Alcohol Consumption Among Drivers Subject to the Swiss License Restriction of Zero Tolerance When Driving

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Background: The restriction of zero tolerance when driving (ZTD) imposed on drivers in Switzerland means that they may drink no alcohol at all before driving and basically consume only moderate amounts of alcohol at any other time. The Institute of Traffic Medicine in Zurich has recently started to confirm this moderate alcohol consumption by analyzing hair samples for ethyl glucuronide (EtG), a metabolite of ethanol. On the basis of the EtG results, this article looks at the alcohol consumption of drivers subject to ZTD restrictions and determines what recommendations can be made in relation to traffic safety. In particular, the behavior of people with alcohol dependence, who are known to have a reduced ability to control their drinking, is looked at in detail.

Methods: Data from all 250 persons with ZTD restrictions, assessed at our Institute in 2010, were evaluated retrospectively. These drivers included 220 men and 30 women, all aged between 21 and 75 (mean age 41 ± 12 years). At the time of the expert review, 26 (10.4%) had no record of driving under the influence (DUI), 121 (48.4%) had one DUI offense, and the rest had 2 or more drunk driving offenses. The length of time for which ZTD is imposed is determined on an individual basis, depending on the history of use and course of events.

Results: EtG hair analysis of all 250 drivers with ZTD restrictions provided the following results: EtG assay was not performed in 16 cases (6%); 126 drivers (50%) did not have any detectable EtG (corresponding to total abstinence); 93 (37%) had an EtG concentration within the limits of social drinking; and the EtG concentration indicated excessive alcohol use by 15 people (6%). EtG was found to be in the range of excessive alcohol consumption in 3 (8%) of the drivers diagnosed as alcohol dependent. It was seen that the majority of those drivers who had previously abstained totally from alcohol continued to do so. None of the drivers with ZTD restrictions committed any drunk driving offenses in 2010.

Conclusions: Imposing a ZTD restriction on individuals with moderate alcohol consumption or those with previous alcohol problems who have been stable for some time and now drink little or no alcohol is worthwhile. In addition, total abstinence from alcohol should be made a license restriction for those with serious alcohol dependence, due to the poor long-term prognosis.

Keywords Zero tolerance when driving; Driver’s license restriction; Ethyl glucuronide; Hair analysis; Driving under the influence (DUI)

INTRODUCTION

In 2009, a total of 20,506 road traffic accidents causing injury to persons were registered in Switzerland. The Federal Statistics Office (FSO 2009) estimated that 2000 (10%) of these accidents involved driving under the influence of alcohol. In the same year, there were 20,643 convictions for driving under the influence (DUI), based on a blood alcohol concentration (BAC) ≥ 0.80 promille or 0.084 percent by volume. According to the FSO, the rate of repeat convictions for Swiss nationals driving under the influence, confirmed by blood alcohol concentration, is 14 percent within a period of 3 years following the first conviction (Statistics of Road Traffic Delinquency, 2004–2008). It can be assumed that this figure would be considerably higher if all drivers living in Switzerland were taken into account. In addition to the deterrent effects of punishment (fines, prison sentences), one possibility for reducing the risk of DUI recidivism is applying measures aimed at ending drinking problems. These measures include allowing drivers to keep their licenses subject to specific conditions, such as abstaining from alcohol. Observance of the restrictions imposed is monitored by regular checks over a long period.

For many years, the Institute of Traffic Medicine in Zürich has monitored fitness to drive; that is, whether the general physical and psychological requirements to drive a motor vehicle safely on the road are met without restriction to a particular
time or event (Liniger 2009). Swiss Traffic Law establishes which drivers are to be referred by the Cantonal Driver and Vehicle Licensing Agency to our institute for expert review. The authorities require an expert review whenever impaired fitness to drive is suspected; for example, when there is evidence of addiction (from a police or medical report). A review may also be requested even if no traffic offense has been committed. In most cases, however, one or more traffic offenses indicate an impaired fitness to drive. The expert review determines the nature and severity of the impairment and a written report is submitted to the authorities. The driver may be considered unfit to drive, fit to drive, or fit to drive only on certain conditions. In the last case, appropriate restrictions are recommended; for instance, that no alcohol and/or drugs are consumed. Conditions related to treatment may also be imposed. The duration of license restrictions varies considerably and ranges from as little as 6 months to the rest of the driver’s life (e.g., conditions for people with diabetes). The traffic medicine expert decides whether an individual’s restrictions can be lifted on the basis of regular reviews, taking the driver’s history into account. As a rule, alcohol- or drug-related restrictions apply for 2 to 3 years. In isolated cases, drivers may be monitored for more than 20 years because of alcohol or drug recidivism. The imposition of zero tolerance when driving (ZTD) is usually intended to last for a period of between 6 months and 2 years. Checks on the observance of these restrictions are made every 6 months, with hair analysis, blood and urine testing, and review of reports from doctors and therapists. In addition, drivers come for a brief discussion to assess their current state of health, social circumstances, and occupational situation and for a brief examination, if necessary. The drivers have to pay the costs of these tests and visits themselves. The restrictions imposed are intended to reduce the incidence of alcohol- and drug-related traffic offenses when there is a known risk. Long-term abstinence from alcohol or drugs aims to establish teetotal behavior and reduce the risk of relapse in alcohol or drug misuse and dependence. The Institute of Traffic Medicine in Zurich introduced the restriction of ZTD in its current form in 2009, using hair analysis to monitor alcohol use by determining the concentrations of ethyl glucuronide (EtG), a metabolite of ethanol. This restriction provides an alternative to total alcohol abstinence (TTA), forbidding the consumption of any alcohol at all, which has been in use for a long time and is monitored in the same way. It should be mentioned that this study is not intended to provide evidence that the imposition of conditions in general and the ZTD restriction in particular reduces the occurrence or recurrence of road traffic offenses. It is assumed that the pressure put on the driver (high associated costs and the threatened loss of license if the restrictions are violated) increases the motivation to adjust consumption accordingly and commit no further traffic offenses. To determine the real effects on traffic offense statistics, it would be necessary to have a control group on which no similar restrictions are imposed, but this would not be possible in Switzerland on both legal and ethical grounds. The aim of the present study was therefore not to prove that these conditions and their monitoring have positive effects on road safety in Switzerland but rather to investigate the alcohol consumption of the drivers concerned, focusing on the ZTD subgroup, in order to determine future recommendations regarding fitness to drive.

What “Zero Tolerance When Driving” Actually Means

Zero tolerance when driving means that persons who have consumed alcohol must not then drive, in strict accordance with the slogan “Don’t Drink and Drive.” The usual limit in Switzerland is 0.5 promille (0.053% by vol.) but people with ZTD restrictions may drive only with a BAC of 0.0 promille (0.0% by vol.). In other words, they may not have consumed any alcohol at all before driving. The restriction is noted on the driver’s license and the driver will be breathalyzed if stopped during a routine police road check. Any violation of the zero limit may result in loss of license. Zero tolerance when driving ensures that drinking alcohol and driving a motor vehicle are strictly separated. This is necessary due to the increased risk of driving under the influence; most people whose licenses are restricted in this way already have one or more DUI offenses.

Not driving after drinking alcohol is, however, only one aspect of the condition imposed. The other side of the coin is that a moderate amount of alcohol may be consumed at other times. However, drinking more than the moderate amount of alcohol considered “social drinking” constitutes excessive consumption or alcohol misuse. Excessive consumption is considered to be harmful to health and to have sequelae, such as alcohol-related mental health disorders or liver, kidney, and cardiovascular diseases. The World Health Organization (WHO) classifies alcohol use into various risk categories; the consumption of 61 g or more of pure alcohol per day carries a high risk to health in men, and 41 g or more is considered high risk in women (Table 1).

Measurement of EtG deposited in the hair provides relatively accurate information about the average quantity of alcohol consumed over a long period of time. The Society of Hair Testing (Society of Hair Testing, 2009) has established a value of 30 pg EtG/mg hair as the upper limit for social drinking. EtG concentrations greater than 30 pg/mg signify excessive consumption or misuse of alcohol. An average daily consumption of 60 g ethanol will exceed the 30 pg/mg limit. Excessive consumption/misuse of alcohol therefore corresponds to the WHO high-risk category. Should the result of the hair analysis made every 6 months show EtG levels higher than 30 pg/mg when there is a ZTD restriction, that person is no longer considered fit to drive and is disqualified from driving. It is assumed that the alcohol consumption amounts to misuse

<table>
<thead>
<tr>
<th>Category</th>
<th>Men (g)</th>
<th>Women (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low risk</td>
<td>1–40</td>
<td>1–20</td>
</tr>
<tr>
<td>Medium risk</td>
<td>41–60</td>
<td>21–40</td>
</tr>
<tr>
<td>High risk</td>
<td>61–100</td>
<td>41–60</td>
</tr>
<tr>
<td>Very high risk</td>
<td>&gt;101</td>
<td>&gt;61</td>
</tr>
</tbody>
</table>

Table 1 WHO (2000): Criteria for risk of alcohol consumption on a single drinking day in relation to acute problems
or that enough alcohol has been consumed to damage the individual’s health and considerably increase the risk of drunk driving.

**Who Gets a Zero Tolerance When Driving Restriction?**

Zero tolerance when driving is imposed in the following 2 situations:

- A primary zero tolerance when driving (primary ZTD) restriction is imposed without any previous condition of abstinence: For some drivers—those with a relatively mild previous alcohol history or long-standing alteration of drinking habits at the time of the expert review—it is worthwhile imposing ZTD immediately because the decision has been made to allow the driver to keep his or her license without insisting on total abstinence. This may be the case when the first DUI offence is associated with social drinking or when the alcohol problems are in the past—meaning that at the time of the expert review there has already been long-term abstinence or the stable consumption of only small amounts of alcohol consistent with social drinking.

- Secondary zero tolerance when driving (secondary ZTD) restriction, with the previously imposed condition of total abstinence: This group of drivers comprises the majority of people with ZTD restrictions. The condition is imposed only after one or more cycles of total abstinence have been observed. Following long-term total abstinence, the strict requirements are relaxed to allow drivers the possibility of drinking alcohol again, as described previously. The idea is that these drivers, who are usually almost ready to be discharged from traffic safety monitoring, have to prove that they are capable of controlling their drinking in a responsible manner. Drivers can, of course, continue to abstain from alcohol altogether despite the relaxed restriction, but those who decide to drink alcohol again after prolonged abstinence must be aware of what they are doing and be able to control their drinking.

**MATERIALS AND METHODS**

**Data Collection**

This retrospective study was carried out in order to analyze the 2010 data from all 250 persons with imposed ZTD and to make recommendations for such restrictions in the future. In all cases, the ZTD restrictions were imposed in the year 2009 or 2010, with many of them continuing to apply after the end of 2010. The following information was obtained from the Institute’s records: (1) sociodemographic data (age and gender); (2) the number of DUI offenses up until the end of 2010, as well as the BAC and the year of the last DUI offense; (3) diagnosis by the traffic safety expert; (4) time of the last traffic safety expert review; (5) duration of the alcohol-related restrictions (ZTD and TAA), including the number of follow-ups; (6) EtG concentrations in hair; (7) additional information such as the existence of other restrictions (treatment, drug abstinence, etc.).

The EtG measured in hair analysis is a metabolite of ethanol. When alcohol has been consumed, this metabolite is transported in the blood to the root of the hair and deposited in growing hair. Normal alcohol consumption (social drinking) leads to EtG concentrations of up to 30 pg/mg hair, and excessive alcohol consumption (alcohol misuse) results in concentrations greater than 30 pg/mg hair. In accordance with this classification, EtG results were divided into (1) “not detected”—EtG concentration below the detection limit of 5 pg/mg hair, indicative of abstinence or, at most, minimal nonrelevant alcohol use; (2) “social drinking”—EtG concentration of 5–30 pg/mg hair; and (3) “excessive alcohol consumption”—EtG concentration of more than 30 pg/mg hair. In accordance with guidelines issued by the hair analysis working group of the Schweizerische Gesellschaft für Rechtsmedizin (Swiss Society of Legal Medicine), a confidence interval of ±25 percent is applied when interpreting the EtG results. The time interval covered by the hair analysis depends on various factors, including the type of hair used (scalp hair or secondary hair from the arms, legs, or chest) and the length of the hair. As a rule, drivers are requested to provide scalp hair samples at least 5 cm long. This gives a window of about 5 to 6 months prior to sampling. Secondary hair is taken only in exceptional cases, such as baldness. Because the length and rate of growth of secondary hair differs from that of scalp hair, the analysis covers a shorter or longer window of detection.

The diagnostic terms used in this study were taken from the traffic safety expert reviews. The diagnosis of alcohol dependence is in line with the International Classification of Diseases (ICD-10) code F10.2 “Mental and behavioural disorders due to use of alcohol.” Unlike the harmful use of F10.1, however, the terms alcohol misuse and excessive alcohol consumption used in the expert reviews do not focus primarily on damage to the individual’s health but rather on the quantity of alcohol consumed and its relevance to road traffic. The diagnosis of traffic safety–relevant misuse of alcohol may therefore be made when periods of excessive alcohol consumption exist and there has been at least one DUI offense.

**Statistical Analysis**

Statistical analysis was carried out using SPSS for Windows (version 19; SPSS Inc., Chicago, IL). Categorized data were analyzed using chi-square and Fisher’s exact test. Test requirements were met for the chi-square tests; that is, less than 20 percent of the expected frequencies were lower than 5 in all tests. Where test requirements were not met, an explanation is given in the presentation of the results. A 2-sided test of significance was applied to all the tests carried out, where \( P < .05 \) was statistically significant.

**RESULTS**

**General Characteristics of the Drivers**

In 2010, a total of 2206 drivers with various license restrictions were monitored by hair analysis in our institute. TAA applied in 1229 cases, ZTD in 250 cases, and other restrictions were imposed on the remainder.
The study of the 250 persons subject to ZTD restrictions included 220 men and 30 women, all aged between 21 and 75 (mean age 41 ± 12 years). Fifty-two percent of all these drivers held licenses subject to one or more additional restrictions: “alcohol-specific therapy” in 65 cases, “abstinence from drugs” in 52, “abstinence from cannabis” in 45, “psychiatric follow-up” in 19, and “abstinence from benzodiazepines” in 4.

Of the 250 drivers investigated, 10.4 percent had no record of drunk driving, 48.4 percent had one DUI offense, 23.2 percent had 2 offences, 14.0 percent had 3, 2.8 percent had 4, and 1.2 percent had 5. The blood alcohol concentration at the time of the last offense was 0.50 to 0.79 promille (0.053–0.083% by vol.) in 4.9 percent, 0.80 to 1.99 promille (0.084–0.21% by vol.) in 48.7 percent, and ≥ 2.00 promille (≥0.212% by vol.) in 37.1 percent of the 224 individuals with records of drunk driving (Table II). The highest BAC was 3.36 promille (0.35% by vol.). The last DUI event had occurred between 8 months and 20 years prior to the expert review, but none of the 250 drivers with ZTD restrictions were convicted of driving under the influence of alcohol in the year 2010.

**Characteristics of the Primary ZTD Group**

In 2010, 81 drivers were allowed to keep their licenses subject to primary ZTD restrictions. In this group, 66.7 percent had no record of drunk driving or had only one DUI offense and 33.3 percent had been convicted of drunk driving at least twice (Table III), with the last occasion being 4.3 years previously, on average. In 53.1 percent of the cases, the expert reviewer concluded that alcohol consumption was not still a problem and remained in the normal range of social drinking. Another 44.4 percent had been drinking heavily, at least periodically; 2.5 percent were considered to be alcohol dependent (Table IV). The 39 drivers who were discharged from traffic safety monitoring in 2010 had been followed up for a mean of 1.1 (±0.5) years.

**Characteristics of the Secondary ZTD Group**

In 2010, 169 drivers were monitored for secondary ZTD restrictions: 55.0 percent of them had no record of drunk driving or only one DUI offense, and 45.0 percent were guilty of at least 2 DUI offenses (Table III). According to the expert reports, 10.7 percent of these drivers showed a pattern of nonproblematic social drinking up to the time of review, 68.0 percent showed periodic or long-term excessive consumption/misuse of alcohol, and 21.3 percent were alcohol dependent (Table IV). The 142 drivers who were discharged from traffic safety monitoring in 2010 had been followed up for 2.3 (±0.9) years on average. The ZTD restriction had been imposed for at least 6 months (one monitoring cycle).

**EtG Results in the Primary and Secondary ZTD Groups**

Table V shows the results of the EtG assays. It can be seen that the largest proportion (44.4%) of the 81 drivers in the primary ZTD group had EtG concentrations in the social drinking range; in contrast; 58 percent of the 169 drivers with secondary ZTD had no detectable EtG. The proportion of drivers with EtG concentrations in the range of excessive consumption, namely, about 6 percent (5 drivers in the primary ZTD group and 10 in the secondary group), was similar in the 2 groups.

**EtG Results in the Different Diagnostic Groups**

The results of the analysis of the EtG concentrations found in the individual diagnostic groups are shown in Table VI: the majority (68.4%) of the 38 alcohol-dependent drivers had no detectable EtG concentrations; 23.7 percent had EtG values in the social drinking range, and the EtG indicated excessive alcohol consumption by 3 drivers (8%). Slightly more than half (50.3%) of the alcohol misusers remained teetotal when the

<table>
<thead>
<tr>
<th>Table III</th>
<th>Drunk driving in the primary and secondary ZTD groups (N = 250)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of DUI</td>
<td>Primary ZTD (N = 81) (%)</td>
</tr>
<tr>
<td>0–1</td>
<td>66.7</td>
</tr>
<tr>
<td>≥ 2</td>
<td>33.3</td>
</tr>
</tbody>
</table>

*Fisher’s test, P ≥ .05.

<table>
<thead>
<tr>
<th>Table IV</th>
<th>Diagnosis made by the expert reviewer in the primary and secondary ZTD groups (N = 250)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expert reviewer’s diagnosis</td>
<td>Primary ZTD (N = 81) (%)</td>
</tr>
<tr>
<td>Unproblematic drinking</td>
<td>53.1</td>
</tr>
<tr>
<td>Excessive alcohol/misuse</td>
<td>44.4</td>
</tr>
<tr>
<td>Alcohol dependence</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*Chi-squared test, P ≤ .001.
ZTD restriction was imposed. Most of the nonproblematic consumers, who had mainly been social drinkers before the expert review, continued to drink in moderation (44.3%) or drank no alcohol at all (39.3%). Eleven of the 15 drivers with EtG values indicative of excessive alcohol use (alcohol recidivism) came from the group of alcohol misusers; 3 were classified as being alcohol-dependent and one driver had been diagnosed by the expert as a nonproblematic drinker.

**EtG Results From All Drivers Investigated**

The results of EtG hair analysis from all drivers investigated are shown in Table VII. The majority (50.4%) had no detectable EtG, equivalent to total abstinence; 37.2 percent had an EtG concentration within the social drinking range; and 6.0 percent (15 drivers) had an EtG indicating excessive alcohol use. These 15 drivers (14 men, 1 woman) violated the condition of zero tolerance when driving, in that they had been drinking large quantities of alcohol and their EtG concentrations at follow-up were accordingly in the range of excessive consumption. Hair was not analyzed for EtG in 6.4 percent of the drivers. In these cases, it was considered necessary to check only the other restrictions imposed (mainly abstinence from drugs) or the drivers freely admitted violating the restriction and voluntarily surrendered their licenses, thus saving themselves the costs of an expensive hair analysis.

**DISCUSSION**

**Differences Between the Primary and Secondary ZTD Groups**

The study results show that drivers in the primary and secondary ZTD groups differ in both their past history of alcohol consumption and current drinking habits. Put simply, drivers in the secondary ZTD group had more serious and current alcohol problems, with significantly more diagnoses of alcohol misuse and dependence ($P \leq .001$). They also showed a trend toward more DUI offenses (not significant, $P \geq .05$) than the drivers in the primary ZTD group. The average duration of traffic safety monitoring in the primary ZTD group was considerably shorter than in the secondary ZTD group. With respect to the EtG results, there was a statistically significant difference between the groups ($P \leq .001$); the majority of the primary ZTD group drank in moderation, with nearly as many remaining abstinent. The majority of drivers in the secondary ZTD group, who had already been subject to a period of total alcohol abstinence before the restriction of zero tolerance when driving was imposed, remained teetotal. This result is satisfactory insomuch as drivers with previously problematic drinking, mostly to be found in the secondary ZTD group, seem to err on the safe side and do not drink despite the prohibition being relaxed. This is also reflected in the EtG concentrations of the alcohol misusers and alcohol-dependent drivers, most of whom remained abstinent. On the other hand, more than one third of the 169 drivers in the secondary ZTD group began drinking again within 6 months of the relaxation of the restriction, indicating that these individuals had probably never really made any sustained effort at total abstinence. The percentage of drivers consuming excessive amounts of alcohol while subject to ZTD, and thus violating the restriction, was the same in both the primary and secondary populations; that is, 6 percent. This was somewhat surprising, because it had been assumed that drivers in the primary ZTD group had left possible alcohol problems behind them. It can be assumed that the expert assessed the long-term stability of the moderate alcohol consumption too optimistically in the cases of the 5 drivers in the primary ZTD group who had been drinking heavily, equivalent to alcohol recidivism. This result shows how important it is to impose ZTD restrictions on individuals whose driving is impaired due to alcohol but who appear to be merely social drinkers at the initial expert review.

**Zero Tolerance When Driving for Alcohol-Dependent Drivers**

As can be seen from the previous discussion, the zero tolerance when driving restriction is also imposed on people previously diagnosed with alcohol dependence, allowing them to drink alcohol in moderation. The question arises as to whether alcohol-dependent people are actually capable of drinking only moderately and in a controlled manner. This is precisely what is described as “difficulties in controlling alcohol-taking behavior in terms of its onset, termination, or levels of use” (ICD-10), which is one of the main criteria for the ICD-10 diagnosis of alcohol dependence. Even though this reduced ability to control

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**Table V** EtG results in the primary and secondary ZTD groups ($N = 250$)

<table>
<thead>
<tr>
<th>EtG concentration</th>
<th>Primary ZTD ($N = 81$) (%)</th>
<th>Secondary ZTD ($N = 169$) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive consumption</td>
<td>6.2</td>
<td>5.9</td>
</tr>
<tr>
<td>Social drinking range</td>
<td>44.4</td>
<td>33.7</td>
</tr>
<tr>
<td>Not detected</td>
<td>34.6</td>
<td>58.0</td>
</tr>
<tr>
<td>EtG not determined</td>
<td>14.8</td>
<td>2.4</td>
</tr>
</tbody>
</table>

**Table VI** EtG results in the various diagnostic groups ($N = 250$)

<table>
<thead>
<tr>
<th>EtG concentration</th>
<th>Unproblematic drinking ($N = 61$) (%)</th>
<th>Excessive alcohol consumption ($N = 151$) (%)</th>
<th>Alcohol dependence ($N = 38$) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excessive consumption</td>
<td>1.6</td>
<td>7.3</td>
<td>7.9</td>
</tr>
<tr>
<td>Social drinking range</td>
<td>44.3</td>
<td>37.7</td>
<td>23.7</td>
</tr>
<tr>
<td>Not detected</td>
<td>39.3</td>
<td>50.3</td>
<td>68.4</td>
</tr>
<tr>
<td>EtG not determined</td>
<td>14.8</td>
<td>4.6</td>
<td>0.0</td>
</tr>
</tbody>
</table>

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*Chi-squared test. Four cells (33.3%) have an expected frequency less than 5. $P \leq .01$. 

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*Chi-squared test. P ≤ .001.
drinking is not essential for the diagnosis provided that at least 3 other criteria are met, it is listed in second place after “a strong desire or sense of compulsion to take alcohol” (ICD-10). Is it not therefore paradoxical to impose such a condition on individuals who are alcohol dependent, rather than require long-term abstinence?

The question of whether it is even possible for people with alcohol dependence to control their alcohol intake is not so easy to answer. For more than 30 years scientists have been in dispute over the possibility of controlled drinking (CD). Particularly when setting therapeutic goals, there is much discussion of whether the aim should be total abstinence or controlled drinking. CD is defined in various ways in the literature but is usually taken to mean the moderate, nonproblematic consumption of alcohol. Reinert and Bowen first described controlled drinking in 1968. Körkel (Körkel, 2002), who is the best-known proponent of this therapeutic goal in Switzerland, agreed with them in defining CD as “organizing the pattern of drinking based on a previously defined plan or rules” (p. 88). Treatment programs that teach patients how to control drinking, which were first introduced in the United States in the 1970s, should enable patients to adjust their drinking habits to a desired plan established in advance. Programs for controlled drinking are at least as effective as programs of abstinence. Controlled drinking can be sustained over many years and forms a bridge to abstinence for some patients (Körkel 2002).

In 2010, the professional association Sucht (Addiction) identified 32 treatment facilities in the German-speaking part of Switzerland that offer CD as an option and asked CD therapists about their experiences with the learning program (Klingemann et al. 2010). Most of the therapists also considered the CD program (individual or group sessions) to be suitable for people with alcohol dependence. A long-term study by Miller et al. (1992) showed that, after 8 years, 14 out of the 99 subjects who underwent self-control training were able to drink in a controlled and nonproblematic manner; 23 participants were teetotal; another 22 were still drinking but not quite so heavily; and the remainder showed no improvement or had died. In this study, sustained CD tended to be achieved less often as the severity of the alcohol dependence increased. Both recidivism and abstinence increased as the study progressed.

On the other hand, critics of controlled drinking, such as Soyka (Bottleneder M, Spanagel R, Soyka M, 2007), have argued that the ability of alcohol-dependent patients to learn controlled drinking is doubtful. Soyka considered alcohol dependence an irreversible process, which means that after the onset of loss of control most addicts are no longer able to control their drinking over a long period. He supported his view with animal studies, such as that by Wolframm and Heyne (1995) on rats. None of the animals who had developed alcohol dependence with loss of control were able to drink in a controlled manner even after a long period of abstinence. Several long-term studies on the development of alcohol-dependent drinking habits in humans have concluded that, in every case, only a very small number of alcohol-dependent people are able to sustain controlled or moderate drinking. Helzer et al. (1985) found that only 1.6 percent of 1289 diagnosed alcoholics who were in medical or psychiatric treatment between 1973 and 1975 showed stable and moderate patterns of drinking after 5 to 7 years. In contrast, 15 percent were teetotal. Vaillant (2003) studied the drinking habits of 268 20-year-old Harvard students and 456 socially deprived young male Bostonians and followed them up long term to the age of 70 to 80. He found that 54 (20%) in the former student cohort and 140 (31%) of the Boston youths developed an alcohol problem (dependence or misuse) at some time during their lives. By the age of 70, more than half of the 19 successfully followed alcohol-dependent former students had died; 21 percent were abstinent but only about 10 percent were controlled drinkers. There were fewer controlled drinkers in the other cohort, the inner-city Bostonians. By the age of 70, more than half of the 72 alcohol-dependent men followed up in this group had also died, 32 percent were abstinent, and 1 percent were controlled drinkers; that is, showed a pattern of drinking that was moderate and nonproblematic. A diagnosis of alcohol dependence and attending Alcoholics Anonymous was the best predictor of abstinence. On the other hand, the best predictor of long-term controlled drinking was less symptomatic alcohol misuse or dependence. It therefore seems that men with a higher level of education and less severe alcohol problems are better able to control their drinking, even though successful CD is rare with overt alcohol dependence. After one, 2, and 3 years, Bottleneder et al. (2007) reexamined 103 alcohol-dependent patients who had undergone outpatient abstinence-oriented rehabilitation and found that only 4 drank in a controlled manner up to a maximum of 24 months, and not one of them had been able to sustain the pattern of controlled drinking for 3 years. In contrast, 44 patients remained teetotal for the entire time.

Returning to the original question of whether controlled or moderate drinking is possible for those with alcohol dependence, it seems from the literature that the question can be answered in the positive in principle, but with the proviso that very few alcohol-dependent drinkers can maintain this control over their drinking in the long term. Is it therefore worthwhile imposing a ZTD restriction, which allows moderate drinking, on drivers who have been diagnosed as alcohol dependent? Given the EtG results for alcohol-dependent drivers in the present study, it can be seen that the vast majority of drivers decided to continue their abstinent behavior and that relatively few relapsed into heavy drinking. The data do not, however, show whether the drivers decided on lifetime teetotalism or to remain abstinent only for as long as they were being monitored for traffic safety. Virtually all of the alcohol-dependent drivers studied had already had some form of alcohol-specific therapy. Drivers who had undergone treatment, and possibly thus had more insight into their problems, may have decided that total abstinence was the safest way of preventing a relapse into their old drinking habits. In any case, these results correlate with Vaillant’s (2003) follow-up findings that the diagnosis of alcohol dependence is a good predictor of abstinence. There are no grounds on which to assume that alcohol-dependent drivers
return to heavy drinking as soon as ZTD has been lifted. It must be noted, however, that this restriction is monitored for a relatively short period (usually for 6 months, less often for one year or longer) and, of course, no conclusions can be drawn about future drinking habits. A slow increase in drinking to previous levels of problematic alcohol use, which develops over a period of more than half a year, will not be detected with an EtG assay after just 6 months. Therefore, whether to extend the monitoring interval from 6 months to one year is under consideration, because this would allow a longer period of observation with the same number of tests and visits. Drivers would still accept the follow-up examinations, because no higher costs would ensue.

Even though a ZTD restriction may be imposed on drivers with alcohol dependence, the long-term studies demonstrating the very small proportion of individuals who are able to sustain moderate drinking habits indicate that ZTD should be used only for selected drivers with this diagnosis. These include, for example, individuals participating in CD programs that incorporate no drinking and driving and drivers whose dependence is less severe. However, the restriction should be imposed in the long term. Most alcohol-dependent individuals should be advised not to drink alcohol again and given the restriction of total abstinence long term until the end of traffic safety monitoring, both for prognostic reasons and to prevent sending the wrong message.

CONCLUSIONS

It is worthwhile imposing ZTD, monitored by hair analysis, on drivers who drink moderately or show long-term stability with little or no consumption of alcohol following earlier alcohol problems. Depending on the history and drinking habits, ZTD may be imposed as a restriction immediately after a person has been declared fit to drive or not until the driver has complied with a period of total alcohol abstinence. Evaluation of hair analysis results in 2010 showed that the majority (about two thirds) of the drivers under investigation, who had been obliged to abstain totally from alcohol for long periods prior to the ZTD restriction, continued to be teetotal. The other third of these drivers, who decided to drink again (mostly after a long abstinence) were able to do this on condition of ZTD and monitoring. Only 6 percent of the 250 people with ZTD restrictions had relapses with excessive alcohol consumption. It does not seem worthwhile imposing ZTD restrictions on individuals who are making efforts toward sustained abstinence or those with severe alcohol dependence. Long-term total alcohol abstinence should be recommended for the latter group due to the poor medical prognosis.

REFERENCES


