SUMMARY

The use of biochemical markers in diagnosis and control of alcohol drinking drivers with suspended driving license can be an important factor in rehabilitation and prevention of recidivism for drinking driving. A review of rehabilitation and prevention of recidivism for drinking driving. A review of biological markers and application in control or drinking drivers is presented.

BACKGROUND

Analysis of drinking habits in drunken drivers tested at road-side checkpoints in Nordic countries results that at least 20-30 percent but usually 50-70 percent can be classified as high consumers of alcoholic beverages, problem drinkers or alcoholics depending on the definition and/or nomenclature used by the investigators.

In roadside study in Northern Sweden we have found about 70 percent high consumers/problem drinkers and in single fatalities in the same area interviewing family members over 50 percent of high consumers/problem drinkers. (Valverius, M.R. 1982) L’Hoste and Papoz (1985) found in France in injured drivers with illegal blood alcohol concentration about 27 percent chronic drinkers.

Gjerde (1987) reported about drinking habits of 3658 drunken drivers in Norway and found that 8 percent reported daily drinking of alcoholic beverages and could be classified as problem drinkers.

A major problem for the diagnosis of high consumer is to recognize the point at which drinking becomes a health and/or social problem. Since alcohol produces changes in nearly every organ of the human body it seems reasonable to test changes from normality and find pathological findings as the result of high and unhealthy consumption. As far as the legal counter-measures have failed to prevent drunken driving - despite fail sentences, heavy fines and withdrawal of drivers license for example usual in Nordic countries - the focus must be on education and rehabilitation/treatment.

The methods to identify high consumers can be psychological tests as MAST or CAGE; physical or clinical findings within general medical inspection like presence of alcohol smell in the breath, color of the face, high blood pressure, palpation of the liver, tremor and anxiety-only to name some of the symptoms.

Plenty of information can be also obtained from case-reports of the person supposing that the investigator has time to ask the questions and read the case-reports from the past.

In the last decade laboratory tests for biological/biochemical markers are
becoming popular.

We have to use more signs and symptoms to identify high consumers among drinking drivers. The biological markers are objective signs giving a dynamic picture of drivers use of alcoholic beverages.

**BIOLOGICAL MARKERS**

We have two types of biological markers:

The trait markers are biological tests which can be identified before individuals have developed advanced alcoholic habits. The hereditary dimension has been studied via adopted-away children and mono-versus dizygotic twins. Metabolic markers such as prolactin response to alcohol use or alcohol related flushing have been found in those at high risk due to familiar alcoholism. In this area of trait markers the measurement of ADH and ALDH-enzymes is of interest when comparing individuals at risk and controls. Trait markers can be used for identification of those with genetic predispositions by differential metabolic responses, but have not be used until yet for identification of problem drinkers in drunken drivers.

State markers are biochemical markers showing the effects of alcohol consumption on various organs. We have today a battery of biochemical markers which in a suitable combination can give an objective and actual picture of the alcohol drinking habits of the person.

State markers are used in rehabilitation of drunken drivers mainly in European countries. The reason is that blood alcohol tests are prevalent in European countries and the same blood sample can be used for estimation of blood alcohol level and for identification of biochemical markers. The breath tests prevalent in USA, Canada and Australia makes it impossible to identify state markers without a special sampling of the drivers blood. The following biochemical markers have been studied in drunken drivers:

**GAMMA-GLUTAMYLTRANSFERASE (GGT)**

Has been used many years controlling alcoholics, but cannot be used for screening of alcoholism. This marker has to be used in combination with Aspartataminotransferase (ASAT) and Alaninaminotransferase (ALAT) which both give a sign of liver damage. Mean corpuscular volume (MCV) is also a well known marker which in combination with above named gives a good correlation with high consumption in the tested person. High density lipoprotein-cholesterol (HDL) and Carbohydrate deficient transferrine (CDT) are markers used with reliable results in alcoholics and could be used also in drunken drivers.

Roine and co-workers (1988) analyzed serum acetate in 727 consecutive drunken drivers and found that the best laboratory test to differentiate the repeating offenders with serious alcohol problems from the first offenders without alcohol problems was serum acetate. The mean serum acetate level of repeating offenders being highly significant than that of the first offenders or non alcoholic controls.

Serum acetate also differentiated first offenders from non alcoholic controls.
Roines assumption is that serum acetate can be used for the screening purposes in drunken drivers to find high consumers. Kristenson (1985) studying drunken drivers in Malmo, Sweden with GGT concluded that GGT has proved to be a useful and simple test in identifying and treating heavy drinkers and monitoring their outcome. Applying tests in drunken drivers in granting licenses to drive 70 percent of subjects did well in compliance with directions over a follow up period of 2-5 years. Good outcome observed Kristensson in 84 percent and questionable outcome with relapses in 16 percent of cases.

In some studies the authors used 25 commonly used clinical laboratory tests and evaluated the results with help of statistical methods. Quadratic discriminant analysis (QDA) takes into account heterogenous medical data and discriminates differences in correlations among variables, variances and means. The technique of QDA has the potential to detect early problem drinkers compared to healthy persons.

The above mentioned markers are not specific for alcohol abuse but can be influenced by medication, illness, food intake and other factors.

Alcoholic beverages consist of ethanol and other alcohols which can be identified and are called as congener alcohols. It was in 1785 when Scheele reported oil-like fraction in a cheap corn brandy, called fusel-oil but only 1971 have Machata and Prokop traced these components in the blood of the consumers. The congeners are the primary and secondary by-products of fermentation and can be identified.

Using the high sensitive flame ionization detector combined with the headspace procedure it is possible to identify some alcohols as characteristic congeners of alcoholic beverages in the blood of drinking drivers.

Methanol is a congener present in the most of alcoholic beverages. Ethanol inhibits the oxidation of methanol and thus the presence of ethanol makes the accumulation of methanol in blood of drinkers possible which means that high consumers of alcoholic beverages and alcoholics have higher blood methanol levels than non alcoholics.

Bonte, Kuhnholz and Ditt (1985) found that 60 percent of alcoholics comprehended for drunken driving had a blood methanol concentration over 5 mg/L whereas only 2 percent of social drinkers reached such a high level. Bonte recommends that the blood methanol level over 10 mg/L indicates that the driver is alcoholic. Methanol levels between 5-10 mg/L arouse suspicion because also a single excessive drinking can cause such a level. In Bonte's results drunken drivers with blood alcohol concentration above 0.25% BAC about 40% have been classified as hidden alcoholics.

Serum methanol is hard to measure and disappears relatively soon after drinking ceases. But in combination with other biochemical markers can be used as valuable marker of excessive drinking.

CONCLUSION

It is obvious that by combination of various biological markers and analysis of congener alcohols in the blood of drunken drivers it is possible to suspect
high consumption or first time drinking.

Using psychological tests and information from the check by physician we could obtain a very good and reliable information about the drinking habits of the drunken driver and in evaluating all information objective facts about his problems in connection with alcohol use.

In connection with withdrawing of driving license in Sweden the use of biological markers was introduced by law. The driver has to prove that he/she is living sober. When the psychological and biological tests give normal values he/she obtain the driving license in due time. If the tests give evidence that he/she is drinking the withdrawing persists. As was mentioned at the beginning about 70 percent of drunken drivers in Sweden are problem drinkers and/or high consumers. By using biological markers it could be possible to influence drivers where the chance to rehabilitate persist and eliminate from driving those who are high consumers and/or problem drinkers and do not change their drinking habits.

REFERENCES


