Crime Scene Contamination Issues

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The issue of contamination of physical evidence has painfully brought notoriety to several criminal cases. Webster's Dictionary defines contamination as; "to make impure, corrupt, by contact; pollute, taint." Potential contamination of physical evidence can occur at the crime scene, during the packaging, collection and transportation of the evidence to a secured facility or laboratory, and during evidence analysis and storage.

While forensic scientists in the laboratory are sensitive to the issue of contamination and have developed protocols to identify and reduce the risk of contamination, law enforcement has been slower to incorporate precautions in contamination prevention. Recent advances in forensic DNA technology are making it even more important that crime scene personnel become more sensitive to the issues of contamination.

The Crime Scene

Crime scene contamination usually results through the actions of the personnel at the scene. In general, the grater number of personnel at the scene, the more likely it is that the scene/evidence will be contaminated. Scene personnel can deposit hairs, fibers or trace material from their clothing or destroy latent footwear or fingerprints. Footwear patterns can also be deposited by crime scene personnel or anyone entering the scene. As Professor Locard has taught us, when two objects come in contact with each other they exchange trace evidence. Each time we enter a crime scene, we not only potentially leave trace evidence behind, but also take evidence away from the scene.

Forensic DNA analysis has become an increasingly powerful investigative tool. Analysis of biological fluids and now cells found at crime scenes can, with relatively high confidence, exclude/include a possible suspect and provide a numerical estimate of the similarity of the crime scene and suspect's DNA. The DNA technology being used in crime laboratories around the country can take samples that are very small or degraded and xerox the DNA present to provide a large enough sample to be analyzed. Because of the analyst's ability to xerox very small amounts of DNA from biological evidence, reducing the potential for contamination at crime scenes becomes ever more significant. Single hairs, perspiration and/or saliva inadvertently deposited by an investigator while at a crime scene can now cost valuable time and create the potential for excluding a viable suspect as well as cloud or confuse the interpretations of the physical evidence.

The level of contamination risk to be expected is related to the type of crime scene and corresponding number of individuals who have access to the scene. At a burglary scene, the victim and the officer taking the report may be the only individuals present. In contrast, a typical death scene would usually be visited by the first responder, paramedics, investigators, crime scene examiners, coroner or medical examiners, prosecuting attorneys and possibly supervisors. Family, friends and neighbors of the victim may be present as well. Obviously, due to the higher number of individuals in contact with the scene, the potential for contamination would be significantly higher at a death scene.

Environmental conditions may also play a major role in the contamination of crime scene evidence. Wind, sun, rain, snow and temperature can play key roles in the destruction of the evidence at a crime scene. For instance, if there is blood at an outdoor crime scene and it rains, the blood may become so diluted that testing of the blood becomes impossible. The same would apply if the blood was exposed to

the sun on an extremely hot and humid day. The fluid would be decomposed or contaminated by bacteria to a point where further analysis would be impossible or inconclusive at best.

Wind and temperature are also possible mechanisms for contamination. Wind can carry in contaminates or literally blow away evidence. Temperature in the extremes can obviously cause problems by the items containing evidence being "cooked" or "frozen". This applies to outdoor scenes that are unprotected, but can also apply to indoor scenes with no heat or cooling capabilities.

Pre-Secured Scenes

The potential for evidence (or crime scene) contamination increases as the number of people entering a crime scene also increases. Once a scene has been secured, the risk of contamination is greatly reduced. However, what about the events which occurred before the scene was secured? How many people entered and left the scene without being recorded as being there? For example, in a private residence, the victim, their family and the investigating officers are usually the only individuals who have been in the crime scene. In sharp contrast, if a bank robbery occurs, physical evidence such as fingerprints, footwear and trace (as well as biological) evidence could be present from many individuals who recently visited the bank or those customers who were present at the time of the event. A similar situation would also be present if the crime occurred in a motel room or a public park. The amount of potential destruction and contamination of physical evidence in public places such as these presents a real challenge for law enforcement.

Post-Secured Scenes

Once the scene has been secured, the potential for contamination still exists. The scene is usually secured by only one officer. This is problematic if no provisions are made for others entering the crime scene from other avenues. It is extremely difficult in some situations to thoroughly protect the scene from unauthorized personnel. Once again, in a residential burglary, the scene is less complex and can be secured fairly quickly with minimal personnel. A public park, on the other hand, may be extremely difficult, if not impossible, to totally secure and keep secured until the crime scene is thoroughly processed.

The risk of contamination in all crime scenes is reduced by thoroughly protecting the scene. Consequently, determining the dimensionality of the scene should be the first priority. We cannot protect something we do not recognize as part of the scene. Indoor scenes, by virtue of being enclosed structures, seem easier to secure. Outdoor scenes, on the other hand, are more difficult to secure because of the potential contamination by agents such as weather conditions and crowds. As a result, these types of scenes require more personnel to properly protect. Barrier tape, is usually yellow in color and marked by the words "crime scene" or "police line" with the additional words of "do not cross", is used to identify the outer perimeter of the scene. Physical barriers are always needed to define the areas restricted to the public as well as other law enforcement personnel. The barrier used can be as simple as a rope or added markings with attached signs. Providing visual boundaries to the scene assists in restricting access and reducing contamination risks.

Once the area is defined, a command post should be established. Forming a command post reduces the potential for contamination of the scene by limiting personnel access to the scene and identifying who is entering and leaving the scene. A major crime may require paramedics, firemen, family, friends, neighbors, patrol officers, investigators, supervisors, crime scene personnel, medical examiners or coroners all present at the scene. Each person has the potential to destroy or contaminate the scene through normal hair loss and transferring fibers and trace evidence from their own environment (home,

office or vehicles) to the crime scene. Even the family pet can contaminate the scene through the introduction of additional trace evidence and the transfer of evidence from one area of the scene to another.

Equipment

The equipment used in documenting and processing crime scenes also represent a possible source of contamination. Crime scene personnel need to be cognizant of the possible cross contamination that can be caused by their equipment. As the crime scene examiner travels from one scene to another they run the risk of transferring hairs, fibers, and biological fluid from other scenes to the new crime scene. This contamination can be easily controlled if crime scene personnel decontaminate their equipment before and after every crime scene. Equipment which should be decontaminated includes, but is not limited to, their clothing, their note pads, photography equipment, sketching equipment and all processing equipment in their crime scene kits.

Crimes involving multiple scenes have similar contamination issues, particularly if a suspect or more than one suspect commits a series of crimes in the same time frame. The situation in Littleton, Colorado, USA, for example, where two suspects shot multiple people in various locations in the huge school complex could have posed a severe contamination issue for law enforcement. If multiple scenes are involved, physical evidence can be easily transferred from one scene to another, if precautionary procedures are not applied by the crime scene personnel. Therefore, when multiple scenes are involved, the processor(s) must be aware of cross contamination issues and take steps to reduce their occurrence. The involuntary transfer of evidence from one scene to another must be taken into consideration and addressed by the law enforcement personnel at the scene. This can be easily addressed by identifying requirements for personal protective equipment (PPE) and a decontamination zone.

Required PPE consist of a mask, jumpsuit, gloves, booties and head cover. All of these items must be disposable. Most crime scene personnel wear booties, a mask and gloves. This is usually done as a biohazard exposure precaution rather than for reducing contamination risk. However, the use of PPE is also an effective mechanism to reduce contamination potential and subsequently, increase the investigative value of biological evidence which may be subjected to forensic DNA analysis.

To reduce the potential for cross scene contamination, a decontamination zone must be established. This safe zone is the area where crime scene equipment and PPE can be safely cleaned, removed and properly discarded. For some scenes, the decontamination zone may be more elaborate than in others. For instance, at a burglary scene, the decontamination zone is simply a “safe” area of the residence where crime scene equipment can be placed. By having equipment and supplies restricted to one area, the potential for contaminating other evidence from the scene is minimized. In a violent scene or any scene with abundant biological fluids, crime scene personnel must be careful not to transfer biological fluid from their footwear to different parts of the scene. Biological fluids also create a safety issue, therefore, crime scene personnel should be required to wear the full array of PPE at these types of scenes.

The decontamination zone must contain the appropriate cleaning supplies and all equipment for the decontamination of the person as well as their equipment. Usually, decontamination involves the removal and discarding of disposable clothing and the wiping down of all equipment with a 10% solution of bleach. Other disinfectants may be appropriate for different equipment, but the most convenient as well as the “standard” of the safety industry is a 10% solution of bleach in water. The use of bleach will require that a plastic tarp or, in cases where the PPE needs to be decontaminated, a small plastic child’s pool (about 3 feet in diameter) be used. This would not only protect the floor covering from the bleach, but also offer the “best” way to safely decontaminate PPE when crime scene personnel move from one scene to another in a multiple scene crime scene.

Even after the crime scene is well secured, contamination risks may still be high. Not only do crime scene personnel frequently walk through the scene, but their equipment has the potential of transferring unassociated trace items in the scene as potential evidence. Furthermore, the processing techniques used by crime scene personnel to find or enhance various forms of evidence can also contaminate the evidence. Typically the crime scene can yield a wealth of potential evidence such as; fingerprints, footwear, toolmarks, hairs, trace material, biological fluids and latent patterns. Each type of evidence may require the use of chemicals or powders to identify or enhance. To reduce the risk of contamination, crime scene personnel should follow a protocol for evidence collection that inhibits evidence destruction and contamination. An order of evidence collection that would reduce contamination is: recover the trace, hairs and fibers first, then biological fluid, tool marks, visible finger prints or footwear patterns, then lastly, latent patterns that require powder or chemical enhancement.

Even then, the decision on what processing steps are needed in the crime scene is left to the judgement of crime scene personnel based on the evidential potential of that item. A pry bar left at a crime scene by the suspect can illustrate this point. A pry bar was used to pry open a door or window to gain entry into a structure. The evidence potential of that item alone includes latent prints, biological and trace material, transfer evidence, tool marks and control standards. Crime scene personnel must keep the potential of the evidence in mind, but also not forget the practicality of the evidence. Physical evidence can support the facts of the case, identify a crime was committed, identify the suspect or victim, develop an M.O., and prove or disprove the theory of the case.

Packaging and Collection

Evidence is packaged to prevent destruction and contamination. New containers must be used to package all evidence. For some evidence, sterile containers are required. The packaging equipment must also be free of contaminates. This is easily accomplished by keeping all the packaging supplies in one case and handle them carefully from one scene to another.

Evidence containers must be sealed at the crime scene. This reduces the contamination potential and keeps the integrity of the evidence intact. When containers are left open and removed from the scene, the potential for contamination increases dramatically. Consequently, containers must be properly sealed and marked for identification at the crime scene.

Because of the sensitivity of the forensic DNA analyses currently being performed by crime laboratories, handling biological evidence properly is critical. Drying items with biological fluids on them prevents destruction or contamination by bacteria. Drying wet objects at the scene may be impossible and at times, not appropriate. It is recommended that wet items be packaged in a paper container and sealed, then placed in an open plastic container. The plastic container is used only as a transportation tool. The plastic container prevents biological fluid from cross contaminating other paper containers of evidence and stops the fluid from leaking through the paper packaging onto the floor or seat of the personnel's vehicle. Once removed from the scene and transported to the police or laboratory facility, wet items can then be removed from the plastic container and dried in a vented hood. The wet evidence can be placed in the drying hood with the paper container still sealed. It will dry without removal from the container. If excessively wet, the item will need to be removed from the container, dried and repackaged. The original container must be kept to maintain chain of custody and evidence integrity. Any trace evidence that may have fallen off the evidence must be retained in the paper container. If a bloody item is to be dried in a vented hood, the hood should be decontaminated first. In addition, do not place items from different cases in the hood at the same time. Access to and from the room where the hood is located should be restricted and monitored for security purposes.

Transporting Evidence

Transportation of the evidence from the scene requires special consideration to prevent destruction and contamination. Some evidence, particularly biological evidence, may be sensitive to absolute temperature or fluctuations in temperature. During the summer months or when a vehicle is in direct sunlight, the temperature inside a vehicle can rise substantially. Placing evidence in an enclosed area of a vehicle under these types of circumstances can destroy or contaminate the evidence. During colder times of the year, precautions to prevent freezing of the evidence should also be taken.

To prevent contamination from the crime scene personnel's perspiration onto the packaging and then on to the evidence, packages must always be handled while wearing disposable gloves. Leakage from the evidence containers can be contained by transporting the evidence in an open top plastic container.

Special precautions must be taken when transporting the evidence from the scene to a temporary facility, such as the crime scene personnel's office. Provisions must be made to properly store the evidence to prevent contamination and maintain evidence security. The ability to temporarily store the evidence in a secured facility, away from other items in a temperature controlled environment must exist or the evidence must be transported to the crime laboratory immediately. Access to these areas on the weekend or after hours must also be controlled and monitored for evidence security purposes.

Crime Laboratory Analysis

To submit evidence for analysis at a forensic laboratory, the evidence is taken to a "sign in" area of the facility, where all evidence is received. This is another area for potential contamination. Evidence from other cases can have a leakage problem and consequently, contaminate all evidence packages placed on the receiving counter. Decontamination of this area should be done on a repeated basis during the working hours of the laboratory. After the evidence is properly received, it usually goes to a temporary storage vault. Potential leakage of other containers in this vault or storage area, in general, may cause contamination problems which need to be addressed. Eventually, the evidence is removed from the vault and taken to a section of the laboratory for examination and analysis. The package is now placed on a table or counter where many other pieces of evidence have been over the years. However, most laboratories have adequate decontamination procedures already in place. The analysts are cognizant of cross contamination issues and keep their work areas decontaminated on a routine basis. Standard procedures and policies are usually adopted by the facility and the forensic scientists to reduce the potential risk of contamination.

After the Analysis

After the evidence has been analyzed, the evidence containers are usually resealed in the same packaging or an additional package and stored in a temporary evidence vault. Eventually, the evidence is transferred to the investigating agency or retained by the laboratory for court. Transporting the evidence to storage and additional handling may also create potential contamination concerns and must not be taken lightly. Further analysis of the evidence may be required at a later date, sometimes years later. Paper containers have the potential of passing fluid through their walls because they are a "breathable" and porous container. Therefore, protective gloves should always be worn when a paper container is handled.

Conclusion

The potential for evidence contamination has been a concern of law enforcement and forensic practitioners, in general, ever since evidence was first analyzed. However, the potential impact of evidence contamination upon the outcome of a criminal investigation has become ever more important due to the sensitivities of current scientific analyses, such as forensic DNA analysis. If evidence is properly collected from the scene, packaged and handled correctly during transportation and storage, and decontamination procedures used, the potential for contamination will be greatly reduced. As a result, the integrity and value of the evidence will be maintained regardless of what additional analyses are developed in the future. Continuing education and training for law enforcement and forensic specialists is required to insure the proper handling of evidence from scene to storage and ultimately, reducing the risk for contamination as well as the impact of these issues upon the outcome of a criminal investigation.

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