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Role of Forensic Science Laboratory in the Investigation of Crime

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Abstract

Forensic Science is a discipline that gathers and examines evidence related to crime. The main function of a Forensic Science Laboratory is to provide an unbiased scientific report to the investigating agencies and thus help the judiciary system. Considering the number of cases pending for trials in courts, Forensic Science Laboratory facilitates the investigation of different crimes with the use of advanced technologies in each and every field of forensic science. Forensic investigator gathers the biological and non-biological evidence usually encountered in civil and criminal cases, does a careful analysis using the latest scientific tools and objectively prepares report to aid the investigating agencies.

Keywords: Forensic science; Evidence; Crime scene; Investigation; Judiciary

Abbreviations: UV: Ultraviolet; STR: Short Tandem Repeats; XRF: X-ray Fluorescence

Introduction

"Wherever he steps, whatever he touches, whatever he leaves, even unconsciously, will serve as silent evidence against him. Not only his finger prints or his footprints, but his hair, the fibers from his clothes, the glass he breaks, the tool mark he leaves, the paint he scratches, the blood or semen he deposits or collects all these and more bear mute witness against him" (Paul, Kirk). Evidence materials may be categorized as biological and non-biological materials. Whether the material evidences are biological or non-biological, the range and diversity of material evidences are indeed unlimited. Biological evidential material includes blood, semen, saliva, viscera, nails, flesh, hairs, leaves, fruits etc. Non-biological evidence material includes fibers, weapons, papers, glass, metals, documents, paint, firearms, petroleum products, narcotic drugs, oils, explosives and other chemicals. Biological evidence is found mostly in the physical violence cases where shedding of blood takes place. In rape cases, other than blood, semen is an important evidence material. Non-biological evidences are found in crimes like robberies, theft, forgery, duplication, fraud, trafficking of drugs cases etc.

A scientist working in a Forensic Science Laboratory plays an important role in the analysis of different types of evidential material found at the crime scene or used in the commencement of an offence. These laboratories are staffed with multi disciplinary personnel and possess highly specialized & sophisticated equipments to carry out all challenging analytical work related to any crime. These laboratories are comprised of different specialized divisions to analyze specific evidential material, depending on the nature of the evidential material found. The rate of crime in the world is ever increasing. Today, due to technological advancement, criminals are also equipped with latest tools. The investigation of criminal cases has become more and more complicated and challenging. Mobile forensic units are available to expedite the collection of evidential material from the crime scene.

Biological Evidence Examination

Biological fluids such as blood, semen, and saliva are frequently encountered as physical evidence in many types of criminal investigations such as homicides, assaults, sexual assaults, and robberies. In poisoning cases, often viscera and blood is received for analysis.

Blood examination

Blood forms the most important evidence in murder and assault cases. Bloodstains may appear red, reddish-brown, tan, grey, or yellowish. Detection of blood and pattern of blood stains on clothes of deceased, injured and accused can reveal significant information. In such cases, the relevant issue may be how the blood was deposited rather than from whom the blood came. Under this circumstance, a senior qualified expert assistance should be taken to interpret bloodstain pattern. After blood testing, immunological testing is carried out to indicate human or non-human origin. After confirming the human origin of blood, ABO blood grouping, DNA testing is performed. Biological evidence is best maintained at controlled room temperature. Wet or moist biological evidence should be dried and packaged into clean and previously unused paper containers (e.g., envelopes, bags, cardboard boxes) (Figure 1). Do not wrap the evidence in plastic bags as these conditions could cause the evidence to degrade. Package each item separately and properly label and seal the container (Figure 2). Liquid evidence should be refrigerated, if it cannot be air dried; and wet evidence should be frozen. If the stained object/weapon is transportable, the entire item may be collected and submitted to the laboratory. Be careful to seal all openings of a package since dried blood may flake-off of an object/weapon.

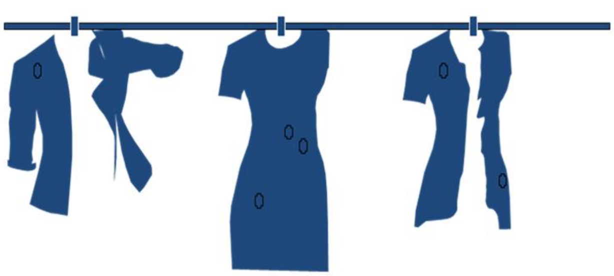

Figure 1: Blood or other body fluid stained articles must be air dried in shadow before packing.

Figure 2: Each exhibit collected has to be packed and labeled and sealed.

The dried bloodstains found on an object such as the upholstery of a car seat or carpet, are collected by using a clean, sharp knife or scissors. The stained area and the unstained margins surrounding the stains are cut. The stains are packed into a paper container, label properly and seal the container. When the amount of blood stain is small, it is advised to select an unstained area adjacent to the suspected bloodstain to collect known as a substrate control. In cases, where blood is found on large surfaces like furniture, door etc, then scrapings should be collected (Figure 3). Use of an ultraviolet (UV) light or other alternate light source may assist in the search for biological stains. All semen or saliva stains will not necessarily fluoresce with a UV light. Blood will not fluoresce when viewed with a UV light and will appear dark.

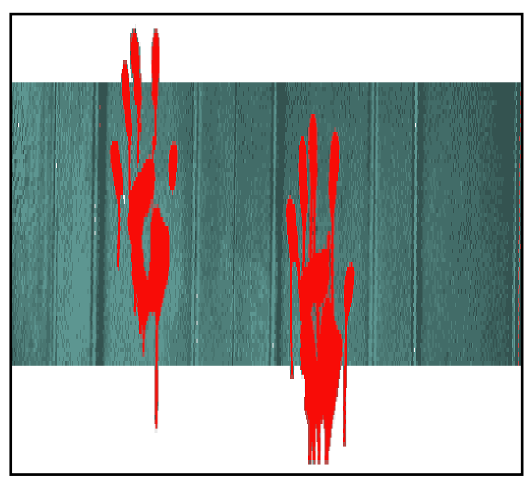

Figure 3: Scrapings should be collected from blood smeared walls or odd sized exhibits like furniture, doors and huge stones.

Saliva examination

Saliva stains are not usually evident from a visual examination. However, certain types of evidence frequently contain traces of saliva e.g., cigarette butts, drinking containers, adhesive surfaces of envelopes, chewing gum, bite marks, ski and/or nylon masks, etc. If the stained object is transportable, submit the item to the laboratory. If it is not transportable, such as bite marks on a body, collect the saliva stain in the following manner. Moisten a sterile cotton swab or a sterile gauge piece with 1-2 drops of distilled or taps water. Gently swab the suspected saliva stain. Allow the swab/gauge piece to thoroughly air dry. Place the dried swabs/gauge pieces in an envelope or paper bag. Swabs collected from the same area should be packaged together and in the same direction. Label and properly seal the container.

Semen examination

In sexual offense cases, semen stains may be found on the victim's body parts as well as on her clothing, bedding, rags, upholstery and other objects. Semen stains may appear off-white, yellow, tan or colorless and may have a crusted appearance. Semen stains may be undetectable to the unaided eye. In cases where victim is minor, in addition to semen stains, blood stains may also be found. As victim's blood, could also be transferred to the suspect or the suspect's clothing. Therefore, depending upon evidence and stain characteristics collection of the suspect's underwear, pants, or other clothing, should be collected, labeled and sealed and send to the laboratory for examination.

Collect all suspected stained material e.g., bedding, underwear or other clothing, etc. Each item of evidence should be packaged separately. Care should be taken to prevent loss of any trace evidence e.g., hairs that may be present (Figure 4). Evidence such as damp stains should be air dried. Consider marking the location on damp stains by circling it with permanent marker, as it may not be visible when dry.

Clean paper should be placed between items hanging next to each other to prevent cross-contamination. Pack and seal each evidential exhibit separately in paper bags or envelopes, along with any paper used. Bathing, showering, and douching by the victim does not necessarily eliminate the possibility of finding semen evidence on the interior of the body. Showering or bathing may eliminate saliva, semen, and trace evidence deposited on the exterior of the body. Undergarments, worn by the victim during and/or immediately after the assault, are good source for collecting semen and hair evidence. Pack each clothing item separately. In general, if more than 84 hours has elapsed from the time of the sexual assault to the time of the medical examination, the chances of finding semen evidence in the body of a living victim are greatly diminished. This time range does not apply to deceased victims; it is recommended that you collect a SAFE Kit from deceased victims regardless of the elapsed time.

Figure 4: Care should be taken to collect trace evidence like hair.

Penile swabbing

If a male suspect is taken into custody within 24 hours of the incident and he has not showered or bathed, a penile swab should be collected. The purpose of collecting penile swab is to collect cells that may have been transferred to the subject as the result of sexual contact. The suspect's underwear should also be collected as such evidence may provide an excellent source of the victim's DNA.

DNA examinations

Deoxyribonucleic acid (DNA) can be extracted from body-fluid, stains and other biological tissues recovered from the crime scene as piece of evidence. The results of DNA profile on evidence samples is compared with the results of DNA profile obtained by reference samples collected from known individuals (accused, injured, victims and deceased). Such comparison of profiles can associate victims and accused with each other, with evidence items, or with a crime scene. Forensic Science Laboratory conducts nuclear short tandem repeats (STR), Y-STR and mitochondrial DNA testing. Nuclear –STR DNA testing/profiling is the most widely used to analyze evidence containing blood, semen, saliva, body tissue, and hairs that have tissue at their root ends (Figure 5). The power of nuclear DNA testing lies in the ability to identify an individual as being the source of the DNA. It has very high discriminating power, definitive power of exclusion and is typically analyzed in almost all evidence material.

- *Extraction of DNA*
- *Quantitation of DNA*
- *Amplification of DNA using Fluorescently labeled primers, Taq polymerase enzyme, Buffer and Template DNA on Thermal cycler*
- *Genotyping and Fragment analysis of DNA using Internal Lane Size Standard Liz-500 and ROX on Genetic Analyzer*
- *Interpretation of Data using GENEMAPPER*

Figure 5: Steps in DNA Profiling.

The Y chromosome is passed from father to son, which means that anyone in the paternal lineage will have the same Y-DNA profile. Many paternal relatives can have the same Y-DNA profile; hence unique identification from Y-STR DNA analysis is not possible. However, in missing person cases, a known sample from a suitable male relative may suffice for comparison purposes. Y- STR analysis can also be of more help in gang rape cases. Y-chromosome DNA can be analyzed in Kinship cases, cases involving unidentified human remains and missing persons only and not for routine evidence analysis. Mitochondrial DNA (mt.DNA) analysis is an excellent technique to use for obtaining information when nuclear DNA analysis is not feasible. Mitochondrial DNA is analyzed on evidence containing naturally shed hairs, hair fragments, bones, and teeth. The mt DNA analysis is highly sensitive. Scientists can obtain information from old evidences associated with cold cases, samples from mass disasters, burnt cases and where there are small pieces of evidence containing little biological material. The maternal inheritance of mt DNA allows scientists to compare a mt DNA profile to reference samples from that victim's mother, brother(s), sister(s), or any other maternal relations. Unique identification is not possible from mt DNA analysis. Prior to mt DNA analysis involving unidentified human remains, bone or teeth specimens should be examined by a forensic anthropologist. Submissions of such items should be accompanied by a written report verifying human origin by a qualified expert.

Hair examinations

Hair examinations can determine whether hairs are animal or human (Figure 6). Characteristics such as, body area, damage, decomposition, alteration (e.g., bleaching, dyeing), and whether a hair has been forcibly removed or naturally shed can be determined through hair analysis. Comparison of the microscopic characteristics in hairs can determine if a person can be included as a possible source of a questioned hair but cannot provide personal identification. Human hairs that are determined by the examiner to be probative and suitable for additional testing may also be submitted for mitochondrial DNA analysis.

Figure 6: Parts of hair.

The analysis of hair and fiber, although not an exact science, can provide corroborative evidence. Hair samples can be compared taking a shed sample at the crime scene to the hair from a suspect to establish a similarity within a limited degree of certainty. If the hair happens to have been pulled out and still has root tissue, there is a possibility for more positive identification using DNA analysis. Animal hair examinations can determine the type of animal (e.g., cat, dog) and whether or not an animal can be included as a possible source of a questioned hair (Figure 7). Animal hairs do not typically possess sufficient characteristics to distinguish between members of similar breed and color.

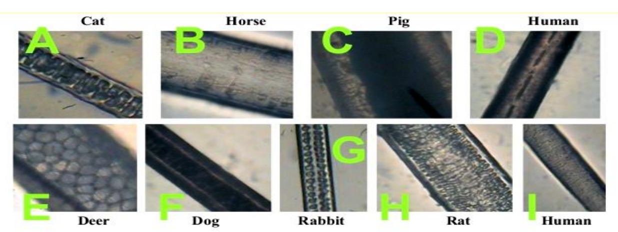

Figure 7: Differentiation of hairs based on types of medulla.

Toxicology examinations

Toxicology is the study of the adverse effects of chemicals on living organisms. Forensic toxicology takes it a step further; it helps in the detection of poisons in medico legal cases.

A systematic toxicological examination is performed to measure alcohol, drugs, and/or poisons in biological samples. This type of examination is carried out to find out if any toxicants are present. If toxicants are found present, then, are they capable of contributing to the death of a person. Further to rule out any toxicants found in viscera represent legitimate use or workplace exposure or prescribed medications. Forensic clinical toxicology; identifies toxicants in living individuals. Often blood, stomach wash or vomit is submitted for analysis. Testing of stomach wash and vomit often discloses what substance (drug/ insecticide/poison) an individual is under the influence of at the time of the incident. Accordingly an antidote can be given to save his/her life. When the subject is deceased, testing may aid in determining the individual's cause of death. For deceased individuals, the viscera (which includes stomach contents, intestinal contents, and other vital organs), blood, etc. are collected at their autopsies by medical officers. They are sealed and referred to forensic science laboratories for examination of poisons, drug overdose, the ingestion of toxic chemicals, or toxic gas inhalation. Hair testing is performed especially in arsenic poisoning and narcotic drugs consumption cases.

Non Biological Evidence Examination

Ballistic examination

Ballistic science addresses the unique aspects of firearms and bullets. Forensic ballistics is the systematic study of fire arm and ammunition used in commission of crime for purpose of investigation and identification.

a. Interior Ballistic: It is concern with motion of projectile inside the barrel of the firearm.
b. Exterior Ballistic: It is study of motion of projectile in open air.
c. Terminal Ballistic: Study motion of projectile at the target.

When a firearm is being loaded to fire, the cartridge loaded into the gun is composed of several components. The bullet portion of the cartridge is tightly pressed into a brass tube, called the casing. At the bottom of this brass casing is a round, flat base slightly larger than the casing, and this base prevents the casing from sliding completely into the cartridge chamber of the gun when being loaded. On the bottom of this flat base of the cartridge is the primer. When the trigger is pulled, the primer is the portion of the cartridge that will be struck by the firing pin of the gun. When struck, the primer ignites the gun powder contained inside the brass casing with an explosion that causes the bullet to leave the casing, travel down the gun barrel, and exit the gun. Each of the components of the cartridge casing can be examined forensically and comparisons can be made (Figure 8). In some cases, it is possible to identify if a cartridge has been fired from the chamber of a specific gun (Figure 9).

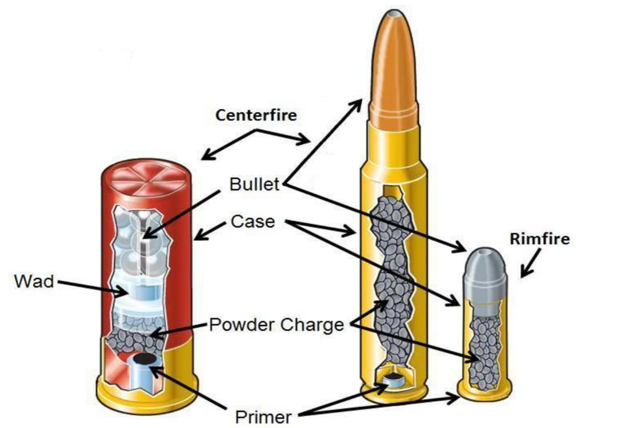

Figure 8: Components of cartridge.

Figure 9: Types of Cartridges.

For ballistic purposes, guns are classified by their calibre, chambering and ejector mechanisms, and firing pin, namely either centre-fire or rim-fire. Eliminations of suspect weapons can often be made by observing the calibre of the bullet and striation marks on them. For instance, a .38 calibre bullet found on a crime scene cannot have been fired from a .22 calibre weapon. Or, that same .38 calibre bullet showing marks from an ejector mechanism could not have been fired from a .38 calibre revolver that does not have an ejector mechanism.

Bullet examination: A fired bullet can be examined to determine physical characteristics, including weight, caliber, bullet design, and rifling marks. These marks are in the form of grooves (Figure 10a). Their number, width, and direction of twist vary with the firearm used. The rifling grooves imparted on a fired bullet by the barrel of a firearm. A microscopic examination of the bullet is conducted to determine if any marks of value are present. If a firearm is seized by investigation officer, a direct microscopic comparison is done between test-fired bullets and the submitted questioned bullet. If a firearm is not recovered, then the submitted fired bullets are compared to determine if they were fired from the same barrel.

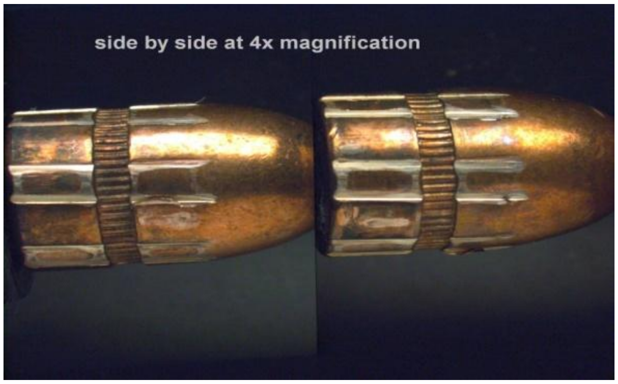

Figure 10a: Striations on bullet due to lands/grooves.

Bullet jacket examinations: Bullets are often jacketed by metal or alloy. This type of classification can often differentiate among the bullet jacket alloys/ metals used by manufacturers to produce different varieties of bullets. It can be used to exclude a bullet fragment as having originated from a particular type of ammunition. This analysis is often helpful when the fragment is too mutilated for direct comparison to a firearm.

Cartridge examinations: An examination of cartridge casing can be examined to determine physical characteristics, including caliber types or gauge, manufacturer, type/extent of marks, and other properties. A microscopic examination of the cartridge case/shot shell casing is conducted to determine if any marks are present (Figure 10b). The cartridges or shot shells are inter compared to determine if they were loaded in and extracted from the same firearm.

Figure 10b: Ejector markings on cartridge cases (empties).

Firing pin comparison: When the firing pin of any gun strikes the primer on the bottom of a cartridge, it leaves an indentation mark (Figure 10c). This firing pin indentation can be matched to the firing pin of a suspect weapon. This requires microscopic examination that looks for the unique characteristics of the firing pin that become impressed into the soft metal of the primer when the contact happens.

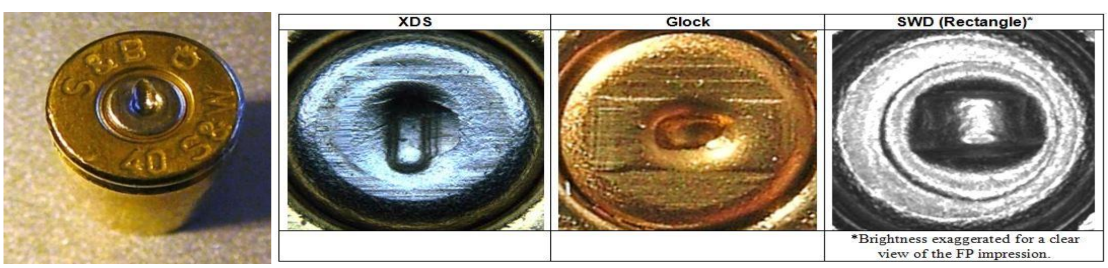

Figure 10c: Impression of firing Pin on percussion cap.

Firearms examinations: A firearm function examination can determine if the firearm operates in the manner in which it was designed by the manufacturer or whether any modifications have been made. Additionally, firearms can be test fired to obtain known specimens for comparison with evidence ammunition, such as bullets, cartridge cases, and shot shell casings. Also ejection pattern and testing of silencer can be conducted.

Gunshot residue pattern examination: Detecting and preserving patterns of gunshot residue can be used as a basis for estimating muzzle-to-target distances. The deposition of gunshot residue on evidence varies with the distance from the muzzle of a firearm to the target. When reproducing residue patterns detected on evidentiary items, the suspect firearm and ammunition similar to the suspect ammunition will be used to produce known-distance test patterns.

Explosives examinations

Evidence collected from an apparent explosion and/or recovered from an explosive device can be tested (Figure 11). Examinations are based on the components and accessories used to construct the devices that survived the explosion, although disfigured.

The examinations can reveal the following:
It can determine the construction characteristics and identify the components used to construct the device, such as switches, batteries, detonators, tapes, wires, and fusing systems. It can identify the explosive main charge and the manner in which the device functioned or was designed or intended to function.

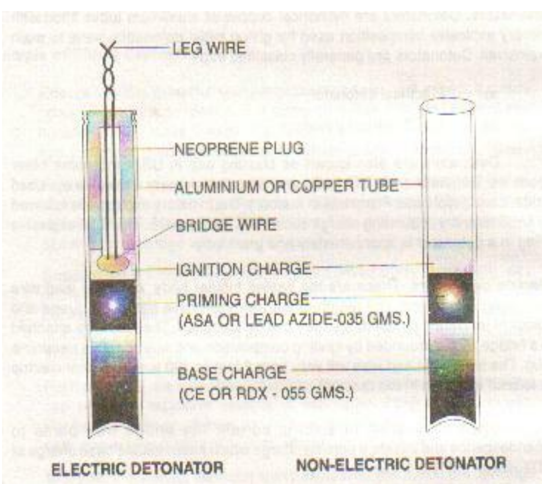

Figure 11a: Component of explosive.

Figure 11b: A briefcase bomb.

Explosives residue can be deposited on metal, plastic, wood, paper, glass, cloth, and other surfaces. Residue may be deposited after handling, storing, or initiating an explosive. The trace residual evidence present on the devices and collected from the crime scene should be preserved so that instrumental analysis regarding type of explosives used can be carried out. Some explosive residue is water soluble and must be protected from moisture. Few explosive residues evaporates quickly and must be collected as soon as possible in airtight containers such as metal cans, glass jars, or heat-sealed or reseal able nylon bags. Always leave a minimum of three inches space between packaged evidence and the top of the container. Do not fill containers to the top to prevent breakage. Zip lock storage bags are not suitable for storing explosives residue evidence. Instrumental analyses of explosive residues can determine the type of explosives used in explosion. They are high-explosive, low-explosive, or incendiary mixtures; whether the composition of the substances is consistent with known explosives products; and the type of explosives.

Lubricant examinations

Lubricants encompass a range of substances, including petroleum products, natural fatty ester oils, and polyalkylene glycol oils. Automotive fluids (e.g., engine oil, brake fluid), certain cosmetics (e.g., bath oils, lotions), and some polishes contain lubricants. Lubricant examinations may also be conducted in sexual assault, vehicular homicide, or heavy-equipment sabotage cases.

Physical examinations

Physical matching is a forensic technique that can be applied, to some extent, as corroborative evidence by the investigator. The more sophisticated aspects of physical matching require the expertise of a person trained in the techniques to form and articulate an opinion that the court will accept as expert evidence. During a crime investigation, physical matching is typically conducted on items, such as, shoe prints, tire prints, fiber examination, tool impressions, broken glass, plastic fragments, and torn edges of items, such as paper, tape, or cloth. Fabric portions can be compared to determine if they physically match or exhibit the same construction and fiber composition. Fabric examinations can also determine whether a fabric has been damaged, the type of damage (e.g., cut, torn, punctured), and may determine the type of implement used. Impressions from fabric may be compared to known fabrics. Fiber samples can often be narrowed down to make a higher probability comparison using microscopic examination for size, color, and type between an unknown sample and control sample (Figure 12).

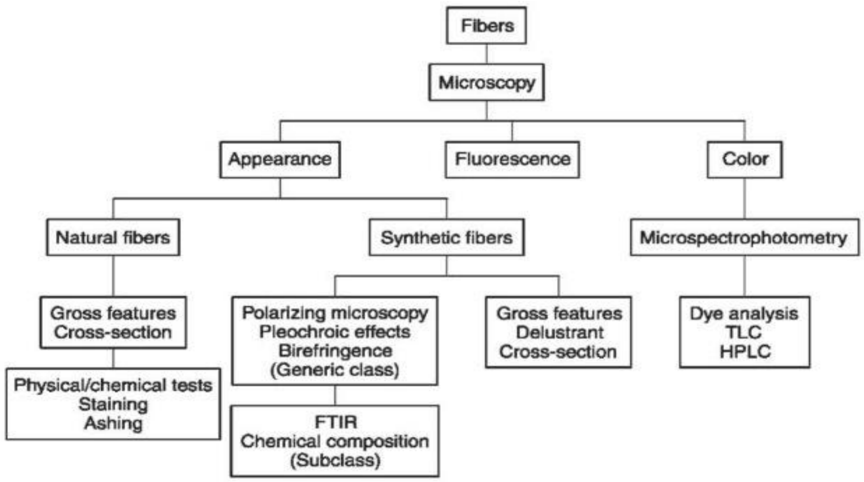

Figure 12: Examination of fibers.

Examinations of shoe print and tire prints impressions could result in the positive identification of the shoes of the suspect(s) or tire(s) from the vehicle(s) of the suspect(s). Polymer evidence typically consists of pieces of plastic or other manufactured materials. The source, use, or manufacturer of polymer evidence usually cannot be identified by compositional analysis. Motor vehicle trim can be compared with plastic remaining on property struck in a hit-and-run case. The manufacturer, make, model, and model year of a vehicle can be determined if a manufacturer's part number is on the trim. Plastics in wire insulation and miscellaneous plastics such as buttons can be compared with known sources. Investigators can often use these physical matching to link the suspect back to the crime scene or the victim. Finding a suspect in possession of a shoe, a tire, or a tool that is a positive match to an impression at the criminal event is a powerful piece of circumstantial evidence.

Glass fragments are first matched for general characteristics, such as material, colour and thickness; however, the process for making the comparison of broken edges requires microscopic examination and photographic overlay comparison of broken edge features to demonstrate a positive match. For scene and fragments of glass have been found on a suspect's clothing, or in cases where glass or plastic fragments are left at the scene of a hit-and-run car crash and a suspect vehicle is found with damage that includes similarly broken items. Glass fracture analysis can also be used to demonstrate which side of a piece of glass received the impact that caused the fracture. This can be a helpful tool in confirming or challenging a version of events, such as insurance fraud, break-in reports, and motor vehicle crashes.

Ink examinations

Examination of ink on documents can provide details regarding document preparation. The composition of writing inks varies with the type of writing instrument (e.g., ballpoint pen, fountain pen, porous-tip pen) and the date of the ink manufacture. Ink analysis is limited to comparisons of the organic dye components. Examinations cannot determine how long ink has been on a document.

Metal examinations

Examinations can determine whether two metals may have come from the same source. Metal comparisons can identify various surface and micro structural characteristics which include fractured areas, accidental damage, and fabrication marks if any. X-ray Fluorescence (XRF) spectroscopy is a non-destructive technique of analysis widely used in forensic science for the identification of elements in pigments, metal alloys, and other materials of evidential clues recovered from the scenes of crime. XRF is also used to examine the evidences like purity of gold and silver jewelry and remnants of glass pieces recovered from crime scenes.

Paint examinations

Paint fragments are often found on the clothing of hit-and-run victim(s). Submit the clothing and pack them separately in paper bags. Paints can be transferred from one car to another, from car to object, or from object to car during an accident or a crime. Control paint chips must be collected from the suspected source of the evidentiary paint. Controls must be taken from an area close to, but not in, any damaged area. If no damage is obvious, controls should be taken from several areas of the suspect substrate. Each layer of paint can be a point of comparison. Controls must have all of the layers of paint down to the substrate. Paint is a mixture of organic and inorganic substances.

The organic component is usually the pigment contained in the paint which gives it its color. The "binder" holds the substances together. A "solvent" is added to paint to give its liquid form. Solvent evaporates in air and allows the paint to convert to a solid. Dried paint contains the binder which is usually inorganic and the pigments which are usually organic but can be either. Paint on safes, vaults, windowsills, and door frames can be transferred to and from tools. A comparison can be made between the paint from an object and the paint on a tool. The layer structure of a questioned paint sample can be compared with a suspected source. The sequence, relative thickness, color, texture, number, and chemical composition of each of the layers can be compared.

Pepper spray and chili powder examinations

Oleoresin capsicum is a resin in various peppers and chilies. It may be used in self-defense sprays or foams. Ultraviolet dye and/or tear gas also may be in the sprays or foams. There is prevalent use of dried chili powder in dacoits and looting cases. The main ingredient of chilies is the alkaloid Capsaicin. It is highly pungent and lachrymatory in nature. By using this criminal often run away from the crime scene or by spraying it on criminals, they can be made to surrender. The effect of lachrymator depends on the capsaicin content, which can be studied by using HPLC and GC-MS technique.

Photocopy or facsimile examinations

Photocopies or facsimiles of documents can be identified with the machine used to produce them if the exemplars and questioned documents are relatively contemporaneous. The possible make and model of the photocopier or facsimile machine may be determined.

Serial number (Altered) examinations

The Laboratory examines serial number restoration/obliterated on stolen vehicles. Depending on the type of metal surface, a thermal or chemical method, along with specialized techniques, is used to assist in restoring and visualizing an obliterated stamping.

Tool mark examinations

Altered or tampered serial or identification numbers, including tool marks on metal, wood, plastic, and fiberglass. If tool marks are present and no suspect tool is submitted, it may be possible to produce a list of possible tools. When tool marks of value are present, a comparison can be made. An examination of the questioned item is conducted to determine if tool marks are present, what types of tool may have caused them, and whether there are tool marks of value for comparison purposes.

Soil examinations

Natural soils are created from combinations of different rocks and organic materials, which undergo a large variety of geological and climatic variations to produce soil. The resulting soil is a complex mixture with a variety of minerals, chemicals, biological, and physical properties. It is relatively unique when compared with soil from different locations. Hence Soil examinations can provide important information in criminal investigations. Trace soil evidence is often overlooked by criminals. When two surfaces come into contact, such as shoes or clothing's belonging to a victim/suspect and a soil surface, there is potential for the mutual transfer of minute traces of material between them. Human-altered or human-transported soil will often contain a combination of minerals or human-made items (such as glass or plastic particles) not normally found in a natural soil. When soil samples from known locations are compared to unknown trace soil evidence taken from shoes or clothing, similarities and differences in the unknown soil's minerals, chemistry, biology and physical characteristics are documented. This variation in soil from place to place makes soil valuable evidence to prove linkage between a suspect and a crime scene. Forensic scientists use different methods to analyze soil evidence including visual analysis, light microscopy, Scanning Electron Microscopy and X-Ray Diffraction analysis.

Conclusions

The most important aspect of evidence collection is preservation and protection of the crime scene in order to keep the pertinent evidence uncontaminated until it is recorded, photographed and collected. The successful prosecution of a case can hinge on the state of the physical evidence at the time it is collected. Once the collected evidence reaches forensic laboratories, it is analyzed by experts. Analysis of evidence using forensic tools can add significant information, making a circumstantial connection between the accused, victim and the crime scene. It adds new insights. Forensic analysis can make the difference between solving a crime and it becoming a cold case. It is high time that we realize the full potential of forensic science and crime scene investigation, Forensic science labs and law enforcement agencies must be provided with the necessary resources and funds to access and implement the latest technology in solving cases. Only then will the future of crime scene investigation and forensic science be attainable.

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