Forensic Evidence Collection Techniques

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Forensic science provides evidence to resolve legal issues by applying scientific principles. Sometimes called simply forensics, forensic science encompasses many different fields, including anthropology, biology, engineering, genetics, chemistry, medicine, pathology, phonetics, psychiatry, and toxicology. Forensic evidence consists of all the physical objects that can support an investigation in reconstructing a sequence of events. The related term 'criminalistics' refers to the scientific collection and analysis of physical evidence in criminal cases. This includes the analysis of various materials such as biological fluids, fibers, ballistics, and prints. Crime scene collection techniques differ depending on the type of evidence and the surface it is found on. It is ideal to collect evidence in its original state. Before collection, the evidence must be photographed. If the evidence is fragile or easily lost, the entire object should be collected and packed, if size and circumstances allow.

Importance of proper handling of evidence in the justice system.

- Preserves the Integrity of Evidence: The chain of custody must be maintained to prove that evidence has not been altered, tampered with, or contaminated. Any break in this chain can lead to inadmissibility in court.
- Ensures a Fair Trial: Proper handling protects the rights of both the accused and the victim. Mismanaged evidence can result in wrongful convictions or acquittals.
- Builds Public Trust: A justice system that is meticulous and transparent with evidence handling builds credibility and public confidence. Mishandling can lead to scandals and erosion of trust.
- Supports Accurate Investigations: Properly preserved evidence helps investigators and forensic experts reconstruct events accurately. It aids in corroborating or disproving witness statements and alibis.
- Complies with Legal Standards: Legal systems have strict protocols for evidence collection, storage, and presentation. Failure to follow these can lead to cases being dismissed.
- Protects Against Legal Liability: Law enforcement agencies and legal professionals may face civil or criminal consequences for improper handling.

About the author:

Ms. Komal Bawake is recognized for her calm determination, strong work ethic, and genuine enthusiasm for forensic science. Thoughtful and meticulous in her approach, she consistently demonstrates a deep commitment to learning and growing in the field. Her analytical mindset, paired with a quiet confidence, allows her to tackle complex problems with clarity and precision. Komal's consistent performance and dedication make her a respected and inspiring presence among her peers.

Procedures for Evidence Collection

Prints

Prints are the best evidence to place an individual at the scene of a crime like burglary where criminals often touch surfaces while breaking in or taking items. In theft or robbery like armed robberies (robberies committed using a weapon) prints are often found on cash registers, doors, or stolen items. In sexual assault, fingerprints or handprints can be found on the victim, clothing, or surrounding area. In kidnapping, prints may be left in the vehicle at the snatching site or on tape or rope. In vehicle theft prints can be found on the steering wheel, tools that are used to break or start the car, and door handles.

In Vandalism, prints can be found on surfaces touched by the vandal while entering or escaping. Collecting prints at a crime scene requires very few materials, making it ideal from a cost standpoint. While collecting the prints we can use grey powder, black powder, or black magnetic powder All small transportable items should be packed in paper bags or envelopes and sent to the lab for analysis. Collecting prints at the crime scene should be every investigator's top priority. Prints from the suspect as well as Exemplar prints from the victim will also be needed for comparison.

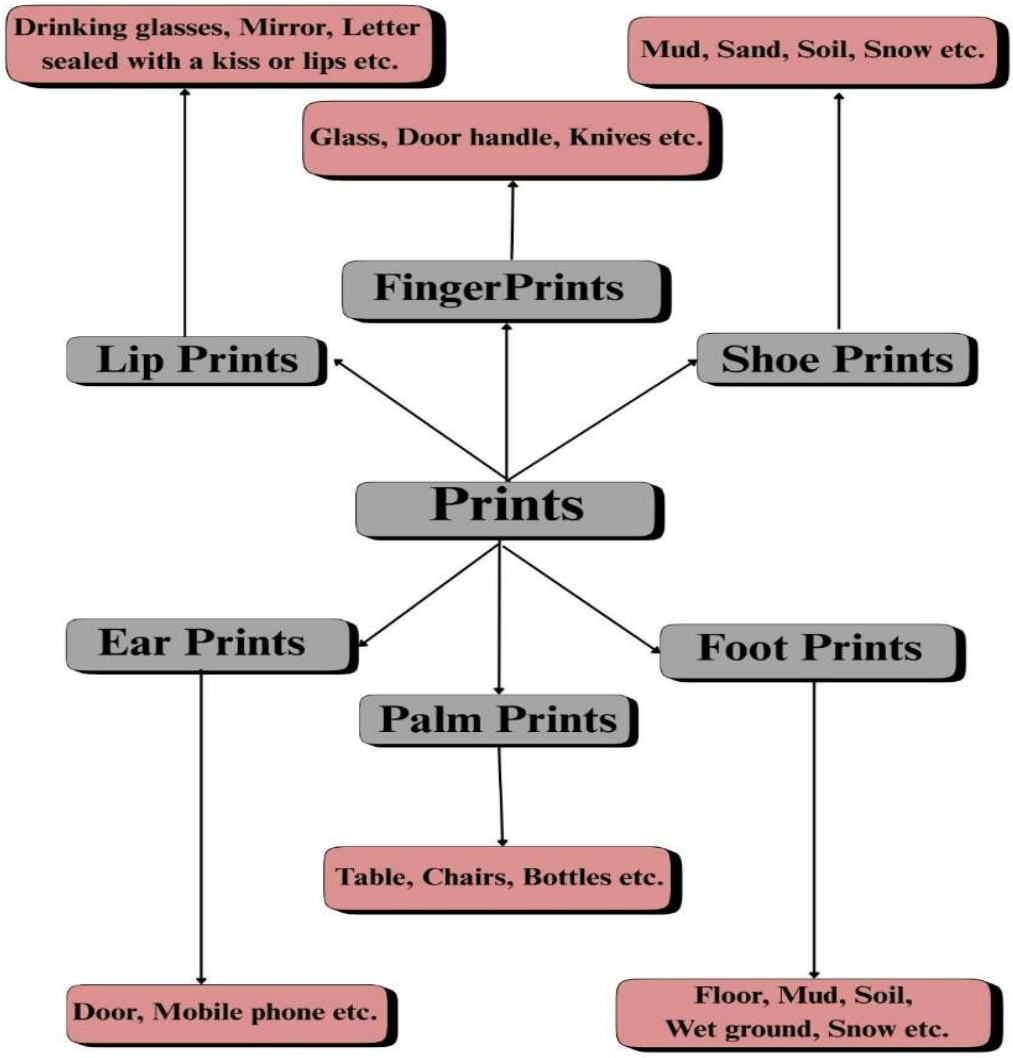

Figure 1: Types of Prints and Their Typical Locations at Crime Scenes

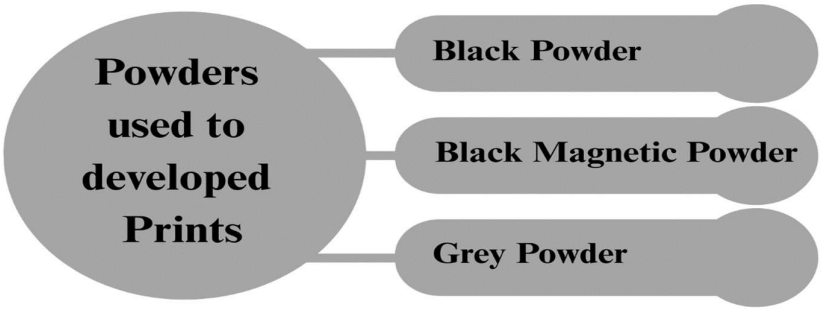

Figure 2: Common Powders Used in Fingerprint Development

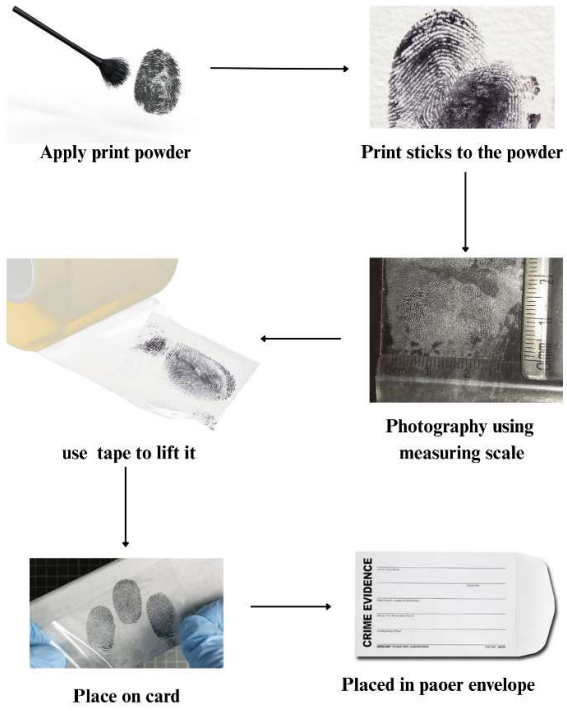

Figure 3: Fingerprint Development and Collection from Smooth, Non-Porous Surfaces

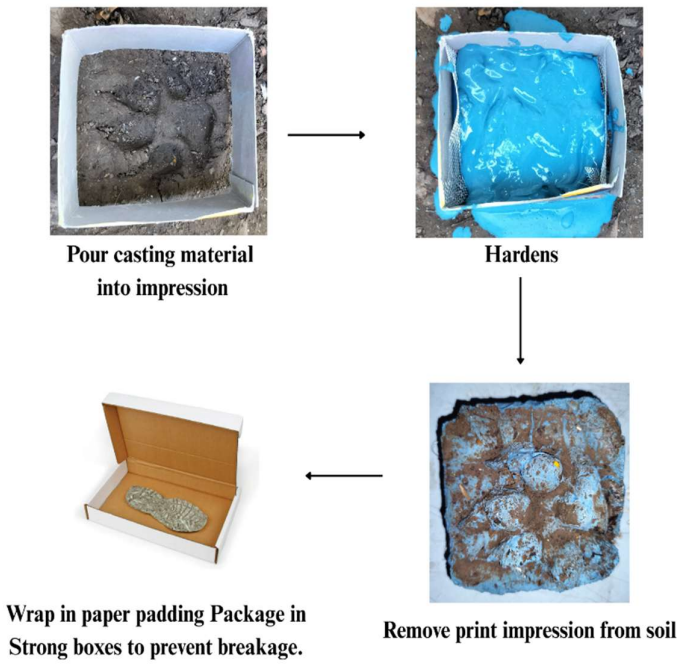

Figure 4: Procedure for 3D Impression Casting of Shoe or Footprints at Crime Scene

Paints

Paint evidence refers to traces of paint that can link a suspect, vehicle, or object to a crime scene. It is a form of trace evidence and is often used to connect people or objects through contact. Paint is found on crime scenes like Hit-and-run accidents where paint from a vehicle may transfer to a victim's clothing or another vehicle. In Burglary Paint may transfer from tools like crowbars to doors or windows. In Vehicle collisions Layers of paint from one vehicle may be found on another, helping identify the car involved. In Vandalism Layers of paint from one vehicle may be found on another, helping identify the car involved. It is collected in the following methods.

Technique	Used For	Collection Method
1. Manual Collection (Chips)	Visible paint or chips	Use clean tweezers to pick up and place in paper envelop.
2. Scraping	Dried paint smears or attached fragments	Gently scrape with a clean scalpel or blade into a druggist fold.
3. Swabbing	Wet or smeared paint (small areas)	Use a sterile cotton swab; air-dry and store in a paper envelope
4. Cutting Out Sections	Paint on surfaces that can be removed	Cut out the portion (e.g., wood, metal, wall) and preserve all layers in a paper envelop.

Paint fragments/chips 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.

Fingernails

Much like a bullet that has individualizing striations on it, natural fingernails have individualizing striations on them. A fingernail is found at a crime scene like Assault where victims may scratch the attacker, leaving DNA under their fingernails. In Homicide Victim's broken fingernails may be found at the scene if they struggled with the attacker. In Domestic violence cuts on the skin that match fingernail scratches. In Child abuse if a child has deep fingernail-shaped bruises on the upper arms, indicating forceful grabbing. The caregiver's DNA is also found under the child's nails, supporting a report of physical abuse. Can be matched to the individual it came from many months after the crime has been committed. 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.

Fingernail Evidence	Collection Method
Fingernail Clippings (Victim/Suspect)	Clip each nail using sterile scissors/nail clippers Place each hand's clippings in separate paper envelopes.
Fingernail Scrapings	Gently scrape under each nail using a sterile wooden stick or disposable tool and fold the scrapings into a paper in paper envelope.
Broken/Torn Fingernails	Pick up using forceps or gloved hands Place in small rigid containers.

Glass

Glass has characteristics, like colour, thickness, or type, so they might have come from the same object. Glass evidence is found in the crime scene like Burglary where Suspects break windows or glass doors to enter a building. In a Hit-and-run accident case vehicle models and match the glass to a suspect's car. In Assault Glass from a bottle can be used in an attack and may be found embedded in the skin. In Robbery, thieves break store windows, glass doors, or display cases to steal items quickly. Smaller glass fragments should be placed in a paper packet and then in an envelope. Plastic paper wrap can be used to cover glass evidence and then placed in a padded cardboard box especially larger or fragile pieces. It helps protect the glass from breaking during transport. Representative samples from the suspect should be submitted to the lab for comparison.

Hair and Fiber

It is found at the crime scene (Sexual assault, Kidnapping, Vehicle or home break, Kidnapping). Following are collection techniques –

Collection Method	Description	Tools Used	Packaging
Visual Collection	Hairs and fibers visible to the naked eye are picked manually.	Clean forceps, trace paper	Folded in clean paper, sealed in a paper envelope
Tape Lifting	Tape is pressed on the area to lift trace evidence.	Water/methanol-soluble tape	Tape stuck on paper, sealed in an envelope
Vacuuming Method	Area is vacuumed, and particles are trapped in the filter.	Vacuum with filter trap	Filter contents wrapped in trace paper, sealed.

Biological Fluids

Biological Fluid	Collection Technique
Blood	Liquid: Use a dropper to place the sample into a clean container or EDTA tube. Wet Stain: Transfer onto a sterile cotton swab or cloth and air dry. Dry Stain: cut out stained area in movable object, scrape in movable surface.
Semen	Liquid: Collect in a sterile container or used swabs (rape kit). Dry stain: Transfer to a damped sterile swab and Air dry.
Saliva	Roll sterile cotton swabs inside the cheek for 30-60 seconds and air-dry swab.
Urine	Co Urine is collected in sterile containers using syringes.
Vaginal/Menstrual fluid	Insert sterile cotton swab 2-3 inches into the vaginal canal, Twist for coverage, Air-dry swab.
Faeces	Collect directly onto a sterile cotton swab.

Chain of Custody

Maintaining the chain of custody is a fundamental requirement in forensic science to ensure that the integrity, authenticity, and legal admissibility of evidence are preserved throughout the investigative and judicial process. The chain of custody refers to the comprehensive, documented process that tracks the movement, handling, and location of evidence from the moment it is collected at the crime scene until it is presented in court. This meticulous documentation serves as a safeguard against allegations of evidence tampering, contamination, substitution, or mishandling, all of which could compromise the outcome of a case.

The chain of custody involves several key elements:

Documentation: Every step in the handling of evidence must be thoroughly recorded. This includes detailed logs of when the evidence was collected, who collected it, when and to whom it was transferred, and for what purpose. These records typically include the dates, times, signatures, and official identifications of all individuals involved in the custody of the evidence.

Sealing: To maintain its integrity, evidence must be securely sealed in tamper-evident packaging immediately after collection. Proper labelling and sealing prevent any unauthorized access or manipulation. If the seal is broken or appears compromised, the evidence may be deemed inadmissible in court.

Storage: Evidence must be stored in a secure and controlled environment that ensures its preservation. Appropriate conditions—such as temperature, humidity, and restricted access—must be maintained based on the nature of the evidence (e.g., biological samples, digital devices, physical objects) to prevent degradation or loss.

In conclusion, forensic science employs a range of scientific methods to help solve crimes through the collection and analysis of evidence. Proper handling of this evidence is crucial, as it ensures a fair trial, maintains public trust in the justice system, and supports accurate investigations. Specialized techniques are required to collect various types of evidences such as fingerprints, hair, paint, glass, biological fluids, and digital data from electronic devices. Each type must be handled with great care to prevent damage, loss, or contamination. A key aspect of evidence integrity is maintaining the chain of custody, which provides a clear, continuous, and verifiable record of who handled the evidence and when. By ensuring an unbroken and well-documented chain of custody, forensic professionals uphold the legal standards necessary for the evidence to be deemed credible and admissible in court proceedings. Any lapse in this process can weaken the prosecution or defence and potentially result in the dismissal of critical evidence. In summary, careful evidence collection, proper preservation, strict adherence to chain of custody protocols, and accurate documentation are fundamental to solving crimes and ensuring that justice is served.

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