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False-Positive Results In The Alcoholmeter Tests For Exhaled Air

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ABSTRACT

The micro particles in suspension in the exhaled air - as smoke, fog, mist, gases and vapors - interfere in the tests of the electric alcoholmeter, even without having any alcoholic composition, showing positive results in the readings during the first 10 minutes after their application. The absence of minimal care, and since the paramedical people do not follow a rigid procedure, can induce the incrimination of innocent drivers (e.g. non drinkers), on the basis of these false-positive results. The authors propose a sequence of actions to be implemented in order to avoid this reading error, beginning with the repetition of the exam of exhaled air at least 10 minutes after the first sample, with the patient to be examined maintained at rest and without the use of any inhalant substance. .

Keywords: Exhaled alcohol. Aerodispersoids. Inhalants

Introduction

The alcoholmeter is increasingly more widely employed for the indirect dosage of the circulating ethylic alcohol in the blood, calculated on the basis of the readings carried out in the exhaled air of drivers.

Indeed, during blitz or established barriers, either in the urban perimeter, or on the highways, at random, the drivers suspected of driving vehicles while intoxicated, are subjected to a test of simple application, by non-technical personal, only barely trained for their use.

Until some years ago the alcoholic quantification in the exhaled air was carried out by passing a well-known volume of the exhaled air of the driver to be examined, in a solution whose color

changed, in shades of increasing intensity, when the vapors of ethylic alcohol or another introduced one, were present. This was a quite precise method, with few external interferences, but of high cost, because of the price of the used reagent tubes. For that reason, it was not economically feasible for use in very large campaigns, when hundreds or thousands of exams had to be carried out in a short time.

Then the electro-electronic alcoholmeters appeared and the new devices replaced with a wide safety margin the former for chemical reading, allowing the development of campaigns of solid prevention, making exams at random, in a large number of people and at low costs.

However, a new problem has appeared: the false-positive results. That is to say, situations in which the reading of the alcoholmeter for exhaled air detects the presence of a certain quantity of alcohol, even when the person has not drunk a single drop.

In this paper the influence and interferences caused by several products are analyzed, on the basis of the determination of alcohol in exhaled air, using the alcoholmeter.

What is already known on this topic

Until some years ago the alcoholic quantification in the exhaled air was carried out by passing a well-known volume of the exhaled air of the driver to be examined, in a solution whose color changed, in shades of increasing intensity, when the vapors of ethylic alcohol, were present. This was a quite precise method, with few external interferences, but of high cost, because of the price of the used reagent tubes. For that reason, it was not economically feasible for use in very large campaigns, when hundreds or thousands of exams had to be carried out in a short time. Then the electro-electronic alcoholmeters appeared and the new devices replaced with a wide safety margin the former for chemical reading, allowing the development of campaigns of solid prevention, making exams at random, in a large number of people and at low costs. In this way, since 1980´s, the alcoholmeter is increasingly more widely employed for the indirect dosage of the circulating ethylic alcohol in the blood, calculated on the basis of the readings carried out in the exhaled air of drivers. From the legal point of view, single alcoholmeter positive results are considered as a legal proof of high ethylic alcohol values in blood. However, no especial concern was given to any kind of false-positive results by influence and interferences of some products, i.e., situations in which the reading of the alcoholmeter for exhaled air detects the presence of a certain quantity of alcohol, even when the person has not drunk a single drop.

What This study adds

The present study revealed the influence and interferences caused by several products analyzed, on the results obtained by determination of alcohol in exhaled air, using the alcoholmeter. The named "alcoholmeter" is not an alcohol meter, as the name would seem to indicate, but a simple resistances comparator, known in physics as "square circuit" or "Wheatstone bridge". Any electricity conductive product, either solid, liquid or gaseous which is dispersed in the breath - the named aerodispersoids - will be able to offer a certain resistance to the electric current passage at the "bridge", that it will be able to be measured. At this list the smokes, fogs, mists, gases and vapors are enclosed. These interferences in the tests of the alcoholmeter can be minimized if, during the test performance for determining the alcohol level in exhaled air, some five simple and effective cautions to avoid the interferences, were observed.

Materials and Methods

A total of 240 patients of both sexes have been studied with ages ranging between 15 and 60 years, variously using the listed products, in the following quantities:

Alcoholic drinks Liquor - a measure Wine - a glass Beer - a long-neck bottle

Tobacco Cigarettes - a piece Cigarrillas - a piece Cigars - half a piece Pipe - a load of tobacco

Marihuana (Cannabis sativa) Cigarettes - a piece

Inhalants, as aerosol Breath perfumes - two expenditures Broncho-expanders (for asthma) - two expenditures Anti-cough products - two expenditures Expectoration Fluidificants - two expenditures

The analyzed person underwent the alcoholmeter test for exhaled air, before the treatment and 1, 2, 3, 5 and 10 minutes after the administration.

All the measurements were carried out with an electro-electronic alcoholmeter, using digital reading, properly calibrated every 2 months. Each patient exhaled 3 successive times the air of his/her total lung content (vital capacity), through the mouthpiece.

Results

All the medications produced positive readings after the first minutes of administration. Their effects, with respect to the positive result in the test of the alcoholmeter, can be seen in the accompanying table.

Table 1. The effect of the different products on the results of the test of the alcoholmeter in the exhaled air.

Product	before	1 min	2 min	3 min	5 min	10 min	1 hour
Alcoholic drinks							
Liquor	0	++++	++++	++++	++++	++++	++++
Wine	0	++++	++++	++++	++++	++++	++++
Beer	0	++++	++++	++++	++++	++++	++++
Tobacco							
Cigarettes	0	++++	+++	+	0	0	0
Cigarrillas	0	++++	+++	+	0	0	0
Cigars	0	++++	+++	+	0	0	0
Pipe	0	++++	++	0	0	0	0
Marihuana							
Cigarettes	0	++++	+++	+	0	0	0
Inhalants as aerosols							
Breath perfumes	0	++++	+	0	0	0	0
Broncho-expanders	0	++++	+++	++	+	0	0
Anti-cough products	0	++++	+++	++	+	0	0
Expectoration Fluidificants	0	++++	+++	++	+	0	0

Ten (10) minutes after the beginning of the experience, except for the alcoholic drinkers, all the values decrease to zero (0).

The variations observed for the sex and the age of analyzed patients are not significant from the statistical point of view.

For aerosols, the patients receiving the higher doses or those that didn't use expansive chambers show the higher readings.

Discussion

It is, exactly, the number of false positives in the determination of alcoholic intoxication with the use of the portable apparatus - the alcoholmeter tests - that is the most worrisome. What is more serious, is the legal consequences that surround these results, in inexperienced and/or tendentious hands, for blame or for deceit, since in these cases, the lack of transparency of the agents' state "machine", can be fatal.

The indirect estimate of the alcohol level by means of determination of ethanol in the breath, far from being a reliable sample exam, for the various interferences it suffers as well as for their positive reinforcements, cannot be used - and much less - even as initial information, for penal purposes. The first concept that should be understood is that the apparatus habitually used doesn't

determine alcohol levels in the exhaled air and much less does it allow the reliable evaluation, indirectly, of the approximate blood alcohol level (rate) of a person.

Indeed, the named "alcoholmeter" is not an alcohol meter, as the name would seem to indicate, but a simple resistances comparator, similar to which one studies in a physics course, with the name "square circuit" or "Wheatstone bridge". Any electricity conductive product, either solid, liquid or gaseous which is dispersed in the breath - the named aerodispersoids - will be able to offer a certain resistance to the electric current passage at the "bridge", resulting that its resistance will be able to be measured. At this list the smokes, fogs, mists, gases and vapors are enclosed.

Following this research line, we have investigated numerous aerodispersoids able to cause positive readings in the test of the alcoholmeter, even without the person having had any contact with the ethanol, i.e., *false-positive results*.

Due to their frequency of use, more attention was given to the smokes and the fogs or aerosols.

Among the smokes we have analyzed those coming from the ignition of vegetables, as tobacco (*Nicotiana tabacum*), in all their forms - cigarettes, cigars and pipe - and marijuana (*Cannabis sativa* L.).

Among the aerosols, we have studied the breath perfumes, and the inhalers in aerosol, of medical use (for asthma, expectorant facilitators, and anti-cough products). For the case of the inhalers, some patients that received higher doses or that didn't use expansion chambers showed higher readings, showing that a direct relationship exists among the concentration of the aerodispersoid product in the exhaled air and the values measured by the alcoholmeter.

All these products and all these presentation forms, indistinctly, even not containing alcoholic excipient, showed positive results when testing for alcohol in exhaled air.

These positive results that are, truly, *false positive*, are able to interfere in the conclusions that you can reach with the tests of the alcoholmeter being, consequently, serious reason of concern for the operators of the Right.

It is true that after some minutes, the results begin to decay, and 10 minutes after the application of the aerosol or of the use of the product that generates smoke or is dispersed as an aerosol, all the readings became negative ones, only still showing positive results in the people that also used alcohol.

We believe that the concern that you/they realize that these interferences in the tests of the alcoholmeter can be minimized if, during the test performance for determining the alcohol level in exhaled air, they observe some simple and effective cautions to avoid the interference of the positive reinforcements and that this you chronic torne.

To leave the person that will be subjected to the test of determination of alcohol in exhaled air, in rest and without smoking and/or without using any aerosol type, at least for 10 minutes, before making any measurements.

Given a positive result in the first sample, the sample should be repeated, under identical conditions, 30 minutes later.

Even under those conditions, it is necessary to remember that the state of clinical interference that the ethanol can take place in an individual, doesn't depend, hardly, on the quantity of alcohol

ingested but, also of a series of anthropometric, ethological and season variables, that are different among the individuals and the time in which the sampling of the exhaled air is taken.

To remember that you evaluate the dosage of ethylic alcohol in blood, for any admitted method that is used, it no greater meaning, randomly, unless conforming to a certain rate that the law, code or regulation specifies. Individual results can have very different effects - from intoxicating to not having any effect -, when applied to different people, as a function of the idiosyncrasy of each individual.

It is important to verify through the clinical-neurological exam - the clinic is always sovereign - which is the influence that a certain quantity of ingested alcohol has in the results of the clinical and comportment tests, for a certain person, in the moment of its interception.

It is true that this sequence of exams, instead of the reliance on only one, can be more annoying and give more work, but without any doubt, but will be closer to the real truth, a result of high confidence.

The detention of somebody innocent and their eventual future conviction, are of such a magnitude that it needs no comments as to their respect and of those that the authorities cannot overlook, hardly in the name of methodological easiness in the field. For this reason, it is necessary to systematize, with rigor, this sampling type and the correct application of their results. One cannot forget that "*the conviction of one innocent is already too many*".

Conclusions

All the products - smokes and fogs (inhalants) - examined, still without having any alcoholic content, neither as a drug, nor in their excipient, can produce false positive readings in the alcoholmeter, during the first 10 min after their use.

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