Blood Alcohol Testing in the Clinical Laboratory: Problems and Suggested Remedies

Walter J. Frajota

Laboratory directors or others responsible for blood alcohol testing are advised to reevaluate their procedures for alcohol tests. The demand for better traffic safety has resulted in a large increase in the number of arrests for drinking and driving violations and in a concomitant increase in the litigation of alcohol-related cases. My experience in the last 20 years indicates that many difficulties in the forensic aspects of these cases and many miscarriages of justice could have been reduced or even avoided if laboratories doing alcohol analyses had followed established guidelines. The most frequently encountered problems involve the physician–patient privilege (“the test was done for medical purposes only”) and the fact that alcohol results were frequently reported as blood alcohol concentrations when they were, in fact, serum alcohol concentrations. Here I discuss these problems and suggest some solutions.

Hospital and independent clinical laboratories perform alcohol analyses for many reasons: e.g., forensic toxicological investigations, diagnostic purposes, and therapeutic monitoring. With an ever-increasing frequency the distinction between these reasons is becoming blurred. Because it is difficult to predict with certainty whether a blood alcohol result obtained for medical purposes will later become the subject of litigation, it is prudent laboratory policy to treat all blood alcohol analyses as forensic procedures (1). For those instances in which laboratory personnel are called upon by police officers to withdraw blood or perform an alcohol analysis, the need to follow standard forensic procedures cannot be questioned. For those instances in which alcohol analyses are required by emergency room trauma protocols, the importance of following forensic procedures has been debated. It is these analyses that are most often challenged in the courtroom.

The usual claim by the laboratory director is that the alcohol test was done for medical purposes only; therefore, the test result should remain confidential and not be made available as evidence. When such claims are made, they are often interpreted to mean that the results are not reliable, the laboratory did not use forensic standard procedures to ensure accuracy, or the jury is being denied necessary information. The “for medical purposes only” argument thus becomes a signal for attorneys to pursue more vigorously their efforts to have the results admitted.

The concept of physician–patient privilege was designed to prevent the embarrassment of patients if intimate details obtained by the physician were made public (2). There is no such privilege in common law; i.e., in the absence of a specific state statute, no privilege exists. A laboratory director contemplating the avoidance of legal problems with respect to alcohol analyses must be aware of the state’s statutes. Some states permit no exceptions to their physician–patient privilege: e.g., Ohio (3), Louisiana (4), and New Hampshire (5). Other states have special conditions on its use. A Minnesota appeals court (6) declared that the drinking/driving defendant lost his right to claim the physician–patient privilege because a third party was present during his physical examination. This destroyed the confidentiality of the physician–patient relationship. The New Jersey Supreme Court has ruled that the privilege does not apply to drinking/driving cases because drunk driving is technically not a “crime” under New Jersey’s criminal code but is merely a “violation” of its motor vehicle act (7). In an earlier case a New Jersey court ruled that the public’s right to safety on the highways outweighed the driver’s right to the privacy of the physician–patient privilege (8).

The landmark Schmerber decision (9) long ago (1966) gave law-enforcement officials the power to demand that a blood sample be taken for alcohol analysis from a driver arrested with probable cause to believe he or she was intoxicated, and provided that the blood be withdrawn in a medically acceptable manner at a hospital or other suitable health care facility.

In two different South Dakota cases in which the driver had to be physically restrained by five officers for the blood sample to be withdrawn, the blood alcohol test was admitted into evidence despite the defendant’s arguments that the alcohol test result was the product of unreasonable search and seizure (10, 11).

In Michigan, alcohol test results are admissible in court under carefully controlled conditions: only if the drinker was involved in an accident and was taken to a medical facility where an alcohol test was ordered as...
part of the medical treatment (12). The Michigan Supreme Court ruling rejected the driver's right to privacy under very special conditions. The ruling would indicate that when persons drive an automobile they should expect diminished protection from the physician-patient privilege.

In Indiana the privilege does not apply if a blood alcohol test is obtained in a hospital at the request of a law-enforcement official (13, 14). Indiana law-enforcement officers are authorized to offer blood alcohol tests to any persons believed to have been operating a vehicle involved in a fatal accident or an accident involving serious bodily injury (15).

Because of the great demand for increased vigilance in removing drinking drivers from our highways, I believe it is improper for laboratory directors to attempt to prevent alcohol test results for alleged drinking drivers from becoming evidentiary data. By following the guidelines for blood alcohol testing in clinical laboratories (16), one can avoid extensive courtroom controversy. To illustrate this, I cite a recent experience in which I served as an expert for the defense in a civil action. A minor had purchased and consumed some beer. Subsequently, he drove into a vehicle and fatally injured the other driver. At an emergency room a blood-alcohol test was ordered for the minor by the physician. The test result (0.16%) was to be introduced as evidence in the trial as a medical business record.\(^3\)

When I inquired about the analytical procedure used, the laboratory director invited me to visit him and the laboratory. I was able to review the analytical protocol, the actual procedures used, the chain of custody, and the actual test data. I discussed the test procedures with the analyst. As a result of that visit I could report to the attorney that the test was performed properly and that, in my opinion, the result was accurate and should not be challenged.

Another serious problem with the analysis of alcohol is, essentially, the consequence of improper word usage and inadequate attention to detail on the part of laboratory workers. For many analytes, blood is obtained without an anticoagulant and the analyte concentrations are determined on the serum obtained after centrifugation. Proper reporting of the results would identify the analyte concentration as a serum concentration, but for many analytes results are reported as blood concentrations; e.g., blood glucose, blood cholesterol, blood electrolytes. For these substances the difference between serum and blood concentrations may not be important; however, for alcohol it is very important. Most state statutes specify blood alcohol, not serum alcohol. The difference between a blood alcohol concentration and a serum alcohol concentration obtained from the same blood may vary considerably. The serum alcohol concentration could be up to 20% higher.

Irrespective of the degree of variation, the statutes, unfortunately, are very specific. Many specify the amount of alcohol by weight in the blood of a person. This issue was addressed in Commonwealth v. Bartolacci (18), where the court warned that reports of serum alcohol concentrations should include an explanation that serum alcohol is higher than blood alcohol. Numerous reports have amply substantiated the fact that the ratio of serum alcohol to whole-blood alcohol varies from 1.09 to as much as 1.35 (16, 19–23).

In many reports the serum alcohol concentration is converted to a blood alcohol concentration by division of the serum result by a factor selected from an average of the ratio of serum to whole-blood alcohol. This is obviously erroneous because an experimental value is, thus, converted to a theoretical one; i.e., for the calculated value to be forensically acceptable, it is necessary to prove that the individual was an average individual. It is difficult to understand why one would resort to such calculations and explanations when a whole-blood sample was available. Preparation of a protein-free filtrate allows one to use a variety of analytical procedures to produce the desired whole-blood alcohol concentrations. Serum or plasma alcohol analyses should not be converted to whole-blood alcohol concentrations (16).

The difference between a serum alcohol and a whole-blood alcohol concentration has been the subject of many courtroom arguments. When this difference is not understood by the judge, the attorneys, the jurors, and, sometimes, not even by clinical chemists, the problem can result in a serious miscarriage of justice. As E. J. Imwinkelried stated several years ago (24), "scientific evidence, transferred from its native environment to the confines of the courtroom, can be severely distorted." Let me illustrate this with one example of several similar experiences I have had as an expert witness (25). The defendant, charged with negligent homicide as well as driving under the influence of alcohol, had struck a vehicle that had made a left turn in front of the driver. A blood sample obtained from the defendant by the sheriff's department was lost in the mail. The emergency room physician obtained a blood sample for an alcohol test as part of the routine treatment of an accident victim. The defense filed a motion to suppress the test result because it was a serum alcohol concentration rather than the required blood alcohol concentration and because the procedure used lacked several foundational requirements. Evidence of controls and proper documentation were missing. The clinical chemist (laboratory supervisor) testified that the Du Pont Automatic Clinical Analyzer (acca test) result was a valid whole-blood alcohol concentration despite the fact that he agreed the blood was not obtained with an anticoagulant present and that the actual specimen analyzed was a serum sample. The judge, faced with two opposing opinions, in his nonscientific wisdom applied a compromise! He permitted the numerical test result to be introduced into evidence without any identifying units and without any mention of whether the test was performed on whole blood or serum!

The above experience should not be considered an
isolated instance of the problem. The major issue of the
guilt or innocence of defendants in many drinking/
driving trials has been whether the reported alcohol
result was a blood alcohol or a serum alcohol concentra-
tion. Courts, influenced by a variety of factors, some-
times may not be interested in learning the difference.
In an Indiana vehicular homicide case involving driving
under the influence of alcohol (26), the prosecuting
attorney was able to prevent the defense expert from
any discussion of the difference between serum alcohol
and blood alcohol on the claim that the discussion was
irrelevant. The hospital laboratory record indicated a
blood–alcohol result even though the laboratory proce-
dure indicated it was, in fact, a serum alcohol. The
difference in the alcohol concentration would have been
enough to bring the result below the proscribed 0.10%.
The defendant was found guilty and his plea to the
appellate court for a rehearing was denied.

Note also that not all laboratory directors are willing
to accept that seemingly important concept. A labora-
tory director, a recognized forensic expert on alcohol
analyses, when challenged on the witness stand, ex-
plained that his laboratory reported all alcohol analyses
as blood–alcohol concentrations and that they do not
make a distinction between blood alcohol, serum alco-
hol, and plasma alcohol (18).

In conclusion, clinical chemists and other laboratory
directors should consider a review of their alcohol anal-
ysis protocol: a) to ensure that the reported result
accurately reflects the analyzed specimen; b) to consider
(if they do not already do so) using protein-free filtrates
to obtain blood alcohol concentrations; and c) to bring
the laboratory procedures into conformance with stan-
dard guidelines for blood alcohol testing in the clinical
laboratory (16).

References
1. Dubowski KM. Alcohol analyses: clinical laboratory aspects.
1918:363.
8. State v. Bodtmann, 590 A 2d 559 (New Jersey Superior L.
1990).
9. Schmerber v. California, 384 US 757, 711–772, 86 S Ct 1826,
1836, 16L.Ed. 2d 908, 920 (1966).
1990), 549 N.E. 2d 1107.
15. Indiana Code Chapter 7, 9-30-7-3.
16. Dubowski KM, chairholder, subcommittee on blood alcohol
testing. National Committee for Clinical Laboratory Standards.
Proposed guideline T/D M 6-P: Blood alcohol testing in the clinical
19. Winea CL, Carfagna M. Comparison of plasma, serum and
20. Bennett TL. Medicolegal aspects of alcohol and alcohol testing
21. Kays S. The collection and handling of the blood alcohol
22. Payne JP, Foster DV, Hill DW, Wood DGL. Observations on
interpretation of blood alcohol levels derived from analysis of
23. Schwar TG. Distribution of alcohol. In: Cooper WE, Schwar
TG, Smith LS, eds. Alcohol, drugs and road traffic. Capetown, SA:
24. Inwinkelried EJ. Science takes the stand (the growing misuse
25. Unreported case, WV v. Jonathan Strang, Circuit Court
Monongalia County, WV, Case #89-F-4 July 23, 1989.
#2-785A213 3rd Dist Court of Appeals rehearing March 31, 1986.