

Standard Operating Protocol for Identification, Collection, Packaging, Storage, Transportation, and Reception of the Forensic Samples in the Laboratory

Ajay Kumar¹, Rajeev Kawatra², Jagdish Ram Attri³

¹Assistant Director (Scene of Crime), Forensic Science Laboratory (Haryana) Madhuban, Karnal.

²Senior Scientific Officer (DNA), Forensic Science Laboratory (Haryana) Madhuban, Karnal

³Former Director Forensic Science Laboratory (Haryana) Madhuban, Karnal – 132037

Abstract: *The initial stages of forensic evidence collection can be pivotal to the success of criminal investigations. The methods employed in the recognition, collection and preservation of forensic samples have been rigorously scrutinized and challenged in the court of law. Application of latest scientific tools and techniques at the time of crime scene investigation, maintaining integrity of the physical evidences, safe collection, packaging, preservation in police station under a very low temperature to resist the degradation of biological samples and their safe transportation to Forensic Science Laboratory examination of these samples in ambient cold environment is the demand of time so that authentic results can be obtained from the examination which will further help in providing justice to the victims, apprehending the real culprit on the basis of authentic opinion thus obtained from the forensic samples. If cold chain and proper storage media is not adopted then it severely affects the possibility of obtaining conclusive results. To establish this confidence, all handlers of biological evidence should follow well-defined protocol for its optimal preservation.*

Keywords: Sampling, preservation, body fluids, poison, tissues, forensic samples

1. Introduction

During the past few decades, forensic samples as physical evidences have become increasingly important in criminal investigations. Courts has often experienced eyewitness accounts as unreliable or biased. Physical evidence such as DNA fingerprinting, and trace evidence may independently and objectively link a suspect/victim to a crime. Physical evidence/forensic sample that has been mishandled, misplaced, lost, or destroyed is an issue of great concern today. The real problem lies with a systemic failure to properly account for physical evidence from collection through final disposition. This failure reduces the public's confidence in the criminal justice system due to inability to convict criminals. Thus for handling the forensic samples, certain standard guidelines are necessary to be laid down to assist in the selection of appropriate sample of the body fluids and tissue for the laboratory analysis and collection of important physical clues from crime scene. So it is the objective of this protocol to ensure the proper identification, collection, Packaging, preservation of the forensic samples at Scene of Crime and transportation of these samples to the police station and then to the Forensic Science Laboratory maintaining the cold chain within the specified time limits. Thereafter proper receipt of these in

the Forensic Science Laboratory through a centralized system i.e. single window reception of the all type of forensic samples pertaining to various divisions in Forensic Science Laboratory is necessary.

2. Scope

Investigation of criminal cases scientifically at the Scene of Crime for administration of justice.

3. Responsibility

All the police officers including scene of crime experts who deal with the investigation of scene of crime for the proper identification, collection, Packaging, preservation of the forensic samples at Scene of Crime and transportation of these samples to the police station in cold chain and then to the Forensic Science Laboratory maintaining the cold chain. Proper receipt of these forensic samples/physical evidences in the Forensic Science Laboratory through a centralized system i.e. single window reception of the all type of forensic samples pertaining to various divisions in Forensic Science Laboratory.

Standard Operating Protocol

S.No	Details
1.	Investigating Officer must have an Investigation Kit which includes following lifting and Packaging materials for proper collection, preservation, packaging and forwarding of the these forensic samples/biological evidences e.g. blood, semen etc. found at various crime scenes: 1. Sterile cotton threads/gauze pad or swabs/cotton tips, "EDTA Blood Collection Vials" and an Ice box. 2. Sterile forceps, tweezers, disposable scalpels and blades.

Volume 6 Issue 9, September 2017

www.ijsr.net

Licensed Under Creative Commons Attribution CC BY

	<ol style="list-style-type: none"> 3. Gloves. 4. Sterile containers, adjustable evidence tubes 5. Porous packaging Paper bag that permits air. 5. Blotting papers 6. Zip lock poly bags 7. Magnifiers and various hand-held light sources 8. Collection bags/boxes 9. Adhesive tape. 10. Ice Box. 																				
2.	Malkhana/Store house of every police station must have a refrigerator to maintain the cold chain for preservation of the biological samples i.e. blood, semen samples etc for a period before submission to the nearby forensic laboratory.																				
3.	<p>Protection of Scene of Crime:- The I.O should take the help of Forensic Investigator and reach the Scene of Crime with his investigation kit as aforementioned as early as possible and secure/protect the Scene of Crime from un-authorized persons by setting up barricades and by cordoning off the spot. For this purpose, every police station must have the following equipments:-</p> <ol style="list-style-type: none"> 1) Cordoning ribbon. 2) Traffic cones, cordoning poles. 																				
4.	Provide immediate medical aid to critically injured persons at scene of crime.																				
5.	Identify and if possible retain the persons who are likely to furnish information for investigation leads.																				
6.	Care should be taken that the Scene of Crime is not altered and its integrity is maintained. Scene of crime must be protected and entry of unauthorized persons must be strictly barred.																				
7.	No physical evidence should be disturbed from its original position without properly documenting and recording it by photography and videography, except valuables, like jewelry, Keys, etc.																				
8.	<p>Assistance of Scene of Crime Team:- Investigating officers must utilize the assistance/guidance of the Scene of Crime Team for identification, collection, Packaging, preservation of the forensic samples from the spot of occurrence and transportation of these samples to the Forensic Science Laboratory as per the procedure. For this purpose every district head quarter must have one complete Scene of Crime unit headed by Sr. Scientific Officer (Scene of Crime). It should be well equipped with the Scene of crime Vehicle and latest scene of crime testing kits for conducting of spot tests to detect various types of physical evidences at crime scene. The following are the essential scene of crime kits:</p> <ol style="list-style-type: none"> 1. Bullet Hole Testing Kit 2. Gun Shot Residue Collection Kit 3. Blood Detection Kit 4. Semen Detection Kit 5. Narcotic Detection Kit 6. Variable Frequency Light Source 7. Finger Print Developer Kit 8. Set of Search Light <p>Scene of Crime Vehicle must have an electric source on which the portable instruments for forensic analysis can be operated to on the spot forensic reports for speedy investigation. With the past paced research in scientific area scene of crime expert will be able to conduct various forensic analysis on the spot for example DNA profile requires proper sample collection and forwarding and take many days or months to obtain DNA reports. But with the latest development in DNA an instrument based on Rapid DNA technique can generate DNA profile directly from the biological sample within 90 minutes only. This will help in manifold speedy investigation and immensely give confidence to the justice delivery system.</p>																				
9.	<p>Recording of Scene of Crime: - The Scene of Crime should be recorded by way of</p> <ol style="list-style-type: none"> 1) Photography 2) Sketching the Scene of Crime and 3) Observation notes. 																				
10.	<p>Method of Search: - Using the afore mentioned scene of crime kits, search the Scene of Crime for the identification of the physical evidences adopting following methods:</p> <ol style="list-style-type: none"> 1. Spiral Search 2. Parallel Search 3. Zonal Search. 																				
11.	<p>Identify the physical evidences/forensic samples and collect them with care to maintain their integrity as per the respective procedure given below:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Sample</th> <th style="text-align: center;">Condition</th> <th style="text-align: center;">Location/ Source</th> <th style="text-align: center;">Methods of collection, preservation & Packaging</th> <th style="text-align: center;">Transportation</th> <th style="text-align: center;">Precautions</th> </tr> </thead> <tbody> <tr> <td>Blood</td> <td>Liquid form</td> <td>Live Person</td> <td> <ul style="list-style-type: none"> • Collect in EDTA tubes (2-5ml) in duplicate. </td> <td rowspan="3"> <ul style="list-style-type: none"> • Keep the EDTA tube containing blood samples in the refrigerator of police station. • Must be submitted in the laboratory within 24 hours after collection. • Liquid blood </td> <td rowspan="3"> <ul style="list-style-type: none"> • Use disposable syringe to collect blood into EDTA tube. </td> </tr> <tr> <td></td> <td>Liquid form</td> <td>Dead Body/ autopsy blood samples</td> <td> <ul style="list-style-type: none"> • Collect in EDTA tubes (2-5ml) two tubes. Request the concerned medical officer to collect blood from dead body by direct cardiac puncture. </td> </tr> <tr> <td></td> <td>Liquid form</td> <td>Crime Scene</td> <td> <ul style="list-style-type: none"> • Collect in EDTA tube using syringe or dropper. Or • Transfer on sterile absorbant cotton gauze pad </td> </tr> </tbody> </table>	Sample	Condition	Location/ Source	Methods of collection, preservation & Packaging	Transportation	Precautions	Blood	Liquid form	Live Person	<ul style="list-style-type: none"> • Collect in EDTA tubes (2-5ml) in duplicate. 	<ul style="list-style-type: none"> • Keep the EDTA tube containing blood samples in the refrigerator of police station. • Must be submitted in the laboratory within 24 hours after collection. • Liquid blood 	<ul style="list-style-type: none"> • Use disposable syringe to collect blood into EDTA tube. 		Liquid form	Dead Body/ autopsy blood samples	<ul style="list-style-type: none"> • Collect in EDTA tubes (2-5ml) two tubes. Request the concerned medical officer to collect blood from dead body by direct cardiac puncture. 		Liquid form	Crime Scene	<ul style="list-style-type: none"> • Collect in EDTA tube using syringe or dropper. Or • Transfer on sterile absorbant cotton gauze pad
Sample	Condition	Location/ Source	Methods of collection, preservation & Packaging	Transportation	Precautions																
Blood	Liquid form	Live Person	<ul style="list-style-type: none"> • Collect in EDTA tubes (2-5ml) in duplicate. 	<ul style="list-style-type: none"> • Keep the EDTA tube containing blood samples in the refrigerator of police station. • Must be submitted in the laboratory within 24 hours after collection. • Liquid blood 	<ul style="list-style-type: none"> • Use disposable syringe to collect blood into EDTA tube. 																
	Liquid form	Dead Body/ autopsy blood samples	<ul style="list-style-type: none"> • Collect in EDTA tubes (2-5ml) two tubes. Request the concerned medical officer to collect blood from dead body by direct cardiac puncture. 																		
	Liquid form	Crime Scene	<ul style="list-style-type: none"> • Collect in EDTA tube using syringe or dropper. Or • Transfer on sterile absorbant cotton gauze pad 																		

			or swabs / cotton tips. Air dry it and keep in paper packet/envelope for biological/DNA examination.	samples must be kept in thermos flask or thermocol box stuffed with Ice/coolant pack i.e. Ice box.	
	Fresh/ wet clot	Crime Scene	<ul style="list-style-type: none"> Collect clot in sterile tube and added equal volume of normal saline. Or Transfer on Sterile absorband gauze pad or swabs / cotton tips. Air dry it and keep in paper packet/envelope. 	<ul style="list-style-type: none"> Maintain the cold chain during the transportation from SOC/Hospital to PS and further to the FSL/RFSL 	
	Wet/damp	Crime Scene clothing, Fabrics, Victim's clothing, suspect's clothing etc.	<ul style="list-style-type: none"> Thoroughly air dry at room temperature. Roll it in clean paper or brown paper. Pack in paper bag/envelope or cloth bag. 	<ul style="list-style-type: none"> Must be submitted in the laboratory without any delay. 	<ul style="list-style-type: none"> Handle fabrics/clothes with bare hands as little as possible. Never use direct sunlight, hot air blower, heater to dry the stains. Never try to pack the clothes dry or wet in air tight container or polythene bags. Always document the stain pattern by sketching, photography or Videography before removing them.
	Wet	Object	<ul style="list-style-type: none"> Thoroughly air dry at room temperature in shade. Collect the item as it is. Pack in paper bag/envelope, cotton cloth depending upon the size of object. 	<ul style="list-style-type: none"> Must be submitted in the laboratory without any delay. Must be submitted in the laboratory without any delay. 	<ul style="list-style-type: none"> Never mix blood scarping. Collect scarps of different spots in separate packets/envelopes. Never make swab of stains at different place by single cloth. Collect swabs of different spots separately, dry it in shade and pack in separate packets/envelopes.
Dried Blood stain, Semen Stain, Vomit, Sputum and other body fluid stains	Crust/stain/ Spatters	Crime Scene, or Unmovable surface, floor, Concrete wall etc.	<ul style="list-style-type: none"> Scrap the crust into paper packet with the sharp edged instrument i.e. sterile disposable scalpel/blade. Transfer on to a sterile cotton thread/ gauze pad or swabs / cotton tips by rubbing against the stain (make a swab), air dry the swab and pack in paper packet/envelope. 	<ul style="list-style-type: none"> Must be submitted in the laboratory without any delay. 	<ul style="list-style-type: none"> Never mix blood scarping. Collect scarps of different spots in separate packets/envelopes. Never make swab of stains at different place by single cloth. Collect swabs of different spots separately, dry it in shade and pack in separate packets/envelopes.
	Stain	Weapon/ firearm/ Bullet	<ul style="list-style-type: none"> Allow the stain to dry. Collect the item directly. Pack and seal in cotton cloth 	<ul style="list-style-type: none"> Must be submitted in the laboratory without any delay. 	<ul style="list-style-type: none"> Never forward loaded firearms. Pack bullets / pellets with sufficient padding to avoid any rattling.
	Stain	Vehicle upholstery, Carpet, Wallpaper, wood etc.	<ul style="list-style-type: none"> Cut out the stained area. Allow it to dry in shade. Package each cutting separately. Also collect an unstained cutting as a control from adjacent area. 	<ul style="list-style-type: none"> Must be submitted in the laboratory without any delay. 	<ul style="list-style-type: none"> Air dry the swab thoroughly and pack, preferably in paper envelope or in sterile glass vial.
Semen	Liquid Form	Victim	<ul style="list-style-type: none"> Collect the sample with sterile cotton cloth/swab, air dry the swab and pack in paper packet/envelope. 	<ul style="list-style-type: none"> Must be submitted in the laboratory without any delay. 	<ul style="list-style-type: none"> Never use direct sunlight, hot air blower, heater to dry the swabs.
	Liquid Form	Object, Crime scene			
Veginal/ Anal/ Oral Swabs	Stain	Victim	<ul style="list-style-type: none"> Request the concerned medical officer to air dry the swabs completely and pack preferably in paper envelope or in sterile glass vial. Also request medical Officer to prepare smear slide from the swab forward both. 		
Tissue/ organs/	Wet/ semi dry	Dead body fragmented or	<ul style="list-style-type: none"> Tissue/organs/viscera should be placed in a clean 	<ul style="list-style-type: none"> Must be submitted in the laboratory 	<ul style="list-style-type: none"> Never add any fixatives like formalin.

	Foetal remains		mutilated remains at crime scene or place of recovery.	container having normal saline (available on medical store as 0.9% DNS) as preservative.	within 24 hours after collection. <ul style="list-style-type: none"> While transporting the exhibit containers must be kept in thermocol box stuffed with Ice/coolant pack i.e. ice box. 	<ul style="list-style-type: none"> Sample must be packed in separately. Store the packed sample in freezer if there is any delay in transportation and submission to the laboratory.
	Bones/Teeth	Wet/semi dry/dry	Dead body/ crime scene or place of recovery	<ul style="list-style-type: none"> Clean and wash the bones/teeth to remove any debris. Allow it to dry completely in air. Roll/pack in brown paper, envelope and seal in cotton cloth. 	<ul style="list-style-type: none"> Must be submitted in the laboratory without any delay. 	<ul style="list-style-type: none"> Never add any fixatives like formalin. Send at least two intact bones. Order of preference for sending intact bones should be: <ol style="list-style-type: none"> i. Femur ii. Tibia iii. Humerus iv. Teeth (Molar) v. Ribs Completely burnt bones are not useful for DNA analysis.
	Hair with root	Dry or wet with blood, semen, saliva	Crime Scene, weapon, victim/ suspects body and clothing	<ul style="list-style-type: none"> Collect with help of tweezers/ forceps and pack in paper envelope. 	<ul style="list-style-type: none"> Must be submitted in the concerned laboratory without any delay. 	<ul style="list-style-type: none"> If wet, allow the hairs to dry in shade.
				<ul style="list-style-type: none"> If found attached in dry blood, weapon etc. do not remove the hair rather entire substrate should be packed intact. If the object is small, mark wrap the object with clean brown paper and pack the object in cotton cloth. Collect reference samples from the victim & suspect. 50-100 hairs should be collect and forwarded. 		<ul style="list-style-type: none"> In rape cases, the victim or the suspect should be made to stand on clean white sheet during medical examination and their public region should be combed. Never wash the recovered hairs.

4. Conclusion

Biological evidence refers to samples of biological material—such as hair, tissue, bones, teeth, blood, semen, or other bodily fluids—or to evidence items containing biological material. This biological evidence should be retained in an appropriate storage facility until the forensic testing. Such evidence is frequently essential in linking someone to or excluding someone from crime scene evidence. Therefore, these forensic samples must be received in Forensic Science Laboratory without any delay. Proper receipt of these in the Forensic Science Laboratory through a centralized system i.e. single window reception of the all type of forensic samples pertaining to various divisions in Forensic Science Laboratory. And blood/semen samples taken from the body of victim/accused must be placed in the refrigerator immediately after their receipt for maintaining the cold chain. Blood/Semen stained cloth parcels, blood stained weapons, and blood stain earth etc. must be kept in a cold store under ambient temperature to resist the bio degradation of these biological samples.

Regular trainings for the Investigating Officers must be organized by the Scene of Crime officers posted at every district head quarter and the forensic experts from the Forensic Science Laboratory to make them aware as well as to train them regarding scientific methods for selection/identification, collection, packaging, preservation, labeling of physical evidences/forensic samples at the scene of crime and proper transportation of these forensic samples to the Forensic Science Laboratory maintaining the cold chain.

Hence this Standard Operating Protocol offers guidance for individuals involved in the collection, examination, tracking, packaging, storing, and disposition of biological evidence. This may include crime scene officers, police officers, medical officers, forensic scientists, forensic laboratory scientists and anyone else who may come in contact with biological evidence.

The success of investigation of a crime largely depends upon how well; various clues, leads and especially physical

evidence available at the scene of crime are protected, located, collected, packed, preserved, recorded, forwarded, processed, evaluated and interpreted. This can happen in biological samples only when these are preserved under low temperature with the adoption of the cold chain throughout as per the Standard Operating Protocol.

5. Acknowledgement

The Authors express their gratitude to Sh. Muhammad Akil, IPS, Additional Director General of Police, Law and Order for providing his immense moral support, guidance and generous encouragement during this work.

References

- [1] Walter C. McCurdy. Postmortem specimen collection. *Forensic Sci Int.* 1987; 35: 61-65.
- [2] Guidline for poison control, WHO, Geneva,1997: 64-65.
- [3] Peter White. Crime scene to court : The essentials of forensic sciences. 1 Edn. Royal society of chemistry, Cambridge,U.K, 1998: 232-253.
- [4] Laboratory guideline, The Medical toxicology unit, Guys and St. Thomas hospital,NHS Trust,London, England.
- [5] Prouty RW and Anderson WH. The forensic implications of site and temporal influences on postmortem blood-drug concentrations. *J Forensic Sci.* 1990; 35: 243.
- [6] Pouuder JD. Forensic entomotoxicology. *J Forensic Sci.* 1991; 31: 469-472. 10. Noguchi TT, Nakamma GR and Griesemer EC. Drug analysis of skeletonizing remains. *J Fornsic Sci.* 1978; 23: 490-492.
- [7] Baker RC. In Cravey, R.H and Baselt RC. Introduction to forensic toxicology, 1 st Edn, Biomedical publication, Davis : CA, 1981: 142-150.
- [8] Moriya F and Hashimoto Y. Pericardial fluid as an alternative specimen to blood for postmortem toxicological analysis. *Leg Med.*1999; 1 (2): 86-94.
- [9] Lee HC, Gaensslen RE, Bigbee MS, Kearney JJ. Guidelines for the collection and preservation of DNA evidence. *Journal of Forensic Identification* 1991;41:344-56.
- [10] Lee HC, editor. Crime scene investigation. Taoyuan (Taiwan): Central Police University Press; 1994.
- [11] Lee HC, editor. Physical evidence. Enfield (CT): Magnani and McCormic; 1995.
- [12]