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**INTRODUCTION TO FORENSIC SCIENCE**

**ANA 406**

**TOPIC:**

**COLLECTION TECHNIQUES AND DOCUMENTATION OF A CRIME SCENE**

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**COLLECTION TECHNIQUES AND DOCUMENTATION OF A CRIME SCENE**

**INTRODUCTION**

A crime scene is any location that may be associated with a committed crime([Douglas, Ressler, Burgess, & Hartman, 1986](#_ENREF_6)). This is a scene in which a crime took place.

**Collection techniques of crime scene**

The importance of avoiding cross contamination cannot be overemphasized. The crime scene investigator performing the collection must ensure tools are clean or sterilized and that gloves are changed between handling each sample ([Cătălin, Andrei, & Mitraşca, 2011](#_ENREF_3)). Once the crime scene has been thoroughly documented and the locations of the evidence noted, then the collection process can begin([Cătălin et al., 2011](#_ENREF_3)). The collection process will usually start with the collection of the most fragile or most easily lost evidence. Special consideration can also be given to any evidence or objects which need to be moved. Collection can then continue along the crime scene trail or in some other logical manner. Photographs should also continue to be taken if the investigator is revealing layers of evidence which were not previously documented because they were hidden from sight ([Schiro, 2007](#_ENREF_24)).

Crime scene collection techniques differ depending on the type of evidence and the substrate upon which it is found ([Verdon, Mitchell, & van Oorschot, 2014](#_ENREF_28)). It is preferable to collect evidence in its original state. If the evidence is fragile or can easily be lost, the entire object should be collected and packaged, if size and circumstances permit ([Carrier & Spafford, 2003](#_ENREF_2)).

Some laboratories recommend the submission of substrate controls. Substrate controls are clean samples of the collection materials or unstained portions of the material the biological evidence is deposited on. The laboratories can use these to troubleshoot contamination, Polymerase Chain Reaction (PCR) inhibition, or interference with fluorescence.

The investigator should consult the local forensic laboratory and refer to the department standard operating procedures regarding crime scene collection techniques and preservation of biological evidence ([Fisher & Fisher, 2012](#_ENREF_9)).

Most items of evidence will be collected in paper containers such as packets, envelopes, and bags. Liquid items can be transported in non-breakable, leak-proof containers. Arson evidence is usually collected in air-tight, clean metal cans. Only large quantities of dry powder should be collected and stored in plastic bags ([Schiro, 2007](#_ENREF_24)). Moist or wet evidence (blood, plants, etc.) from a crime scene can be collected in plastic containers at the scene and transported back to an evidence receiving area if the storage time in plastic is two hours or less and this is done to prevent contamination of other evidence ([Schiro, 2007](#_ENREF_24)). ([Horswell, 2004](#_ENREF_16)).

UNDER NO CIRCUMSTANCES SHOULD EVIDENCE CONTAINING MOISTURE BE PACKAGED IN PLASTIC OR PAPER CONTAINERS FOR MORE THAN TWO HOURS ([Schiro, 2007](#_ENREF_24)). Moisture allows the growth of microorganisms which can destroy or alter evidence.

Any item which may cross contaminate each other must be packaged separately ([Lee, Ladd, Scherczinger, & Bourke, 1998](#_ENREF_19)). The containers should be closed and secured to prevent the mixture of evidence during transportation. Each container should have: the collecting person's initials; the date and time it was collected; a complete description of the evidence and where it was found; and the investigating agency's name and their file number ([Falsetti, Falsetti, & Enslow, 2017](#_ENREF_8)).

Each type of evidence has a specific value in an investigation. The value of evidence should be kept in mind by the investigator when doing a crime scene investigation. For example, when investigating a crime he or she should spend more time on collecting good fingerprints than trying to find fibres left by a suspect's clothing. The reason is that fingerprints can positively identify a person as having been at the scene of a crime, whereas fibres could have come from anyone wearing clothes made out of the same material ([Gehl & Plecas, 2017](#_ENREF_10)). Of course if obvious or numerous fibres are found at the point of entry, on a victim's body, etc., then they should be collected in case no fingerprints of value are found. It is also wise to collect more evidence at a crime scene than not to collect enough evidence. An investigator usually only has one shot at a crime scene, so the most should be made of it ([Rossmo, 2017](#_ENREF_22)).

1. **Crime scene collection techniques for blood and other body fluids.**

**Cuttings:** Removal of a section of the item containing the stain using a sterile or clean cutting device ([Dash, Shrivastava, & Das, 2020](#_ENREF_4)).

**Wet Absorption:**

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| A sterile swab, gauze pad, or threads are slightly moistened with sterile distilled water. An effort should be made to concentrate the stain in a localized portion of the swab or pad. For example, when using a swab, the stain should be concentrated on the tip. The collection medium is concentrated into the stain and allowed to air dry. Some laboratories recommend following the first moistened swabbing with a second dry swabbing to ensure thorough sample collection. Both swabs are retained and submitted for analysis ([Van Kampen, 2018](#_ENREF_26)). |  |

**Scraping Method:** Using a clean razor blade or scalpel, the sample is scraped into a clean piece of paper that can be folded and packaged in a paper envelope or other appropriate packaging ([Henderson, Swafford, & Itzkowitz, 2017](#_ENREF_15)).

**Lifting with Tape:** For dried blood stains on a non-absorbent surface, fingerprint lifting tape may be placed over the stain and lifted off. The stain is transferred to the adhesive side of the tape, which may then be secured on a clear piece of acetate for submission to the laboratory ([Geradts, 2017](#_ENREF_11)).

1. **Crime scene collection techniques for hair and fibres**

**Visual Collection:** On some surfaces, hairs and fibres can be seen with the naked eye. Using clean forceps and trace paper, the sample can be removed from the surface and placed into a clean piece of paper that can be folded and packaged in a paper envelope or other appropriate packaging ([Henderson et al., 2017](#_ENREF_15)).

**Tape Lifting:** Water or methanol soluble tapes are available for the collection of trace hair and fibre evidence. The tape is applied to the location of the suspected sample, removed, and packaged ([Gunn, 2019](#_ENREF_13)).

**Vacuuming Method:** The area where the suspected samples are located are vacuumed up and caught in a filtered trap attached to the vacuum. These samples are packaged in clean trace paper for submission to the laboratory. Vacuuming is the least desirable collection method because there is a risk of cross contamination if the equipment is not properly cleaned between each use ([Vickar, Bache, Daniel, & Frascione, 2018](#_ENREF_29)).

1. **Reference sample crime collection techniques**

Reference samples should be collected from individuals who might be linked to the crime scene where DNA evidence is found. Reference samples can be used for elimination or comparative analysis ([Hakim et al., 2019](#_ENREF_14)). For example, buccal swab samples taken from the suspect and/or victim, a known source, should be compared to biological evidence found at the crime scene to eliminate or place them at the scene.

**Buccal Swab:** Sterile swabs or other buccal collection devices are rubbed against the inside cheek of the individual's mouth to collect epithelial cells for analysis ([Saffitz & Asimaki, 2019](#_ENREF_23)).

**Liquid Blood Samples:** Generally collected in purple topped vacuum tubes that contain the preservative ethylene diamine tetra acetic acid (EDTA).

**Packaging & Storage:** Biological evidence should be dried before packaging to minimize sample degradation. Packaging in paper is preferred; however, some laboratories allow packaging in plastic if the sample is thoroughly dried.

Liquid samples, such as water from a toilet bowl or pipes, should be properly documented and packaged in sterile glass or plastic containers and refrigerated as soon as possible ([Kirwan et al., 2018](#_ENREF_18)).

**The following is a breakdown of the types of evidence encountered and how the evidence should be handled:**

1. **Fingerprints**

Fingerprints (also includes palm prints and bare footprints) are the best evidence to place an individual at the scene of a crime. Collecting fingerprints at a crime scene requires very few materials, making it ideal from a cost standpoint. All non-movable items at a crime scene should be processed at the scene using gray powder, black powder, or black magnetic powder ([Vander Pyl, 2019](#_ENREF_27)). Polaroid 665 black and white film loaded in a Polaroid CU-5 camera with detachable flash should be used to make one-to-one photographs of prints which do not readily lift. All small transportable items should be packaged in paper bags or envelopes and sent to the crime lab for processing. Because of the "package it up and send it to the lab" mentality, some investigators skim over collecting prints at a crime scene. Collecting prints at the crime scene should be every investigator's top priority. Fingerprints from the suspect as well as elimination fingerprints from the victim will also be needed for comparison (the same holds true for palm and bare footprints) ([Vander Pyl, 2019](#_ENREF_27)).

1. **Bite Marks**

Bite marks are found many times in sexual assaults and can be matched back to the individual who did the biting. They should be photographed using an ABFO No. 2 Scale with normal lighting conditions, side lighting, UV light, and alternate light sources. Color slide and print film as well as black and white film should be used. The more photographs under a variety of conditions, the better. Older bite marks which are no longer visible on the skin may sometimes be visualized and photographed using UV light and alternate light sources. If the bite mark has left an impression then maybe a cast can be made of it. Casts and photographs of the suspect's teeth and maybe the victim's teeth will be needed for comparison. For more information consult a forensic odonatologist ([Swetha & Ganapathy, 2019](#_ENREF_25)).

1. **Broken Fingernails**

Much like a bullet that has individualizing striations on it, natural fingernails have individualizing striations on them. A broken fingernail found at a crime scene can be matched to the individual it came from many months after the crime has been committed. Broken fingernails should be placed in a paper packet which is then placed in a paper envelope. It can then be transported to the crime lab for analysis. Known samples from the suspect and maybe from the victim will be needed for comparison ([Reid, 2018](#_ENREF_20)).

1. **Questioned Documents**

Handwriting samples can also be matched back to the individual that produced them. Known exemplars of the suspected person's handwriting must be submitted for comparison to the unknown samples. Questioned documents can also be processed for fingerprints. All items should be collected in paper containers. For more information consult a questioned documents examiner ([De Alcaraz-Fossoul & Roberts, 2017](#_ENREF_5)).

1. **Blood and Body Fluids**

Currently, if using the PCR method of DNA analysis or conventional serological techniques then blood and some body fluids can be said to come from a certain population group to which the individual belongs. As PCR technology advances, these population groups will become smaller, eventually giving it the same discriminating power as RFLP analysis has today. Dried blood and body fluid stains should be collected in the following manner: If the stained object can be transported back to the crime lab, then package it in a paper bag or envelope and send it to the lab; if the object cannot be transported, then either use fingerprint tape and lift it like a fingerprint and place the tape on a lift back; scrape the stain into a paper packet and package it in a paper envelope; or absorb the stain onto 1/2" long threads moistened with distilled water. The threads must be air dried before permanently packaging. For transportation purposes and to prevent cross contamination, the threads may be placed into a plastic container for no more than two hours. Once in a secure location, the threads must be removed from the plastic and allowed to air dry. They may then be repackaged into a paper packet and placed in a paper envelope. Wet blood and body fluid stains should be collected in the following manner: all items should be packaged separately to prevent cross contamination, if the item can be transported to the crime lab, then package it in a paper bag (or plastic bag if the transportation time is under two hours), bring it to a secure place and allow it to thoroughly air dry, then repackage it in a paper bag. If the item cannot be transported back to the lab, then absorb the stain onto a small (1"x1") square of pre-cleaned 100% cotton sheeting. Package it in paper (or plastic if the transportation time is less than two hours), bring it to a secure place and allow it to thoroughly air dry; then repackage it in a paper envelope.

Note: UNDER NO CIRCUMSTANCES SHOULD WET OR MOIST ITEMS REMAIN IN PLASTIC OR PAPER CONTAINERS FOR MORE THAN TWO HOURS.

Victim and suspect's known whole blood samples will have to be collected in yellow, red, or purple top "Vacutainers." Contact the lab to which the samples will be submitted for specific information ([Bright et al., 2019](#_ENREF_1)).

1. **Firearms and Tool marks**

Bullets and casings found at the crime scene can be positively matched back to a gun in the possession of a suspect ([Gehl & Plecas, 2017](#_ENREF_10)). Bullets and casings can also be examined at the crime lab and sometimes tell an investigator what make and model of weapons may have expended the casing or bullet. A bullet found at the crime scene can sometimes be matched back to the same lot of ammunition found in a suspect's possession. Toolmarks can be positively matched to a tool in the suspect's possession. Firearm safety is a must at any crime scene. If a firearm must be moved at a crime scene, never move it by placing a pencil in the barrel or inside the trigger guard. Not only is this unsafe, but it could damage potential evidence. The gun can be picked up by the textured surface on the grips without fear of placing unnecessary fingerprints on the weapon. Before picking up the gun, make sure that the gun barrel is not pointed at anyone. Keep notes on the condition of the weapon as found and stops taken to render it as safe as possible without damaging potential evidence. The firearm can then be processed for prints and finally rendered completely safe. FIREARMS MUST BE RENDERED SAFE BEFORE SUBMISSION TO THE CRIME LAB. The firearm should be packaged in an envelope or paper bag separately from the ammunition and/or magazine. The ammunition and/or magazine should be placed in a paper envelope or bag. It is important that the ammunition found in the gun be submitted to the crime lab. Any boxes of similar ammunition found in a suspect's possession should also be placed in a paper container and sent to the crime lab. Casings and/or bullets found at the crime scene should be packaged separately and placed in paper envelopes or small cardboard pillboxes. If knives (or other sharp objects) are being submitted to the lab (for tool marks, fingerprints, serology, etc.), then the blade and point should be wrapped in stiff unmovable cardboard and placed in a paper bag or envelope. The container should be labelled to warn that the contents are sharp and precautions should be taken. This is to prevent anyone from being injured ([Gehl & Plecas, 2017](#_ENREF_10)).

1. **Shoeprints and Tire Tracks**

Shoeprints and tire tracks can be matched positively to a pair of shoes or to tires in a suspect's possession. Shoeprints and tire tracks can sometimes tell investigators what type of shoes or tires to look for when searching a suspect's residence or vehicles. Before any attempt is made at collecting shoeprints or tire tracks, one-to-one photographs should be made using a tripod, ruler, and level. The flash should be held at about 45 degree angles from the surface containing an impression. Casts can be made of impressions using dental stone. Once hardened, the cast can be packaged in paper and submitted to the lab. When photographing prints on hard flat surfaces the flash should be used as side lighting. Shoeprints on hard flat surfaces can also sometimes be lifted like a fingerprint. Dust prints on certain surfaces can be lifted with an electrostatic dust print lifter ([Katireddy & Sidda, 2017](#_ENREF_17)).

1. **Fracture Matches**

Fracture matches can positively link broken pieces at the scene with pieces found in the possession of a suspect. For example, headlight fragments found at the scene of a hit and run could be positively matched to a broken headlight (just like putting together a jigsaw puzzle) on a suspect's vehicle. Larger fragments should be placed in paper bags or envelopes. Smaller fragments should be placed in a paper packet and then placed in an envelope ([Zannin & Huber, 2017](#_ENREF_30)).

1. **Hair**

If a root sheath is attached, then DNA analysis using PCR technology can say that this hair came from a certain percentage of the population to which the suspect belongs ([Schiro, 2007](#_ENREF_24)). If there is no root sheath, then a microscopic analysis can say that the hair has the same characteristics as the suspect's hair and is similar to his or her hair. At this point, no one can say that a hair came from a particular individual. Hair found at the scene should be placed in a paper packet and then placed in an envelope. If a microscopic examination is required, then 15-20 representative hairs from the suspect must be submitted to the lab for comparison. If DNA analysis if going to be used, then a whole blood sample from the suspect must be submitted to the lab in a "Vacutainer." Contact a DNA lab for more information ([Schiro, 2007](#_ENREF_24)).

1. **Fibres**

Fibres can be said that they are the same type and colour as those found in a suspect's clothes, residence, vehicle, etc. fibres should be collected in a paper packet and placed in an envelope. Representative fibres should be collected from a suspect and submitted to the lab for comparison ([Ren & Bertsch, 1999](#_ENREF_21)).

1. **Paint**

Paint can be said that it is the same type and colour as paint found in the possession of a suspect. Paint fragments should be collected in a paper packet and placed in an envelope. Representative paint chips or samples should be collected from the suspect and submitted to the lab for comparison ([Schiro, 2007](#_ENREF_24)).

1. **Glass**

Glass can be said that it has the same characteristics as glass found in the possession of a suspect. Smaller glass fragments should be placed in a paper packet and then in an envelope. Larger pieces should be wrapped securely in paper or cardboard and then placed in a padded cardboard box to prevent further breakage. Representative samples from the suspect should be submitted to the lab for comparison ([Schiro, 2007](#_ENREF_24)).

**Other Trace Evidence**

Sometimes during the commission of a crime, there are other items which may be transferred to a perpetrator from the scene or from the perpetrator to the scene (sheetrock, safe insulation. etc.). The guidelines for collecting the evidence and obtaining known samples is about the same as for paint and fibres ([Goodpaster & Liszewski, 2009](#_ENREF_12)). For specific information, contact your crime lab.

**Documenting the Crime Scene**

1. **Videotaping the Crime Scene**

If available, a video camera is the first step to documenting a crime scene. Videotape can provide a perspective on the crime scene layout which cannot be as easily perceived in photographs and sketches. It is a more natural viewing medium to which people can readily relate, especially in demonstrating the structure of the crime scene and how the evidence relates to the crime. The video camera should have a fully charged battery as well as date and time videotape display functions. A title generator and "shake free" operations are also nice options. If a title generator is not available, then about 15 seconds at the beginning of the tape should be left blank. This will allow the addition of a title card with any pertinent information to the beginning of the crime scene tape. The condition of the scene should remain unaltered with the exception of markers placed by the investigators and any lights turned on during the walk through. These alterations can be noted on the audio portion of the tape. Before taping, the camera range should be cleared of all personnel. Any people in the area should be forewarned that taping is about to commence and they should remain silent for the duration of the tape. This prevents recording any potentially embarrassing statements.

Once the video camera begins recording, it should not be stopped until the taping is complete. The key to good videotaping is slow camera movement. A person can never move too slowly when videotaping, yet it is all too easy to move the camera fast without realizing it. This is why videotaping is not ideal for viewing detail. People have a tendency to pan past objects in a manner that does not allow the camera to properly capture the object. This is why slow panning of an area is necessary and it should be panned twice in order to prevent unnecessary rewinding of the tape when viewing.

The taping should begin with a general overview of the scene and surrounding area. The taping should continue throughout the crime scene using wide angle, close up, and even macro (extreme close up) shots to demonstrate the layout of the evidence and its relevance to the crime scene. If videotaping in a residence, the camera can show how the pertinent rooms are laid out in relation to each other and how they can be accessed. This is sometimes lost in photographs and sketches. After the taping is complete, it is wise to leave about 15 seconds of blank tape to prevent the crime scene tape from running into anything else previously recorded on the tape. The tape should then be transferred to a high quality master tape. The recording tabs should be removed from the master tape after transferring the crime scene tape and the master should be stored in a safe place. This is to prevent accidental erasure of the crime scene tape. Copies can then be made from the master tape ([Doyle, 2010](#_ENREF_7)).

1. **Still Photography**

Whether a video camera is available or not, it is absolutely essential that still photographs be taken to document the crime scene. If a video camera is available, then photographs will be the second step in recording the crime scene. If video is not available, then still photography will be the first step. Photographs can demonstrate the same type of things that the videotape does, but photographs from the crime scene can also be used in direct comparison situations. For example, actual size photographs (also known as one-to-one photos) can be used to compare fingerprint and shoeprints photographed at the crime scene to known fingerprints or shoes from a suspect. This is the advantage of photographs over videotape.

Almost any type of camera with interchangeable lenses and a format of 35mm or larger will do in crime scene photography. The lenses should include a 28mm wide angle lens, a normal 55mm lens, and a lens with macro capabilities (1:4 or better). The flash unit used with the camera should be one that is not fixed to the camera. It should be able to function at various angles and distances from the camera. This is to allow lighting of certain areas to provide maximum contrast, place the flash in hard to reach areas, and reduce flash wash out which can render the item photographed invisible. Print and/or slide colour film (25-400 ISO) should be used. A tripod, a level, and a small ruler should also be available for one-to-one photography. It may be of help to the investigation to have a Polaroid camera handy for instant photographs. For example, an instant photograph of a shoeprint found at a crime scene can be provided to investigators who are running a search warrant on a suspect's residence. The photo will tell them the type of shoe for which they are searching.

The photography of the crime scene should begin with wide angle photos of the crime scene and surrounding areas. When shooting the general overall scene, the photos should show the layout of the crime scene and the overall spatial relationships of the various pieces of evidence to each other. A good technique to use indoors is to shoot from all four corners of a room to show its overall arrangement. The next set of photos should be medium range to show the relationships of individual pieces of evidence to other pieces of evidence or structures in the crime scene. Finally, close up photos should be taken of key pieces of evidence. A ruler should be photographed with items where relative size is important or on items which need to have one-to-one comparison photographs. The object should first be photographed as is, then photographed with the ruler. It is important that when doing one-to-one photography that the ruler is on the same plane as the object being photographed and the film plane is parallel to the ruler. This is why a level and a tripod are necessary. Notes should also be taken as to what the investigator is photographing or wishes to demonstrate in each photograph. This is to prevent the investigator from getting the picture back at a later date and trying to figure out what he or she was trying to accomplish with the photo. The same areas should be photographed in the same sequence as mentioned above in the paragraphs on videotaping ([Doyle, 2010](#_ENREF_7)).

1. **Crime Scene Sketching**

The final phase in documenting the scene is making a crime scene sketch. The drawback of photographs is that they are two-dimensional representations of three-dimensional objects. As a result, most photographs can distort the spatial relationships of the photographed objects causing items to appear closer together or farther apart than they actually are. If spatial relationships of the evidence are important or if something needs to have proportional measurements included in it for calculations (such as bullet trajectory angles, accident reconstructions, etc.) then a sketch must be made of the crime scene.

A sketch is usually made of the scene as if one is looking straight down (overhead sketch) or straight ahead (elevation sketch) at a crime scene. A rough sketch at the scene is usually made first on graph paper in pencil with so many squares representing so many square feet or inches. Directionality of the overhead view is determined by using a compass. Using a tape measure or other measuring devices, measurements are taken at crime scene of the distances between objects and/or structures at the crime scene. These measurements are proportionally reduced on the rough sketch and the objects are drawn in. Two measurements taken at right angles to each other or from two reference points will usually suffice in placing the objects where they belong in a sketch. Double measurements should also be taken to make sure they are correct. This is especially true where calculations will later be used. A final sketch can be made later using inks, paper, and ruler, or a computer. The original rough sketch should be retained and preserved in case it is needed at a later date. Once the scene has been thoroughly documented then the evidence collection can commence ([Doyle, 2010](#_ENREF_7)).

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