

# An Analysis of the Challenges Encountered by the Cauayan City Crime Laboratory Office in Deoxyribonucleic Acid Testing

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## ABSTRACT

DNA profiling is a cornerstone of modern forensic investigation due to its unique ability to identify individuals. This study explored the challenges encountered by the Cauayan City Crime Laboratory Office (CCCLO) in Isabela, Philippines, in conducting Deoxyribonucleic acid (DNA) analyses. Employing a descriptive qualitative design, data were collected through in-depth interviews with seven CCCLO personnel using purposive sampling. The study conducted from June 2020 to July 2022. Thematic analysis revealed primary challenges to include lack of core DNA analysis equipment, shortage of DNA analysts, and the absence of dedicated DNA laboratory facility. While the CCCLO has implemented strategies such as DNA sample transportation to National Head Quarters-Crime Laboratory Division and limited training initiatives, these measures appear insufficient to address the identified problems. The findings underscore the critical need for enhanced resources and capacity building to optimize DNA analysis capabilities in Philippine crime laboratories.

**Keywords:** Deoxyribonucleic Acid, DNA testing, Preservation of Evidence, Forensic Science, Cauayan City Crime Laboratory Office.

## INTRODUCTION

During the past decades, physical evidence has become increasingly important in any criminal investigation. Courts often view eyewitness accounts as biased or unreliable. Physical evidence, such as fingerprints, DNA, and trace evidence, may independently and objectively link the suspect or victim to a crime, disprove an alibi, or develop important leads in investigations. Physical evidence may also prove invaluable for exonerating the innocently convicted people. Police Investigators and laboratory personnel should work together to determine the most probative pieces of evidence and to establish priorities. Given the sensitive nature of DNA or Biological evidence, officers should always contact their laboratory personnel or the evidence collection technicians when collection questions arise.

The goal of any forensic investigation is individual identification and the individual may be a perpetrator in a burglary case or an unknown victim in a death case. The development of biological profile is a key factor during the identification process (Nikkimor, et al., 2019). On the other hand, forensic experts need to follow and acknowledge a uniform set of universal principles, policies, and best practices in their profession to avoid DNA discrepancies during DNA collection, analysis, and testimony in courts of law.

DNA profiling assists in human identification with great precision and is used for various purposes, including adjudication of civil and criminal matters. In the criminal domain, DNA helps in stitching crime with criminals and identifying the victim. In civil courts, DNA has increasingly been used to resolve paternity disputes by identifying putative fathers (Goswami & Goswami, 2018).

In today's technology-driven world, Crime Scene Officers have many responsibilities and they have to expand their role to take full advantage of the technology available. To do due diligence to their job, they need to stay

updated with the advances in the field so that they become ready for whatever challenges they will face in their field and the best way to accomplish this goal is to invest in ongoing training (Wadhvani, 2019).

According to Stevenson (2018), many challenges are surrounding DNA mixture interpretation in the laboratory, which remain unresolved by the scientific community. The presentation of statistics to support DNA mixtures raises further problems: the use of nuanced mathematical tools places significant demands on both the professional and lay fact finder. Bashinski (2019) also claimed that the rapid expansion of forensic science continues, concerns about analytic error, insufficient laboratory protocol, and misrepresented results have served to generate concern and skepticism in the field.

While forensic science is very much employed in criminal investigations around the world, it is rarely included in criminal investigations in the Philippines. There is a general lack of resources, facilities, and qualified personnel in different fields of forensic sciences. Hence, not all cases undergo a thorough forensic investigation, and upwards of 90% of cases rely solely on testimonial evidence (Go & De Ungria, 2019).

Discovery is particularly important in cases involving DNA evidence because it may reveal concerns about the evidence's collection, transportation, storage, and testing (CHIN).

Given the rarity of the inclusion of forensic science in a criminal investigation in the Philippines, the researchers deem it imperative to determine the problems encountered in DNA Testing of the CCCLO in DNA Laboratory equipment, the personnel conducting the test, and preservation of DNA evidence and how these problems address by the CCCLO.

Apart from shedding light on the challenges encountered by the CCCLO, this study is hoped to generate information beneficial to the PNP National Headquarters (PNP-NHQ) as their reference in the planning of programs, policies, and the management on how to cope with the problems encountered in DNA testing. Also, to the CCCLO, the findings will help the CCCLO personnel improve and upgrade their capability in DNA testing. Lastly, the findings are useful for future criminological researchers.

### **Theoretical and Conceptual Framework**

This study is grounded in organizational theory, examining how the structural, operational, and relational dynamics within forensic science laboratories influence employee performance and overall productivity. Drawing on sociology, psychology, economics, and management, this framework provides a lens to understand the complex interplay between organizational design and human behavior in this specific context. By applying this perspective, this research seeks to address operational and logistical challenges prevalent in crime laboratories. Miles (2012) conceptualizes organizations as deliberate structures where individuals collaborate toward shared objectives. This perspective emphasizes the intentional design of organizations to achieve specific goals through collective efforts. Forensic science laboratories, as intricate social systems, require meticulous structuring and management to optimize performance, accuracy, and efficiency.

This research posits that forensic science laboratories are social entities with distinct structures, cultures, and objectives. Organizational design significantly impacts employee behavior, job satisfaction, and productivity. Effective organizational management is crucial for overcoming operational and logistical challenges in forensic science.

To complement this perspective, Resource Dependence Theory (RDT) is incorporated. This theory posits that organizations rely on external resources for survival and growth. RDT explains the dependency of organizations on resources in their external operating environment. RDT suggests that, in the supply chain, member firms should be dependent and collaborate to seek higher performance gains in the long-run instead of pursuing short-term benefits at the expense of others. According to the RDT, firms are dependent on resources provided by others in order to sustain growth, as well as other organizations that may be dependent on them (Pfeffer and Salancik, 1978). One important assumption of the RDT is that firms cannot be fully self-

sufficient with regards to strategically critical resources for survival. Forensic science laboratories are dependent on funding, technology, human capital, and legal frameworks. By understanding these dependencies, laboratories can develop strategies to mitigate risks, foster collaborations, and optimize resource allocation.

This study aims to contribute to the body of knowledge on forensic science laboratory management by providing insights into organizational factors influencing performance. By applying organizational theory and resource dependence theory, this research seeks to inform strategies that enhance efficiency, accuracy, and overall performance in forensic science laboratories.

### Objectives of the Study

This study aims to determine the problems encountered in DNA testing in the Scene of the Crime Operation in Cauayan City. More specifically, the study aims to:

1. Identify the specific challenges and bottlenecks experienced by the Cauayan City Crime Laboratory Office (CCCLO) in the DNA testing process; and
2. Determine the strategies implemented by the CCCLO to address the identified problems in DNA testing.

### METHODOLOGY

In this study, the researcher used descriptive qualitative analysis. This study was conducted at CCCLO, Cauayan City, Isabela Philippines, and its seven (7) personnel were the respondents using purposive sampling. The institution approved an intent letter for gathering the data through interviews and the conduct of the study in coordination with the Chief of the CCCLO. Likewise, the informed consent was signed by each of the participants before the conduct of the interview. The interview guide was used to gather data and the proceedings were recorded through the audio recorder. The responses to the interview questions were treated using predetermined categories, and thematic analysis. The participants are identified in this study as Respondent A, B, C, D, E, F and G to conceal and safeguard their identity. The researchers also respected the privacy, confidentiality and anonymity of the participants by having a closed-door one and one interview. After completing the study, a copy of the research paper was forwarded to CCCLO, San Fermin, Cauayan City, Isabela, the Philippines for the dissemination, and possible utilization of significant findings.

### RESULTS AND DISCUSSION

#### 1. Challenges and bottlenecks experienced by the Cauayan City Crime Laboratory Office (CCCLO) in the DNA testing process

The following discussions encompass the personnel of CCCLO revealed as among the problems encountered in DNA testing, specifically on DNA laboratory equipment or tools, personnel conducting the test, and the preservation of DNA evidence.

**Lack of core DNA analysis equipment.** In dealing with DNA testing, laboratory equipment is essential. Lack of laboratory equipment may lead to a delay in the administration of justice. The respondents of this study stated that the problems encountered in DNA testing spring from lack of DNA testing equipment. This insufficiency of DNA testing equipment is supported by the statements of the respondents.

As stated by Respondent A, *"wala tayong DNA equipment yun lang yun. Actually, sa Region 2 wala tayong DNA equipment na magagmit for DNA analysis."* (We just don't have that DNA equipment. Actually, in Region 2 we do not have DNA equipment available for DNA analysis) and a follow-up statement of respondent A that *"ang magiging problema talaga when it comes to region, mga provincial hindi pa ganun ka kumpleto yung laboratory equipment"* (The problem really is that the region, or province is not yet fully equipped with laboratory equipment). Also, respondent C seconded that *"awan gamit mi ittoy sir for DNA testing idiy amin"*

*Crame ti ayan na adiy manen ti problema*” (We don't have any equipment here sir for DNA testing, it's all in Crame, that's the problem again). According to respondent B, “*yung mga laboratory equipment natin more on collection lang*” (Our laboratory equipment is more on collection only). Furthermore, respondent D said, “*more on the collection of evidence lang kami sir ta awan met gamit mi for DNA testing*” (more on the collection of evidence because we have no equipment for DNA testing). Respondent E also revealed, “*adda sir ti laboratory equipment mi sir ngem pang collect lang ti evidence ngem nu pang DNA test awan sir*” (we have laboratory equipment but only for collecting of evidence but for DNA test we don't have).

The participants' answers establish that more than just the absence of the equipment for DNA testing, a secondary problem goes with the transport of the evidence to Crame. Such a situation adds to the waiting time for the results compared to when the equipment is available at the CCCLO. The opportunity for the development and enhancement of the skills of the analysts also becomes limited.

Clarifying further the problem with the laboratory equipment, all of the respondents affirmed that the non-availability of DNA testing equipment is accounted for by the cost of that laboratory equipment. As stated by respondent A “*Kasi ang halaga kasi ng equipment ay million at hindi lang kasi doon nag... kung nagprovide kasi sila ng DNA equipment sa atin yung maintenance pa ang medyo mabigat din yung maintenance*” (Because the cost of our equipment is million and if they provide DNA equipment to us then the maintenance is still a bit expensive). Respondent B also said, “*Ang price niyan sir million po ang mga equipment na yan very expensive ah wala pa tayong.. hindi pa capable yung PNP na mag purchase ng ganun sa bawat region nga ag procure iti kasjay nga machine*” (The price of the equipment sir is million it is very expensive and ahh we do not have the funds .. the PNP is not capable to buy the same in every region and procure that machine). Respondent C also said, “*Mabalin siguro nga agi provide da ngem very expensive kasi ang mga equipment ginagamit nila*” (They can probably provide, but the equipment they use is very expensive). As mentioned by respondent D, “*Kasi nangina ngamin ti equipment na awan ti budget*” (The equipment is expensive and no budget). Respondent E also stated that, “*Yung mga equipment kasi ng DNA testing expensive sir kaya wala kaming mga ganung gamit nasa Crame yung mga equipment na yun sir*” (The equipment for DNA testing is expensive so we don't have that equipment, those equipment are in Crame sir). As supported by respondent F, “*sobrang mahal kasi mga equipment na yun sir*” (Those equipment are too expensive sir). And lastly, a follow-up statement of Respondent G saying that “*nangina agijay gamin sir nga gamit ti pang DNA testing..*” (those equipment for DNA testing is too expensive sir).

The unavailability of the DNA equipment impedes the progress of the crime investigation activities of the CCCLO. This problem with laboratory equipment weighs heavily on serving justice speedily, or the resolution of cases. Unavailability of laboratory equipment in DNA testing will delay the identification of possible suspect or victim, unidentified cadaver, and the administration of justice of cold cases. Maybe the PNP-Crime Laboratory Division may face persistent backlogs of requests for DNA testing and a low level of quality. Hoffman, (2017) described in his article that the integration of lean into the DNA unit's management and testing processes, which ultimately resulted in increased productivity and reduced turnaround times for DNA results while maintaining a high level of quality.

As mentioned by the respondents, the absence of DNA testing equipment lacks funding and the expensiveness of DNA laboratory equipment. This finding implies that aside from the limitation of experiences in DNA testing among the analysts, funds for the smooth operations of the CCCLO in their activities can also be at stake.

The demand for crime laboratories is often higher than their capacity, causing a backlog of unprocessed, untested evidence. Several federal grant programs have contributed to clearing backlogs of forensic DNA evidence in crime laboratories. Between 2004 and 2011, NIJ awarded approximately \$542 million to state and local DNA laboratories. Federal funding helped these laboratories increase capacity almost fourfold between 2005 and 2010. At the same time, most jurisdictions remain hard-pressed to keep up with the demand

(Convictions, W., Exonerations, D. N. A., & Testify, S. E. C. How Forensic Science Is Transforming Criminal Justice).

As BASHINSKI (2019) estimates of the total cost of the equipment required for Southern blot RFLP analysis range up to \$100,000, although much of the equipment may already be available in the laboratory. The cost of probes and other reagents has been estimated at approximately \$50 per sample. The basic equipment for PCR costs an additional \$10,000, with reagent costs of approximately \$25 per sample.

**Shortage of trained DNA analysts.** Aside from the DNA laboratory equipment, another problem encountered by the respondent concerns the personnel conducting the DNA test. Respondent A said “*Dito sa Region 2 collection of evidence lang tayo wala din kasi tayong DNA analyst dahil basic lang yung natapos ko din dahil kulang din ng officers ng region 2 so hindi rin ako makapag undergo ng training*” (Here in region 2 we only conduct collection of evidence and we don’t have DNA analyst and I only finished the basic and we only have a few officers in region 2 so I couldn’t undergo training). As supported by the statement of respondent G that “*awan ah sir ti DNA analyst tayo ditoy Region 2*” (we don’t have DNA analyst here in Region 2 sir)

Respondent B stated, “*Awan ti DNA analyst mi ditoy sir am amin nga kuwa nga for DNA examination sinasubmit lahat sa Crame collection and preservation of evidence kami lang*” (We have no DNA analyst here, all DNA subject for examination will be submitted to crame). Even C also said, “*Awan ti problema iti personnel sir ta well-trained kami iti SOCO. Adda training mi nga SOCO to conduct and collect all evidence adiy lang ti problema awan ti DNA analyst tayo ditoy sir. Ti DNA testing eh diay Doctor idiy Crame*” (We have no problem in personnel because we were well trained in SOCO. We have proper training here in SOCO to conduct and to collect all evidence. The only problem is that there is no DNA analyst here that is why DNA testing is done in Crame where the DNA equipment, as well as the doctor, is found). However, respondent D said, “*Nu ti personnel awan met problema sir adiy lang nga talaga ti DNA analyst ditoy sika mi ti mangipan idiy Crame nukwa sir adiy collected evidence*” (We don’t have problem in personnel. Just that we don’t have a DNA analyst here so we bring the collected evidence to Crame). Furthermore, respondent D also said, “*Ittoy region 2 sir awan pay ti trained nga DNA analyst na.*” (Here in region 2 there is no trained DNA analyst yet.) Even E stated, “*Awan ti trained nga DNA analyst tayo ditoy sir more on collection and preservation of evidence kami lang ditoy sir*” (We do not have a trained DNA analyst here we are more on the collection and preservation of evidence here sir). And also mentioned by respondent F that “*trained kami na mag collect ng evidence ng DNA sample pero wala kaming DNA analyst dito sa Cauayan sir*” (we are trained in collecting evidences such as DNA sample but we have no DNA analyst here in Cauayan sir). As supported by the statement of respondent G that “*awan ah ti DNA analyst mi ditoy SOCO Cauayan*” (we have no DNA analyst here at SOCO Cauayan)

The responses gathered for the participants in this study is revealing not only in as far as the person to conduct the DNA analysis is concerned, but also, the inability of the personnel to go for training in DNA analysis. As revealed, the personnel in SOCO Cauayan City is seemingly undermanned, that is why even if one of the staff can qualify for training, it cannot be possible because all the more, the department will be under-staffed. The experiences of the CCCLO are then limited to the collection of evidence.

The respondent's overall statement is that they have a problem in terms of personnel conducting the test because they have no DNA analyst in their office. They only conduct collection, preservation, and proper packaging of DNA sample then send it to NHQ-Crime Lab. Division for DNA examination. The finding reveals that the problem is a lack of trained DNA analysts. This finding is consistent with that of Hicks (2018), who found out in his study that one of the problems plaguing forensic science is that many analysts are woefully under-educated and lack proper training. The lack of advanced education in the hard sciences can indicate that many analysts have not experienced severe scientific research methodology and laboratory protocols.

**Absence of dedicated DNA laboratory facility.** In crime scene processing, collection of evidence is the beginning step in the life cycle of an evidentiary item. Accurate tracking and securing storage location are

essential in maintaining the integrity of the evidentiary items collected during an investigation. This will be the most essential item that can be presented during the trial. One core challenge identified by the Needs Assessment is the levels of funding needed to provide the numerous types of services requested, especially for disciplines beyond DNA analysis, and to meet the evolving demands of the system. Advancements in forensic services are also tempered by the absence of a dedicated federal funding stream for forensic science research and development programs (National Institute of JusticeJ).

This study surfaced that the problem lies not much in the preservation of DNA evidence but also the facility and the transport, as supported by the quotes from the participants.

Respondent A said, *“Ah sa preservation, collection and preservation wala namang problema.”* (We have no problem on the collection and preservation.) While Respondent B agreed that there is no problem with the preservation, he revealed, *“awan ti problema ti preservation adia lang sir kurang kami nga talaga ti facility.”* (There’s no problem in the preservation, rather it is on the lack of facility). Furthermore, respondent C said *“ah awan met sir ti problema ah maencounter mi ta ammo mi ti procedure adia lang ah kurang nga talaga ti facility mi.”* (We have not encountered any problem because we know the procedure rather it is on the lack of facility). In addition, Respondent D said, *“Ahh wala pa naman kaming naencounter na problema sir as long as naka airdry diay DNA sample.”* (We didn’t encounter any problem, as long as the DNA sample was air-dried). Respondent E also said, *“Awan ti problema sir kanyami ti collection ken preservation kasi ahh I airdry mi lang nukwa then proper packaging sir ahh ang problema lang sir nukwa yung pagdala ng evidence sa Crame kasi personal naming idadala dun malayo”* (We have no problem in the collection and preservation all we have to do is air-dry then proper packaging, the only problem is the transportation of evidence because we need to submit personally the evidence to Crame and it is very far). As supported by respondent F states, *“awan pay met naencounter mi nga problema sir pagdating sa preservation adia lang sir pagtransport mi idia NHQ ket nagadayo”* (We haven't encountered any problems when it comes to preservation, it's just that when we transport it to NHQ it's too far away).

Overall, this researcher found out that the preservation of evidence is not a problem but the facility and the transportation of DNA evidence to the NHQ-Crime Laboratory Division. As further suggested by the responses, the availability of facilities would have been better. Even if the participants claimed that they are well-trained in collecting and preserving or securing the samples, their work would tremendously be made more fulfilling had they been provided in their laboratory all the facilities that they need so that the evidence will be guarded better. The advantage of having all facilities within reach of the investigators is supported by the studies that follow. Bashinski’s (2019) study reveals that the use of crime laboratory services falls exponentially with the distance between the police agency and the crime lab that serves it and becomes vanishingly small when that distance exceeds 50 miles. The same phenomenon may be observed between the referring crime laboratories and a centralized forensic DNA facility. Distance creates logistical problems with evidence transport and can compound problems of maintaining the chain of custody of the evidence. However, the collection and preservation of forensic evidence are vital to an effective investigation. If evidence is not properly collected, degraded, or contaminated during collection, handling, transport, or storage, the characterization and analysis may be bargained (Asif, 2019).

Furthermore, for successful adoption of use of DNA in crime investigations, facilities and resources such as crime and forensic labs, technicians, testing materials and other accessories ought to be available (Njeru, 2020).

## 2. Strategies implemented by the CCCLO to address the identified problems in DNA testing

**Transporting of DNA Sample to NHQ Crime Laboratory Office.** Because of lack of DNA laboratory equipment, the CCCLO personnel needs to transport the DNA sample to the NHQ-Crime laboratory division in Camp Crame personally for DNA examination. According to A, *“Ahh after packaging kasi ahh dinadala*

*na namin sa NHQ-Crime lab division yung yung evidence for DNA examination lahat yun dadalhin dadalhin naming sa Camp Crame Crime lab specifically the DNA division,"* (After packaging we will submit the sample to the NHQ-Crime lab division for DNA examination. All collected samples will be transported to Camp Crame Crime lab, specifically the DNA division." And as a follow-up statement of A, "*Winowork out na ng taas kung paano iprovide sa region yung kung anong meron sa NHQ-Crime Lab.*" (The NHQ is now working on it on how to provide the region the equipment that the NHQ-Crime Lab has.) Even B said that "*After ngarud sir after right after iti collection, ipreserve mi didiay opisina, idiy region, provincial offices and then after that kelangan ehh kwa hand carry ng mismong personnel sa Manila.*" (Right after the collection we will preserve that in the office, in the region and provincial offices and then after that the personnel needs to hand carry that to Manila.) However, C said, "*All examination for DNA test endorse to Camp Crame amin sir personal mi nga iyapan amin idiy Crame*" (All examination for DNA test are endorsed to Camp Crame and we are the ones personally transporting those to Crame.) In addition, respondent D said, "*Sika mi mangipan idiy crame nukwa sir adiy collected evidence.*" (We will personally transport the collected evidence to Crame.) Also, E said, "*sika mi mangi travel nukwa sir idiy Crime lab division ijay Crame.*" (We will transport the sample to the Crime lab division in Crame.) As supported by the statement of respondent F, "*sika mi ah sir mangipan ijay NHQ i travel mi nukwa*" (we are the one who will transport to NHQ).

As to the respondents' statements, they have no better option than to transport the collected samples to Crame because they have no available equipment for DNA testing. They personnel personally hand-carry the collected pieces of evidence to the NHQ-Crime lab Division for examination. This demand on the work of the CCCLO can be doubly demanding and difficult since whatever happens to the samples being transported will be on the personnel's accountability.

Holmes (2018) stated that swabs should allowed to dry for transport to the laboratory for refrigeration or stored until DNA analysis is possible. In situations when the sample is not under the direct control of the sample custodian, it can be preferably placed with limited access during transportation and storage in a locked vehicle, refrigerator, or laboratory (Asif, 2019). Officers transporting DNA evidence and maintaining chain of custody, should avoid storing the evidence in places that may get hot, such as the trunk of a car (CHIN).

**To Regularly Conduct Enhancement Trainings for DNA Analysts.** To maintain the quality and integrity of the DNA sample, people particularly, the DNA analyst, handling it must be competent in all aspects, and competence is gained not only from experience but also from training. According to respondent A, "*Ang inuuna kasi ngayon ahh DNA yung DNA analyst muna yung magkaroon tayo ng training sa DNA analysis.*" (As of now the focus is to have a training on DNA analysis." Even B also said, "*Ongoing yung training ngayon doon sa Camp Crame lahat kasi ng ahh training ng DNA dapat ang magconduct lang diyan; ang may authority lang na mag conduct Camp Crame DNA division kasi yung DNA natin sa Crame sila yung ISO certified.*" (The training is on-going in Camp Crame because all the training and those authorized to conduct the training in DNA are in Camp Crame DNA division, especially that they are ISO certified.)

When it comes to the so-called Forensic staff, regardless of whether they are doing fieldwork (on the scene of a criminal event) or in a lab, it is necessary to have certain skills related to the evidence material such as detection, identification, protection, documentation (written and photo/video), packaging, labeling, safe transport, to ensure that it does not change the evidence material by proper handling, which could make it partially or completely unsuitable for the analysis and thus negatively affect the results of the analysis. Personnel should be trained to ensure that no material changes (physical, chemical or biodegradable nature) occur to prevent material loss or contamination, to avoid sampling, both when locating and sampling, as well as during transport or disposal (if necessary fridge/freezer), and handling the same during laboratory work and storage after completing the analysis (Ivanovic, 2019).

It is expected that with the increased number of trained forensic DNA analysts, there will be an improvement in the quality of forensic DNA evidence presented in courts and a reduction in backlog (Nambati, 2020).

To support an appropriate level of quality assurance and case review, a laboratory should be in a position to train at least two DNA analysts or to participate in a collaborative peer review arrangement with another DNA testing facility (Bashinski, 2019).

The CCLO personnel's responses and the literature cited all point to the need for training for one to become an expert in doing DNA analysis.

**Air-drying of DNA sample.** Another way the CCLO personnel approach the problems encountered relative to DNA testing is to maintain or continue their practice of making certain the preservation of the DNA sample. When asked what they do with samples, the respondents gave the following answers.

To avoid contamination of DNA evidence proper collection and preservation are very important to maintain the integrity of the evidence during court presentation. According to A, "*Meron naman tayong ano meron naman tayong ahh proper packaging on that..example kasi yung sa crime scene ahh yung sa dugo na collected namin ini airdry na lang naming yun and then after airdrying saka kami magkakaroon ng proper na packaging na dun sa ebidensya.*" (We have proper packaging on that.. for example we collected blood sample all we have to do to air dry the blood sample and after airdrying then proper packaging of the evidence will be done.) As respondent B also said, "*Regarding iti ayan ti pag preserve idiy ayan ti idiy DNA sample although after collection may air dry.*" (Regarding the preservation of DNA sample, although after collection we airdry the sample.) Even C said, "*Na nu fresh nga dara iyangyang lang I airdry mo lang haan mo nga I direct iti sunlight airdry lang sir.*" (For fresh blood we airdry instead of direct sunlight, just airdry and that's it.) Moreover, respondent D said, "*I air-dry mi nukwa sir jay DNA sample.*" (We airdry the DNA sample). Also, respondent E stated, "*Nu malpas mi nga ahh ma collect agidiay ebidensya lalo nu ahh DNA material ti aramiden mi nukwa ket I airdry mi and ah proper packaging kasjay sir.*" (After we collect the evidence specially DNA material all we have to do is to airdry and then proper packaging). Respondent G also stated, "*nu ma kolekta min sir ti aramiden mi I airdry mi tapos proper packaging*" (after we collect all we have to do is to airdry and proper packaging sir).

In general, the respondents commented that the DNA sample should be air-dried at room temperature and not to be put under direct sunlight to maintain the quality and integrity of the evidence and avoid contamination before proper packaging.

The importance of protecting the quality and integrity of evidence is supported by the literature herein cited. The potential for contamination of forensic evidence is especially salient when considering legal cases based on DNA evidence. However, DNA evidence is considered by many to be nearly infallible if handled and processed with due care. The reality surrounding DNA paints a much different picture (Hicks, 2018).

As stated by Mozayani and Parish-Fisher (2017), for packing of items with biological stains, use paper bags and cardboard. Avoid the use of plastic bags as these retain moisture and can speed the degradation of the sample. Exhibits containing liquid samples such as blood and semen stains should be allowed to dry before packaging. When the swabbing technique is applied, will enable the swab to dry in sir without touching other objects. It is preferred to air dry the samples before packing the samples in paper envelopes (Asif, 2019). Direct sunlight and warmer conditions may degrade DNA, so the best way to preserve DNA evidence is to keep it in a cold environment (CHIN).

DNA evidence needs proper collection and preservation. From this evidence we can extract a lot of essential information that helps in solving crimes and also provides a lead in case findings (Khanna, 2020).

Overall, this study verified that despite the absence of DNA testing equipment in the CCLO, its personnel exert their efforts to maintain their good practices of protecting the integrity of the DNA samples that they gather. Even if there is the unavailability of facilities, they are not hindered from performing their functions and maximizing their capacity.



## CONCLUSION

The Cauayan City Crime Laboratory Office (CCCLO) exhibits proficiency in DNA sample collection and preservation. Nevertheless, this study underscores substantial limitations in its DNA analysis capabilities. A dearth of essential laboratory equipment, coupled with the absence of a dedicated DNA facility due to budgetary constraints, significantly hinders in-house DNA testing. Moreover, the limited number of trained DNA analysts exacerbates these challenges. To enhance forensic capacity, the CCCLO must prioritize the procurement of requisite laboratory equipment, invest in comprehensive personnel training, and explore strategic partnerships or alternative testing arrangements. By implementing these recommendations, the CCCLO can optimize its DNA testing services, leading to accelerated case resolution and improved investigative outcomes.

## RECOMMENDATIONS

Based on the study's findings and conclusion, the following are hereby recommended for the PNP-NHQ:

1. Secure funding for the procurement of essential DNA laboratory equipment in Region 2 to improve DNA analysis capacity, and specialized temperature-controlled transportation vehicles to ensure the secure and intact delivery of DNA samples to the NHQ-Crime Lab. Division.
2. Implement a comprehensive DNA analyst training program to increase the number of certified forensic DNA analysts in the country focusing on advanced techniques and quality assurance and conduct a comprehensive workforce analysis to identify critical staffing gaps in Crime Laboratory Offices and develop a phased recruitment and training plan to fill vacancies.

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