An unusual case of highly false-positive breath-alcohol test in a motor vehicle driver

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Abstract: Breath-alcohol measuring is considered to be the most common and most widely used procedure during police driven road-side traffic stops of suspected drunk drivers. In spite of significant advances in technology and legal structure, significant challenges still remain to be solved. Positive breath alcohol concentrations despite abstinence while driving have been reported after exposure to a variety of alcohol-containing substances or endogenous breath volatile. The article describes an unusual case of highly false-positive breath alcohol test in a motor vehicle driver caused by environmental exposure of the subject to alcohol vapour. After police investigation, it was concluded that the driver was carrying refined spirit in the vehicle the day before the road-side control and some part of spirit was spilled in the car while loading the spirit-containing barrels. This case reaffirms, that in order to exclude possible false-positive breath-alcohol analysis due environmental alcohol inhalation, blank sample of air in the motor vehicle (or any confined space) should be obligatory prior to any breath-alcohol analysis. In addition, current literature on the possibilities of false-positive results is reviewed.

Key Words: breath-alcohol analysis, alcohol vapours, false-positive results, environment, contamination.

INTRODUCTION

Analysis of the expired air is an indirect way how to monitor the concentration of volatile substances in the pulmonary blood. This approach has found very interesting and particularly important applications even in forensic practice. The main application is breath-alcohol analysis, widely used across the world. This method is based on the principle that a diffusion-powered transfer of alcohol from arterial blood to inhaled air takes places in the alveoli [1]. This method is widely used for testing drivers ability in traffic law enforcement, for workplace alcohol testing, in the field of public safety, in the field of research, but also in emergency medicine to estimate the alcohol load in the body [2]. Reasons for widespread forensic application in checking the breath alcohol include a./ easy to use handy analytical instruments, b./ immediate results, c./ computerized instrumentation, d./ non-invasive sample collection, e./ analytical reliability, and f./ worldwide legal acceptability [3]. Because of these reasons, breath alcohol analysis has emerged as the predominant method for field testing of “driving under influence” in law-enforcement authorities in US, Europe, and Australia [3].

Most of current breath-testing instruments have the ability to measure the concentration of alcohol in exhaled air flow by following mechanisms: (1) electrochemical fuel-cell sensors that oxidize ethanol while free electrons – created electric current is measured, being in proportional ratio to consumed ethanol (2) absorption of infrared energy at wavelengths corresponding to vibrational stretch in the ethanol molecules. Sophisticated units for evidential testing are equipped also with microprocessor, controlling entire breath-test sequence (volume of breath, the temperature of breath, concentration-time profile etc.). These units

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are capable of providing credible results when operated even in a non-laboratory environment by people without any scientific training as far as they require only minimal cooperation of the testing subject.

The key aspects of breath sampling for alcohol analysis that relate to instrumental and procedural design include a./ gaining of last portion of a prolonged breath expiration, because only this amount of air exhaled reflects the alcohol concentration in arterial blood to which the brain as the main target organ for ethanol is being exposed; b./ avoiding the residual mouth alcohol (recent ingestion, regurgitation or eructation) by measuring concentration–time profile, and c./ preventing of breath condensation in evidential instruments, which are cooler than exhaled breath, because it might cause a reduced breath alcohol numeric result [4].

In common practice, the possibility of environmental contamination of breath sampling is not always considered as an important complication of evidential breath testing, although many forensic experts perceive the problem as significant. Based on the own experience, the authors report an unusual case of false-positive evidential breath testing due to exposure of the subject tested to an environment containing alcohol vapours. As far as the possibility of the testing failure in such conditions is rather underestimated in the medicolegal literature, the case report should perhaps bring some useful information to avoid a possible mistake in the breath-alcohol testing and evaluation.

CASE REPORT

A man, 53 years of age, without any significant medical history was driving a small delivery truck used in pharmacy supply. The subject was randomly controlled by traffic police patrol in a preventive action. Within the ordinary control the subject was asked to perform breath-alcohol check by use of breath alcohol analyzer (AlcoQuant 6020 plus, Envitec Wismar GmbH, Germany). Because of winter weather conditions, the subject was allowed to perform the breath analysis within the enclosed vehicle interior. Results of first analysis was very annoying for driver – 0.59 mg/L of exhaled air. Driver insisted on non-alcohol drinking period minimally 2 days before drive. The second analysis was performed outside the car, 12 minutes after the first analysis. The result was also disqualifying for the driver – 0.18 mg/L. He declared strictly his soberness, thus he insisted on blood sampling. Police, aware of the great decline of alcohol curve after consulting with prosecutor, took the driver to nearest hospital for blood sample taking. By this act – 60 minutes after the first analysis – driver’s breath analysis had been performed for a third time, now surprisingly with the result of 0.00 mg alcohol per liter of exhaled air.

In that moment the driver mentioned that he carried a refined spirit in his car the day before, when some amount of the spirit had splashed out in the car while loading the barrels. Having this information, the police carried out an inspection of the mentioned car. It was found that a small delivery truck involved in the story (Fiat Ducato) had a rear load space separated to the crew cabin by the solid metal barrier with wide open window. The real load space of the car was covered by soft felt layer. The large spots, still wet and of alcohol smell, were found on the felt. The driver mentioned that he didn’t clean the load space the day before because of cold weather, nor he didn’t ventilate the car while driving because of the same reason. The driver also declared the documentation of legal transport of the spirit in total amount of 300 litters in 6 barrels. Laboratory analysis of the refined spirit sample proved 96% ethanol, 3% water, 1% other substances (aldehydes, esters, acids and other alcohols). The driver’s blood sample had been analysed by gas chromatography with unsurprisingly negative results.

DISCUSSION

Breath alcohol analysis has been widely employed as a primary means of determining alcohol involvement in violations of rules of safe road traffic, and will hold this position definitely - at least in the near future. In many countries, the numeric outcomes of breath analysers have the legal power for accusation and conviction of the suspect in case of driving and drinking. However, the validity of breath alcohol results is often questioned, especially at the court [5]. For this reason, requirements for evidential breath testing have to be very strictly defined. It is very important that the analysis must be conducted in conformance to all applicable rules and regulations.

For forensic experts, the requirements for evidential breath testing are clear and understandable. The most important aspects of breath testing were summarized by Caplan [6]:

- At least 15 minutes long pretest alcohol deprivation period with observing of possible emesis, regurgitation or alcohol ingestion;
- Analysis of a room air blank sample prior to any subject or control test to establish the absence of environmental contamination;
- Analysis of control specimen to demonstrate proper calibration and maintenance of the breath alcohol analyzer;
- Documentation of conduction all steps of prescribed testing protocol;
- Documentation of instrument maintenance and calibration.

As recommended aspects is to report the results as "breath alcohol concentration", not as "blood alcohol concentration" and taking of two separate samples to ten minutes apart to avoid mouth alcohol contamination.
Breath alcohol analysers are not operated by forensic experts but by qualified persons mostly from law enforcement authorities. In author’s opinion and experience, training of such persons includes basically thorough operational knowledge of the given breath alcohol analyser, taken mainly from the user’s manual. The authors studied the detailed instructions for use of breath analyser used in the presented case. The user’s guide was approved by police. Throughout the whole text of the user’s manual, a simple mention on possible influence of environmental vapours of ethanol or other alcohols on breath alcohol analysis was not found. Keeping such user’s manual seriously, it is practically impossible for police authorities to take into account and deal with a case as being described.

There are also other specific situations which can cause a false positivity of breath alcohol analysis and which the investigator should have in mind while performing the test. Probably the most frequent is the question of residual mouth alcohol. Alcohol remaining in the oral cavity can alter the results of a single Breathalyser test [7-10]. The investigator should carefully ask for peroral use of any substances containing alcohol, which may distort the results of breath analysis to some extent, sometimes very seriously. Such substances are many: mouthwashes, inhalers, mouth-sprays, or even homeopathic tinctures, to name a few [11-12]. On the other side, using of food, beverages, breath freshening tablets, gastroesophageal reflux disease, and blood in the mouth were excluded as a potential source of affection of Breathalyser test [13-18], although, according to our experience, this still requires further research. It has been also proved by some studies that dentures, dental adhesives and use of oral jewellery have no effect on breath alcohol results [19-20]. However, the pretest observation period in length minimally 15 minutes should reliably exclude the influence of breath analysis by above mentioned chemical substances.

Similar contamination of exhaled breath by alcohol can occur if vapours of anti-freeze alcohol-based washer fluids from windshield washer permeates the automobile’s cabin [21]. Another ways, how the environmental alcohol vapours can affect breath analysis, are false-positive results after using an alcohol-based hand disinfectant lotion prior the test [22-23]. All these cases signalise the “alcohol air-pollution” nearby the subject being tested, directly influencing the results. Solution of these problems can be find in recommended analysis of air blank sample prior to any control test to establish the absence of environmental contamination [4] or the mentioned pretest observation of the subject in length of at least 15 minutes.

Rather rare problem in breath alcohol analysis interpretation means the serious dieting of the subject. Low caloric diets can lead to ketonaemia with elevated blood concentrations of acetone, acetoacetate, and ß-hydroxybutyrate. Under certain circumstances the acetone reduces to isopropanol by hepatic alcohol dehydrogenase (ADH). In such cases, isopropanol can cause the false-positive results of breath alcohol analysis [24]. The isopropanol impact to the breath analysis results can’t be avoided even by strict adherence to common requirements for evidential breath testing, thus the mentioned problem needs further discussion.

Breath alcohol analysis is firmly established as an important tool facilitating the apprehension and prosecution of driving under influence of alcohol [25]. In spite of significant advancements in technology and legal structure, many challenges still remain to be solved. One of them – the possibility of environmental influence to the analysis is well known but – in author’s opinion - it is still not properly applied in practice. As is it was shown in the case presented - in order to exclude possible false positivity of breath alcohol analysis by environmental alcohol vapours, blank sampling of air should be obligatory prior to any test made in enclosed space (cars, rooms and others). The above mentioned possibility of “alcohol air-pollution” should be also seriously stated in the user manuals of breath analysers and the police authorities should be trained how to deal with such a possibility.

Conflict of interest. The authors declare that there is no conflict of interest.

References