

Fingerprint on Ballistic after Shooting

Narong Kulnides

Abstract—This research involved fingerprints on ballistics after shooting. Two objectives of research were as follow; (1) to study the duration of the existence of latent fingerprints on .38, .45, 9 mm and .223 cartridge case after shooting, and (2) to compare the effectiveness of the detection of latent fingerprints by Black Powder, Super Glue, Perma Blue and Gun Bluing. The latent fingerprint appearance were studied on .38, .45, 9 mm. and .223 cartridge cases before and after shooting with Black Powder, Super Glue, Perma Blue and Gun Bluing. The detection times were 3 minute, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78 and 84 hours respectively.

As a result of the study, it can be conclude that

1. Before shooting, the detection of latent fingerprints on .38, .45, and 9 mm. and .223 cartridge cases with Black Powder, Super Glue, Perma Blue and Gun Bluing can detect the fingerprints at all detection times.
2. After shooting, the detection of latent fingerprints on .38, .45, 9 mm. and .223 cartridge cases with Black Powder, Super Glue did not appear. The detection of latent fingerprints on .38, .45, 9 mm. cartridge cases with Perma Blue and Gun Bluing were found 100% of the time and the detection of latent fingerprints on .223 cartridge cases with Perma Blue and Gun Bluing were found 40% and 46.67% of the time, respectively.

Keywords—Ballistic, Fingerprint, Shooting.

I. INTRODUCTION

CURRENTLY, there is an increase of crimes such as the murders, rapes, robbery burglaries, mayhem, etc. and it is often found that with these crimes firearms were used. Statistics on firearms crimes occurred across the country from January to December 2010. [6]

In cases involving firearms, police arrested the offender in 22,162 cases in which firearms were used; most crimes involved illegal firearms, such as machine guns, machine guns, etc. The problem of increased crime is that there is also more intricate crime.

Controlling crime can result in less crime. In controlling crime, there is the step of the identification evidence, the scientific evidence for the detection with scientific reliability and acceptability in court. Of course, the criminals leave their mark at the scene by mistake, making it possible to find evidence in a crime scene area, such as the identification of carbon powder using a SEM (Scanning Electron Microscopy) or DNA (Deoxyribonucleic acid) identification, etc. In case of litigation, the gun is a weapon. Bullet cases usually fall into the crime scene. These bullet cases can be checked to compare with other bullet cases and the automatic to makes notes immediately with guns of any type. It is necessary to use the fingerprints on bullet casings help to identify the offender [5].

N. Kulnides is with the Doctor of Philosophy in Forensic Science, Suan Sunandha University, 1 U-tong Nok Road, Dusit Bangkok 10300, Thailand (phone: +662-160-1213; e-mail: narong.ku@ssru.ac.th).

From the problems discussed above, the researcher was interested in studying fingerprints on bullet cases in different time frames after shootings. Comparison of the detection of fingerprints on shell casings were made with different methods. This can be used to compare the fingerprint identification to identify the offender and produce enough evidence to prosecute by law.

A. Theory of Fingerprint

Fingerprint identification is based upon unique and invariant features of fingerprints. Fingerprints are graphic flows, like ridges present in human fingers which are formed during embryonic development, caused by ridges underneath the skin. According to the FBI, the odds of two people sharing the same fingerprints are one in 64,000,000,000. Fingerprints differ even for the ten fingers of the same person [1].

Some of the advantages of fingerprint identification are: high distinctiveness, high permanence, low potential for fraud, high performance with medium collectivity, and acceptability. It also has certain drawbacks, like need for training, finger and hand impairment, worn ridges, etc. acting as a barrier to universality [2]-[4].

B. Theory of Firearms and Bullet

1. Meaning of Firearms

"Firearms" means and includes every weapon which uses machined bullet delivery, grenade launcher, or uses means of gas or air force, or any mechanical device, which have the virtue of energy in operation of any part of the weapon.

2. Types of Firearms

Firearms classification, 4 types according to use: 1) Pistol 2) Sub-Machine Gun 3) Rifle and 4) Automatic Rifle.

3. Meaning of Bullet

"Bullet" means and includes any outstanding bullets, the bullets, grenades, and rockets, either with or without acid gas, pathogens, poison or fuel for compression or use of bullet.

4. Type of Bullet

- 1) Lead Bullet made of lead and used with bullets at a speed lower than 2,000 feet per second.
- 2) Jacketed Bullet with a lead core metal organ other layer of core.

5. Bullet Case

Bullet cases are mostly are made from Solid Brass. The appearance of the 3 types of bullet cases: (1) Straight Case (2) Tapered Case and (3) Bottle necked Case. The shape of the end of the 5 types of bullet cases: (1) Rimmed (2) Semi-Rimmed (3) Rimless (4) Rebated-Rim and (5) Belted.

II. THE METHODOLOGIES

The research was conducted for a latent fingerprint on the bullet cases, both before and after shooting. The first experiment was performed for sitting fingerprints on bullet case by fixing weights to stamp fingerprint on the bullet case to values of about 300 g.

- 1) Process for latent fingerprints on bullet case before shooting. The first experiment was performed on fingerprint stamped on to .38, .45, 9 mm. and .223 cartridges with 20 shots to experiment finding latent fingerprints on bullet cases. The detection times were 3 minutes, 6 hours, 12 hours, 18 hours and 24 hours, respectively. The means used for detecting latent fingerprints were dusting Black Powder, Super Glue, Perma Blue and Gun Bluing.
- 2) Process for latent fingerprints on bullet case after shooting. Three experiments were performed on fingerprints stamped onto four types of bullets:
 - (1) The first experiment was performed on fingerprints stamped onto 180 shots of .38 cartridges.
 - (2) The second experiment was performed on fingerprint stamped onto 180 shots of .45 and 9 mm cartridges.
 - (3) The third experiment was performed on fingerprints stamped onto 180 shots of .223 cartridges.

When the fingerprint stamping experiments were performed onto bullet cases, it consisted of placing a bullet in the gun barrel sizes and shooting. The bullet case experiment then sought out to find a fingerprint with detection times of 3 minute, 6, 12, 18, 24, 30, 36, 42, 48, 54, 60, 66, 72, 78 and 84 hours respectively. The methods of detection of latent fingerprints were with Black Powder, Super Glue, Perma Blue and Gun Bluing on each of the three bullet cases in each period.

- 3) Four methods of detection of latent fingerprints on bullet case all using the same methods, both before and after the shooting, but using different times to find the details of the different fingerprints.

- (1) Process for latent fingerprint dusting with Black Powder

(1.1) At the end of the period as defined. The bullet case is picked up with forceps from the table.

(1.2) The brush tapped to dust Black Powder over bullet case. If a clear latent fingerprint is found while dusting powder, the process was stopped. (Care was taken about the amount of dust used. If you used too much dust, there would not be sharp lines and the special characteristics could not be read).

(1.3) After the appearance of latent fingerprints, there was then the tracing of the surface of the bullet case, using clear tape to stick it down on paper for the fingerprints.

(1.4) Check the latent fingerprint and photographs, and record the experimental results.

- (2) Process for latent fingerprint with Super Glue

(2.1) At the end of the period as defined, a sharp-tipped stick is used to pick up the bullet case through the mouth of the bullet case and then plugged with foam pad and prepare on Super Glue Oven.

(2.2) Weigh pure water into a cup wrap with aluminum foil. The ratio of a Super Glue and placed on a heating oven.

(2.3) Weigh Super Glue into a cup wrap with aluminum foil. The ratio of Super Glue and water is placed into a heating oven.

(2.4) Turn off oven tightly to prevent air leaks. Leave for 30 minutes to allow the air inside the cabinet was saturated.

(2.5) The Bullet case is prepared to put them in the oven until appears latent fingerprints, taking out the check to latent fingerprints.

(2.6) Take photo and record the results.

- (3) Process for latent fingerprint with Perma Blue

(3.1) At the end of the period as defined. Bullet case put out on the table by putting end plate of bullet and face up to bullet case hole.

(3.2) Put Perma Blue liquid in beaker in the amount that can be dipped into around bullet case.

(3.3) Put pour water into the beaker volume dipping bullet case can either be used to wash the chemicals.

(3.4) Forceps clamp used bullet case. Perma Blue liquid and dip into a soak period of about 10 seconds and raised rinsed into a beaker of water again.

(3.5) Check the results of a latent fingerprint.

(3.6) Take photo and record the results.

- (4) Process for latent fingerprint with Gun bluing

(4.1) At the end of the period as defined. Bullet case put out on the table by putting end plate of bullet and face up to bullet case hole.

(4.2) Put Gun bluing liquid in beaker in the amount that can be dipped into around bullet case.

(4.3) Pour water into the beaker volume dipping bullet case can either be used to wash the chemicals.

(4.4) Forceps clamp used bullet case. Perma Blue liquid and dip into a soak period of about 5 seconds and raised rinsed into a beaker of water again.

(4.5) Check the results of a latent fingerprint.

(4.6) Take photo and record the results.

III. RESULT

1. Before shooting the detection of latent fingerprints on .38, .45, 9 mm. and .223 cartridge case with Black Powder, Super Glue, Perma Blue and Gun Bluing could detect the fingerprints at every detection time.
2. After shooting the detection of latent fingerprints on .38, .45, 9 mm and .223 cartridge case with Black Powder, Super Glue did not appear latent fingerprints. The detection of latent fingerprints on .38, .45, 9 mm .cartridge case with Perma Blue and Gun Bluing was found the appearance of latent fingerprints 100% and the detection of latent fingerprints on .223 cartridge case with Perma Blue and Gun Bluing was found the appearance of latent fingerprints 40% and 46.67% respectively.

TABLE I
RESULTS DETECT FINGERPRINTS ON BULLET CASES WITH BLACK POWDER
AFTER SHOOTING AT VARIOUS PERIODS

Type of Bullet case	38. No.			45. No.			9mm. No.			223. No.		
Time	1	2	3	1	2	3	1	2	3	1	2	3
3min.	-	-	-	-	-	-	-	-	-	-	-	-
6hrs.	-	-	-	-	-	-	-	-	-	-	-	-
12hrs.	-	-	-	-	-	-	-	-	-	-	-	-
18hrs.	-	-	-	-	-	-	-	-	-	-	-	-
24hrs.	-	-	-	-	-	-	-	-	-	-	-	-
30hrs.	-	-	-	-	-	-	-	-	-	-	-	-
36hrs.	-	-	-	-	-	-	-	-	-	-	-	-
42hrs.	-	-	-	-	-	-	-	-	-	-	-	-
48hrs.	-	-	-	-	-	-	-	-	-	-	-	-
54hrs.	-	-	-	-	-	-	-	-	-	-	-	-
60hrs..	-	-	-	-	-	-	-	-	-	-	-	-
66hrs.	-	-	-	-	-	-	-	-	-	-	-	-
72hrs.	-	-	-	-	-	-	-	-	-	-	-	-
78hrs.	-	-	-	-	-	-	-	-	-	-	-	-
84hrs.	-	-	-	-	-	-	-	-	-	-	-	-
total	0			0			0			0		

TABLE III
RESULTS DETECT FINGERPRINTS ON BULLET CASES WITH PERMA BLUE
AFTER SHOOTING AT VARIOUS PERIODS

Type of Bullet case	38. No.			45. No.			9mm. No.			223. No.		
Time	1	2	3	1	2	3	1	2	3	1	2	3
3min.	/	/	/	/	/	/	/	/	/	/	/	/
6hrs.	/	/	/	/	/	/	/	/	/	/	/	-
12hrs.	/	/	/	/	/	/	/	/	/	-	/	/
18hrs.	/	/	/	/	/	/	/	/	/	/	-	/
24hrs.	/	/	/	/	/	/	/	/	/	/	/	-
30hrs.	/	/	/	/	/	/	/	/	/	/	/	-
36hrs.	/	/	/	/	/	/	/	/	/	-	/	/
42hrs.	/	/	/	/	/	/	/	/	/	-	/	-
48hrs.	/	/	/	/	/	/	/	/	/	/	-	-
54hrs.	/	/	/	/	/	/	/	/	/	-	-	/
60hrs..	/	/	/	/	/	/	/	/	/	-	-	-
66hrs.	/	/	/	/	/	/	/	/	/	-	-	-
72hrs.	/	/	/	/	/	/	/	/	/	-	-	-
78hrs.	/	/	/	/	/	/	/	/	/	-	-	-
84hrs.	/	/	/	/	/	/	/	/	/	-	-	-
total	45			45			45			18		

TABLE II
RESULTS DETECT FINGERPRINTS ON BULLET CASES WITH SUPER GLUE
AFTER SHOOTING AT VARIOUS PERIODS

Type of Bullet case	38. No.			45. No.			9mm. No.			223. No.		
Time	1	2	3	1	2	3	1	2	3	1	2	3
3min.	-	-	-	-	-	-	-	-	-	-	-	-
6hrs.	-	-	-	-	-	-	-	-	-	-	-	-
12hrs.	-	-	-	-	-	-	-	-	-	-	-	-
18hrs.	-	-	-	-	-	-	-	-	-	-	-	-
24hrs.	-	-	-	-	-	-	-	-	-	-	-	-
30hrs.	-	-	-	-	-	-	-	-	-	-	-	-
36hrs.	-	-	-	-	-	-	-	-	-	-	-	-
42hrs.	-	-	-	-	-	-	-	-	-	-	-	-
48hrs.	-	-	-	-	-	-	-	-	-	-	-	-
54hrs.	-	-	-	-	-	-	-	-	-	-	-	-
60hrs..	-	-	-	-	-	-	-	-	-	-	-	-
66hrs.	-	-	-	-	-	-	-	-	-	-	-	-
72hrs.	-	-	-	-	-	-	-	-	-	-	-	-
78hrs.	-	-	-	-	-	-	-	-	-	-	-	-
84hrs.	-	-	-	-	-	-	-	-	-	-	-	-
total	0			0			0			0		

TABLE IV
RESULTS DETECT FINGERPRINTS ON BULLET CASES WITH GUN BLUING
AFTER SHOOTING AT VARIOUS PERIODS

Type of Bullet case	38. No.			45. No.			9mm. No.			223. No.		
Time	1	2	3	1	2	3	1	2	3	1	2	3
3min.	/	/	/	/	/	/	/	/	/	/	/	/
6hrs.	/	/	/	/	/	/	/	/	/	/	/	/
12hrs.	/	/	/	/	/	/	/	/	/	/	/	-
18hrs.	/	/	/	/	/	/	/	/	/	/	-	/
24hrs.	/	/	/	/	/	/	/	/	/	/	/	-
30hrs.	/	/	/	/	/	/	/	/	/	-	/	/
36hrs.	/	/	/	/	/	/	/	/	/	/	-	/
42hrs.	/	/	/	/	/	/	/	/	/	-	/	/
48hrs.	/	/	/	/	/	/	/	/	/	/	-	-
54hrs.	/	/	/	/	/	/	/	/	/	-	/	-
60hrs..	/	/	/	/	/	/	/	/	/	-	-	/
66hrs.	/	/	/	/	/	/	/	/	/	-	-	-
72hrs.	/	/	/	/	/	/	/	/	/	-	-	-
78hrs.	/	/	/	/	/	/	/	/	/	-	-	-
84hrs.	/	/	/	/	/	/	/	/	/	-	-	-
total	45			45			45			21		

TABLE V
COMPARE THE RESULTS OF DETECT FINGERPRINTS ON THE BULLET CASES
BEFORE SHOOTING IN VARIOUS METHOD AND PERIODS

Method	Results appear fingerprints on bullet cases (Percent)
Black Powder	100
Super Glue	100
Perma Blue	100
Gun Bluing	100

TABLE VI
COMPARE THE RESULTS OF DETECT FINGERPRINTS ON THE BULLET CASES
AFTER SHOOTING IN VARIOUS METHOD AND PERIODS

Method	Results appear fingerprints on bullet cases (Percent)
Black Powder	0
Super Glue	0
Perma Blue	85
Gun Bluing	86.67

IV. SUGGESTION AND FUTURE WORK

- 1) Policy: Develop a verification method for a standard to support practitioner's verification of latent fingerprints on bullet cases. Make the identification evidence even more powerful, in particular, the performance of the identification evidence in the three southern border provinces which is important to the stability of the country. When experiencing problems with latent fingerprints collected on bullet casings of various kinds of terrorists, the examiner can take the results of this study to the consideration when evidence is collected and in the identification of latent fingerprints on bullet casings at the scene in each category.
- 2) Workshop: research on latent fingerprints on bullet casings from each category which are correlated with the duration of the persistence of latent fingerprints and how to verify each method. Work on how to make the identification. Bring standardization and the level of verification, as well as the quality of chemicals and chemical categories. It is very useful to use these methods in identification in the laboratory.
- 3) The research and development: The results of this study can be used to develop latent fingerprint identification and in the identification of firearms including equipment and tools used in the identification. Materials Science Chemical equipment used in the identification of latent fingerprints that were associated with gun shell casings and firearms to the standards and performance even more, as well as research and development. Research on the identification of latent fingerprints on bullet casings provides modern standards and meets international advanced technology standards.

The research study for time periods of latent fingerprints on bullet case after shooting gun type brass of .38, .45, 9 mm and .223 weapons compared the performance methods for detecting latent fingerprints for Brush Black Powder, Super Glue and Perma Blue Gun Bluing on bullet cases only.

This study does not detail other types of ammunition, chemicals and other chemicals and chemical study of four types of bullet case. Verification methods used with chemicals may result in an increase of detection which will lead to the development of a database of verified fingerprints on bullet case which can be divided by gunshot, such a size and gunshot. Verification method Chemicals and chemicals used to verify could be beneficial to store data on a small fingerprint MAFIS (Mini Automated Fingerprint Identification System) is useful in the investigation of the case of offenders using firearms in the commission of offenses. This is

particularly the case with respect to maintaining stability and counter-terrorism in the three southern border provinces. This can lead to the development of measures and guidelines for identification of latent fingerprints on bullet casings effectively which will benefit the justice system in the future.

ACKNOWLEDGMENT

This Research was supported by Suan Sunandha Rajabhat University.

REFERENCES

- [1] Holbrook, K. A. & Wolff, K. "The structure and development of skin" In T. B. Fitzpatrick, A. Z. Eisen, K. Wolff, I. M. Freedberg, & K. F. Austen (Eds.). *Dermatology in general medicine* 4th ed., New York: McGraw-Hill. 1993, pp. 97-145.
- [2] Kuller, J. M. "Skin care management of the low birth weight infant" In L. G. Genderson, & K. Carole (Eds.). *Care of the 24-25 weeks gestational age infant a small baby protocol* 2nd ed., California: Nicuink. 1995, pp. 107-143.
- [3] Lane, A. T., & Drost, S. S. "Effects of repeated application of emollient cream to premature neonates' skin" *Pediatrics*, 1993, pp. 415-419.
- [4] Lund, C. H., Kuller, J., Lane, A., Lott, J. W., & Raines, D. A. "Neonatal skin care: The scientific basis for practice". *Neonatal Network*, 18 (4), 1999, pp. 15-27.
- [5] Thongrachata riansuwan. "The developing of latent fingerprint on .38 silver metal cartridge cases" Master of Science (Forensic Science) Graduate Silpakorn University. 2009.
- [6] Royal Thai Police. "Criminal statistics" [Internet]. 2011. [cited 2011 Feb 2]. Available from: <http://statistic.police.go.th/>

Pol.Lt.Gen Narong Kulnides' was born at Bangkok, Thailand, April, 1947. He holds a Bachelor of Science from Mahidol University, Master of Arts from Chulalongkorn University, Diploma in Scientific Crime Detection for Drug and Investigation from International Institute of Drug Enforcement Administration, USA, and Doctor of Philosophy in Development Administration (Justice Administration) from Suan Sunandha Rajabhat University.

From 2009 to the present he works at Suan Sunandha University, 1 U-Thong Nok Road, Dusit, Bangkok, Thailand in The President of Doctor of Philosophy and Master of Science in Forensic Science.

Pol.Lt.Gen.Narong Kulnides' Ph.D. has also published and presented his research in local and international conference.