Example of Spurious Information on "Interference."

Case Notes: THE EFFECT OF SOLVENTS ON MEASUREMENT OF BREATH ALCOHOL CONCENTRATION (BrAC) BY THE INTOXILYZER 5000

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The Intoxilyzer 5000 is used by many law enforcement agencies for evidentiary breath alcohol testing. The instrument measures infrared absorption of a breath sample in the methyl stretch region at 3.39 μm and 3.48 μm. The dual wavelength measurement is employed primarily to detect and correct for the presence of acetone, which absorbs in this infrared region. The Intoxilyzer distinguishes between ethanol and acetone based upon differing 3.39 to 3.48 absorption ratios for these two substances. During the calibration procedure, the instrument electronically balances the absorption for ethanol at 3.39 and 3.48. If acetone is present (which has a different 3.39 to 3.48 absorption ratio), the instrument detects an unbalanced signal at these two wavelengths and indicates the presence of an interferent. Depending on the concentration of breath acetone, the Intoxilyzer will either correct for the acetone to obtain a BrAC result or abort the breath test.

A number of chemical solvents other than acetone that absorb in this infrared region may have the potential to cause a false positive or falsely-elevated result. Several years ago a case report was published concerning a cabinet maker exposed to lacquers and paint thinners who tested greater than 0.20 on the Intoxilyzer (1). Analysis of blood volatiles revealed 0.026% acetone, 11mg/L toluene and no detectable ethanol. Since the instrument corrects for acetone, it was concluded that toluene present in the lacquers and thinners was responsible for the false-positive result.

In addition to toluene, other chemical solvents such as methanol, isopropanol, xylene, methyl ethyl ketone, ethyl ether and aliphatic hydrocarbons may have the potential to cause false positive or falsely elevated BrAC results on the Intoxilyzer. There are very few published studies concerning these and other potentially-interfering substances. A rather extensive study on possible interfering substances was conducted on the Intoxilyzer 4011AS-A, an early Intoxilyzer model that also measures absorption at 3.39 and 3.48 (2). Of eleven substances tested in this study, three solvents, methyl ethyl ketone, toluene and isopropanol, were found to cause false positive results on this instrument. One of the authors has recently related that similar results were observed with the Intoxilyzer 5000 (3). In another study using the Intoxilzer 5000, N-propranol, toluene, diethyl ether, acetylaldehyde, methanol, isopropanol and gasoline were found to give false positive results when introduced directly into the instrument (4). This study also reported on a subject exposed to diethyl ether, who gave false positive BrAC results for 2.5 hours postinhalation.

From a theoretical standpoint, a chemical solvent may cause a false positive or falsely elevated BrAC result on the Intoxilyzer 5000, if it possesses the following characteristics:

1. Organic, and sufficiently volatile.
2. Limited toxicity and thus present in high enough breath concentration in a conscious person.
3. Sufficient infrared absorption at 3.39 and 3.48 m.
4. A 3.39 to 3.48 m absorption ratio similar to alcohol.

There are few chemicals in use that possess the above characteristics necessary to produce a false positive BrAC. The possibility of a false positive BrAC, however, becomes more likely with exposure to a mixture of chemical solvents as found in many industrial products. This likelihood is further enhanced when an individual consumes less ethanol than the amount needed to reach the legal limit and is also exposed to chemical solvents. Thus, it has recently been demonstrated with certain combinations of ethanol and solvent, that the Intoxilyzer does not detect and subtract interferent and produces an inaccurate BrAC reading (5).

In what appears to be a response to the above concerns, the manufacturer of the Intoxilyzer, CMI, has recently included two new channels in its latest model; one to detect toluene and the other to detect acetaldehyde interference. The problem of other potentially interfering solvents has yet to be addressed by the manufacturer . Furthermore many law enforcement agencies are still using the old 5000's that do not have the new channels. Consequently, the possibility of inaccurate BrAC results remains an issue for evidentiary breath alcohol testing.

References

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