

# The Methods of Extracting Trace Evidence in Criminal Investigation

DONALD T. SUMAD-ON, ROBINO D. CAWI  
University of the Cordilleras

**Abstract:-** Among the types of evidence collected from the crime scene, the trace is one of the necessary evidences that need to take into consideration during crime scene investigation. A well known accepted principle in criminalistics “Every contact leaves a trace” known as Locard’s exchange principle and is the basis for all forensic science as we know it today. The researchers employed the Qualitative-descriptive design of research using the phenomenological research with the methods of extracting trace evidences. Five(5) factors were identified and analyzed in the study; (1)Collection and preservation of blood, (2)Collection and preservation of saliva or semen, (3)Collection and preservation of urine, (4)Collection and Preservation of Body Fluids, (5)Collection and Preservation of Fingerprints. After the evaluation and analysis conducted, it concluded that the method for analyzing Trace Evidence in Criminal Investigations still used the conventional method of extracting trace evidence and still admitted as valuable evidence in prosecuting the person of interest(POI). It was strongly recommended to provide new technology in Forensic Science to be priority in all Crime Laboratories so as to minimize delays in the process of trace evidences.

**Keywords:-** Trace evidence, criminal investigation, crime scene.

## I. INTRODUCTION

Traces of evidence refer to a minuscule part or component of a document, or a small amount, usually very small matter, not easily visible to the naked eye, and such traces of evidence are often transferred through physical contact. Possible during the commission of a crime or an incident. (forensic Expert Group, Singapore). Traces of evidence can be used to link a person or thing to a place, other person, or object and often serve as a starting point or trail for a particular line of investigation. Traces of evidence help put the pieces of the investigation together, Dr. Edmond Locard, a pioneer in forensics in France, hypothesized that “Every contact leaves a trace.”. This is known as Locard’s principle of exchange and forms the basis of all forensic science as we know it today.

The recent report of the National Research Council of the U.S. National Academies “Strengthening Forensic Science in the United States: A Path Forward” found evidence that the level of scientific development and evaluation varies substantially among the forensic science disciplines. Robertson, 2010 in his study Trace evidence: Here today, go tomorrow?, the The status of trace evidence will be considered from an international perspective with specific reference to case studies. The article argues that the

discipline of tracking evidence must be learned and serious concerted action is needed internationally if evidence lines are to continue to meet the standards expected by forensic science around the world. gender. ' The paper concludes that it is important that evidence trails remain an important part of forensic investigation because of their important role in answering the "what happened" question.

Forensic Analysis of trace evidence in criminal investigation is more than essential as to reach the point of conclusion whether a crime has been committed and a real crime scene exists. In many situations, one of the initial and primary duties of the field investigator is to provide the appropriate resources. Resources should be based on the complexity and severity of the alleged incident. Therefore, the primary role of the field investigator is to conduct a forensic investigation. (Pye, K. (2007).

At a crime scene, there are often tiny fragments of physical evidence to compare specific types of trace material that could be transferred during the commission of a violent crime. These trace materials include human hair, animal hair, textile fibers and fabric, rope, soil, glass, and building materials. The physical contact between a suspect and a victim can result in the transfer of trace materials. The identification and comparison of these materials can often associate a suspect with a crime scene or to another individual. Physical anthropology (skeletal remains) examinations are also performed. These examinations are conducted to assist in the identification of human remains. (FBI.gov). This evidence can be used to reconstruct an event or indicate that a person or thing was present.

Careful collection of material from a crime scene can yield a wealth of information about where a sample came from and how it helps to tell the story. Scientists examine the physical, optical, and chemical properties of trace evidence and use a variety of tools to find and compare samples and look for the sources or common origins of each item. Most test methods require magnification and/or chemical analysis.

## II. STATEMENT OF THE PROBLEM

This study aimed to determine the methods of Extracting Trace Evidence in Criminal Investigations. Specifically, it required to answer the following;

1. What are the methods of extracting trace evidence in criminal investigations?
2. What makes the trace evidence determine its value in the conduct of the investigation?

**A. Theoretical Framework:**

The PNP he mission of the Crime Laboratory is to provide forensic investigation services and other technical support to the offices of the Philippine National Police (PNP) and other agencies through field work, operations and crime scene operations, forensic laboratory services, forensic training and research. The Detective Management and Investigations Directorate has continued to continually revise the existing investigative handbook to provide PNP field investigators with immediate reference and to help field investigators stay up-to-date. applicable laws, procedures and case law. According to the Philippine Genome Center (PGC), concerted efforts are being made to increase the number of forensic pathologists in our country as the University of the Philippines (UP) and the Department of Science and Technology (DOST) ) continues to advocate for scientific activities and technology applications for the benefit of the country.

n April 7, 2015, Forensic Science Symposium was held to further promote the use and advantages of forensic science in conducting criminal investigations like examining crime scenes or tampering evidences; in identifying casualties after natural calamities like Typhoons Yolanda and Ondoy or manmade disasters like the Maguindanao massacre or the most recent Mamasapano tragedy; and in establishing familial relationships. With the advent of social media and communication gadgets, there is an even greater need for Filipinos to be more discerning when receiving and passing on information, especially about crime. Not discounting the help of eyewitness accounts, forensic science plays a significant role in the pursuit of criminal justice in the country.

n the fight against crime, DNA plays an important role through research and forensic science. Since deoxyribonucleic acid (DNA) was first isolated by Friedrich Miescher in 1869, and its molecular structure was determined in 1953 by James Watson and Francis Crick, the application of DNA has evolved from the field of science. study, applied to solve many problems of mankind. , such as

social, criminal and political issues. In the Philippines alone, many paternity cases have been resolved. According to Dr. Maria Corazon de Ungria, head of the DNA analysis laboratory, the state of DNA research in the country is comparable to that of foreign laboratories.

**EVIDENCE COLLECTION, PROCESSING, AND TRANSPORTATION** In the context of crime scene investigations for violent crimes and other crimes, the handling of the scene or the collection, processing and transportation of evidence is primarily performed by SOCO experts from Crime Labs. However, in some cases, first responders or enumerators may need to collect evidence that could be destroyed or contaminated if not collected. In such cases, collection should be managed and documented appropriately. The following procedures are defined as guidelines not only for the SOCO team but can be applied to any crime scene investigator in the collection and processing of evidence. However, the collection and submission of reference samples for comparison must be done by a crime laboratory.

**B. Conceptual Framework of the Study**

For a better appreciation of the relationship among the variables in the study, the conceptual framework was presented using sequential exploratory design in the conduct of the study.

Criminal investigators refers to law enforcement professionals who collect evidence, interview witnesses, and arrest suspects(Criminal Justice Degree School, 2021) that have an integral role in crime investigation and criminal justice. Upon determining that a crime was committed, the investigators can work on different trace evidence, then collected and preserve the said trace evidence for laboratory examination(Criminal Investigation Manual, 2011). After doing so, the investigator must prepare the complaint to be filed and all evidences at hand to the prosecutor, then as a procedure the prosecutor shall determine if there is a probable cause to believe that a crime was committed and the suspect was the one committed it As shown below, Figure 1. Paradigm of the study;



Fig. 1: Paradigm of the Study

### III. RESEARCH METHODOLOGY

The researchers utilized the Qualitative Descriptive Method of research using phenomenological research design that facilitate to appreciate the meaning of people's lived experience (Duquesne University, 2020). Phenomenological research examines what people have experienced and uses subject analysis to focus on the experience of the phenomenon. Mc Combes (2019) The descriptive study aims to explain the population, situation, or phenomenon accurately and systematically. This can answer questions, where, when, how, and investigate one or more variables using a variety of investigation methods. Qualitative description is appropriate because this study aims to determine how to collect evidence in criminal investigations.

#### A. Data Gathering Procedure:

The researchers first sought permission through a written letter to PCPT Joyce B Bulauan, OIC, PNP Crime Laboratory, Santiago City, Isabela, to conduct the research studies by means of interview among the PNP Crime Laboratory personnel with the used of the questionnaire as guide.

As to the distribution of the questionnaire, the researcher met personally with the respondents and an interview was conducted to include the elaboration about the research and then proceeded to the answering of the research questionnaire. After gathering the data, the researcher closely examines by means of thematic analysis, Identify common themes (themes that keep popping up, ideas, patterns of meaning) come up with its findings of the study.

#### Population and Locales of the Study

The scope of this research was limited to the personnel of the PNP Crime Laboratory, Santiago City, Isabela, to determine techniques of extracting Trace Evidence in Criminal Investigations.

#### B. Presentation, Analysis & Interpretation of Data

a) Part 1. The techniques of extracting trace evidence in Criminal Investigations.

- Collection and Preservation of Blood;

The result of the interview conducted to the respondents revealed that there are types of blood specimen; Detachable material blood, blood pool, underwater blood, and dry blood. The procedure for blood in removable materials is to simply cut them. If blood can be removed from cloth, wood, etc., the investigator puts each material in a wrapping paper and seals it with tape. If the materials are wet or damp, pack each material in a taped plastic bag. Open and dry for forensic examination.

The pool of blood are the most common encountered in their investigation, they collected pools of blood by means of swabbing, they only take several samples if larger blood are encountered. They Place the swab in a swab pouch or folded paper. Wrap it in an envelope, keep it dry while tapping the blood in water, and catch the water with a jug or syringe. Dry Blood Sample Method If this is not possible,

cut a portion of the surrounding material, moisten the swab with water, and then rub it until it turns dark brown / red or until the swab absorbs blood. Place the swab in a swab pouch or folded paper. Put it in an envelope and store it in a cool, dry place.

An article published by the Crime Museum (2021) revealed that blood samples can become unavailable after 48 hours and should be delivered to the laboratory as soon as possible. If you need to ship a sample, it must be completely air dried before packing. If the sample is not completely dry at the time of packaging, wrap the sample on paper, label it, and then place it in a brown paper bag or box. In addition, for this reason, do not put the sample in one container for more than 2 hours. Since the Sciro (2020) blood analysis is a comparative analysis (comparing the victim's blood with the suspect's blood found at the crime scene), a reference blood sample from the victim and the suspect is required. It is necessary to compare the genetic markers of the victim's blood and the suspect's blood. You can then analyze blood samples from crime scenes to look for different genetic markers between the suspect and the victim.

- Collection and Preservation of Semen or Saliva

One among the challenging in extracting trace evidence is the semen or saliva especially when it was already dried. Based on the result of the interview, there are two(2) common types of evidence; the first is the semen or saliva on removable materials, they will scrap to removable the sample and then Place each ingredient in a separate paper bag. The second type is dry semen or saliva, which either cuts off some of the surrounding material or moistens a cotton swab with water. Place each specimen in a paper bag or envelope, or air dry and place the swab in a swab wrapper or folded piece of paper. This supported a study by Cătălin Et Al(2020) that liquid semen could be transferred to a clean cotton cloth by absorption. The wipes are then air dried, bagged, sealed and properly labeled.

- The Collection and Preservation of Urine

Based on the data gathered, urine is one of their top specimens if the incident is through gun for hire or premeditated crime, wherein the suspect is waiting for his target in which usually the gunner urinated not far from his position when committing a crime. What the crime laboratory personnel do is that they will collect the urine sample to include the soil or leaves where urine is suspected and then keep in a refrigerator for examination. Skobe C(2004) Laboratory urine samples are categorized according to the type of collection performed. Random specimens were mostly sent to laboratories for analysis, primarily because they were the easiest to obtain and readily available. This sample is usually submitted for urinalysis and microscopic analysis. As the name implies, samples can be taken at any time. There are no specific guidelines for performing the collection, but it is advisable to avoid bringing contaminants into the sample. This requires clear instructions to the patient not to touch the inside of the cup or cup lid.

- The Collection and Preservation of Body Fluids

Based on the data gathered, there were 10 types of body fluids to wait; DNA Typing from dead people, DNA



typing from living persons through saliva, DNA typing from living persons through blood samples for drug/ alcohol analysis, finger rub, penis sample, anal sample, and vaginal sample. Among the types of body fluids, the most common collection is the sample for drug and alcohol analysis. According to the Bombo radio report, from November 2019 to January 2020, there are an increase of motor vehicle accidents and majority of the driver is under the influence of liquor and some of them then were tested positive users of illegal drugs. The procedure of extracting a sample is that it must have 10ml of venous blood for drug analysis and 20 ml of urine in two test tubes with screw caps and then keep the tubes in a refrigerator for examination. This was in support of the study of Oliveira(2017) illustrating procedure that Bodily fluids can be collected using either a wide-mouthed pipette or a disposable subcutaneous syringe with a suitable needle gauge and length.

- The Collection and Preservation of Fingerprints

Fingerprint is the most common among extracting of trace evidence. Based on the data gathered and presented by one of the personnel. There were 10 types of fingerprint specimen; Fingerprints on removable objects, plastic prints, coloured and etched prints, prints in dust, fingerprints in blood, fingerprints on removable objects, fingerprints on dry objects, fingerprints on dry surfaces, fingerprints on wet surfaces, fingerprint on wet, non-porous surfaces, such as glass, metal, plastic, painted wood, fingerprints On wet, porous surfaces, such as paper, cardboard, unpainted wood. Among the 10 types of fingerprint specimen, there were 2 types commonly encountered by the respondents, the first one is the fingerprints on dry surface if the prints are fresh, they try brushing with magnet powder or as the investigator opted to be used based on the type of material where the latent print was located. If possibly, they try to cut out the areas of where the latent prints are located. The second type is on the fingerprint with a removable objects like knives, drinking bottles, firearms, cloth, wallet, and bags. As to the procedure, the personnel or the investigator usually bring the item to the PNP Crime laboratory for examination.

The simplified guide for Fingerprint Analysis(2021) published that Potential fingerprint collection is done by dusting a smooth or non-porous surface with fingerprint powder (black granules, aluminum flakes, black magnetic powder, etc.). If you see a print, take a picture as above and lift it off the surface with clear tape. Then place the lifting strap on the potential lift card to maintain pressure. Investigators often follow a two-step process when searching for fingerprints. In the first phase, patents and plastic prints are visible and are sought after. Flashlights are often used at this stage. According to scientific evidence, the second step is to blindly search for potential prints. Paul C. Giannelli, Edward J. Imwinkelried, Andrea Roth, and Jane Campbell Moriarty, *Scientific Evidence*, p. 949 § 16.03 (5th ed. 2012). To narrow down the search, investigators typically focus on the entrances and exits used by the suspect, as well as items that appear to have been disrupted, such as falling ramps or possible weapons.

b) Part II. The Value of trace evidence in forensic analysis in the application of criminal investigation.

The main value of trace evidence in Criminal Investigation can portray an essential aspect to other evidences as the findings can provide the sufficiency of a strong probable cause. The respondent revealed that some of the trace evidence are often difficult to see like latent prints and saliva, what they usually apply is a prudent course of action, then cares should be used when collecting as improper handling and packaging can compromise the trace evidence. The crime laboratory finding are one tool of prosecution in establishing probable cause as to merit the case filed. The city prosecutor usually coordinates with the Crime Laboratory for a criminal cases filed by the Police investigator for forensic examination like rape, homicide, robbery, and drug cases and according to the respondent, their findings are very vital for the prosecutor in charging the person of interest(POI) and in their assessment almost 90% of their findings of trace evidence of criminal offence were recognized by the court as exhibit for trial.

According to the Philippine Public Safety Forum, the creation of National Forensic Science Training(NFST)is a gate way Institutionalize a world-class institutional and scientific training program designed to train service-oriented public security personnel dedicated to successful criminal prosecution through scientific investigations. Philippine National Police Officers; Fire Protection Bureau; Prison Administration The Prison Department has been given the opportunity of investigative training as part of the implementation of the policy on training of competent criminal investigators in the country issued by former President Gloria Makapagal Arroyo. Department Crime Investigation and Detection Course Created Safety.

#### IV. CONCLUSIONS

Based on the findings of the study, The method of analyzing forensic evidence in criminal investigations still uses traditional methods for extracting forensic evidence, and based on the results, concludes that it is still an effective tool for criminal investigations. I attached it. Unlike the United States, if the suspicious blood is already dry, it is sprayed with the chemical reagent luminol, which reacts with the blood to phosphorylate and give off a faint glow. (National Institute of Justice).

- Recommendations

Based on the result of the research study, the researcher strongly suggest the following;

- The PNP Crime Laboratory Personnel must be proactively in their training to develop skills, all personnel must know how all possibly in extracting traces of evidence as revealed by the findings that they have limited expertise in regard to extracting trace evidence.
- The PNP Crime Laboratory Personnel through the Central Office must undergo advance training in scientific extracting of evidence to advance their skills. Moreover, the Congress shall allot budget for the purchase of the advance crime laboratory instrument per Crime laboratory office.

## REFERENCES

- [1.] Cătălin Et Al(2020) MODERN METHODS OF COLLECTION AND PRESERVATION OF BIOLOGICAL EVIDENCE FOR HUMAN IDENTIFICATION BY DNA ANALYSIS. [https://www.abacusdiagnostics.com/Modern\\_Methods\\_of\\_Collection.pdf](https://www.abacusdiagnostics.com/Modern_Methods_of_Collection.pdf)
- [2.] Criminal Investigation Manual (Revised 2011). Directorate for Investigation and Detective Management Philippine National Police. [http://www.pnp.gov.ph/images/Manuals\\_and\\_Guides/DIDM/Criminal-Investigation-Manual.pdf](http://www.pnp.gov.ph/images/Manuals_and_Guides/DIDM/Criminal-Investigation-Manual.pdf)
- [3.] Duquesne University(2020), Qualitative Research Methods. <https://guides.library.duq.edu/c.php?g=836228&p=5972144>
- [4.] FBI.gov <https://www.fbi.gov/services/laboratory/scientific-analysis/trace-evidence>
- [5.] Elijah Domingo (2009)Research Paradigm. [https://www.academia.edu/34862628/Research\\_Paradigm](https://www.academia.edu/34862628/Research_Paradigm)
- [6.] GMA News, 2020 <https://www.gmanetwork.com/news/news/nation/770827/fortun-on-medico-legal-report-did-dacera-really-have-aneurysm-and-was-something-injected-on-her/story/>
- [7.] James Robertson(2010), Claude Roux, Trace evidence: Here today, gone tomorrow?, Science & Justice, Volume 50, Issue 1, 2010, Pages 18-22, ISSN 1355-0306,
- [8.] Jalea, G. (2021) TIMELINE: The Christine Dacera case.CNN Philippines. Published Jan 6, 2021 1:34:24 PM. <https://www.cnnphilippines.com/news/2021/1/6/Timeline-Christine-Dacera-case.html>
- [9.] Janina Zięba-Palus, (2017). Institute of Forensic Research, Poland, Forensic examinations of micro-traces, DOI: 10.15761/FSC.1000113
- [10.] National Institute of Justice(2013). Without a Trace? Advances in Detecting Trace Evidence. <https://www.ojp.gov/pdffiles1/jr000249b.pdf>
- [11.] Oliveira, RJ, Vieira, DN, and Magalhaes, (2017). Guidelines for Collection of Biological Samples for Clinical and Forensic Toxicological Analysis. Forensic Sciences Research. Published online 2017 Jan 16. doi: 10.1080/20961790.2016.1271098
- [12.] Philippine National Police Manual(2011). Field Manual on Investigations of Crimes of Violence and other crimes. [http://www.pnp.gov.ph/images/Manuals\\_and\\_Guides/DIDM/Field-Manual-on-Investigation-of-Crimes-of-Violence-and-other-Crimes.pdf](http://www.pnp.gov.ph/images/Manuals_and_Guides/DIDM/Field-Manual-on-Investigation-of-Crimes-of-Violence-and-other-Crimes.pdf)
- [13.] Philippine Public Safety College(2021). National Forensic Science Training Institute. <https://ppsc.gov.ph/2015-03-27-03-54-36/2015-04-03-00-28-57>
- [14.] Pye, K. (2007). *Geological and soil evidence: forensic applications*. CRC press.
- [15.] Question Pro, Empirical Research(2020)
- [16.] <https://www.questionpro.com/blog/empirical-research/>
- [17.] Schiro, G.(2020). Collection and Preservation of Blood Evidence. Crime Scene Investigation Network. <https://www.crime-scene-investigator.net/blood.html>
- [18.] Skobe C,( 2004). The Basics of Specimen Collection and Handling of Urine Testing. <https://www.bd.com/en-us/offers/capabilities/specimen-collection/vacutainer-educational-services-and-materials/labnotes/labnotes-14-2-2004>
- [19.] Tumamos, S.(2016), Forensic science, DNA applications, vital for Philippine development. Business Mirror. <https://businessmirror.com.ph/2016/05/23/forensic-science-dna-applications-vital-for-philippine-development/>