs. Of those individuals who were able to pass a breathalyzer test (i.e. BrAc <0.08) 41% were positive for one or more illegal drugs. Six individuals registered no alcohol (0.0% BrAc) and 4 of these 6 (67%) were positive for one or more of the drugs screened for. Two hundred sixty six subjects produced illegal BrAc concentrations with a mean BrAc of 0.154 (nearly twice the legal limit) and 29.1% of these legally drunk individuals (77/266) were also confirmed positive for one or more illegal drugs. The mean BrAc level of the legally drunk/drugged individuals was exactly the same as those who were only drinking (BAC =0.154g%). Of the 288 subjects who consented to provide both breath and urine samples 30% (86/288) were under the influence of illegal drugs. Since there was roughly 30% refusal rate for breath and an estimated 40% refusal rate for urine we can only assume that these data represent a conservative estimate of the real scope of the problem

**Workpackage No.:** 3

**Author:** WARREN, R., SIMPSIN, H., HILCHIE, J., CIMBURA, G., LUCAS, D. AND BENNETT, R.

**Year:** 1981

**Title:** Drugs detected in fatally injured drivers in the province of Ontario.

**Journal/Book Name:** In: Alcohol, drugs and traffic safety. (L. Goldberg, Ed.) Almqvist and Wiksell Int. Sweden.

**Keywords:** marihuana; field

**Workpackage No.:** 3

**Author:** WECHSLER, H., ROHMAN, M., KOTCH, J.B. AND IDELSON, R.K.

**Year:** 1984

**Title:** Alcohol and other drug use and automobile safety: a survey of Boston area teenagers.

**Journal/Book Name:** J Sch Health

**Volume:** 54, 5, 201-3

**ISBN/ISSN:** 0022-4391

**Keywords:** accidents, traffic, adolescence, alcohol drinking, attitude, behaviour, cannabinoids, female, health education, human, male, Massachusettes, pharmaceutical preparations, questionnaires, street drugs

**Abstract:** To provide educators with information regarding students' behaviors and beliefs about drinking, drug use and driving, the authors surveyed a stratified random sample of approximately 2,000 seventh and 10th graders in the Boston area in the spring of 1982. The focus of the present paper is on those students who might be most at risk for operating a motor vehicle under the influence of alcohol or marijuana. Therefore, the analysis presented here is limited to 623 students who were 16 years of age or older at the time of the survey. About half of the students in this age group used alcohol (63%) or marijuana (44%) and as many as 18% had used other illicit drugs during the 1982 school year. While most current drinkers (72%) drank not more than three times a month, nearly half (46%) of the current marijuana users smoked at least once a week. A substantial proportion of students combined drug and/or alcohol use with driving. Between 43% and 50% had been a passenger with a driver who was under the influence of alcohol or marijuana at least once since the beginning of the school year. Many students did not appear to be aware of the dangers involved in driving under the influence of alcohol or marijuana and about one out of four believed they could use alcohol and other drugs responsibly. Both students' behaviors and beliefs regarding drinking, drug use and driving were significantly related to the extent of their involvement with alcohol and other drugs

**Workpackage No.:** 3

**Author:** WELLS-PARKER, E; COSBY, P.J. AND LANDRUM, J.W.

**Year:** 1986

**Title:** A typology for drinking driving offenders: methods for classification and policy implications.

**Journal/Book Name:** Accident Analysis Prevention

**Volume:** 18(6), 443-43

**Keywords:** Accidents, Traffic, Adult, Alcoholic Intoxication CL/RH ; Automobile Driving ; Female ; Human ; Jurisprudence ; Legislation, Drug, Male ; Middle Age ; Mississippi ; Support, U.S. Gov't, Non-P.H.S.

**Abstract:** Comprehensive arrest histories were obtained for 353 DUI offenders who were referred to a probation and rehabilitation demonstration program. The average number of total offenses was 7.9, with 89% of all tracked offenders having more than one offense. Approximately 63% of all recorded offenses were other types of offenses besides DUI. The overall arrest history profile of the group suggested that many DUI offenders are habitual violators of other laws as well. To identify distinctive arrest profiles within the referral sample, a Q mode factor analysis followed by a discriminant function analysis was used to classify offenders into profile subgroups. Five distinctive subgroups emerged. A "low offense group was characterized by the lowest average number of overall arrests and also contained all offenders with no arrest besides the index DUI arrest. A "mixed group had a higher average number of total arrests than the "low offense group and diverse types of offenses. A young "traffic group was distinguished by many hazardous moving violations other than DUI. Two smaller and older groups--a "public drunkenness group and a "license group--had the highest average number of arrests including DUI, public drunkenness, license violations, equipment violations, disturbance arrests and assault arrests. These subgroups were found to differ on demographic variables and drinker status variables. The "public drunkenness group was found to have the highest accident rate. Groups were compared to groups found in other cluster analyses. Also, treatment implications were discussed. It was suggested that treatment programs focusing exclusively on changing alcohol consumption behavior are not likely to reduce accident risk for some of the offender groups. For example, it was suggested that effective intervention for the "traffic group should target driving behaviour, whether drunk or sober, rather than focus exclusively on consumption behavior. Other alternatives are also discussed.

**Workpackage No.:** 1

**Author:** WETHERELL, A

**Year:** 1996

**Title:** Performance Tests

**Journal/Book Name:** Environmental Health Perspectives

**Volume:** 104,S2, 247-273

**ISBN/ISSN:** 0091-6765

**Keywords:** psychomotor tests/drug effects/ diazepam/performance models/ psychometrics /test standardisation/short-term memory/information-processing performance/environmental research/ dual-task performance/ psychomotor performance/ driving performance/ human psychopharmacology/ dose levels/ cognitive performance/ intravenous diazepam

**Abstract:** This paper discusses the use of psychological performance tests to assess the effects of environmental stressors. The large number and the variety of performance tests are illustrated, and the differences between performance tests and other psychological tests are described in terms of their design, construction, use, and purpose. The stressor emphasis is on the effects of drugs since that is where most performance tests have found their main application, although other stressors, e.g., fatigue, toxic chemicals, are mentioned where appropriate. Diazepam is used as an example. There is no particular performance emphasis since the tests are intended to have wide applicability. However,

vehicle-driving performance is discussed because it has been the subject of a great deal of research and is probably one of the most important areas of application. Performance tests are discussed in terms of the four main underlying models-factor analysis, general information processing, multiple resource and strategy models, and processing-stage models-and in terms of their psychometric properties-sensitivity, reliability, and content, criterion, construct, and face validity. Some test taxonomies are presented. Standardization is also discussed with reference to the reaction time, mathematical processing, memory search, spatial processing, unstable tracking, verbal processing, and dual task tests used in the AGARD STRES battery. Some comments on measurement strengths and appropriate study designs and methods are included.

**Workpackage No.:** 1

**Author:** WIECZOREK, W.F; MILLER, B.A. AND NOCHAJSKI, T.H.

**Year:** 1992

**Title:** Multiple and single location drinking among DWI offenders referred for alcoholism evaluation.

**Journal/Book Name:** Am J Drug Alcohol Abuse

**Volume:** 18 (1), 103-16

**ISBN/ISSN:** 0095-2990

**Keywords:** Adult ; Alcoholic Intoxication \*PX ; Alcoholism DI/\*PX/RH ; Automobile Driving LJ/\*PX ; Ethanol PK ; Female ; Human ; Male ; New York ; Risk Factors ; Social Environment \* ; Support, U.S. Gov't, Non-P.H.S.

**Abstract:** Problem-drinker drivers who drank at multiple locations differ substantially from those who drank at only one location. Persons who drank at more than one location prior to their DWI arrest exhibit the most severe alcohol problems. Multilocation drinkers consumed significantly greater amounts of alcohol--for nearly all alcohol measures including consumption per drinking day, consumption averaged over 30 days, and consumption on the day of the DWI arrest--than single location drinkers. The multilocation group experienced more alcohol problems in their lives, had higher Mortimer-Filkins test scores, were intoxicated more frequently, and had a greater probability of a DSM-III-R alcohol-dependence diagnosis. Compared to the single location drinkers, the multilocation group had more bad driving incidents, frequently (once a week) drove while drunk, and expressed the attitude that the DWI had less of an impact on their lives. The findings suggest that multilocation drinkers require intensive interventions.

**Workpackage No.:** 3

**Author:** WIECZOREK, W.F., MILLER, B.A. AND NOCHAJSKI, T.H.

**Year:** 1992

**Title:** The limited utility of BAC for identifying alcohol-related problems among DWI offenders

**Journal/Book Name:** J Stud Alcohol

**Volume:** 53, 5, 415-9

**ISBN/ISSN:** 0096-882X

**Keywords:** Accidents, Traffic, Adult, Alcohol Drinking BL ; Alcoholism DI; Automobile Driving LJ; Female ; Human ; Male ; Psychiatric Status Rating Scales ; Support, U.S. Gov't, Non-P.J.S.

**Abstract:** To see if blood alcohol concentration (BAC) is a significant indicator of problem drinking or an alcohol-related diagnosis, the relationships between BAC at arrest for drinking and driving, typical drinking, alcohol-related problems, problem drinking and an alcohol abuse or dependence diagnosis were examined for 235 drinking and driving offenders referred for alcoholism evaluation. BAC and typical drinking correlated weakly and no significant relationship between alcohol-related problems and BAC was found. Further, no significant relationship was found between BAC and alcohol abuse or dependence diagnoses, or between problem drinking and BAC. These findings cast doubt on the usefulness of a single report of BAC for diagnostic and screening purposes.

**Workpackage No.:** 3

**Author:** WILLIAMS, A.F., PEAT, M.A., CROUCH, D.J., WELLS, J.K. AND FINKLE, B.S.

**Year:** 1985

**Title:** Drugs in fatally injured young male drivers

**Journal/Book Name:** Public Health Reports

**Volume:** 100, 1, 19-24

**Keywords:** alcohol, marijuana, cocaine, fatally injured, crashes, driving, drugs

**Abstract:** One or more drugs were detected in 81 percent of 440 male drivers, aged 15-34, killed in motor vehicle crashes in California; two or more drugs were detected in 43 percent. Alcohol, the most frequently found drug, was detected in 70 percent of the drivers, marijuana in 37 percent, and cocaine in 11 percent. Each of 24 other drugs were detected in fewer than 5 percent. Except for alcohol, drugs were infrequently found alone; typically they were found in combination with high blood alcohol concentrations. The causal role of drugs in crashes was assessed by comparing drivers with and without drugs in terms of their responsibility for the crash. Alcohol was associated with increased crash responsibility; the role of other drugs could not be adequately determined

**Workpackage No.:** 3

**Author:** WILLIAMS, H., TAYLOR, R. AND ROBERTS, M.

**Year:** 1998

**Title:** Gamma-hydroxybutyrate (GHB): a new drug of misuse.

**Journal/Book Name:** Irish Medical Journal

**Volume:** 91:2 56-7

**Keywords:** GHB; field

**Abstract:** Accident and Emergency Departments offer a unique opportunity for identifying and monitoring new drugs of misuse. This series of six case reports describes the potentially serious medical complications associated with the use of gamma-hydroxybutyrate (GHB) a new drug of misuse on the UK scene. Profound unconsciousness occurred in all cases and despite full (and often rapid) recovery all

patients required medical intervention. Adverse effects occurred both when GHB was used alone or in combination with other illicit drugs and alcohol.

**Workpackage No.:** 3

**Author:** WILLUMEIT, HP; OTT, H; NEUBERT, W; HEMMERLING, KG; SCHRATZER, M. AND FICHTE, K

**Year:** 1984

**Title:** Alcohol interaction of lormetazepam, mepindolol sulphate and diazepam measured by performance on the driving simulator.

**Journal/Book Name:** Pharmacopsychiatry

**Volume:** 17(2), 36-43

**ISBN/ISSN:** 0720-4280

**Keywords:** Adult; Anti-Anxiety Agents, Benzodiazepine\*PD Antianxiety Agents Benzodiazepine; Automobile Driving\*; Diazepam\*PD; Double-Blind Method; Drug Interactions; Ethanol BL/\*PD; Female; Human; Lorazepam\*AA/PD; Male; Pindolol\*AA/PD; Placebos; Psychomotor Performance\*DE; Pulse DE; Reaction Time DE

**Abstract:** Sixteen healthy volunteers of a mean age of 26.4 years took part in a driving simulator test in an eightfold crossover study under double-blind conditions. The additional influence of alcohol was tested acutely after a single administration of 2 mg lormetazepam, a new, highly effective derivative from the benzodiazepine class, 10 mg mepindolol sulphate, a new betablocker without sedating properties, and 10 mg diazepam. All drugs were compared with placebo and the test was performed 1, 2 and 3 hours after oral intake. The aim was to investigate particularly the risks relevant in road traffic caused by simultaneous intake of these substances with alcohol. For this purpose, besides the driving simulator, an accurate reaction test ( "G ) and self-rating scales were used, the latter in order to assess subjective stress and anxiety levels. Lormetazepam, due to its strong sedating property, showed a reduction in driving performance and an increase in reaction time and pulse rate as compared with placebo, and these effects were highly potentiated by alcohol. Mepindolol sulphate expectedly reduced pulse rate when compared with placebo, otherwise there were no significant differences. Diazepam, when compared with placebo, like lormetazepam caused a reduction in driving performance and reaction capacity and an increase in pulse rate, but intensity and duration of this effect were less than with lormetazepam and did not reach statistical significance. No significant potentiating effects were observed after the additional application of alcohol.

**Workpackage No.:** 2

**Author:** WILLUMEIT, HP; OTT, H. AND NEUBERT, W

**Year:** 1984

**Title:** Simulated car driving as a useful technique for the determination of residual effects and alcohol interaction after short and long-acting benzodiazepines

**Journal/Book Name:** Psychopharmacology Suppl

**Volume:** 1, 182-92

**Keywords:** Anti-Anxiety Agents, Benzodiazepine\*PD Antianxiety Agents Benzodiazepine; Automobile Driving\*; Diazepam PD; Double-Blind Method; Drug



Interactions; Ethanol \*PD; Flurazepam PD; Heart Rate DE; Human; Lorazepam AA/PD; Pindolol AA/PD; Psychomotor Performance DE; Reaction Time\*DE; Sedatives, Nonbarbiturate PD

**Abstract:** Subjects and methods: 54 healthy volunteers took part in 3 placebo controlled double-blind trials designed partly as crossover, partly as parallel group studies. The long-acting (elimination half-life greater than 24 h) test drugs diazepam (DIA 5; 10 mg) and flurazepam (FLU 30 mg) were compared to the short-acting drugs (elimination half-life less than 12 h) lormetazepam (LOR 1.5; 2 mg) and mepindolol sulfate (MEP 10 mg; betablocker) following acute or subchronic application. Alcohol (ALC; 0.4-0.8 per mill blood ALC concentration) was used as a compound interfering with the test drugs. Measurements with the driving simulator TS2 were taken at different times between 1 h and 15 h p.a. Results: Subchronic use of FLU causes significant impairment of driving performance the next morning in contrast to LOR which even increases the driving ability. The ALC potentiating effect of LOR is larger than that of DIA after acute intake. MEP acts like placebo but reduces blood pressure and heart rate. Interaction of LOR and ALC in the evening does not result in a prolonged hangover effect which could disturb driving performance the next morning. Discussion: Short-acting benzodiazepines without active metabolites have a profound advantage over those with long-acting accumulating characteristics in respect to matutinal car driving ability, if those drugs are used as nighttime hypnotics. These results highlight the necessity of screening hypnotic and tranquilizing drugs concerning their influence on car driving performance at different times after intake and under conditions of interactions with psychotropic drugs, especially alcohol. In view of future methodological requirements a revised model of driving simulation is presented. It is based on a coherent description of the system "driver-vehicle environment at the level of visual conditions, vehicle behaviour and driver performance. Preliminary data are shown.

**Workpackage No.:** 2

**Author:** WILSON, D.G.

**Year:** 1981

**Title:** Psychoactive drugs and driving impairment,

**Journal/Book Name:** Alcohol, Drugs and Traffic Safety. Proceedings of the T80 8th International Conference. Sweden, Graphic Systems, Goteborg. Edited by L. Goldberg.

**ISBN/ISSN:** 91-22-00425-4

**Keywords:** psychoactive drugs, driving, impairment

**Workpackage No.:** 1

**Author:** WILSON, D.

**Year:** 1985

**Title:** Experience with drugs and driving in Queensland, Australia

**Journal/Book Name:** Medicine, Science and The Law

**Volume:** 25, 1, 2-10

**ISBN/ISSN:** 0025-8024

**Keywords:** drugs, driving, Queensland, legislation, legal considerations, prescription drugs, abuse of therapeutic drugs, alcohol-drugs, methadone, Australia, drug interactions, legislation, methaqualone, pharmaceutical preparations

**Abstract:** Many prescribed drugs acting principally on the central nervous system are capable of impairing driving performance (e.g. analgesics, antidepressants, sedatives, hypnotics etc). Other drugs may produce undesirable side effects which impair driving performance (e.g. antihistamines, hypotensive agents). The degree of impairment varies widely from person to person, is dose related, and may be lessened by pharmacological tolerance. Thus, it is difficult to predict whether or not a disabling reaction will occur in any specific incidence. This paper discusses the legislation related to drugs and driving, the prescription and abuse of therapeutic drugs, drug-alcohol interaction, the problem of drug-driving, drugs commonly associated with impaired driving, legal considerations.

**Workpackage No.:** 1

**Author:** WINDHABER, J., MAIERHOFER, D. AND DANTENDORFER, .

**Year:** 1998

**Title:** Panic order induced by large doses of 3,4-methylenedioxymethamphetamine resolved by paroxetine.

**Journal/Book Name:** Journal of Clinical Psychopharmacology

**Volume:** 18(1), 95-6.

**Keywords:** ecstasy; MDMA; field; panic attacks

**Workpackage No.:** 3

**Author:** WOLSCHRIJN, H., DE GIER, J.J. AND DE SMET, P.A.G.M.

**Year:** 1991

**Title:** Drugs and Driving: a new categorization system for drugs affecting psychomotor performance

**Journal/Book Name:** Maastricht: Institute for Drugs, Safety and Behaviour, University of Limburg.

**Publisher:** drugs, driving, classifications, impairment, psychopharmacologists

**ISBN/ISSN:** 90-5147-017-7

**Abstract:** As a result of a number of epidemiological studies it appears that users of a particular group of drugs are more often involved in traffic accidents than non-users. Further epidemiological evidence concerning the risk aspect of drugs with regard to accident involvement has not yet been established. However, experimental research has clearly shown that drugs which affect the Central Nervous System (e.g. tranquillizers and hypnotics) can influence psychomotor performance adversely. The authors discuss packet warning labels and research on the behavioural side-effects of drugs. A feasibility study for a new drug classification system is reported based on the severity of side-effects. The system proposed contains seven categories to be used by an advisory committee for the classification of drugs hazardous to driving on the basis of their established level of negative effects on driving performance or skills related to driving. The 45 psychopharmacologists who answered their questionnaire were also asked to classify those drugs with which they had research experience, according to the proposed system.

The results of the questionnaire show clearly that a consensus exists among experts concerning the use and applications of the proposed system. Moreover, a clear consensus exists concerning the classification of a number of frequently used potentially (in traffic) hazardous drugs such as tranquillizers, hypnotics, antidepressants and antihistamines. It is the purpose of this study to enhance and clarify information concerning drugs having a potentially dangerous effect on driving.

**Workpackage No.:** 1

**Author:** WORLD HEALTH ORGANISATION,

**Year:** 1997

**Title:** Cannabis: a health perspective and research agenda.

**Journal/Book Name:** WHO MSA/PSA/97 4.

**Workpackage No.:** 1

**Author:** WORM, K., CHRISTENSEN, H. AND STEENTOFT, A.

**Year:** 1985

**Title:** Diazepam in blood of Danish drivers: Occurrence as shown by gas-liquid chromatographic assay following radioreceptor screening

**Journal/Book Name:** Forensic Science Society

**Volume:** 25, 407-413

**Keywords:** benzodiazepines/ blood ethanol samples/ impaired driving/ toxicology/ diazepam

**Abstract:** A rapid radioreceptor screening technique for benzodiazepines was found to correlate well with results from specific , quantitative GLC technique. Analysis of a sample of the 26000 bloods taken from Danish drivers for ethanol determination in one year (1978-79) showed that out of 1382 contained diazepam or desmethyldiazepam. In only 15% of these positive cases had a request for benzodiazepines analysis been made by the police.

**Workpackage No.:** 3

**Author:** WORM, K., STEENTOFT, A. AND TOFT, J.

**Year:** 1998

**Title:** Drug and narcotic use among Danish drivers

**Journal/Book Name:** Ugeskr-Laeger

**Volume:** 160, 7, 1025-9

**ISBN/ISSN:** 0041-5782

**Keywords:** adult, automobile driving, benzodiazepines, Denmark, English abstract, ethanol, female, forensic medicine, human, male, narcotics, substance abuse, detection

**Abstract:** Marijuana is a crude, intoxicating drug that has become much more potent in the past decade. Adolescents intoxicated from marijuana suffer from impairment of short-term memory and automobile driving skills. The drug is easily detected in users by means of immunoassay analysis of urine specimens. Frequent use by young adolescents can impede normal maturation and cause or contribute to an amotivational syndrome.

**Workpackage No.: 1**

**Author:** WYLIE, K.R., THOMPSON, D.J. AND WILDGUST, H.J.

**Year:** 1993

**Title:** Effects of depot neuroleptics on driving performance in chronic schizophrenic patients

**Journal/Book Name:** Journal of Neurol Neurosurg Psychiatry

**Volume:** 56, 8, 910-3

**ISBN/ISSN:** 0022-3050

**Keywords:** adult, aged, antipsychotic agents, automobile driving, delayed action preparations, female, human, male, middle age, psychiatric status rating scales, psychomotor performance, reaction time, schizophrenia, schizophrenic psychology

**Abstract:** Patients who are prescribed psychotropic medication may be expected to have some impairment in general attention and concentration and in measures of psychological and motor performance. These impairments may be due to the illness itself, the medication or the combination of both. Twenty two patients who were receiving depot neuroleptics for chronic schizophrenia were compared with sixteen control subjects in their performance on simulated driving tests. There was a significant decrement in driving performance in the index group compared with a normal control group.

**Workpackage No.: 2**

## Y

**Author:** YANEZ, J.L., DEL RIO, M.C. AND ALVAREZ, F.J.

**Year:** 1993

**Title:** Alcohol-related mortality in Spain.

**Journal/Book Name:** Alcoholism: Clinical and Experimental Research

**Volume:** 17, 2, 253-255.

**Workpackage No.:** 3

**Author:** YU, J.A. AND WILLIFORD, W.R

**Year:** 1991

**Title:** Calculating DWI/DWAI recidivism with limited data: using state driver license file for drinking and driving research.

**Journal/Book Name:** J Drug Educ

**Volume:** 21(4), 285-92

**ISBN/ISSN:** 0047-2379

**Keywords:** Research, Recidivism, alcohol drinking, automobile driving, data collection, data interpretation, statistical, human, licensure, New York, recurrence, research, support, Non U.S. Gov't

**Abstract:** One major research issue in drinking-driving is the volume of DWI/DWAI recidivism in a political unit during a given period of time. This article addresses a methodological issue: How can limited data from the official driver license file be used to calculate drinking-driving recidivism rates? New York State maintains one of the most comprehensive driver license files in the nation, but a dynamic process purges records on the file that are more than ten years old. The magnitude of the recidivism rate calculated from this file, thus, is influenced by the number of data points included: the more years of data included, the higher the rate. We used OLS to examine the impact of the dimension of the data on the recidivism rate and mathematically extended the file to the point where the impact of the data dimension is minimum. We, then, calculated the New York State DWI/DWAI recidivism with an "extended dimension"

**Workpackage No.:** 1

**Author:** YU, J; ESSEX, D.T. AND WILLIFORD, W.R.

**Year:** 1992

**Title:** DWI/DWAI offenders and recidivism by gender in the eighties: a changing trend?

**Journal/Book Name:** Int J Addict

**Volume:** 27, 6, 637-47

**ISBN/ISSN:** 0020-773X

**Keywords:** Adult ; Alcohol Drinking LJ/\*TD ; Automobile Driving LJ ; Female ; Human ; Male ; New York ; Recurrence ; Sex Factors ; Support, Non-U.S. Gov't

**Abstract:** The study is based on a systematic random sample from the New York State's Driver License File, which contains 15,032 drivers who were convicted of DWI/DWAI at least once in the period of 1978 to 1988. The analysis reveals (1) the proportion of male offenders 20 and younger continued to decrease through the 1980s, while the proportion of female offenders 21 and older increased; and (2) the female DWI/DWAI recidivism rate began to parallel the male recidivism rate after the mid-1980s. A number of factors may be attributed to the changing DWI/DWAI structure, such as the impact of the 21 alcohol purchase age law, the change of women's roles and lifestyles, and the changing attitudes of the public and the police toward female drinking-driving.

**Workpackage No.:** 3

**Author:** YU, J. AND WILLIFORD, W.R.

**Year:** 1993

**Title:** Problem drinking and high-risk driving: an analysis of official and self-reported drinking-driving in New York State.

**Journal/Book Name:** Addiction

**Volume:** 88(2), 219-28

**ISBN/ISSN:** 0965-2140

**Keywords:** Problem drinking, High risk drinking, alcohol drinking, automobile driving, female, human, male, New York, public health, questionnaires, risk factors, sex factors, support, U.S. Gov't, Non=PHS

**Abstract:** The authors collected data from 878 respondents at high risk of problem drinking and drunk driving and tested a hypothesis that stipulates problem drinking and high-risk driving as two necessary conditions of drunk driving. Controlling for a number of alcohol and non-alcohol-related variables, the analysis shows problem drinking to have consistent and significant effects on repeat DWI offences and on the frequency of self-reported drinking-driving events. High-risk driving increases the frequency of self-reported drinking-driving. Males are more likely than females to be arrested for DWI, but there is no gender differences in self-reported drinking-driving. The authors further note a possible 'suppress effect' in that a negative relationship between DWI arrests and high-risk driving is concealed by problem drinking. That is, problem drinkers with multiple DWI arrest records may drive more carefully than before so as to avoid further contact with the police and licensing authorities. Public policy implications of the findings are discussed.

**Workpackage No.:** 3

## Z

**Author:** ZACNY, J.P, LICHTOR, J.L., ZARAGOZA, J.G. AND DEWIT, H.

**Year:** 1992

**Title:** Subjective and behavioral responses to intravenous fentanyl in healthy volunteers.

**Journal/Book Name:** Psychopharmacology

**Volume:** 107:2-3 319-26

**Keywords:** fentanyl

**Abstract:** Fentanyl is a mu opiate agonist which is occasionally abused by medical personnel who have ready access to the drug. We examined in healthy volunteers (N = 13) the subjective and psychomotor-impairing effects of intravenous fentanyl (0-100 micrograms/70 kg). A randomized, placebo-controlled, crossover design was used in which subjects were injected with 0, 25 (N = 6), 50 and 100 micrograms/70 kg fentanyl in a double-blind fashion. Subjects completed several questionnaires commonly used in abuse liability testing studies before drug injection and at periodic intervals for up to 3 h after drug injection. Subjects also completed several psychomotor tests at these times. Some aspects of psychomotor functioning (e.g., eye-hand coordination) were impaired by fentanyl. Fentanyl produced dose-related increases in ratings of "high" and "sedated," but also tended to produce dysphoria and somatic symptomatology. Most subjects reported liking the effects of the two higher doses of fentanyl for at least a brief time after injection, but they varied widely in their liking ratings across the 3-h post-drug injection period. Despite the transient increases in liking ratings, fentanyl did not increase scores on a widely-used measure of drug-induced euphoria (morphine-benzedrine group scale of the Addiction Research Center Inventory). The present results suggest that some medical personnel who experiment with fentanyl may like it, and thus be at increased risk for abusing the drug in the future.

**Workpackage No.:** 2

**Author:** ZACNY, J.P.

**Year:** 1996

**Title:** Should people taking opioids for medical reasons be allowed to work and drive?  
Editorial

**Journal/Book Name:** Addiction

**Volume:** 91, 11, 1581-1584

**ISBN/ISSN:** 0965-2140

**Keywords:** opioids, driving, tolerance, impairment, cognitive, psychomotor performance

**Abstract:** This editorial discusses the propensity of psychoactive drugs to impair cognitive and psychomotor performance, particularly in relation to driving and work. It is noted that opioids that are most likely taken for pain relief or heroin pharmacotherapy do not cause marked psychomotor or cognitive impairment. However, it is acknowledged that some studies have demonstrated impairment which seems to be a slowing down, rather than an impaired accuracy of, responding. People who are on stable doses of

opioids for extended periods of time, including cancer patients and people taking methadone for the treatment of heroin abuse, show little if any impairment to morphine-like opioids, suggesting that some sort of tolerance or habituation occurs

**Workpackage No.:** 1

**Author:** ZANCANER, S., GIORGETTI, R., FENATO, F., ROSSI, A., TEDESCHI, L, SNENGI, R, FRISON, G., MONTISCI, M., TAGLIARO, F., MERONI, M, GIRON, G., MARIGO, M. AND FERRARA, S.D.

**Year:** 1995/6

**Title:** Psychoactive substances and driving disability: epidemiological roadside survey in north-east Italy

**Journal/Book Name:** Proceedings of the 13th International Conference on Alcohol, Drugs and Traffic Safety (T'95) NHMRC Road Accident Research Unit, The University of Adelaide, Australia, 5005

**Keywords:** psychotropic substances/ alcohol/ drugs/ road accidents/ toxicological analysis/ cannabinoids/ cocaine/ amphetamines/ opiates/ benzodiazepines/ barbiturates

**Abstract:** Deaths due to road accidents during weekends have become a worrying phenomenon in Italy. With the aim of highlighting the role of psychotropic substances (alcohol, drugs of abuse, psychoactive drugs) in causing road accidents, a survey based on clinical and chemico-toxicological analyses was carried out on car drivers in the Veneto region during the weekends of the three-month period June-August 1994. Rapid clinical screening was carried out on 1237 drivers. 265 of these, suspected to be under the influence of psychotropic substances, were subjected to complete clinical and toxicological ascertainment involving the following procedures: a) anamnesis, aiming at evidence of possible current or past use of psychotropic substances; b) objective clinical examination, aiming at finding evidence of recent (signs of acute or chronic intoxication) or past use (signs of withdrawal or associated organic pathologies) of psychotropic substances; c) double sampling of blood and urine and chemico-toxicological analysis using immunochemical and GC/MS-SIM techniques. As well as many data of social and behavioural interest, processing of results demonstrated that: a) 58% of the drivers examined had consumed alcohol beverages; b) 34.8% had BACs higher than the threshold permitted in Italy (80mg% mL); c) 10.56% of drivers were found to be under the influence of drugs of abuse or psychoactive drugs; d) 42.8% of the BACs in the range 50-100mg% mL as ascertained by breathalyser, showed significant discrepancies with respect to direct blood dosage; e) the most frequently found substances were (in order): cannabinoids, cocaine, amphetamines, opiates, benzodiazepines, barbiturates.

**Workpackage No.:** 3

**Author:** ZEILER, HC

**Year:** 1993

**Title:** Women and drunk driving-- reference from the legal expert practice

**Journal/Book Name:** Blutalkohol

**Volume:** 30(1), 30-42

**ISBN/ISSN:** 0006-5250



**Keywords:** Accidents, Traffic LJ/SN ; Adolescence ; Adult ; Alcohol Drinking BL/EP LJ ; Alcoholic Intoxication BL/EP ; automobile Driving LJ/SN ; Cross-Sectional Studies ; English Abstract ; Ethanol PK ; Expert Testimony LJ ; Female ; Germany EP ; Human ; Incidence ; Middle Age ; Sex Factors

**Abstract:** From 1980 to 1990 the number of female drunken drivers increases significantly from 5.33% to 7.87% in Germany. Women between 25 and 55 years old are overrepresented, especially the 35-45 aged. The number of women, who had been sentenced for the first time because of drunken driving significantly decreases from 12.75% in 1985 to 9.07% in 1990 within the total subpopulation of those who were medical-psychologically examined in Münster. The blood-alcohol-concentrations (BACS) of the women examined in Münster were analyzed. There were no differences in the average BACs and in the variance. In every year the examined women were part of the same population of people with similar problems. The average BACs are 2.04/1000 (1980), 2.2/1000 (1985) and 2.01/1000 (1990). The analysis of the results of the medical-psychological examinations shows no significant difference between men and women in 1990. In 1980, 1985 and 1990 there was no increase in negative judgements because of medical reasons, in 1980 only one woman was suggested to participate in a driver-improvement-course and in 1985 significantly less women were rejected because of psychological reasons. This was caused by a significant increase in positive judgements in the subgroup of those women, who had more than one drunken driving offence or other incidents. The results show, that those women examined in Münster belong to the group of people who drink alcohol in an excessive and abnormal way. The equal treatment of women and men by the examining psychologists can be regarded as justified. In respect to the different conditional structure responsible for abnormal drinking of women in comparison to men it is necessary to examine women and men in different ways.

**Workpackage No.:** 3

**Author:** ZIMMERMANN, E.G., YEAGER, E.P., SOARES, J.R., HOLLISTER, L.E. AND REEVE, V.C.

**Year:** 1983

**Title:** Measurement of  $\Delta^9$ -Tetrahydrocannabinol (THC) in whole blood samples from impaired motorists

**Journal/Book Name:** Journal of Forensic Sciences

**Volume:** 28, 4, , 957-962

**Keywords:** toxicology, marihuana, tetrahydrocannabinol, driving (motor vehicle operation), radioimmunoassay, impairment

**Abstract:** The major psychoactive cannabinoid in marihuana  $\Delta^9$ -tetrahydrocannabinol (THC) was measured in 1792 randomly selected blood specimens from erratic motorists arrested for impairment who submitted to blood alcohol sampling. Of these specimens, 14.4% were positive for THC ( $\geq 5.5$ ng/mL). In those erratic driver specimens negative for alcohol THC positives arose to 23%. Drivers who used marihuana covered a broad age range. Aliquots of hemolyzed blood (10 $\mu$ L) were analyzed by a sensitive radioimmunoassay (RIA) not requiring extraction. RIA accuracy and specificity were validated by gas liquid chromatography/mass spectrometry (GLC/MS) split pair analysis (correlation coefficient =0.93). This initial experience should facilitate and amplify a

program designed to set forth the epidemiology of marihuana use in motorists and possible behavioural correlates.

**Workpackage No.: 3**