

Driving under the influence of drugs and medicines

Summary

Driving under the influence of drugs and psychoactive medicines is a threat to road safety. Especially the simultaneous use of alcohol and drugs and the combined use of different drugs cause a considerable increase of the risk. Presently, legislation on driving under the influence of drugs in traffic is being prepared in the Netherlands. Limits for several types of drugs are proposed in the legislation. Just as for alcohol such limits should preferably be based on factual information about the risks involved in their various concentrations and combinations. According to expectations, however, it will be some time before a system of effectively substantiated, accepted and workable risk-related limits has been established. Until that time, behaviour-related limits like those in the proposed legislation seem a workable alternative. Saliva testers in particular have been undergoing intensive development in recent years and seem to be the most suitable tool for screening drivers on drug use. Supplementary evidence could then be obtained by other means such as a blood test. In the case of medicines that could impair driving skills, physicians and pharmacists providing patients with good information could contribute to solving the problem. It must be noted that it is important to remain aware of the fact that in traffic alcohol is by far the most widely used psychoactive substance and that there are many more road fatalities due to alcohol use than fatalities due to the use of drugs and medicines.

Background and content

Article 8, Section 1 of the Dutch Road Traffic Act of 1994 makes it "an offence for a person to drive or to be in charge of a motor vehicle, when he is under such influence of a substance of which he knows or reasonably should know that its use – either in combination with or not in combination with the use of another substance – could diminish driving skills, that he must be considered unfit to drive". Included in these substances are alcohol, drugs and psychoactive medicines. This fact sheet addresses drugs and medicines; another fact sheet discusses the use of alcohol in traffic: [Driving under the influence of alcohol](#).

New legislation for driving under the influence of drugs is currently being prepared in the Netherlands. The proposed legislation covers the following substances: substances from the amphetamine category (amphetamine, methamphetamine, MDA, MDMA – this is ecstasy – and MDEA), cocaine, THC (cannabis), and GHB. Individual, behaviour-related limiting values have been determined. These limiting values indicate that once they are exceeded, the driving skills are affected in such a way that the driver can no longer be expected to drive properly. The proposed legislation does not give limiting values for medicines.

How many drivers use drugs and medicines?

Late 2011, a large European research project into driving under the influence of alcohol, drugs, and medicines during the period 2007-2009 was completed (DRUID: Driving Under the Influence of Drugs, Alcohol and Medicines). This study indicates that drugs and/or medication were found in the bodies of approximately 4% of the drivers in Europe (Houwing et al., 2011). This proportion was lower in the Netherlands (3.4%). The lower proportion in the Netherlands is, however, to be attributed to a lower use of medicines; for the use of drugs the proportion of approximately 2.8% is above the European average of about 2.6%. Just as with alcohol, drugs are more frequently used during night time hours than during the rest of the day. Medicines, on the other hand, are found among drivers more frequently during daytime. *Table 1* presents a comparison between the use of psychoactive substances in Dutch traffic and the estimated European average. The 95% confidence interval is given in brackets.

	Psychoactive substance	Prevalence in Dutch traffic (n = 4,822)	Estimated European average (n = 48,542)
No substance found	None	94.5% (93.81 - 95.10)	92.6%
Alcohol	Alcohol only, > 0,1 g/l	2.2% (1.78 - 2.60)	3.5%
Drugs	THC only	1.7% (1.34 - 2.07)	1.3%
	Cocaine/benzoylcegonine only	0.3% (0.18 - 0.50)	0.4%
	Amphetamines only	0.2% (0.10 - 0.36)	0.1%
	Illegal opiates (e.g. heroin) only	0.01% (0.00 - 0.09)	0.1%
Medicines	Benzodiazepines only	0.4% (0.25 - 0.62)	0.9%
	Medicinal opiates (e.g. morphine and codeine) only	0.2% (0.08 - 0.32)	0.4%
	Z-drugs (e.g. zolpidem and zopiclon) only	0.04% (0.01 - 0.15)	0.1%
Combinations	Multiple drugs use	0.4% (0.22 - 0.56)	0.4%
	Alcohol-drugs combinations	0.2% (0.13 - 0.42)	0.4%

Table 1. Prevalence of psychoactive substances in traffic during the period 2007-2009 (Houwing et al., 2011); 'n' is the number of persons tested; in brackets are the 95% confidence intervals.

The most commonly used drug among drivers is cannabis. During the period 2007-2009, only THC, the active component in cannabis, was found in almost 1.7% of the drivers in Dutch traffic. This percentage is higher than the European average of 1.3%. Furthermore, another 0.4% of THC was found in combination with alcohol or other psychoactive substances. In 0.3% of the drivers only cocaine and in 0.2% of the drivers only amphetamines were found. In addition these two drugs were also found in approximately similar percentages in combinations with alcohol or other drugs. A total of 0.2% of the drivers tested positive on the combination of alcohol and drugs and 0.4% on a combination of drugs and drugs or medicines. Combinations of different drugs and of alcohol and drugs are most frequent among male drivers younger than 35; in 1.5 to 2% of this group of drivers one of these combinations was found.

The use of medicines only (0.6%) is lower in Dutch traffic than the use of one drug only (2.2%). In the Netherlands the use of medicines that affect driving skills is approximately half of the use in other countries that participated in the DRUID study. This is mainly a result of medicine use in the Netherlands being relatively low. Two thirds of the drivers who tested positive for the use of medicines affecting driving skills were users of benzodiazepines (sleep medication or tranquilizers). The remaining drivers who had used medicines mainly tested positive for medicinal opiates like morphine or codeine. These medicines are mostly used as strong painkillers. The use of SSRI's (serotonin re-uptake inhibitors which are used as anti-anxiety medication) was not included in the DRUID study, although the use of such medication has increased considerably during the period 2000-2007 (Pharmaceutisch Weekblad, 2007) and drivers who use SSRIs have an increased risk of being involved in a crash (Ravera et al., 2011).

During the period 2000-2004, a similar study was carried out into the use of medicines and drugs in traffic in the Dutch city region Tilburg. This study was done within the European IMMORTAL project (Impaired Motorists, Methods of Roadside Testing and Assessment for Licensing). Especially the percentages for the use of benzodiazepines and THC by drivers were higher in the IMMORTAL study than in the recent DRUID study. It is difficult to say whether this is indeed due to the fact that fewer people participate in traffic who have used THC and benzodiazepines, because the research methods used in the studies differed on a number of important points.

How does the use of drugs and medicines affect driving skills?

The effect of drugs and medicines on driving skills varies according to the type of drug; there can be differences in the effects even within a single type of drug. The effect of cannabis, for example, is that the user becomes 'high' or 'stoned' and experiences feelings of euphoria, relaxation and lethargy. Their reaction time increases, their coordination decreases, and their memory is affected. As a consequence, complex driving tasks in which the driver's attention has to be divided over various individual tasks are not performed equally well. Cannabis users, however, are aware of their diminished skills and adjust their driving behaviour so that the adverse effects may be less than would be expected. In combination with alcohol, on the other hand, the use of cannabis leads to an extra deterioration of driving performance, because the negative effects of both substances are mutually reinforcing (Robbe, 1994; Steyvers & Brookhuis, 1996; Shinar, 2006). Findings of epidemiological research support the adverse effect of combined substance use (Haworth et al., 1997; Drummer et al., 2004; Mathijssen & Houwing, 2005; Hels et al., 2011).

Stimulant drugs such as amphetamines, ecstasy and cocaine make users feel energetic and alert. This can lead to users becoming reckless and driving faster and more aggressively. Drivers under the influence of stimulant drugs also take more risks even though their control over their vehicle diminishes (Shinar, 2006).

Medicines, particularly the benzodiazepines (sleeping pills, tranquilizers and anti-anxiety medications) and codeine can also affect driving skills. Their use can result in such effects as drowsiness, absent-mindedness, reduced coordination and reactions, and a reduced ability to make judgements. These effects vary depending on the type of benzodiazepine. For example, diazepam, flurazepam, flunitrazepam and lorazepam are known to reduce a driver's control over the vehicle. As using benzodiazepines in combination with alcohol has extra strong negative effects, various researchers strongly advise against their combined use (see, for example, Steyvers & Brookhuis, 1996; Shinar, 2006).

How many severely injured drivers have used psychoactive substances?

The DRUID study not only looked at the prevalence of psychoactive substances in traffic, but also investigated the prevalence among seriously injured drivers who had been admitted to hospital (Isalberti et al., 2011). Alcohol, drugs and/or psychoactive substances were found in 27.8% (Lithuania) to 52.6% (Belgium) of the seriously injured drivers in six European countries. Four countries also looked at the use of psychoactive substances among fatally injured drivers: this percentage varied from 30.5% in Sweden to 47.7% in Portugal. Alcohol was most frequently found among both fatally injured and seriously injured drivers. The Netherlands was one of the six countries that only tested for psychoactive substances in seriously injured drivers. Psychoactive substances were found in the blood of approximately 35% of the seriously injured drivers who had been admitted to hospitals in the Dutch municipalities of Tilburg, Enschede and Nijmegen. Also in the Netherlands alcohol was by far the most found substance. However, because the sample is small, the findings of the Dutch hospital study must be considered as indicative. The percentages per substance are given in *Table 2*, including the 95% confidence intervals.

Out of the seriously injured drivers in the Dutch study, 180 were also tested for GHB use, GHB only, or GHB in combination with the any of the substances that were tested for in the DRUID study (Houwing, 2011). GHB was found in another 2.8% (n = 5) of the 180 drivers GHB. In four cases (2.2%) the drivers had used no other substances; the fifth driver was found to have used GHB in combination with amphetamines.

	Psychoactive substance	Prevalence among seriously injured drivers (n = 186)
No substance found	None	66.1% (59.0 - 72.5)
Alcohol	Alcohol only, > 0,1 g/l	25.3% (19.6 - 32.0)
Drugs	THC only	0.5% (0.0 - 2.9)
	Cocaine/benzoyllecgonine only	1.1% (0.3 - 3.9)
	Amphetamines only	1.1% (0.3 - 3.9)
	Illegal opiates (e.g. heroin) only	-- (0.0% - 2.0%)
Medicines	Benzodiazepines only	-- (0.0% - 2.0%)
	Medicinal opiates (e.g. morphine and codeine) only	0.5% (0.0 - 2.9)
	Z-drugs (e.g. zolpidem and zopiclon) only	0.5% (0.0 - 2.9)
Combinations	Multiple drugs use	0.5% (0.0 - 2.9)
	Alcohol-drugs combinations	4.3% (2.2 - 8.3)

Table 2. Prevalence of psychoactive substances among seriously injured drivers who have been admitted to hospital (Isalberti et al., 2011).

The percentages in *Table 2* are no indication of how many casualties are *due to* the use of psychoactive substances in traffic. For this to be determined, the percentages among injured drivers must be compared with the percentages among random drivers. This way, the relative injury rates of the use of different psychoactive substances can be determined. The risks of drugs and medicines will be discussed in the next section.

What are the risks of using drugs and medicines?

Comparison of the prevalence of their use in ordinary traffic with the prevalence of their use among seriously and fatally injured drivers, gives an indication of the relative risk of drivers under the influence of these substances compared to that of sober drivers. *Table 3* gives the results of the DRUID study, with the relative risks of serious and of fatal injury are combined (Hels et al., 2011). The abbreviation BAC which is used in the table, stands for Blood Alcohol Content or Concentration and is expressed in g/l or ‰.

Risk level	Relative risk	Psychoactive substance
Moderate increase of risk	1-3	Alcohol, BAC 0,1 - 0,5
		Cannabis only
Average increase of risk	2-10	Alcohol, BAC 0,5 – 0,8
		Cocaine
		Illegal opiates
		Benzodiazepines and Z-drugs
		Medicinal opiates
Large increase of risk	5-30	Alcohol, BAC 0,8-1,2
		Amphetamines
		Multiple drugs use
Extremely large increase of risk	20-200	Alcohol, BAC 1,2 and higher
		Alcohol-drugs combinations

Table 3. *Relative risk of serious or fatal injury due to psychoactive substances in traffic (Hels et al., 2011).*

Use of a single drug

For cannabis a slight increase in risk was found which is comparable to a BAC of 0.1-0.5 ‰ alcohol (1 to 3 times higher risk).

For cocaine and illegal opiates (heroin) an increase in risk was found which is comparable to a BAC of 0.5 to 0.8 ‰ (2 to 10 times higher risk). However, during the DRUID study heroin was rarely found in Dutch traffic.

The risk for amphetamine use is relatively high and, based on the DRUID data, is comparable to a BAC of about 0.8 to 1.2‰. Experimental studies within the same DRUID project, however, do not indicate that amphetamine use causes a strong decrease in driving skills. According to the researchers who were involved, an explanation for the difference between these results may lay in the fact that the concentrations of amphetamines found in traffic are much higher than the concentrations used in the experimental studies. Furthermore, they think that part of the increased risk may be due to an increase in fatigue when the amphetamines cease to be effective.

Use of medicines

For sleep medication and tranquilizers and for strong painkillers the DRUID project found an increase in risk comparable to a BAC of 0.5 to 0.8 ‰ (2 to 10 times higher risk).

Experimental research, however, indicates that the risk is higher for incidental and beginning users than for chronic users (Verster & Ramaekers, 2009).

Furthermore, there may be large differences within one particular group of medicines. A recent study (Ravera et al., 2011), for example, only found an increased risk for benzodiazepines with an average period of effectiveness which were used as sleep medication. The study found no (significant) increase in effect for other types of benzodiazepines. Furthermore, this same study by Ravera et al. did find a significant increase in risk for SSRI's. As was mentioned earlier, this type of anti-anxiety medication was not investigated in the DRUID study.

The use of benzodiazepines in particular is associated with the problem of illegal and/or improper use. The illegal use of sleep medication and tranquilizers seems to be particularly high in South European countries (Houwing et al., 2011), due to a relatively high use of benzodiazepines combined with alcohol and drugs. In Italy the single use of benzodiazepines also occurs mainly in young drivers, both male and female, whereas in the rest of Europe benzodiazepines are mainly used by females over 35 years of age.

Use of multiple drugs

Users of multiple drugs are also a road safety hazard. In the DRUID study, approximately 0.4% of all drivers had used multiple drugs, but they made up 7.4% of the fatally and severely injured drivers. The risk of sustaining severe or fatal injury in a traffic crash is about 5 to 30 times higher for users of multiple drugs than for sober drivers.

How can the use of drugs and medicines by drivers be detected?

Recent use of drugs and medicines that impair driving skills is best established by using blood or saliva tests. Although other methods such as the testing of hair, urine and sweat can indicate drug use, they have a longer detection window. This means that when traces of drugs or medicines are detected, it cannot be indicated with certainty whether that person is still actually under the influence. Urine tests, moreover, are both difficult to conduct and prone to fraud. In addition, they violate physical integrity, as for that matter do blood tests.

Blood tests are expensive and cannot easily be used along the side of the road. Most drugs can be detected in the blood until approximately 24 hours after use. Some drugs, such as heroin, can only be detected in the blood up to one to two hours after use, whereas they can affect driving skills for a longer time.

Saliva tests have been undergoing rapid development in recent years. Unlike blood and urine tests, they scarcely violate physical integrity, they can fairly easily be conducted at the side of the road, are less prone to fraud than urine tests, and result less often in a false-positive result. Saliva specimens have the same short detection window as blood samples and are thus suitable for establishing recent drug use. Certain drugs such as cannabis and ecstasy, however, reduce the production of saliva, thus making it difficult to obtain a sufficient specimen. For some drugs, the sensitivity of saliva tests is still inadequate (Verstraete & Raes, 2006; Blencowe et al., 2010), but whether this disadvantage outweighs the previously mentioned advantages is questionable. The saliva test therefore appears suitable as a screening agent. Should police suspect drug use, they could then order a blood test and, in exceptional cases, a urine test as supplementary evidence.

The Dutch Ministry of Transport commissioned a test programme to be carried out to investigate the quality of a small selection of saliva testers between October 2008 and January 2009. Based on the results of this test programme, the National Police Services Agency (KLPD, 2009) draws the conclusion that "the predictability of certain drug use by drivers of vehicles acquired from the used saliva testers is of a level which is acceptable to the police" and that these saliva testers can be used as a preselective tool. At present legislation is being proposed to use the saliva test as a legal preselective tool for the detection of drug use by drivers. However, the blood test remains necessary to establish legal evidence. Although the sensitivity of the saliva testers is not equally reliable for all drugs, an evaluation of saliva testers (Blencowe et al, 2010) indicates that some testers can be considered sufficiently reliable as a preselective tool. The law proposal states that when a saliva test indicates drug use or when drug use is suspected, a blood test is required to establish whether the suspect is indeed an offender.

In addition to the presence of substances in the body, drivers can also be examined on the basis of clinical signs of drug use, such as wide pupils, bloodshot eyes or chewing movements, and a number of coordination exercises. In some European countries such as Belgium, Portugal and Sweden, this is done by specially trained police. An experiment is being conducted in the Dutch region of Twente in which the police examine drivers for drug use on the basis of clinical signs. The police in Twente are being supported in their assessments of clinical signs by an experienced, external drugs expert. No evaluation is known of this specific method. Results from the DRUID study (Blencowe et al., 2010) indicate that at standard alcohol tests, normal, untrained policemen are hardly capable to pick out drug users on the basis of clinical signs. It is to be expected that improved training and more experienced policemen will give better results, in addition to tests being carried out in places and at times where more serious users are to be expected.

A recent cost-benefit analysis of drugs enforcement in traffic (Veisten et al., 2011) indicates that drug enforcement in the Netherlands is cost-effective. However, the safety gains diminish as drug enforcement is carried out at the expense of alcohol enforcement as alcohol is still the most widely found substance among seriously injured drivers under the influence of psychoactive substances.

What measures can be taken?

Current measures against driving under the influence are aimed primarily at alcohol consumption and only to a very limited extent at the use of drugs and medicines. Even so, there are measures that could reduce the use of medicines and drugs that impair driving skills.

Introducing limits

The introduction of risk-related limits for drugs, just as we have for alcohol, would be the most desirable solution from a safety point of view. The use of risk-related limits means that the use of drugs is only punishable when it is at or above the level of which it can be scientifically established that that concentration unacceptably affects the risk. These limits are more difficult to establish for drugs than for alcohol because various drugs result in different levels of risk when used in different concentrations and in different combinations. This means that various limits would have to be established. Therefore, it will probably be some time before a properly supported and accepted system of risk-related limits can be defined. The present law proposal uses behaviour-related limits, meaning that a limit is set above which driving skills are affected. The road safety effects of using behaviour-related limits are not yet known to us. It would be advisable to focus drug enforcement particularly on groups with the highest risk such as the multi-drugs users. However, it is important to be aware of the fact that there are fewer traffic casualties due to the use of drugs and medicines than to alcohol consumption.

Providing information about medicines that impair driving skill

Drivers should be warned of the potential risk of combining medicine use and driving. This can be done by various forms of communication such as warning labels on the packaging of medicines, issuing leaflets, and running public information campaigns in the media. The objective of national campaigns initiated by the government such as *Drive safely with medicines* is to make users of medicines that impair driving skills aware of the risks of participating in traffic. These campaigns are launched at regular intervals.

Another possibility is having physicians and pharmacists provide individual patients with thorough information. For either of these forms of providing information, the medicines first need to be classified in a uniform manner according to their potential effect on driving skills. Such a system has also been set up within the DRUID project.

Conclusions and recommendations

There are various indications that the use of drugs by road users plays a role in road crashes.. Especially the combined use of alcohol and drugs and a combination of various drugs lead to considerably higher risks. The combined use of these substances occurs most frequently among young males. A drug limit could contribute to counteracting the use of drugs among drivers. From a road safety point of view, drug limits, just as for alcohol, should preferably be based on factual information about the risks involved in using the various concentrations and combinations. As this is not yet possible, the present law proposal in the Netherlands uses behaviour-related limits. Certain medicines also have an adverse road safety effect. Effective communication provided by physicians and pharmacists about the potential dangers of combining driving with the use of medicines that can impair driving skill can contribute to a reduction in the number of road casualties among this group of users.

From a road safety point of view the enforcement of alcohol in traffic is more important than the enforcement of drugs and medicines that impair driving skills.

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