The Additive Effects of Alcohol and Benzodiazepines on Driving

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ABSTRACT

Objectives: To examine the relationship between the combination of alcohol and benzodiazepines and the risk of committing an unsafe driver action.

Methods: We used data from the Fatality Analysis Reporting System (1993-2006) on drivers aged 20 or older who were tested for both alcohol and drugs. Using a case-control design, we compared drivers who had at least one unsafe driver action (UDA; e.g., weaving) recorded in relation to the crash (cases) to drivers who did not (controls).

Results: Drivers who tested positive for intermediate- and long-acting benzodiazepines in combination with alcohol had significantly greater odds of a UDA compared to those under the influence of alcohol alone, up to blood alcohol concentrations (BACs) of 0.08 and 0.05 g/100 ml, respectively. The odds of a UDA with short-acting benzodiazepines combined with alcohol were no different than for alcohol alone.

Conclusions: This study demonstrates that the combination of alcohol and benzodiazepines can have detrimental effects on driving beyond those of alcohol alone. By describing these combined effects in terms of BAC equivalencies, this study also allows for the extrapolation of simple, concrete concepts that communicate risk to the average benzodiazepine user.

Key words: Automobile driving; benzodiazepines; alcohol drinking; drug interactions; case control studies

La traduction du résumé se trouve à la fin de l'article.

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Benzodiazepines are common prescription drugs, especially in older populations, where usage rates as high as 25% have been documented.¹ Using simulator and on-road driving experiments, researchers have shown that benzodiazepines increase reaction times,^{2,3} decrease control over the vehicle's lateral position,⁴⁻⁶ affect speed maintenance,^{5,7,8} impair visual attention,⁹ and increase effort.¹⁰ Drugs that take a longer time to be eliminated from the body have a greater detrimental effect on driving ability.^{4,5,11,12} These effects may result in higher crash involvement^{13,14} and culpability rates.¹⁵

Considering the widespread incidence of drinking and driving and the extensive use of benzodiazepines, it is not surprising that alcohol and benzodiazepines are regularly found together in the bloodstreams of drivers.^{13,16} Yet the current research addressing the combined effects of alcohol and benzodiazepines on driving is sparse and has yielded contradictory results. Some claim an additive effect (an outcome different from what would be expected from either agent alone).^{3,17,18} Others purport that the resulting impairment is no different from that which would be expected from alcohol alone.¹⁹ Not only is the research conflicting, but it has often overlooked important issues such as drug half-life and blood alcohol concentration (BAC).

In this study, we aimed to clarify the association between the combination of alcohol and benzodiazepines and unsafe driver actions by taking into consideration many variables that previous researchers could not, and to advance the debate over the risks of mixing alcohol and medications.

METHODS

Data

Data were obtained from the Fatality Analysis Reporting System (FARS). Based on information compiled by the National Highway Traffic Safety Administration (NHTSA) and the National Center for Statistics and Analysis, FARS includes information on every fatal traffic crash on public roads in the US since 1975. This dataset consists of details including the sequence of each crash, contributing factors and characteristics of the people involved. FARS has included detailed drug information since 1993, and hence only data from that point through 2006 (inclusive) were used for this study.

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Table 1. Demographic Information by Group

Characteristic	Alcohol and BZD Free (N=70,440)	Alcohol Only (N=43,366)	BZDs Only			BZDs + Alcohol			F/ χ^2 *	p-value
			Short (N=174)	Intermediate (N=419)	Long (N=932)	Short (N=60)	Intermediate (N=210)	Long (N=909)		
Age, Mean	45.95	35.33	43.73	42.77	43.79	36.17	37.87	37.61	1497.66	<0.001
Male, No (%)	45,622 (64.8)	35,887 (82.8)	114 (65.5)	256 (61.1)	595 (63.8)	52 (86.7)	156 (74.3)	706 (77.7)	4344.19	<0.001
Previous Driver History, No. (%)										
Crashes	10,276 (14.6)	6953 (16.0)	15 (8.6)	87 (20.8)	195 (20.9)	4 (6.7)	39 (18.6)	218 (24.0)	142.12	<0.001
DWI	1191 (1.7)	4508 (10.4)	5 (2.9)	35 (8.4)	77 (8.3)	4 (6.7)	34 (16.2)	138 (15.2)	4442.90	<0.001
Other Convictions	11,081 (15.7)	10,006 (23.2)	30 (17.2)	118 (28.2)	176 (18.9)	17 (28.3)	58 (27.6)	185 (20.4)	1032.16	<0.001
Speeding	13,303 (18.9)	10,333 (23.8)	42 (24.1)	119 (28.4)	192 (20.6)	13 (21.7)	58 (27.6)	200 (22.0)	420.27	<0.001
License Suspension	7023 (10.0)	11,266 (26.0)	17 (9.8)	90 (21.5)	184 (19.7)	14 (23.3)	68 (32.4)	250 (27.5)	5210.87	<0.001
Any of Above	27,634 (42.5)	23,559 (54.3)	74 (42.5)	241 (57.5)	470 (50.4)	31 (51.7)	135 (64.3)	534 (58.7)	2607.02	<0.001
Other Medications, No. (%)										
Depressant	1354 (1.9)	749 (1.7)	15 (8.6)	15 (8.6)	80 (19.1)	2 (3.3)	40 (19.0)	569 (62.6)	23280.06	<0.001
Narcotic	2265 (3.2)	868 (2.0)	16 (9.2)	128 (30.5)	204 (21.9)	9 (15.0)	26 (12.4)	84 (9.2)	2555.69	<0.001
Stimulant	3975 (5.6)	4163 (9.6)	16 (9.2)	81 (19.3)	108 (11.6)	11 (18.3)	24 (11.4)	115 (12.7)	796.14	<0.001
Cannabinoid	2778 (3.9)	3592 (8.3)	9 (5.2)	34 (8.1)	63 (6.8)	2 (3.3)	33 (15.7)	74 (8.1)	1006.42	<0.001
Other	5230 (7.4)	3165 (7.3)	56 (32.2)	133 (31.7)	631 (67.7)	23 (38.3)	70 (33.3)	614 (67.5)	9096.49	<0.001
Any of Above	11,877 (16.9)	10,025 (23.1)	85 (48.9)	296 (70.6)	789 (84.7)	27 (61.7)	123 (58.6)	734 (80.7)	6098.62	<0.001

* F-statistic given for age; chi-square value given for all other descriptors

Drivers were selected if they met specific criteria. First, only drivers of passenger vehicles, SUVs and light pickup trucks were included. Second, drivers under the age of 20 were excluded in order to control for driver history. Third, drivers were required to have been tested (with a blood test) for both drugs and alcohol. Fourth, of those who tested positive for multiple benzodiazepines, only those positive for a single half-life class of benzodiazepine were retained.

Study design and statistical analyses

First, descriptive statistics were used to summarize demographic information for four groups: 1) alcohol- and benzodiazepine-free, 2) alcohol only, 3) benzodiazepines only (subgrouped by half-life) and 4) alcohol plus benzodiazepines (subgrouped by half-life). Half-life was classified as either short (≤ 6 hours), intermediate (>6 and ≤ 24) or long (>24).¹² Groups were then compared for differences in age using a one-way ANOVA. The Pearson chi-square test was used to assess group differences in sex, previous driver history (convictions such as speeding within the previous three years) and use of other medications (licit and illicit).

Next, detections of benzodiazepines only and benzodiazepines in combination with alcohol were examined by year to achieve a better understanding of how the use and detection of these agents are changing over time.

Finally, data were examined using a case-control design. Drivers for whom at least one unsafe driver action (UDA) was recorded in relation to the crash (for example, weaving or speeding) were considered cases. Drivers without a UDA were classified as controls. To develop a model, the first logistic regression included benzodiazepine exposure, BAC and a BAC-squared term (to identify the possibility of quadratic effects), sex, age, age squared, previous driver history, other medication usage, and all two- and three-way interactions. The final model excluded non-significant interactions. Age was centred at 45 years, which was approximately the average age of the sample and generally considered an age at which drivers are safest.²⁰ Again, the benzodiazepine groups were broken down by half-life, and alcohol was treated as a continuous variable, although it was examined at 0.01 mg/100 ml intervals up to 0.08 (the legal limit in most of North America) in order to calculate fitted odds and odds ratios.

All analyses were performed using SPSS Version 15.0. Confidence intervals at various BAC/benzodiazepine half-life levels were obtained using the delta method.²¹

Figure 1. The prevalence of benzodiazepine and benzodiazepine + alcohol detections over time

RESULTS

Descriptive statistics

A breakdown of descriptive information by alcohol and benzodiazepine group is included in Table 1. There were 116,510 drivers included in the analysis, of whom 71.6% were male and the average age was 41.88 years. There were statistically significant variations in sex and age among the groups. Although they made up the majority in all categories, the highest proportion of males was found in the alcohol-only group (82.8%) and all three combination subgroups (86.7%, 74.3% and 77.7% for short, intermediate and long benzodiazepines with alcohol combinations, respectively). These same four alcohol-positive categories also had an average age just under 10 years younger than the four remaining alcohol-free categories ($F [7, 116,502] = 1497.66, p < 0.001$).

Drivers positive for intermediate only (57.5%) or long benzodiazepines only (50.4%) were slightly more likely to have a poor driving history than the alcohol- and benzodiazepine-free group or short benzodiazepine-only subgroup (both 42.5%), and were most similar to the alcohol-only group (54.3%). Overall, rates of a prior driving record were 7-9% higher in all three benzodiazepine sub-

Table 2. Odds Ratios with 95% CI for the Final Model Predicting Unsafe Driver Actions

Variable, Referent	Adjusted OR		
Age (decades)	1.00 (0.99-1.02)		
Age ²	1.08 (1.07-1.09)		
BAC, 0.00 g/100 ml	1.11 (1.11-1.12)		
BAC ²	1.00 (1.00-1.00)		
Sex, female	0.94 (0.90-0.98)		
Age x BAC	1.00 (1.00-1.00)		
Age ² x BAC	1.00 (1.00-1.00)		
Age x Sex	0.93 (0.91-0.94)		
Age ² x Sex	1.02 (1.01-1.03)		
Depressants, none	1.58 (1.42-1.77)		
Narcotics, none	1.32 (1.22-1.43)		
Stimulants, none	1.85 (1.75-1.97)		
Cannabinoids, none	1.06 (0.99-1.12)		
Other Medications, none	1.10 (1.04-1.17)		
	Short	Intermediate	Long
Benzodiazepine Exposure, none	0.85 (0.55-1.32)	1.78 (1.34-2.36)	1.47 (1.22-1.76)
Benzodiazepine Exposure x BAC	1.01 (0.95-1.07)	0.96 (0.94-0.99)	0.96 (0.95-0.97)
Benzodiazepine Exposure x Age	1.02 (0.86-1.22)	1.10 (0.96-1.26)	0.99 (0.92-1.07)
Benzodiazepine Exposure x Age ²	1.01 (0.92-1.11)	0.98 (0.91-1.05)	0.93 (0.89-0.96)
	1	2	3 or more
Prior Driving Record			
Accident, none	1.14 (1.10-1.19)	1.30 (1.19-1.44)	1.43 (1.19-1.72)
DWI, none	1.09 (1.04-1.14)	1.12 (1.30-1.21)	1.23 (1.10-1.37)
Speeding, none	1.05 (1.01-1.09)	1.08 (1.01-1.16)	1.20 (1.08-1.32)
Suspensions, none	1.26 (1.19-1.33)	1.34 (1.23-1.47)	1.41 (1.30-1.54)
Other, none	0.95 (0.87-1.04)	0.94 (0.77-1.16)	0.95 (0.59-1.53)

DWI=Driving while intoxicated.

Figure 2. The log-odds of committing an unsafe driver action

Note: Depicts various points at which alcohol combines with intermediate and long benzodiazepines to create detriments equivalent to an alcohol-only BAC of 0.05 and 0.08 g/100 ml.

groups in the presence of alcohol. In general, drivers positive for benzodiazepines (with or without alcohol) were more likely to be positive for other medications when compared to their benzodiazepine-free counterparts.

Prevalence of benzodiazepine use and combination with alcohol

The prevalence of benzodiazepine only and alcohol plus benzodiazepine detections over time was examined (see Figure 1). While detections of long benzodiazepines overall are becoming less frequent (from a high of just over 2% in 1996 to a low of nearly 1.25% in 2006), they continue to constitute the most frequently detected benzodiazepines when combined with alcohol (0.5% in 2006). Short and intermediate benzodiazepines made up smaller portions of the detection prevalence, however their detection rate is increasing (from a low of close to zero detections in 1994 to a high of over

0.25% in 2006 for short, and from a period low of approximately 0.15% in 1995 to just under 0.75% in 2006 for intermediate benzodiazepines).

Predicting unsafe driving actions

The results of the final regression model are presented in Table 2. Although the age term was not significant (OR=1.00; 95% CI=0.99-1.02), the age-squared term was (OR=1.08; 95% CI=1.07-1.09), indicating a non-linear effect. Overall, this term significantly interacted with long benzodiazepines (Wald(1)=13.5, $p < 0.005$) where odds peaked at approximately 45 years, but not short (Wald(1)=.08, $p = 0.774$) or intermediate (Wald(1)=.40, $p = 0.527$). Sex was significant in the model and showed that, overall, men had lower odds of committing a UDA than women (OR=0.938; 95% CI=0.901-0.977), noting that the model was centred at age 45.

Drivers with a prior driving record demonstrated significantly higher odds ratios for committing a UDA, ranging from 1.05 (95% CI=1.01-1.09) for one record of speeding to 1.26 (95% CI=1.19-1.33) for one record of license suspension. Odds ratios increased with the number of incidents recorded, to a high of 1.43 (95% CI=1.19-1.72) for three or more previous car crashes. The only non-significant previous driver history term was the "other" category.

The odds of committing a UDA were significantly increased for drivers positive for depressants (OR=1.58; 95% CI=1.42-1.77), narcotics (OR=1.32; 95% CI=1.22-1.43), stimulants (OR=1.85; 95% CI=1.75-1.97), and agents in the miscellaneous drugs category (OR=1.10; 95% CI=1.04-1.17), but not for those positive for cannabinoids (OR=1.06; 95% CI=0.99-1.12).

Figure 2 shows the log-odds of performing a UDA for drivers positive for alcohol only, and for each benzodiazepine group plus alcohol combination. It also depicts the points at which the odds of committing a UDA are equivalent to those evident at common legal driving limits.

Compared at common legal BAC limits (0.05 and 0.08 g/100 ml), drivers positive for intermediate benzodiazepines had greater odds of committing a UDA than drivers positive for the same level of

alcohol alone (0.05 g/100 ml OR=1.38; 95% CI=1.21-1.74; 0.08 g/100 ml OR=1.32, 95% CI=1.03-1.61). This same comparison using long benzodiazepines revealed significantly greater odds at a BAC of 0.05 g/100 ml (OR=1.18, 95% CI=1.01-1.34), beyond which level significance was lost. At no point did short benzodiazepines combine with alcohol to create odds significantly different from alcohol only.

DISCUSSION

The results of this study allow the combined effects of alcohol and benzodiazepines to be expressed in terms of a BAC equivalency, or points at which the combination creates detriments equivalent to those for alcohol alone. For example, using 0.08 g/100 ml as a benchmark, the findings in this study suggest that this equivalence was reached with intermediate benzodiazepines in combination with a BAC of approximately 0.03 g/100 ml. Using 0.05 g/100 ml as a benchmark, this equivalence was reached with long benzodiazepines in combination with a BAC of only 0.02 g/100 ml; further, drivers under the effects of an intermediate half-life benzodiazepine were already beyond the detriments associated with a BAC of 0.05 before alcohol had been consumed. Short-life benzodiazepines combined with alcohol did not yield risks significantly different from those found with alcohol alone. This finding is in line with previous research which demonstrated that short half-life benzodiazepines do not affect driving ability.¹¹

This research also provided a better look at the type of person likely to drive under the combined influences of benzodiazepines and alcohol. Combination users were younger and more likely to be male than drivers in the benzodiazepine-only subgroups, and in fact were most similar to those in the alcohol-only group. Combination users also had slightly worse driving records than their benzodiazepine-only counterparts, suggesting that they may be greater risk-takers.

The prevalence of detections has been falling for long but rising for intermediate benzodiazepines. This shift may be related to physicians' increasing awareness of the dangers of long benzodiazepines, resulting in the prescribing of the shortest-acting benzodiazepines possible to meet their patients' needs.¹ However, while short half-life benzodiazepines appear to be safe, the heightened risks associated with intermediate half-life benzodiazepines are evident, especially in combination with alcohol.

While our findings are important, this study does have limitations. First, the FARS database reports only presence versus absence of benzodiazepines. Blood concentration levels would have allowed for the classification of therapeutic levels. Because our study may include drivers with subtherapeutic concentrations, removing those drivers from the analysis¹⁵ may have revealed higher odds of committing a UDA for the drivers at or above therapeutic levels.

Second, information on the drivers' tolerance to benzodiazepines was unknown. Detrimental effects appear greatest in the initial period after filling a benzodiazepine prescription.^{14,22-24} Because odds ratios could only be calculated for all users, this study may overestimate risk for long-term users, and underestimate risk for new users.

Third, the data only represent drivers involved in fatal crashes, and further, only those who were selected to be tested for alcohol and drugs; as such, the data may represent those most unfit to drive or those for whom impairment was suspected. This makes generalizing results to the general population more difficult.

Finally, underlying medical conditions for which benzodiazepine may have been prescribed are unknown. Although research has suggested that anxious²⁵ and insomniac⁷ patients do not differ from healthy controls when it comes to driving ability under the effects of benzodiazepines, the possibility of these conditions confounding the results cannot be ruled out.

Despite these limitations, this study on the combined effects of alcohol and benzodiazepines on driving enhances the literature. Further research is now imperative, perhaps utilizing a combination of laboratory experiments and epidemiological studies, to address factors such as tolerance, benzodiazepine blood concentration levels, and the possible confounding effects of underlying medical conditions. Such corroborative investigations would arm physicians, pharmacists and public health and injury prevention groups with the concrete information needed to communicate appropriate warnings to benzodiazepine users.

REFERENCES

1. Tu K, Mamdani MM, Hux JE, Tu JB. Progressive trends in the prevalence of benzodiazepine prescribing in older people in Ontario, Canada. *J Am Geriatr Soc* 2001;49:1341-45.
2. Vanakoski J, Mattila MJ, Seppala T. Driving under light and dark conditions: Effects of alcohol and diazepam in young and older subjects. *J Clin Psychopharmacol* 2000;56:453-58.
3. Willumeit HP, Ott H, Neubert W, Hemmerling KG, Schratzner M, Fichte K. Alcohol interaction of lormetazepam, mepindolol sulphate and diazepam measured by performance on the driving simulator. *Pharmacopsychiatry* 1984;17(2):36-43.
4. Brookhuis KA, Volkerts ER, O'Hanlon JF. Repeated dose effects of lormetazepam and flurazepam upon driving performance. *Eur J Clin Pharmacol* 1990;39(1):83-87.
5. O'Hanlon JF, Volkerts ER. Hypnotics and actual driving performance. *Acta Psychiatr Scand Suppl* 1986;332:95-104.
6. van Laar MW, Volkerts E, Verbaten M. Subchronic effects of the GABA-agonist lorazepam and the 5-HT_{2A/2C} antagonist ritanserin on driving performance, slow wave sleep and daytime sleepiness in healthy volunteers. *Psychopharmacology* 2001;154(2):189-97.
7. Staner L, Ertle S, Boeijinga P, Rinaudo G, Arnal MA, Muzet A, Luthringer R. Next-day residual effects of hypnotics in DSM-IV primary insomnia: A driving simulator study with simultaneous electroencephalogram monitoring. *Psychopharmacology* 2005;181:790-98.
8. van Laar MW, Volkerts ER, van Willigenburg AP. Therapeutic effects and effects on actual driving performance of chronically administered buspirone and diazepam in anxious outpatients. *J Clin Psychopharmacol* 1992;12(2):86-95.
9. Berthelon C, Bocca ML, Denise P, Pottier A. Do zopiclone, zolpidem and flunitrazepam have residual effects on simulated task of collision anticipation? *J Psychopharmacol* 2003;17:324-31.
10. Verster JC, Volkerts ER, Verbaten MN. Effects of alprazolam on driving ability, memory functioning and psychomotor performance: A randomized, placebo-controlled study. *Neuropsychopharmacology* 2002;27:260-69.
11. Verster JC, Veldhuijzen DS, Volkerts ER. Residual effects of sleep medication on driving ability. *Sleep Med Rev* 2004;8:309-25.
12. Dubois S, Bedard M, Weaver B. The impact of benzodiazepines on safe driving. *Traffic Inj Prev* 2008;9(5):404-13.
13. Barbone F, McMahon AD, Davey PG, Morris AD, Reid IC, McDevitt DG, MacDonald TM. Association of road-traffic accidents with benzodiazepine use. *Lancet* 1998;352:1331-36.
14. Neutel CI. Risk of traffic accident injury after a prescription for a benzodiazepine. *Ann Epidemiol* 1995;5:239-44.
15. Drummer OH, Gerostamoulos J, Batziris H, Chu M, Caplehorn JR, Robertson MD, Swann P. The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes. *Accid Anal Prev* 2004;36(2):239-48.
16. Appenzeller BM, Schneider S, Yegles M, Maul A, Wennig R. Drugs and chronic alcohol abuse in drivers. *Forensic Sci Int* 2005;155(2-3):83-90.
17. Linnoila M, Stapleton JM, Lister R, Moss H, Lane E, Granger A, Eckardt MJ. Effects of single doses of alprazolam and diazepam, alone and in combination with ethanol, on psychomotor and cognitive performance and on autonomic nervous system reactivity in healthy volunteers. *Eur J Clin Pharmacol* 1990;39(1):21-28.
18. Longo MC, Hunter CE, Lokan RJ, White JM, White MA. The role of alcohol, benzodiazepines and stimulants in road crashes. 2000. Stockholm, Sweden, 15th International Conference on Alcohol, Drugs & Traffic Safety. May 22, 2000.

19. Longo MC, Hunter CE, Lokan RJ, White JM, White MA. The prevalence of alcohol, cannabinoids, benzodiazepines and stimulants amongst injured drivers and their role in driver culpability: Part II: The relationship between drug prevalence and drug concentration, and driver culpability. *Accid Anal Prev* 2000;32:623-32.
20. Baldock MRJ, McLean AJ. Older drivers: Crash involvements rates and causes. Adelaide, Australia: Centre for Automotive Safety Research, 2005.
21. Oehlert GW. A note on the delta method. *Am Stat* 1992;46(1):27-29.
22. Engeland A, Skurtveit S, Morland J. Risk of road traffic accidents associated with the prescription of drugs: A registry-based cohort study. *Ann Epidemiol* 2007;17:597-602.
23. Oster G, Russell MW, Huse DM, Adams SE, Imbimbo J. Accident- and injury-related health-care utilization among benzodiazepine users and nonusers. *J Clin Psychiatry* 1987;48(Suppl):17-21.
24. Hemmelgarn B, Suissa S, Huang A, Boivin JF, Pinard G. Benzodiazepine use and the risk of motor vehicle crash in the elderly. *JAMA* 1997;278(1):27-31.
25. O' Hanlon JF, Vermeeren A, Uiterwijk MM, van Veggel LM, Swiigman HF. Anxiolytics' effects on the actual driving performance of patients and healthy volunteers in a standardized test. An integration of three studies. *Neuropsychobiology* 1995;31(2):81-88.

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RÉSUMÉ

Objectif : Examiner la relation entre la combinaison d'alcool et les benzodiazépines et le risque de commettre une action de conducteur dangereux.

Méthodes : Nous avons utilisé les données du Fatality Analysis Reporting System (1993-2006) sur les conducteurs âgés de 20 ans ou plus qui ont été testés pour l'alcool et les drogues. En utilisant un devis cas-témoin, nous avons comparé les conducteurs ayant au moins une action de conduite dangereuse (par exemple, changements de voie fréquent) enregistré par rapport envers les accidents (cas) aux conducteurs qui n'ont pas (contrôles).

Résultats : Les conducteurs qui ont testés positifs pour les benzodiazépines à durée d'action intermédiaire et à longue durée d'action en combinaison avec l'alcool avaient une probabilité significativement plus élevée de commettre une action de conduite dangereuse par rapport à l'alcool seul, jusqu'à un taux d'alcool de 0,08 et 0,05 g/100mL, respectivement. Les benzodiazépines à effet de courte durée en combinaison avec l'alcool n'étaient pas différents de l'alcool seul.

Conclusions : Cette étude démontre que la combinaison d'alcool et de benzodiazépines peut avoir des effets néfastes sur la conduite au-delà de celles de l'alcool. En décrivant ces effets combinés sur le plan d'un taux d'alcoolémie équivalent, cette étude permet également l'extrapolation de concepts simples qui communiquent les risques aux utilisateurs de benzodiazépines.

Mots clés : conduite automobile; benzodiazépines; interactions de drogues; études cas-témoins

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