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Assessment Of Alteration In Blood Alcohol Concentration With Time In Samples Collected From Living Human Subjects

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ABSTRACT

Background: To assess alteration in blood alcohol concentration with time in samples collected from living human subjects
Materials & methods: A total of 10 volunteer subjects were enrolled in the study group. Thirty vacutainers, sodium fluoride, potassium oxalate, ten 10 ml syringes were kept ready. Eight subjects volunteer consumed alcohol commercial drink with alcohol concentration of 37.8 percent. Two volunteers did not consume any alcohol and was taken as control. The volume of alcohol consumed was not regulated. Half an hour after the last drink, 10 ml of venous blood was collected from each subject. Examination of sample was done on two intervals, day 1 and day 10 after collection. 'Chemito GC 1000' gas chromatograph with Flame ionization detector was used. Standard solution of ethanol was injected. Standard calibration curve was drawn for standard. All the samples were analysed and results were subjected to statistical analysis.
Results: The blood sample concentrations about subjects of study group and control group at day 1 was 15.6 mg% and 0 respectively. The blood sample concentrations about subjects of study group and control group at day 10 was 12.3 mg% and 0 respectively.
Conclusion: Immediate assessment of blood samples will help in getting accurate results and proper blood alcohol values.

Key words: Human Subjects, Alcohol, Blood

INTRODUCTION

Because the rate of absorption of ethanol (EtOH) is greater than its rate of elimination, both the amount of EtOH consumed and the rate of absorption of alcoholic beverages are key determinants of the peak blood alcohol concentration (BAC). The rate of elimination of EtOH is determined largely by the activity of hepatic alcohol dehydrogenases (ADH), the primary enzymes that metabolize EtOH. ADH are saturated at relatively low concentrations of EtOH leading to a rate of elimination that is sometimes described as zero-order kinetics at higher concentrations and pseudo-linear or first-order at concentrations below the saturation of ADH.[1, 2]

Tubes made of plastic are more robust and are less likely to break during transport, handling and storage of specimens or after cycles of freezing and thawing. The switch from glass to plastic tubes has also occurred in connection with forensic analysis of ethanol and other drugs in blood, such as in traffic-law when impaired drivers are arrested. This raises the question of the stability of blood-ethanol concentrations after various periods of storage in glass and plastic evacuated tubes.[3, 4] Several reports state that reliable levels of alcohol can

be obtained from whole blood samples stored at room temperature (25°C) for two days and those refrigerated (4–5°C) or frozen (−10°C) for two weeks, but they report greater losses than Dubowski et al.[5, 6] Hence; the present study was conducted alteration in blood alcohol concentration with time in samples collected from living

MATERIALS & METHODS

The present study was conducted alteration in blood alcohol concentration with time in samples collected from living. A total of 10 volunteer subjects were enrolled in the study group. Thirty vacutainers, sodium fluoride, potassium oxalate, ten 10 ml syringes were kept ready. Eight subjects volunteer consumed alcohol commercial drink with alcohol concentration of 37.8 percent. Two volunteers did not consume any alcohol and was taken as control. The volume of alcohol consumed was not regulated. Half an hour after the last drink, 10 ml of venous blood was collected from each subject. Examination of sample was done on two intervals, day 1 and day 10 after collection. 'Chemito GC 1000' gas chromatograph with Flame ionization detector was used. Standard solution of ethanol was injected. Standard calibration curve was drawn for standard. All the samples were analysed and results were subjected to statistical analysis.

RESULTS

The blood sample concentrations about subjects of study group and control group at day 1 was 15.6 mg% and 0 respectively. The blood sample concentrations about subjects of study group and control group at day 10 was 12.3 mg% and 0 respectively.

Table 1: Blood level concentrations with time

Sample	Day 1	Day 10
Study group	15.6 mg%	12.3 mg%
Controls	0	0

DISCUSSION

Epidemiological studies have determined that alcohol contributes significantly to both the risk and severity of traffic fatalities and injuries. The probability of involvement in a serious crash has been shown to increase dramatically for blood alcohol concentrations (BAC) greater than 0.08 percent. In fact, studies have indicated that a driver's information processing ability and judgment may be seriously degraded at BACs as low as 0.05 percent. Nevertheless, the majority of the research on the effects of alcohol consumption on driving ability was carried out more than twenty years ago using relatively high BACs. Early studies of performance decrements in the skills related to driving were conducted at BACs as high as 0.15 percent. In contrast, relatively few studies have been conducted at lower BAC level. This makes it particularly difficult to generalize the results of previous studies of driver impairment to the lower BAC levels that have recently been adopted by several states.[5- 9]

The blood sample concentrations about subjects of study group and control group at day 1 was 15.6 mg% and 0 respectively. The blood sample concentrations about subjects of study group and control group at day 10 was 12.3 mg% and 0 respectively. Dilley JE et al examined the effect of alcohol dose, concentration, and volume on BAC in rats with a high alcohol drinking (HAD) phenotype. Study one examined the relationship between the amount of alcohol consumed and BAC. Alcohol-naïve, male, HAD rats (N=7) were given access to alcohol for 2 hrs/day for 9 consecutive days with food and water ad libitum. Alcohol intake and BAC were measured at 30, 60, and 90 minutes after onset of access. BAC was more strongly correlated with the ratio of alcohol intake (g/kg BW) to total fluid intake (mls) than it was with the amount of alcohol consumed

(g/kg BW). No effect of alcohol dose was seen during the first hour following the onset of an alcohol infusion regardless of whether dose was achieved by altering alcohol volume or concentration. After one hour, higher alcohol doses were predictive of greater BACs. The fact that a three-fold differences in alcohol dose did not result in significant differences in BACs during the first 30 minutes after ingestion of alcohol has potentially important implications for interpretation of studies that measure alcohol sensitive endpoints during this time.[11]

In a similar study conducted by Penetar DM et al, authors compared plasma, serum, and whole blood ethanol concentrations. Five adults consumed a standard alcoholic drink (0.7 g/kg) over a 15-min period, and blood samples were taken 5 times during a 3-h period following drinking onset. Samples for plasma and whole blood were drawn into Vacutainers® containing either an anticoagulant or an anticoagulant plus preservative. Samples for serum were drawn into Vacutainers containing no additives or a preservative only. Separate sets of samples were analyzed on the day of the study, after storage at room temperature (25°C) for 24 h, after storage at room temperature for 10 days, or after 10 days of refrigerated storage. Neither processing condition (i.e., type of additive) nor storage condition significantly affected ethanol levels. Consistent with the literature, plasma and serum samples had significantly higher concentrations of ethanol than whole blood.[12] In some studies of ethanol stability greater losses occurred the more often the tubes were opened to remove aliquots for analysis. Repeatedly opening the tubes introduces a new air-space above the blood sample, which probably facilitates further oxidation to acetaldehyde in the erythrocytes. Several recent papers have investigated stability of ethanol in ante-mortem forensic blood samples during storage and all point towards a gradual decrease in concentration when sodium fluoride and oxalate were used as the preservatives. Blood samples from subjects who had not consumed alcohol were negative initially (<0.0025 g/L) and remained negative when re-analysed after 13–39 months storage at room temperature. In the same study the blood–ethanol concentration in drinking subjects (mean 0.64 g/L) decreased when the specimens were kept at room temperature or in a refrigerator at 4 °C.[13- 15]

CONCLUSION

Immediate assessment of blood samples will help in getting accurate results and proper blood alcohol values.

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