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Letters to the Editor

Fatal Traffic Accidents—Legal Assistance in Chemical Causation

Sir:

The seemingly inevitable and unceasing morbidity and mortality resulting on and from our nation's highways continue to represent a national disgrace, not only because we refuse to legislate seat belt requirements for occupants, which alone would prevent thousands of fatalities each year, but also because many elements of safety design are relegated to the "backseat" as far as automobile manufacturers are concerned. A ray of hope exists on the horizon, however, with the passage of legislation at the federal, state, and local levels with reference to raising the age of alcoholic beverage purchase and imposing stiffer punishments for those flunking the sobriety test at the roadside.

Regarding those many fatalities in which medical examiners and coroners routinely examine for intoxication, it has long been apparent that subjects who initially survive in the hospital, only to succumb later, seldom have such an alcohol analysis performed, and so are "lost" to any statistical evaluation of drunken driving. The few instances in which a court order mandating blood testing is obtained on "probable cause" activity do not begin to balance against the vast numbers that are missed because of prolonged medical recuperation.

In this issue of the *Journal*, the authors report an instance of hypoglycemia as the causative factor in a traffic accident fatality. However unusual or subtle such a case may be, the key to uncovering the incident was the regulation promulgated as part of the Medical Examiner Law, requiring hospitals to retain an admission blood specimen on all trauma victims. This preserved sample thus becomes available for analysis if the individual dies, whether it is after a few minutes or many weeks following such an injury. For protection against self-incrimination, the specimen is destroyed if and when he or she survives and eventually leaves the hospital.

Since the inception of this procedure in Rhode Island, we have shown that an additional 10% of driver fatalities per year have documented ethyl alcohol in their antemortem system, but their postmortem samples when analyzed were negative for alcohol. This means that *60%* of fatal traffic accidents were alcohol related by chemical testing, rather than the often quoted 50% which is the figure accepted by the National Safety Council and other reliable investigators. Two instances of elevated carbon monoxide levels were also uncovered by this testing mechanism.

A preliminary survey indicates that few other jurisdictions in the United States are empowered to obtain and test such specimens. We encourage medical examiner physicians, coroners, forensic scientists, attorneys, and legislators to enact such laws or pass appropriate regulations or both, along with other pending drunken driving legislation, to enable chemical testing of specimens obtained upon admission to emergency rooms and hospitals in trauma cases, especially those involving alcohol related vehicular accidents. The exclusion of the nondrinker, with possible identification of a more subtle etiology, is the obvious bonus of such a program, as noted in this issue of the *Journal*. But most important, a further legal mechanism would be provided wherein reliable data will be obtained in additional traffic cases, and the drunken driver will become more easily identified and take his rightful place in the criminal justice system more regularly.

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Training of Arson Investigators: Common Sense from the Laboratory[1]

Sir:

When training fire investigators, the forensic science laboratory must represent itself realistically. It is of little service to client agencies to promise wonderful things only to deny them access to lab services. Arson is a serious crime in the United States and a complex one to investigate. Its proper investigation requires not only teamwork between fire and police departments, but close, communicative cooperation between the laboratory and investigators at *all* stages, from training through prosecution. Some guidelines for improving the interactions between laboratories and fire investigators, particularly in the area of training, are offered.

The Fire Investigation Problem

Fire scenes provide the most daunting challenges of any crime scene to investigator and laboratory analyst alike. These challenges stem from several features peculiar to fire investigation. First of all, every fire scene is a *potential* crime scene, that must be diligently searched even to establish whether a crime, that is, arson, has been committed. Unlike other crimes, where a blown safe or a bloodied corpse is a strong indication of criminal activity, considerable resources must be extended at a fire scene before accidental or natural causes can be eliminated and a criminal causation identified. Second, fire scenes are typically very difficult crime scenes to search. They are everything a good crime scene should *not* be. They are disrupted, contaminated, the focus of considerable attention by press and populace, and all too frequently large and impossible to secure. Third, a criminally set fire is virtually the only sort of criminal activity that destroys evidence as it progresses rather than creating more of it. Thus, the later this crime is suspected and investigated, the smaller the amount of evidence which will survive.

Next, the nature of fire incidents is such that their investigation falls in a gap between the statutory authority of a fire department (which is obligated to identify the causes of fires on behalf of public safety) and that of the police (who have an obligation to investigate known crimes and apprehend the perpetrators). All too often fire departments refuse to pursue an investigation beyond the determination of the cause because they are not set up to investigate and apprehend, while police officials refuse to involve themselves because of the noncriminal nature of many fires. Finally, there is a supposition held by both perpetrators and investigators that all evidence of criminal activity is destroyed by a fire and its extinguishment. This is certainly the rationale that prompts many criminals to set fires to conceal the evidence of other criminal activities. It is not, in fact, the case in real life. Most fires are extinguished before there is total destruction of all combustible materials. In spite of the fire and subsequent suppression activity, a small percentage of the evidence created by the fire setter will survive. It is the challenge that faces both the scene invetigator and the laboratory analyst to maximize not only the recovery of this evidence but the efficiency of its interpretation.

Training the Investigator

One of the most important steps any agency can take to improve its investigation of fires is to improve the training of detection and collection of evidence in those doing the fire scene search. Those crime lab people participating in this training will find it both a rewarding and puzzling experience. It is rewarding because fire fighters (who do most of the fire scene searches) are generally thorough and methodical in their approach to problems. By their training and experience, they are naturally observant of structures, fire behavior, and small signs of

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human activity and can be remarkably analytical in their interpretation of even small details. It is the ability to observe and analyze that allows them to safely negotiate burning or smoke-filled rooms, rescue potential victims, and fight fires efficiently.

It is a puzzling experience because of the different outlook or "mind-set" of fire fighters which is in sharp contrast to that of most police investigators. The differences between statutory responsibilities mentioned previously are both a cause and a result of this difference in attitudes and self-perception. Fire fighters are the last unsullied American heroes. They perceive themselves as being there to do good for people. They rescue people in trouble, provide aid to the injured, and protect property from encroaching disasters. In fact, it is difficult for anyone to perceive the fire fighter as anything but a "good guy." For instance, where it might not be so difficult to imagine a police officer ignoring a crime in progress for the sake of remuneration, it is impossible to think of fire fighters failing to try to rescue someone no matter what sort of inducement might be offered.

Unlike the police, fire fighters tend to consider all people to be unfortunate victims of circumstances. To most fire fighters, each client is probably a "good guy" about whom it would be unthinkable to suspect criminal motives. Unfortunately, it is not always the case. It is now apparent that incendiary fires, that is, those set with intent to destroy whether or not there is a criminal motive, now account for a frightening percentage of all fires to which fire fighters respond. Although the exact percentages will never be known, it is not unreasonable to conclude that in urban areas in the United States today something like 40% of all structure fires are incendiary in cause. Nor is the rural or suburban fire fighter safe in his innocence. It has been estimated that up to 90% of all grass and wildland fires in the United States are man-made in cause. It is this sort of statistic that must be used to shock the fire fighting community into realization that many, if not most, of the fires they deal with are caused not by accident but by criminal activity. This activity can ony be stemmed by thorough investigation and close cooperation between police and fire investigative units who must make the most of the minimal evidence which gives testimony to that criminal origin.

It has been the experience of this author in having helped train many hundreds of fire investigators that exposure to "common sense" evidence recognition and collection practices results in substantial improvement in the quality and quantity of evidence recovered from fire scenes. Starting with the thorough, observant, and analytical job skills most fire fighters have already developed, it is comparatively easy to offer examples of common evidence types, discuss their limitations and offer illustrations of the best ways in which to collect the preserve that fragile evidence. The physical properties of each category of evidence are stressed, for these physical properties are the source of that evidence's limitations. For instance, volatile liquids are used as fuels to accelerate fires because they *evaporate* thus providing convenient, easily ignitable mixtures of fuel vapor and air. It is precisely that volatility, however, that gives them such a short life as useable physical evidence. If flammable liquids get too hot or are exposed for too long they will evaporate, and simply go away, so that they are not detectable by even the most clever or sophisticated laboratory techniques. With this physical property in mind, the investigator is encouraged to seek out volatile liquids where they will most likely be found—in cracks and crevices, soaked into absorbent materials *away* from the heat of the fire, in soil under porous floors, or trapped in water-soaked debris in the area. Useful quantities of volatiles will not be found on nonabsorbent materials or at the seat of the fire where the flames were the hottest for the longest time. The container used must be selected with this volatility in mind as well.

Blood and other physiological materials are valuable only as long as they remain chemically "intact." If one seals damp stains or garments in an airtight container and keeps them warm, these sensitive materials will quickly decompose, their usefulness destroyed. Therefore, such materials should be air dried, kept in porous containers such as paper bags, and kept as cool as possible, even refrigerated. Delicate materials, such as charred documents, should be handled with great care. They should be packed in rigid containers with fluffed cotton and

hand carried to the laboratory. Trace or transfer evidence is valuable for associating a suspect and a scene only because it *can* move from garment to garment or object to object. When garments or objects bearing such potential trace evidence are recovered separately, every effort must be made to prevent subsequent crosscontact. Paper bags, envelopes, and bindles (a folded paper packet used to secure small quantities of valuable or irreplaceable materials) offer a selection of convenient, low cost packaging methods applicable to different forms of trace evidence. Stressing the physical shortcomings of such evidence and such concepts as taking steps to preserve the *state* of the evidence and especially the concept of "chain of custody" will result in material improvement in the quality of physical evidence submitted to the laboratory.

Laboratory Services

Once the evidence is submitted to a laboratory, we come to an entirely new set of problems for it is now the responsibility of the laboratory to maximize the quality and quantity of information that comes from the modest bits that have survived the trauma of fire, suppression, and finally, collection. Because fires must be investigated before a criminal agent can be identified, the response of the laboratory plays a critical role in the future of inquiries regarding that fire. Communications between submitting agency and laboratory are important in all investigations but they play a more critical role in fires than in many other kinds of cases. It is important to maintain two-way communication between forensic scientist and fire investigator. What are the suspicions of the investigator? What kind of fire occurred? What sort of fire suppression was used? How long has it been since the fire? These are all questions the laboratory should ask the investigator when evidence is brought in. Such questions may not only expedite the analysis, but may also improve its accuracy and value to the investigator. Because of the degradation and contamination of much fire evidence, conclusive identifications may not be possible so the laboratory should not hesitate to offer suggested or qualified solutions to the investigator. Further, they may suggest new lines of inquiry for him or may prompt him to seek other possibilities for the laboratory to try. Two-way communications are basic to improving the quality of the laboratory's services on fire evidence.

Because the fire must be investigated and, in many cases, evidence analyzed before it can be determined that there was in fact criminal activity, every laboratory should strive to maintain some sort of screening service with a rapid turnaround for fire investigators. This may be nothing more than a simple gas chromatograph (GC), set up to accept headspace samples of suspected volatiles so that some idea of the potential value of the evidence can be quickly gained. Even if the precise nature of the flammable is not identified, at least the investigator has some assurance that he has gathered evidence of an incendiary origin. Remember that flammable liquids are not used on all arson fires and may indeed be detected in only 50% or so of all suspected arson cases submitted to a laboratory. Such liquids are, however, the single most *common* type of arson set used by the amateur arsonist.

The truly professional arsonist more typically uses flammable fuel materials (papers, cardboard, foam, platic, and so forth) already at the scene and avoids the use of readily detectable fuels or accelerants. Although the professional arsonist is undoubtedly responsible for a significant percentage of all high dollar loss structure fires, his work is sufficiently sophisticated so that it is not often submitted to a laboratory as evidence because it is not readily detected by the investigator in the first place.

In maintaining efficient laboratory services it is *vital* that the lab not preclude all arson cases on the basis of an arbitrary prioritization scheme. Although it may be convenient for laboratory managers to proclaim that "property-only crimes or crimes without suspects will not be analyzed," it must be realized that these two criteria apply to virtually all arson cases. Arson, with its direct and indirect costs, now costs the people of the United States more money every year than all other types of crime put together. It is one of the most serious criminal and social problems facing out cities today. We must not deny investigators of such a massive

crime access to our laboratories on the basis of an arbitrary dictum. Do not put your client agencies in the dilemma of not being able to identify a fire as a criminal act or identify a suspect because they cannot get a laboratory analysis while, on the other hand, requiring that a suspect be named before the analysis can take place. The crime of arson is an exceptional one with regards to its occurrence, evidence, and investigation and it deserves exceptional treatment by the crime laboratory if any progress is to be made in meeting its challenges.

One promising program of lab fire investigation interaction has been developed at the Metropolitan Police Forensic Science Laboratory of London. There, the Fire Investigation Unit, a team of specially trained forensic scientists, is on 24-h call. When a fire brigade officer suspects an incendiary fire, these scientists are called upon to conduct the scene investigation, determine cause and origin of the fire, collect necessary evidence, and conduct the necessary lab tests. The results to date have been excellent. Hundreds of fire scenes have been examined and a fair number of arsons detected. The rate of successful prosecutions for these arsons is much higher than in most other jurisdictions. The interactive role of the laboratory's Fire Investigations Unit has improved the performance of both fire brigade investigators and lab personnel as experience is gained and shared.

When a forensic scientist attempts to investigate a new phenomenon or duplicate the conditions of a crime scene to test hypothetical reconstructions, small scale laboratory tests are very often adequate. But this is not the case for fire evidence. A grass or structure fire is a very complex and dynamic process which is susceptible to all sorts of environmental effects, that is, ventilation, weather conditions, fuel load, and even the manner in which the fire was extinguished. Proper interpretation of fire evidence requires an understanding of the complex chemical and physical processes involved in fire. This understanding, although it can be approximated in small-scale laboratory tests, requires real fire experience for full comprehension. Many surprising, and almost contradictory, things happen in a full-scale fire environment which would not be suspected from small-scale tests. The laboratory should pursue every opportunity to participate with fire and police agencies in its area in experimental structure fires. Every jurisdiction is provided with vacant buildings to be demolished for a variety of reasons. The fire department makes use of these buildings for training their personnel in fire fighting techniques and testing new equipment. It is a very simple matter to expand the scope of these experiments to include the setting of various types of incendiary devices under a variety of environmental and fuel load conditions as well as simulating various accidental means of ignition. The entire sequence of the fire, from the moment of ignition to the time extinguishment, can then be observed by the laboratory specialist *and* the investigator.

Conclusion

Far too much information upon which we rely was gathered strictly from post-fire scene investigation (and hypothetical reconstructions) without any direct observations of the complex processes that produced the effects. These full-scale fire experiments not only lend more credence to the expert testimony of the laboratory analyst but provide him or her with an understanding of the fire processes involved and with the nature of the suppression and overhaul efforts that play such a vital role in the survival of the evidence. It also provides a convenient opportunity to deal with client agencies in a real life situation that cannot be duplicated in any other field of forensic science endeavor. In the field of fire and arson investigation every laboratory should strive to avoid the "voice from the ivory tower" syndrome and get to know both the client agency and the evidence with which both sides must deal.

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