International Journal of Health, Economics, and Social Sciences (IJHESS)
Vol. 7, No. 1, January 2025, pp. 395~405
DOI: 10.56338/ijhess.v7i1.6984
Website: https://jurnal.unismuhpalu.ac.id/index.php/IJHESS

The Role of Fingerprint-Based Forensic Laboratories in Supporting the Disclosure of Firearms Misuse Cases in the North Sumatra Regional Police Area

Yudiatnis[1]*, Syawal A. Siregar[2], Rudolf Silaban[3]
[1]Master of Law Student, Darma Agung University, Indonesia
[2]Darma Agung University, Indonesia

Article Info

Article history:

Received 19 Nov, 2024
Revised 10 Jan, 2025
Accepted 20 Jan, 2025

Keywords:

Forensic Laboratory, Firearms
Fingerprints, Firearms Misuse

ABSTRACT

The Indonesian National Police Forensic Laboratory plays a crucial role in supporting the disclosure of firearms abuse oriented towards firearm fingerprint analysis. Fingerprints on firearms are one of the most important forensic evidence in criminal investigations. In the context of firearms abuse, fingerprints found on weapons can provide critical information about who has held or used the weapon. This study aims to analyze the role of fingerprint-based forensic laboratories in supporting the disclosure of firearms abuse cases in the North Sumatra Regional Police. The research method uses a qualitative method with a normative legal approach, and data collection is done by conducting interviews with laboratory officers, as well as reviewing documents and case reports. The results of this study conclude that fingerprint analysis on firearms, bullets, and cartridges allows for the identification of perpetrators in a scientific and accurate manner. Then, there are several obstacles that affect the role of firearm fingerprint-based forensic laboratories in the North Sumatra Regional Police, namely the challenges in managing evidence that may be damaged or contaminated, as well as the need for technological and technical updates even though the facilities at the North Sumatra Regional Police Bidlabfor are complete. In addition, the lack of coordination between the forensic laboratory and the investigation unit can slow down the examination and analysis process.

Corresponding Author:
Yudiatnis
Master of Law Student, Darma Agung University, Indonesia
Email : atnisyudi@gmail.com

INTRODUCTION

In efforts to support the disclosure of criminal cases, the role of forensic laboratories is increasingly vital, especially in dealing with crimes involving firearms. In the jurisdiction of the North Sumatra Regional Police (Polda Sumut), cases of misuse of firearms are often a serious concern because of their broad impact on public security and order. In this context, fingerprint-based forensic laboratories play an important role as one of the main tools in revealing the identity of criminals through irrefutable scientific evidence. At Polda Sumut, the challenges of disclosing cases of misuse of firearms involve various factors, such as limited resources, technology, and complex geographic terrain. However, the existence of a forensic laboratory with fingerprint analysis capabilities provides a significant advantage in the investigation process. By using methods such as digital imaging, chemical processing, and automatic

matching with national databases, forensic laboratories can help identify perpetrators, even if they try to hide their tracks.

The use of fingerprint-based forensic laboratories is not only limited to revealing the identity of the perpetrator. Fingerprint evidence is also often used to strengthen charges in court. Thus, forensic laboratories not only support the operational tasks of the police, but also make a major contribution to the criminal justice system as a whole. The reliability of evidence produced by fingerprint-based forensic laboratories helps ensure that justice can be upheld better. In addition, the integration of the latest technology in fingerprint analysis, such as automation systems and artificial intelligence, further increases the efficiency and accuracy of the investigation process. This is especially relevant in areas with high crime rates such as North Sumatra, where fast and accurate case disclosure is a top priority. The use of this technology allows the police to handle a larger volume of cases without sacrificing the quality of the investigation. However, the success of fingerprint-based forensic laboratories also requires the support of competent human resources and ongoing training. Laboratory technicians and investigators must have in-depth knowledge of fingerprint collection, analysis, and interpretation techniques. Regular training and collaboration with international institutions can help increase the capacity of local experts, thereby ensuring that the quality of investigation results remains at a high standard. In cases of firearm misuse, fingerprints found on weapons are often one of the few physical clues available. Therefore, proper evidence management, from collection at the scene to analysis in the laboratory, is very important to maintain the integrity of the evidence. In the North Sumatra Regional Police, cooperation between field investigators and forensic laboratories has shown significant results in uncovering various major cases, including illegal arms trafficking networks.

Fingerprints are one of the most reliable biometric identification methods and have been used for more than a century in forensics. According to Saferstein [1], fingerprints are a form of physical evidence that can connect a person to an object or crime scene (TKP). In the context of firearm misuse, fingerprints found on weapons can provide critical information about who has held or used the weapon. The uniqueness of each individual's fingerprint pattern makes it an accurate and irreversible identification tool. In cases of firearm misuse, fingerprints left on weapons or ammunition are often the main key to linking the perpetrator to the crime that occurred. The technology used in modern forensic laboratories allows fingerprint analysis to be carried out quickly and precisely, including on difficult surfaces, such as metal or plastic which are often found on firearms. In this context, fingerprints found on firearms can be very important evidence in identifying the perpetrator of the crime. Fingerprints on firearms are identified through special techniques in forensic laboratories, which aim to link the weapon to a specific individual.

LITERATURE REVIEW

The importance of forensic laboratories in law enforcement, especially in solving cases involving firearms. As explained by Habeahan [2] that technological advances in forensics have enabled fingerprint identification to be carried out with a very high level of accuracy. Then, on the other hand, Munandar [3] emphasized the importance of proper evidence management procedures in maintaining the integrity of forensic analysis. In the case of firearms, fingerprints are often found on metal or plastic surfaces that require special techniques for their removal. In the context of an area such as North Sumatra, where the crime rate is quite high, this progress has a significant impact in supporting the investigation of firearms abuse cases. Rachmie [4] highlighted that the existence of a forensic laboratory equipped with the latest technology is an urgent need for police institutions in Indonesia, including the North Sumatra Police. Then, Rachmad [5] also stated that fingerprint-based forensic laboratories are very strategic in supporting the investigation of firearms abuse cases because they can rely on an automated fingerprint matching system and found that this technology has a high level of accuracy, although it still requires validation by human experts. Both opinions, it can be concluded that the importance of investment in laboratory infrastructure and human resource training as a strategic step to improve the effectiveness of law enforcement.

Firearm fingerprints in forensic laboratories are the principles used to identify and link fingerprints found on firearms to specific individuals. This is an important area in forensics and criminal investigations, because fingerprints can provide clues about who has held the weapon and, possibly related to certain criminal activities. Fingerprints on firearms as one of the most important forensic evidence in criminal investigations.

Fingerprint analysis on firearms conducted by the National Police forensic laboratory in this case the North Sumatra Police Bidlabfor, there are two different things, namely fingerprints (individual) and firearm fingerprints. Firearm fingerprints and individual fingerprints found on firearms are two interrelated concepts but have fundamental differences, especially in the context of forensic analysis for examining firearm misuse cases. According to Fraser [6] regarding the differences between fingerprints (individual) and firearm fingerprints in forensic analysis, namely

Individual (Human) Fingerprints

Individual fingerprints refer to the unique patterns found on the tips of human fingers. These patterns include arches, loops, and whorls, which are considered unique to each individual, even identical twins. In a forensic context, individual fingerprints are used to identify or associate an individual with an object or crime scene. By analyzing fingerprints found at a crime scene or related object, investigators can determine whether an individual has touched or been at the location. Fingerprints are analyzed through methods such as direct ink fingerprinting, the use of powders to reveal latent fingerprints, or digital technology to match fingerprints to databases.

Firearm Fingerprints (Bullets and Bullet Casings)

Firearm fingerprinting, or more accurately ballistic fingerprinting, refers to the unique markings left by firearms on bullets and shell casings when fired. Each firearm leaves unique markings caused by small differences in the gun's barrel, trigger mechanism, or other parts. In forensics, firearm fingerprint analysis is used to determine whether a bullet or shell casing found at a crime scene was fired from a specific gun. This helps investigators link a particular firearm to a specific crime. Firearm fingerprint analysis is typically performed by comparing recovered bullets or shell casings to bullets or shell casings fired from a suspected firearm in a laboratory. Technologies such as comparative microscopy are used to compare the micromarks on bullets and shell casings. Then, according to Bose & Kabir [7], in comparing firearm fingerprints, they can be divided into two main categories, namely:

Physical Comparison

Refers to techniques and methods that directly involve the physical analysis of fingerprints found on firearms. This involves the collection and analysis of fingerprint impressions that can be seen or made clear by certain techniques. Then, the techniques and methods are 1) fingerprint printing which uses materials such as fingerprint powder, silicon sheets or ink to create an impression of the fingerprint impression on the firearm; 2) chemical processing which is a method such as the use of chemicals (e.g. ninhydrin or superglue fuming) to increase the visibility of fingerprints that are not visible to the naked eye; 3) visual and digital analysis which uses microscopes or scanning software to examine and analyze the details of fingerprints printed on the firearm..

Non-Physical Comparison

Refers to techniques that do not involve direct analysis of fingerprints found on firearms, but rather utilize data collected from various sources to support identification. This comparison uses the following techniques and methods: 1) Database and digital comparison, which uses a forensic database to match fingerprints found with registered fingerprints. An automated system (AFIS-Automated Fingerprint Identification System) can be used for this matching; 2) Profiling and context, which analyzes the context in which firearm fingerprints (bullets and cartridges) are used to understand the possibility of the firearm being used; 3) statistical analysis and forensic models, which uses statistics and probabilistic models to evaluate the likelihood of a match between firearm fingerprints (bullets and cartridges) found and registered. The explanation of the physical and non-physical comparisons is that there are several processes in examining firearms misuse cases, as stated by Nickell & Fischer [8], namely:

Physical Comparison Process

Fingerprint Capture, through wet and dry methods. The wet method is using chemicals such as ninhydrin or superglue fuming to develop fingerprints on the surface of firearms or bullet casings. Then, the dry method is using special tape to print fingerprints that have dried on firearms or bullets.

Comparative microscopy analysis, by comparing the fine details of identified firearm fingerprints on bullets and cartridges with recorded firearm fingerprints. Comparative microscopy helps to compare and assess the match between recovered firearm fingerprints and existing references. Using a microscope to assess the match of firearm fingerprints by comparing the fine details of the firearm fingerprint pattern on bullets and cartridges, which can confirm or reject the match based on the unique characteristics of the firearm fingerprint.

Non-Physical Comparison Process

Non-physical comparison involves analysis that does not require direct examination of fingerprints on the firearm, but uses data and information to support identification. There are two processes carried out in non-physical comparison, namely The firearm fingerprint database (bullets and cartridges), can be found compared to the registered firearm fingerprint database, which aims to assist in identifying or matching firearm fingerprints with registered bullets and cartridges. The purpose of this process is to assess information related to bullets and cartridges with suspected firearms so as to strengthen information about the match of firearm fingerprints used as evidence. 2. The use of comparative microscopy in a non-physical

context, can be used to verify data obtained from databases or other sources with physical details of firearm fingerprints (bullets and cartridges) found. Aims to strengthen the results of visual comparisons from the microscope with data in the database.

In accordance with this physical and non-physical comparison process, in the examination of firearm evidence in the form of bullets and cartridges, it can strengthen and compare the fingerprint images of firearms taken with a comparative microscope. By using a comparative microscope, forensic experts can effectively examine and compare firearm fingerprints, both in terms of physical details and available information, to produce valid and reliable results in criminal investigations. Comparative microscopes play an important role in the physical comparison of firearm fingerprints (bullets and cartridges), allowing for detailed analysis and accurate identification. While non-physical comparisons rely more on contextual data and information, microscopes can be used to verify and support findings from firearm fingerprint databases (bullets and cartridges).

METHODOLOGY

This study uses a qualitative method with a normative legal approach. This approach is used to evaluate how forensic laboratories contribute to legal evidence through fingerprint analysis on firearms. According to Branco [9] that this normative legal research is a study of written laws and legal norms, documents or books related to the object being studied. The nature of the research to be carried out is classified as descriptive research. The nature of the research used is descriptive, this research is carried out by describing the object of research based on laws and regulations and aims to provide a picture of an object that is a problem in the research. This research also attempts to search for facts by providing the right interpretation of the data with the aim of making a description, picture or painting systematically and facts regarding the problems that researchers are investigating. The descriptive method is intended to describe the state of the object solely as it is. Peter [10] that the data analyzed qualitatively will be presented in the form of a systematic description, then all data is selected, processed and then stated descriptively so that it can provide solutions to the problems in question. In a normative legal manner. then the data is analyzed to understand how the law views and regulates the use of forensic evidence, especially fingerprints, in the evidentiary process. Then a thematic analysis is conducted based on interviews and documents to identify key themes related to the influence of forensic laboratories in law enforcement. This study will conclude to what extent the results of forensic laboratory analysis, especially fingerprints on firearms, influence the legal process in cases of firearm misuse.

RESULT

Forensic laboratories play a very crucial role in the world of law enforcement and criminal investigation. In this modern era, technology and science are developing rapidly, so that traditional methods of solving crime cases are increasingly being replaced by a more accurate and reliable scientific approach. Forensic laboratories provide the tools and techniques needed to analyze physical evidence found at the scene of the crime, which in turn can speed up the process of solving crime cases. Forensic laboratories are the backbone of the modern crime solving process. With a variety of sophisticated technologies and analysis methods, forensic laboratories provide accurate and reliable scientific evidence, which speeds up the investigation and prosecution process. From DNA analysis to digital trace analysis, every aspect of the forensic laboratory contributes to revealing the truth and upholding justice. Investment in forensic technology and continuous training for law enforcement is key to ensuring that forensic laboratories can continue to play a vital role in accelerating the disclosure of crime cases in the future. Moniharapon [11] The rise in crime and misuse of firearms is a security situation that requires special attention. It is not uncommon for firearms to be misused to support robbery accompanied by murder, there are also cowboy or thuggery actions using firearms in the community. Information like this can easily be accessed from the media which intensively reports or makes it headline news, requiring law enforcement officers, in this case the Indonesian National Police, to act to reveal every case of criminal acts using firearms quickly and accurately.

Regulation of the Indonesian National Police Number 1 of 2022, has explained that a firearm is a tool that is partly or entirely made of metal that has mechanical components or tools such as a barrel, striker or trigger, trigger, spring, and bullet chamber that can eject bullets or gas through the barrel with the help of explosives. According to Nichols [12], firearms as a tool designed to shoot bullets or projectiles using energy from the combustion of explosives and firearms function as an important tool in law enforcement and self-protection, but can also be a dangerous tool if misused. Thus, based on the explanation of the firearm, the use and ownership of firearms must specifically comply with the provisions that have been regulated in the territory of the Unitary State of the Republic of Indonesia (NKRI), because firearms are objects that can be dangerous both to others and to oneself, even though the purpose of owning a firearm is also to protect.

One important aspect in law enforcement related to firearms abuse cases is forensic examination, which serves to reveal the truth and support the law enforcement process. In this context, fingerprint-based technology on firearms is one of the methods used to improve the efficiency of forensic examinations. Fingerprints, as one of the most reliable physical evidence in forensic investigations, play a key role in linking suspects to the crime scene (TKP) or certain objects, including firearms used in crimes. In this context, fingerprints found on firearms can be very important evidence in identifying perpetrators of crimes. Fingerprints on firearms are identified through special techniques in forensic laboratories, which aim to link the weapon to a particular individual. The crucial nature of firearm analysis through firearm fingerprints is due to the large number of cases of firearms abuse that undergo a long process of examination and investigation, resulting in new cases with the same motive but unable to quickly reveal the perpetrators. These problems are the basis for the importance of the role of the National Police forensic laboratory through firearm fingerprints. Data from the Forensic Laboratory Center (Puslabfor) Bareskrim Polri with the service areas of Polda Metro Jaya, Polda West Java and Polda West Kalimantan, conducted examinations of firearm evidence in 2022 as many as 83 cases and in 2023 as many as 66 cases. In North Sumatra, based on the North Sumatra Central Statistics Agency, data on firearm misuse fluctuates every year. In 2019 there were 24 cases, in 2020 there were 11 cases, and in 2021 there were 15 cases. Meanwhile, several cases that went viral in the North Sumatra Police work area also made it important to conduct examinations that were oriented towards firearm fingerprints so that it would be easier for the police to find the root of the problem of firearm crime. The cases were shootings and grenade throwing at the end of 2011 in Aceh Province. At least during the period from October 2011 to January 2012, 13 people had died and 13 people were injured due to shooting incidents.

Based on the explanation from the Head of Criminal Investigation Unit, Commissioner General of Police. Sutarman to the media crew of tribunnews.com, the series of events are: (a) October 14, 2011 at 19.15 WIB robbery in Babussalam Village, the perpetrators used 6 long-barreled guns and 1 short-barreled gun causing 1 person to die, the perpetrators stole 300 million, a laptop, and 2 cellphones; (b) October 18, 2011 firearm theft, BRI Pidie, Aceh. There were no victims or losses; (c) November 29, 2011 grenade throwing at the office of the gubernatorial candidate. Crime scene investigation found a pineapple grenade; (d) December 1, 2011 grenade throwing at Hermawan's house, incident 3 injured; (e) December 4, 2011 shooting of plantation farmers. The perpetrators were 2 people with long-barreled guns, 4 people died, 3 injured; (f) December 20, 2011 shooting of a car driver; (g) December 13, 2011 shooting at Lhoksuemawe warehouse, perpetrators used Mio and King motorbikes, no casualties, 2 perpetrators caught, 2 fugitives; (h) December 31, 2011 shooting at Telkom cable workers, Bireun. Allegedly 2 perpetrators. Three died, 7 injured; (i) December 31, 2011 shooting at Istana Boneka shop, Banda Aceh, 1 person died; (j) January 1, 2012 shooting in North Aceh. 1 died; (k) January 5, 2012 shooting in Aceh Besar, short-barreled firearm, 3 died; (l) January 10, 2012 shooting and throwing of Molotov cocktails at the house of the deputy chairman of the Aceh DPR, and a candidate for the regent of North Aceh. Using long-barreled firearms, no casualties. From several shooting incidents, based on a preliminary survey conducted by the author at the Bidlabfor Polda North Sumatra, there is evidence including bullet casings, bullets and grenade levers obtained from the crime scene of Uram Village, Jalan, Geureudung Pase District, North Aceh Regency (Lhokseumawe I), the crime scene of PT. Jimi Mulia, Lajang Village, Sawang District, North Aceh Regency (Lhokseumawe II), the crime scene of BlanCot Tenong Village, Jeumpa District, Bireuen Regency, the crime scene of Istana Boneka Shop in Banda Aceh, the crime scene of Gp.Seureuke Blok B, Langkahan District, North Aceh Regency (Lhoksukon), the crime scene of Aneuk Galong Titi Village, Suka Makmur District, Aceh Besar Regency, the crime scene of Keude Kreueng Village, Kuta Makmur District, North Aceh Regency (Lhokseumawe III), the crime scene of Seramo Irwandi/Muhyan Office on Jln. T. Daud Bereueh, Kuta Alam District, Banda Aceh, and the TKP Mess Menkopolhukam T. Daud Bereuh, Kuta Alam District, Banda Aceh, which were sent to the Bidlabfor Polda North Sumatra to be asked to be examined scientifically. After the examination, it was found that the 7.62 shells and bullets at the TKP (Lhokseumawe I, II, Bireuen and North Aceh) were fired from one 7.62 caliber firearm including AK 47, AK 56. The 5.56 mm shell casings at the TKP (Lhokseumawe I and III) were fired from one 5.56 caliber firearm including M16, AR 15. The 38 SPL caliber bullets from the TKP Aceh Besar I, Banda Aceh, and from the body of the victim SA were fired from one 38 SPL caliber firearm including Revolver types Smith and Wesson, INA, RUGER. The grenade launcher at the scene of the Seramo Irwandi/Muhyan Office in Banda Aceh came from a Type GT-5 PE. A2 Hand Grenade made by Pindad. The grenade launcher at the scene of the Coordinating Minister for Political, Legal and Security Affairs' Mess in Banda Aceh came from a Type K 75 Hand Grenade made in Korea.

From the development of the results of the examination of evidence, in March to April 2012 the Police succeeded in arresting the perpetrators of the shooting. In September 2012 the perpetrators were sentenced to different sentences according to their respective roles and involvement. Based on the statement of the Public Prosecutor quoted by the media Viva News, there were 7 defendants who were combatants or armed civilians, the cases that befell these defendants were not terrorist cases and had

nothing to do with terrorist networks but were purely related to the Aceh Regional Head Election in 2007, where there was disappointment with the elected Governor of Aceh who they had previously supported who was considered to have broken his promise after taking office.

The problems explained above show the important role of the North Sumatra Police forensic laboratory through firearm fingerprinting so that it can support the efficiency of examining firearms abuse cases. The existence of this laboratory not only speeds up the investigation process, but also ensures that every step in the investigation is carried out to a high standard, minimizing the possibility of error and increasing the reliability of the evidence collected. In the context of firearms cases, the forensic laboratory functions as an essential source of evidence, which can reveal many things from simply identifying the perpetrator to analyzing the motives behind the criminal act. As conducted in the examination of evidence in the form of bullet casings, bullets and bullet fragments obtained from the results of the crime scene processing (TKP) by the Bidlabfor Polda North Sumatra, it is known that the robbery with a firearm at Bank CIMB Niaga is related to the robbery of a Bali money changer in Belawan Medan on July 3, 2010 and the shooting at the Hamparan Perak Police on September 22, 2010 which killed 3 people. The results of the arrest on Sunday, September 19, 2010 against 3 perpetrators in Belawan and 2 in Tanjung Balai and confiscated evidence of 1 AK-56 weapon, 1 caliber 9 pistol, 1 caliber 45 pistol, and 1 assembled pistol. The ambush on 1 to 3 October 2010 in the Dolok Masihul hills area of Serdang Bedagai sub-district arrested 9 perpetrators, 6 of whom died. Evidence was confiscated in the form of 1 AK-47, 1 M-16, 1 assembled pistol and 1 manufactured pistol and 700 bullets. From the examination of the firearms and bullets in the forensic laboratory, it was discovered that the firearms confiscated from the perpetrators were the same firearms used in the attack on the Hamparan Perak police station and robberies in a number of other locations. It was concluded that the shootings were carried out using the same firearms.

Overall, the North Sumatra Police forensic laboratory is one of the main pillars in the law enforcement system in Indonesia, which helps facilitate the disclosure of firearms cases in a more efficient and effective manner. Because the Bidlabfor (Forensic Laboratory Division) of the North Sumatra Police as a technical support element for investigations at the Regional Police level with regional service areas covering the North Sumatra Police and the Aceh Police recorded the results of examinations of evidence related to crimes using firearms as many as 14 cases in 2022 and 16 cases in 2023. Thus, the existence and function of this laboratory are becoming increasingly important in the modern era, where the complexity of criminal cases is increasing and the need for accurate scientific evidence is increasingly urgent.

DISCUSSION

Finding fingerprints on firearms, bullets, or cartridges can provide direct evidence linking the perpetrator to the weapon used in the crime. This can help build a strong case against the suspect. Identification of fingerprints on firearms can help link the perpetrator to the scene of the incident or to a particular weapon, which is important in the investigation process. By analyzing fingerprints on bullets and shell casings, forensic laboratories can provide information about how a weapon was used. For example, the number of shell casings found can provide an indication of the number of shots fired. Fingerprints on a firearm can also provide information about who may have handled the weapon before or after the incident, as well as whether the weapon has been used before.

Forensic laboratories help in tracing and identifying chains of evidence that can lead investigators to perpetrators or criminal networks. This can include identifying the same firearm used in multiple cases. Fingerprint analysis can link multiple cases if the same firearm is involved in multiple crimes. However, the biggest challenge faced by Bidlabfor regarding the examination of firearm evidence is when the quality of the evidence is low, such as fingerprints found on firearms or bullets can often be damaged or blurred due to environmental factors or the physical condition of the evidence. This can complicate the identification and analysis process. Therefore, forensic laboratories must use special techniques to develop unclear fingerprints and maximize the available detail. During the collection and analysis process, the risk of contamination or damage to fingerprints must be minimized. Contamination from other sources can affect the results of the analysis and make fingerprints unidentifiable. Thus, forensic laboratories play a very important role in supporting the disclosure of firearm abuse cases, especially in terms of fingerprint analysis of firearms, bullets, and cartridges. Through scientific methods and advanced techniques, forensic laboratories can provide strong evidence and support the legal process in an objective and accurate manner. Despite the challenges and obstacles, the role of forensic laboratories in fingerprint identification and analysis is a key component in criminal investigations and ensuring justice. With proper understanding and application, forensic laboratories can continue to make significant contributions to solving cases and law enforcement.

In Indonesia, firearms case investigations involve various units and divisions within the Indonesian National Police (POLRI), including the Criminal Investigation Division (Bareskrim) and the POLRI Forensic Laboratory (Labfor). This investigation process not only includes firearms identification and tracking, but also ballistic analysis, fingerprints, gunshot residue, and other evidence related to the use of

firearms in crimes. The main purpose of firearms case investigations is to identify perpetrators of crimes, understand the modus operandi, and collect evidence that can be used in court. In addition, this investigation also aims to uncover illegal arms trafficking networks that are often the source of firearms used in crimes. Thus, firearms case investigations have a direct impact on law enforcement efforts and public security. In accordance with the explanation of Termature., et al (2024) that firearm crimes are one of the crimes that must be addressed with focus and seriously so that they must be addressed with sophisticated technology that aims to facilitate the investigation and evidence process in criminal cases using firearms. The process of investigating crimes using technology is commonly called scientific investigation where the role and function are carried out by forensic laboratories.

Firearms case investigations face a variety of complex challenges. First, firearms are often traded illegally, making it difficult to trace their origins. Second, the technology used in the manufacture and modification of firearms continues to develop, requiring sophisticated technical skills and tools from investigators. Third, forensic evidence related to firearms, such as gunshot residue and fingerprints, often requires in-depth and accurate laboratory analysis. In addition, the legal aspect is also a challenge. Regulations governing the ownership, use, and trade of firearms must be interpreted and applied correctly by law enforcement. Mistakes in the interpretation or application of the law can result in failed investigations or even the acquittal of perpetrators. Technology plays an important role in firearms case investigations. The development of forensic technology allows investigators to conduct more in-depth and accurate analysis of evidence found at the scene of the crime. Technologies such as ballistic identification systems, gunshot residue analysis, and automatic fingerprint matching are invaluable tools in solving cases involving firearms. Ballistic identification systems, for example, allow investigators to match projectiles and shell casings found at a crime scene to national or international databases, thereby identifying the weapon used. Gunshot residue analysis helps determine whether someone fired the shot or was near the firearm that was fired.

Forensic laboratories are important facilities in law enforcement, especially in investigating criminal cases such as the use of firearms. Therefore, Termature [13] investigations in forensic analysis can help answer several questions such as: (1) shooting distance, (2). The direction of the bullet's travel, (3). Whether the alleged perpetrator had just fired. Analysis of the distance and direction of the bullet's movement is part of the effort to reconstruct the incident. Collecting and analyzing gunpowder residue on the alleged perpetrator's hands can answer the question of whether the person concerned has fired this new firearm. When the bullet is detonated, unburned or partially burned gunpowder particles plus smoke and particle residue are scattered at the muzzle of the firearm following the direction of the bullet. At the same time, some of these particles are scattered back towards the shooter's hand so that they stick to the shooter's hand.

The explosion pattern and direction of the bullet can be analyzed to help reconstruct the shooting distance and/or the relative position of the perpetrator and the victim. Weli [14] In shooting cases, information is usually needed about the estimated distance from the muzzle of the firearm to the victim. Determining this shooting distance is very important, especially in cases of suicide and the suspect's confession that he shot in self-defense against threats by the victim. Both types of cases must occur at close range. In an effort to determine the shooting distance, it is necessary to detect and identify gun shot residue and interpret the shot and the scattering pattern of gunpowder. In close-range shots, gunpowder residue sticks around the shooting hole. If the residue found does not contain carbon charcoal, this indicates that the distance is medium (around 50 cm to 75 cm). If the shooting is carried out from a distance of more than 1 meter, usually no gunpowder residue is found on the victim's body. If traces of the muzzle of a firearm are found around the entrance hole, it is certain that the shooting was carried out by attaching the muzzle of a firearm.

The North Sumatra (Sumut) Regional Police as one of the law enforcement institutions in Indonesia, utilizes a forensic laboratory to support the investigation process of firearms cases. The forensic laboratory provides scientific tools and techniques that help in collecting, analyzing, and interpreting evidence found at the scene of the crime (TKP). There are several roles of the forensic laboratory in the North Sumatra Regional Police, namely

Identification of firearms and ammunition

The forensic laboratory has special equipment to identify the types of firearms and ammunition used in a crime. Through ballistic analysis, forensic experts can determine the type, model, and even the origin of the firearm. This is important to link the firearm to the crime being investigated.

Ballistic Analysis

Ballistic analysis is one of the main techniques used in investigating firearm cases. Ballistic experts can analyze the trajectory of the bullet, the impact of the shot, and the traces of the bullet on the victim or objects around the crime scene. This information can help determine the position of the shooter and victim,

as well as verify testimony.

Collection and processing of evidence

The forensic laboratory plays a role in collecting and processing physical evidence from the crime scene, such as bullet casings, bullet fragments, and gunshot residue. This evidence is then analyzed to look for fingerprints, DNA, or explosive residue that can link the suspect to the firearm used.

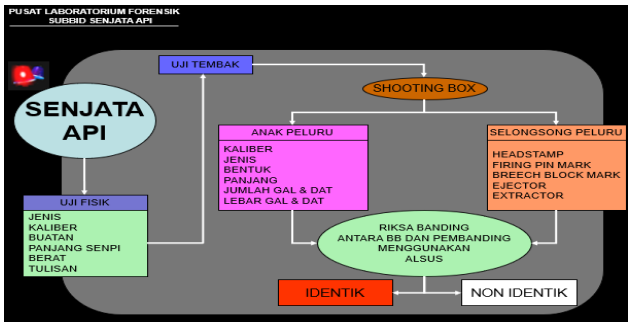

Figure 1. Firearms Inspection Process

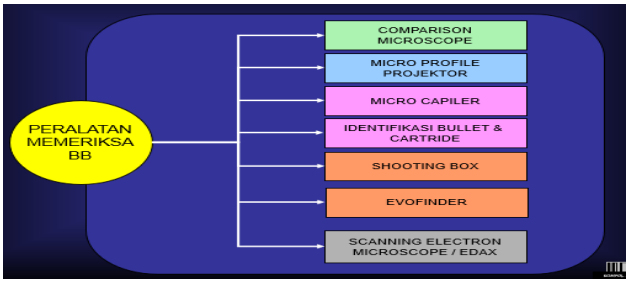

Figure 2. BB Checking Equipment

Gunshot residue analysis

Gunshot residue (GSR) is small particles produced when a firearm is fired. Gunshot residue analysis can help identify whether a person has fired a firearm or was near a firearm that was fired. This technique is very useful in strengthening evidence of a suspect's involvement in a crime.

Figure 3. Results of the Inspection Process Through Residue Analysis

Incident reconstruction

By combining various analysis results, forensic laboratories can assist in the reconstruction of criminal incidents. Information about the position of the shot, the distance of the shot, and the type of firearm can help investigators understand the chronology of events and determine the most likely scenario.

The results that can be shown from the forensic laboratory results in investigations related to proof of evidence, such as the image below:

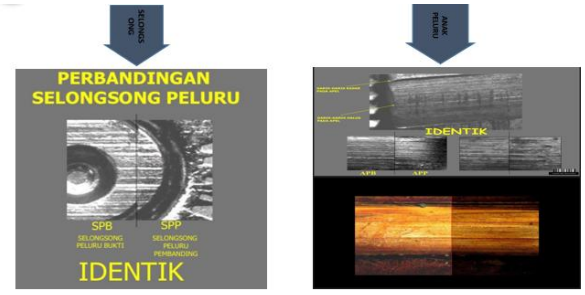

Figure 4. Firearm Fingerprint Examination Process

Misuse of firearms is one of the most deadly and disturbing forms of crime. Misused firearms can be used for various crimes, such as robbery, murder, and terrorism. In the North Sumatra Regional Police, the number of cases of misuse of firearms is quite high, requiring serious attention from law enforcement officers. In recent years, the increasing number of cases of misuse of firearms in North Sumatra has raised concerns among the public.

Riza [15] Criminals are getting smarter in hiding their identities, including through the use of gloves or other efforts to avoid fingerprint detection. Therefore, more sophisticated technology and investigation methods are needed to identify perpetrators and process cases more efficiently. Therefore, the role of a firearm fingerprint-based forensic laboratory is a facility equipped with sophisticated equipment and experts who are able to analyze fingerprints found on firearms or other firearm components. Fingerprints, as a unique identification mark owned by each individual, can be used to link a particular firearm to the perpetrator of the crime or the presence of fingerprints in physical form on the object directly, namely firearms (pistols, rifles, etc.). This firearm fingerprint analysis can not only provide information about the perpetrators of the crime but also information about the factories that produce firearms, equipment, cameras, vehicles, both four-wheeled and two-wheeled, other machine products must print numbers, letters or combinations of numbers on one of the metal parts that make up the products. These numbers are a very important part in determining who owns the products. Criminals usually damage or try to remove these numbers and letters to complicate the identification, classification and individualization process by investigators who are trying to uncover the crimes committed.

The disclosure of the Bali I bombing case is an example of this type of crime. The perpetrators had previously damaged the chassis number of the L-300 car used as a bomb container. The disclosure of the international case was based on the success of the Forensic team in re-creating the damaged car chassis number. When the number is printed on the metal surface, there is a difference in density between the printed part compared to the other parts that are still normal. So even though it has been removed, the numbers can still be re-emerged using reetching chemicals, electrolyte methods, ultrasonic cavitation, and magnetic particle methods. Thus, forensic laboratories play an important role in criminal investigations, especially in collecting, analyzing, and interpreting scientific evidence. In the context of firearm abuse, firearm fingerprint-based forensic laboratories play a special role. Firearms used in a crime often leave traces that can be analyzed by forensic experts to identify the perpetrator. Evidence collected from firearms

includes fingerprints, ballistic traces, and gunshot residue, all of which can provide significant clues in identifying the perpetrator. The North Sumatra Police forensic laboratory plays an important role in supporting the disclosure of firearm abuse cases through fingerprint analysis on firearms, bullets, and cartridges. By using sophisticated scientific methods and the latest technology, this laboratory provides strong and reliable evidence for the legal process. Fingerprint analysis not only helps in identifying the perpetrator but also in connecting various incidents and building a comprehensive case. Despite the challenges in collecting and analyzing fingerprints, the North Sumatra Police forensic laboratory is committed to providing high-quality services and supporting law enforcement in an objective and accurate manner. Through continuous efforts to update technology and techniques, this laboratory continues to play a crucial role in ensuring justice and public safety.

CONCLUSIONS

The National Police forensic laboratory plays a very crucial role in supporting the acceleration of investigations into the misuse of firearms. With the existence of a forensic laboratory, investigators can utilize advanced technology and scientific methods to identify firearms used in crimes, analyze ballistic traces, and examine DNA traces and fingerprints. Analysis of firearm fingerprints, bullets, and bullet casings allows for the identification of perpetrators in a scientific and accurate manner. This laboratory helps in linking perpetrators to weapons used in crimes, as well as providing evidence that supports the investigation and prosecution process. The forensic laboratory is a vital component in the investigation of firearms cases at the North Sumatra Regional Police. By providing accurate and in-depth analysis, the forensic laboratory helps ensure that crimes can be solved quickly and perpetrators can be tried according to applicable law. With the help of a forensic laboratory, investigations into firearms cases can be carried out more quickly and accurately. The forensic evidence obtained helps investigators make the right decisions and supports a fair legal process. This also reduces the possibility of errors in investigations and increases public confidence in law enforcement.

REFERENCES

[1] R, Saferstein. (2001) Criminalistic: An Introduction to Forensic Science (8th ed). New York: Prentice Hall.

[2] Habeahan, Togar, Deri Chandra. (2020) Peranan Laboratorium Forensik Dalam Pembuktian Mengungkap Tindak Pidana yang Menggunakan Senjata Api (Studi di Kepolisian Daerah Sumatera Utara). Universitas HKBP Nomensen: Skripsi.

[3] Munandar, Evan., et al. (2024) Penanggulangan Tindak Pidana Kepemilikan dan Penggunaan Senjata Api Tanpa Izin Dalam Sistem Peradilan Pidana, Law Jurnal, Volume 2 (3) Desember, 2018, pp. 338-353 Di akses pada 6 Juni 2024 dari https://doi.org/10.24815/sklj.v2i3.11763

[4] Rachmie, Synthiana. (2024) Peranan Ilmu Digital Forensik Terhadap Penyidikan Kasus Peretasan Website. Jurnal Litigasi, Volume 21 No. 1 Edisi April Tahun 2020. Di akses pada 14 Agustus 2024 dari http://dx.doi.org/10.23969/litigasi.v17i2.138

[5] Rachmad, Andi. (2024) Peranan Laboratorium Forensik Dalam Mengungkap Tindak Pidana Pada Tingkat Penyidikan. Jurnal Hukum Samudra Keadilan, Volume 14 No. 1 Tahun 2019. Di akses pada 2 Agustus 2024 dari https://doi.org/10.33059/jhsk.v14i1.1078

[6] Fraser, Jim. (2016) Essentials of Forensic Science. London: Routledge.

[7] Bose, Kumar, Palash & Kabir, Jubaidul, Mohammad. (2017) Fingerprint: A Unique and Reliable Method for Identification. Journal of Enam Medical College, Vol 7 No 1 January, 2017, pp 29-34 Di akses pada 6 Agustus 2024 dari http://dx.doi.org/10.3329/jemc.v7i1.30748

[8] J, Nickell & JF, Fischer. (1999) Crime Science: Methods of Forensic Detection. Lexington: University Press of Kentucky.

[9] Branco, Joseph, P, R. (2017) Pemberian Sanksi Terhadap Tentara Bayaran (Mercenary) yang Ikut Serta dalam Sengketa Bersenjata Ditinjau Dari Hukum Humaniter Internasional"; Jurmal Lex Crimen Vol. VI/No.6/Ags/2017

[10] Marzuki, Muhammad, Peter. (2017) Penelitian Hukum (Revisi). Jakarta: Kencana Prenada Media Group.

[11] Moniharapon, G.G., Titahelu, J.A., & Leasa, E.Z. (2021). Sanksi Pidana Perbuatan Sengaja Menyalahgunakan Senjata Api Oleh Anggota Kepolisian Negara Republik Indonesia. TATOHI: Jurnal Ilmu Hukum, 1(7), 679 – 690. Di akses pada 10 Juni 2024 dari DOI: https://doi.org/10.47268/tatohi.v1i7.663.

[12] Nichols, Ronald. (2024) Firearm and Toolmark Identification: The Scientific Reliability of The Forensic Science Discipline. USA: Academic Press. 2018.Di akses pada 4 Juli 2024 dari https://doi.org/10.1016/C2016-0-04649-1

[13] Termature, Marlen., Sopacua, Gladis, Margie., Latumaerissa, Denny. (2024) Kebijakan Hukum Pidana Terhadap Tindak Pidana Kepemilikan Senjata Api Oleh Masyarakat Sipil, Pattimura: Law

Study Review Journal, Volume 2 No 1 Tahun 2024.Di akses pada 24 Juli 2024 dari https://doi.org/10.47268/palasrev.v2i1.13868

[14] Weli, Wahyudi. (2024) Penerapan Unsur Tindak Pidana Perbuatan Memiliki Menguasai Mempunyai Persediaan Padanya Atau Menyimpan Senjata Api Tanpa Izin". Unes Journal of Swara Justisia: Volume 6 No 3 Tahun 2022. Di akses pada 13 Juni 2024 dari https://doi.org/10.31933/ujsj.v6i3.269

[15] Sativa, Riza. (2024) Scientific Investigation dalam Penyidikan Tindak Pidana Pembunuhan, Jurnal Ilmu Kepolisian, Volume 15 No. 1 Edisi April 2021, Di akses pada 20Agustus 2024 dari https://doi.org/10.35879/jik.v15i1.295