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Evaluating the Dusting Methods of Latent Print Processing on Small Caliber Cartridges and Cartridge Cases

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Abstract

Fingerprint identification is one of the most important methods of solving crimes in the field of forensic science. Forensic scientists and researchers agree that finger prints are individual characteristics that can assist in identifying an individual person from a population. The most challenging duty of a crime scene investigator is to bring suitable finger prints from crime scene to the laboratory. Barriers between surface type, texture of surface, size, shape, contamination, and other multiple factors could be listed as limitations of developing suitable latent finger prints. Undischarged cartridges and discharged cartridge cases are more challenging items for latent finger print processing personnel. Because finger prints are composed of about 98% water, 2% fats (oils) and other components, any latent prints deposited on cartridges prior to being discharged are either burned off from the heat of the discharging, and/or stripped away during extraction as the fire arms goes through the cycle of fire. Human factors, environmental factors and surface area to volume ratio can also play a role in the deposition of latent prints on small sized cartridges and cartridge cases. In this research, we evaluated the dusting methods used for developing latent finger prints from small sized undischarged cartridges and discharged cartridge cases.

We conducted experiments on 143 cartridges and cartridges cases of different calibers and metal alloys in controlled environments by considering different factors. The results showed that no suitable latent finger prints were developed from cartridge cases. Only 5 suitable prints were developed from brass 45 auto undischarged cartridges. Baltimore Police crime laboratory's call history for 5 past years showed that many thousands of cartridges and cartridge casings were collected from crime scene. However, the numbers of suitable latent fingerprints developed in the past 5 years are not significant. We surveyed Baltimore Police crime laboratory personnel who served as a mobile unit or crime scene science unit technicians, with 1 to 40 years of service experiences and 97% of the responses showed that suitable latent finger prints were not developed via dusting methods from cartridges and cartridge cases. We also extended our questionnaires to 5 randomly selected sister-state laboratories to share their experiences on development of latent finger prints using dusting methods. 2 state laboratories reported that, they do not practice this method on cartridges and cartridge cases at all. The other 2 states reported that they also found out the dusting method as a non-effective method and they are looking for some other method to replace dusting. The 5th state reported that data was not available to share.

Keywords: Forensic science; Fingerprint; Small caliber cartridges; Crime laboratory; Environmental factors

Introduction

A finger print is an impression or mark made on a surface by a person's fingertip, and is commonly used for identifying individuals [1,2]. Finger prints can be classified as visible, plastic and latent finger prints. Latent prints may exhibit only a small portion of the surface of a finger and this may be smudged, distorted, overlapped by other prints from the same or from different individuals, or any or all of these in combination. Developing latent finger prints is the most challenging practice because of different factors [1]. Latent finger prints are hidden from investigators unaided eye and are susceptible to human and environmental contamination.

Recently, thanks to scientific researchers, different techniques of developing latent finger prints are being periodically researched and published. However, the forensic laboratories should take different factors into consideration before they choose the best techniques that work for them. The dusting method is one of the oldest and most applicable latent finger print developing techniques for smooth, flat, and nonporous surfaces. This method is still an effective and reliable technique in which most of law enforcement laboratories of the world are practicing [3].

Law enforcement laboratories and forensic scientists have stated the dusting method as the least effective technique of developing latent finger prints from cartridges and cartridge casings. The most discussed and explained reason is that finger prints are composed of about 98% water, 2% fats (oils) and other components, any latent prints deposited on cartridges prior to being discharged is either burned off from the heat of the discharging, and/or stripped away during extraction as the fire arms goes through the cycle of fire. However, it is also hard to develop latent finger prints even from undischarged cartridges. Other factors should also be taken in to consideration. Size, shape, corrosion, type of metal from which the cartridge is made from, characteristics of alloy, such as brass, nickel plated brass, and steel are all factors that affect the development of prints [4].

Alloy metals are less susceptible to corrosion than individual metals. For example, Brass, nickel plated brass and steel are not easily corroded

compared to individual metal such as aluminium. Environmental factors such as wind, rain, and high temperature, contamination from animals or humans, and intentional alteration of crime scene are other factors that should be taken in to consideration. Due to the combination of all the above factors, the dusting method is the least effective technique to develop latent finger prints from small sized ammunition and discharged cartridge casings. In this article, previous research reports on dusting methods have been discussed [5].

Dusting Ammunition and Cartridge cases For Latent prints

In spite of the developments made in DNA profiling, fingerprints are still considered the most widely established form of forensic evidence used by law enforcement to certainly identify an individual. Undischarged cartridges and discharged cartridge casings are very common pieces of physical evidence found at shooting and homicide crime scenes. DNA and finger print profiles enunciate the individual characterization of the organism. Latent prints are important but very fragile and very challenging to develop suitable ones [6,7]. Research indicated that there are many factors that need to be considered in finding latent finger prints from undischarged cartridges and discharged cartridge casings (Figures1-8).

Metal composition and resistance to corrosion of ammunition

A cartridge or ammunition is made up of different metal components. The most common are Brass, nickel plated brass, steel and aluminium. Most of the metals used to make cartridges are alloys, which combine two or more metallic elements together to provide strength against or resistance to corrosion. The cartridge case of ammunition keeps the powder, projectile and primer together and ensures tightness on the backside. It is the largest part of a cartridge. It has to withstand the pressure while also being capable of removed after the shot [8].

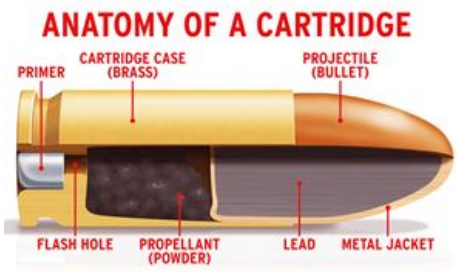

Figure 1: Anatomy of a cartridge.

Brass, containing 70% copper and 30% zinc, is the best alloy metal to make cartridges. Cases have also been made of steel, but are not corrosion resistant. Softer materials such as aluminium are slightly less strong and may oxidize at the surface. Brass or nickel plated brass is therefore the best material from which to manufacture ammunition because of its unique combination of properties. For example, good strength and ductility are combined with excellent corrosion resistance and superb machinability which makes brass preferable to make ammunition.

Size and shape of ammunition

Ammunition is generally expressed in a measurement. Most of the world uses a metric rating, while the commercial market in the United States uses a U.S. standard measurement. The measurements in metric are almost always a “diameter to length” ratio; for example, a bullet in the caliber for example, 5.56×45 mm is 5.56 mm wide and 45 mm long. 9×19 mm cartridge is 9 mm wide and 19 mm long. The smaller, the ammunition the lesser the chance of developing latent finger prints from its surface. The shape of the ammunition is also a major challenger for latent finger analysts. Small and round surfaces do not hold prints as well as big and flat surface [6].

Environmental and natural alteration of crime scenes

Environmental factors such as air circulation, dust, humidity, light exposure, precipitation, temperature, ultraviolet rays, wind, and rain could affect deposition and life span of latent finger prints on even nonporous and good surfaces. The composition of fingerprints also changes over time which may affect the efficiency of development techniques. Such factors are more influential on ammunition and cartridge casings [9,10].

Human and animals: Alteration of crime scenes

Law enforcement officers and medical personnel might contaminate or alter a crime scene. It is not possible to eliminate all potential contamination of a crime scene. We can only control and record on-going contamination with a goal to avoid damaging the forensic integrity of the crime scene and the exhibits. Crime scene contamination usually results through the actions of the personnel at the scene. In general, the greater number of personnel at the scene, the more likely it is that the scene/evidence will be contaminated. Scene personnel can displace, destroy and damage latent fingerprints. The risk of contamination in all crime scenes is reduced by thoroughly protecting the scene [11]. Consequently, determining the dimensionality of the scene should be the first priority. The equipment used in documenting and processing crime scenes also represents a possible source of contamination. Crime scene personnel need to be cognizant of the possible cross contamination that can be caused by their equipment. Animals such as dogs, cats, birds and rodents can also be listed as possible source of crime scene contamination.

Alteration of crime scene by suspects

Criminal offenders have a fundamental goal not to leave any traces at the crime scene. Some may believe that items washed with water will have no forensic value. They could throw evidence in grass, in trees or even bury evidence in the soil. If time allows, they could burn evidence in fire as well. All such activities make the investigation process more challenging [7].

Witness and family members: alteration of crime scenes

Crime scene investigators and other law enforcement personnel are oftentimes confronted with distraught and emotional family members, friends and witnesses. In many cases, close family members and friends often try to 'help' the victim by either moving him or her or 'putting the place back in order' before police arrive, for various reasons. In many cases, family members and friends will want to know information about the death of their loved one. In such cases, family members may express anger or impatience against those in charge of

the crime scene. As a result, the crime scene could become contaminated [9].

Mechanical and kinetic energy impact from firing process on cartridge casings

The cartridge casing is considered as the test tube of a chemical reaction. Although there is a wide range of types of firearms, the basic theory behind how a projectile is fired is fairly generic-the weapon aims to convert chemical energy into kinetic energy in order to expel a projectile from the firearm.

A round is first loaded and locked into the breach. This round consists of an outer cartridge case, a bullet, some form of propellant, and a percussion cap. The firing pin is generally mechanically restrained and, when the firearm is cocked, the firing pin spring is compressed [12-14]. As the trigger is pulled, the hammer-mounted firing pin is forced forward to strike through a small hole in the breech face, hitting the primer cup. This contains a mixture of sensitive chemicals which rapidly burn, producing sufficient hot gases to ignite the propellant [15,16]. As the gunpowder is ignited, an expansion of gas occurs in a small, confined space, and eventually forces the bullet down the barrel of the firearm. Firearms, nowadays, use smokeless powder. Smokeless powder is made of insoluble nitrocellulose, soluble nitrocellulose, and paraffin. Chemistry of "The Bullet Black" powder firearms fired bullets that were made of pure lead. This was perfect for the low speed firearms that used black powder. Modern firearms no longer use pure lead bullets. While still using lead, it is now mixed with tin or antimony [8].

Objective

The main objective of this research is to evaluate the ordinary dusting methods used to process small caliber ammunitions and cartridge casings for latent finger prints (Tables 1-3).

We all agreed on the fact that finger print evidence is one of the most helpful evidence to solve crime. Unfortunately, fingerprint evidence can easily be damaged, insufficient and invisible. Developing latent finger prints from cartridges and cartridge casings is the most challenging practice for crime scene scientists. Although, previous research indicated that it is possible to get prints from cartridges and cartridge casings, the dusting method is losing interest as technology advances throughout the world.

Actual name	Caliber
Ruger standard	0.22 LR
Besra Thunder 380	0.380 Auto
Glock 19	9 mm luger (9×19)
Glock 20	10 mm
Glock 21	0.45 Auto
Glock 23	0.40 S&W
S&W 0.357 Magnum	0.357 MAL
S&W 10-6	0.38 Special

Table 1: Ammunition nomenclature from BPD firearms unit.

According to scientific methods, if a scientific activity does not provide the expected or desired outcome after continuous implementation, the hypothesis of that method should be evaluated and changed. Based on these facts, we evaluated the Baltimore Police Crime Laboratory's long term practice of processing cartridges and cartridge casings by means of their standard operation manual.

Specific Aim

- Preparing survey or questionnaires for all crime scene personnel currently working in the crime scene unit as well as for all employees who previously served as crime scene scientist or mobile unit for Baltimore police crime lab. Collecting their responses in terms of their long term and short term experiences of developing latent finger prints from cartridges and cartridge casings.
- Analyzing call history data of real crime scene cases with firearms evidence especially, cartridges and cartridge casings that were processed for latent prints between the years 2015 to 2018.
- Performing experiments on different caliber and metal made cartridges and cartridge casings by collaborating with Baltimore Police Crime Lab, firearms unit. The experiment was conducted by considering environmental conditions, rusting and oxidation characteristic of metal alloys in a controlled environment, then using the dusting method, with bichromatics and magnetic powder, Baltimore Police Crime laboratory technicians processed the cartridges and the cartridge casings like actual evidence. Carefully evaluating all brass, nickel platted brass, aluminium and steel cartridges and cartridge casings for latent finger prints.
- Collaborating with randomly selected sister laboratories in the state of Maryland and other US states to share their practice and experiences of developing latent finger prints from cartridges and cartridge casings.
- Reviewing scientific journals and articles in reference to processing cartridges and cartridge casings for latent prints by dusting methods and assess their data and conclusions.

Materials and Methods

Baltimore Police Crime Laboratory mobile unit, crime scene science unit has practiced dusting methods for developing finger prints at least for the past 35 years. This practice is still active. Technicians are required to look for finger prints deposited on small caliber unfired cartridges and fired cartridge casings. The method refers brushing the surface of the cartridges and casings with ordinary finger print brush using either magnetic or bichromatic finger print powders.

Survey or questionnaire, was prepared and provided for all crime scene personnel currently working in the crime scene unit as well for all employees who previously served as crime scene technicians, mobile unit for Baltimore Police Crime laboratory. The survey was supported with specific instructions for sharing their short-term long-term experience with developing latent finger prints from cartridges and cartridge casings. 37 responses were collected, recorded and analyzed.

The call-history data of cases with firearms evidence, especially cartridges and cartridge casings, that were processed for latent prints between the years 2015 and 2018 were analyzed for number of calls in which cartridges and cartridge casings were collected, number of cartridges processed for latent prints and the number of latent prints lifted from cartridges and cartridge casings using origin software.

143 cartridges were provided by the firearms units of the laboratory. We tried to get cartridges, but only 143 with different calibers and metal alloy characteristics were available for this experiment. 46 brass, 41 nickel-plated brass, 35 aluminium, and 21 steel cartridges were obtained, with a variety of calibers including 0.22 to AK 45 and 12G shotgun, and carefully sorted.

The print donors were randomly selected from technicians in the crime scene unit. They were instructed to hold the cartridges and casings between their thumb, index finger and middle finger, as most people could fit all three on the cartridge, and hold for 2-5 sec with clean, dry hands. The cartridges were exposed to weather condition and temperature of the day. We placed them outside. They were placed on open ground, like they would be if at a crime scene, for about 40 mins. After 40 mins, volunteer crime lab technicians or personnel processed the cartridges for latent finger prints using dusting with either Bichromatic powder or/and magnetic powder as the same as they do for cartridges recovered from a crime scene.

Then, after the cartridges were cleaned with soap and water, wiped with paper towels and dried, the print donors were again instructed to hold the cartridges and casings between their thumb, index finger and middle finger, as most people could fit all three on the cartridge, and hold for 2-5 sec with clean, dry hands. The cartridges, on which latent finger prints were deposited, were submitted to the firearms unit for discharging. The discharged cartridge casings were collected from firearms unit and processed for latent finger prints with the same procedure as the cartridges.

Caliber	Brass	N-P Br	Al	Steel
0.22	5	5	0	5
380 auto	5	5	5	0
9 mm L	5	5	5	5
0.45 auto	5	5	5	5
0.40 S&W	5	5	5	0
0.38 Special	5	5	5	0
10 mm	5	5	5	0
357 Mag	5	5	5	0
7.62*39 AK45	5	0	0	5
12G Shotgun	1	1	0	1
Total	46	41	35	21

Table 2: List of experimental ammunition by metal alloy and number.

We contacted randomly selected sister laboratories in the state of Maryland and other US states to share their practice and experiences of developing latent finger prints from cartridges and cartridge casings. Washington DC. Crime lab, Philadelphia police crime lab, Memphis crime lab in Tennessee, Baltimore county crime lab, and Prince George's county crime laboratories were all contacted in regard to this research. Collaboration was requested to share their experiences within the past 5 years, as well as call history or information on developing latent finger prints from undischarged cartridges and discharged cartridge cases. An excel spread sheet to be filled and clear instruction was sent and most of them responded. Scientific journals and articles published in United States and all over the world on the topic of finger print development from metal surfaces, ammunitions and cartridge casings were collected and reviewed. The data generated and the conclusions made were compared to the results of our live experiments.

Results and Discussion

The responses from questionnaires prepared and provided for all crime scene personnel in Baltimore Police Crime Laboratory indicated that very few latent prints were developed from cartridges and cartridge casings by dusting methods. 37 responses were collected, recorded and analyzed. The responders also shared their short-term long-term experiences of developing latent finger prints from cartridges and cartridge casings. The results showed that dusting of cartridges and cartridge casings for latent print is not an effective methods of developing prints.

Service years of experiences	Number
Under 2 years	14
2-15 years	20
16-18 years	3
Total	37

Table 3: Service years of experience and number of crime scene scientists participated in answering the survey.

The above 37 participants include Crime scene technicians I, crime technicians II, crime scene technician supervisors, latent print examiners, firearm examiners and forensic scientists who served as crime scene personnel and were directly associated with the dusting techniques.

Participants experiences	Number of prints from cartridges	Number of prints from Cartridge casings
Under 2 years	2	1
2-15 years	17	6
16-18 years	9	1
Total	28	8

Table 4: Total number latent prints (lift cards) developed from Cartridges and cartridge casings in the past 18 years.

Table 4 indicates that only 28 lift cards were developed from cartridges and 8 lift cards were developed from cartridge casings in the past 18 years. Only 2 lift cards were suitable for identification in the past 18 years. Baltimore Police central complaint number 07-6F6577 in 2007 and 13-9L00056 in 2013 are the only latent print lift cards used for Identification reportedly.

The number of calls from 2015 to 2018 were selected and analysed for number of calls in which cartridges and cartridge casings were collected, number of cartridges processed for latent prints and the number of latent prints lifted from cartridges and cartridge casings using origin software. The results were indicated in the following Table 5.

Year	Total	Firearms	Prints	P. cartridges	P. casings
2015	14824	9363	24270	2	1
2016	14599	863	24055	1	1
2017	16146	1064	22067	2	1
2018	11134	861	13753	0	0
Total	56,703	12,151	84,145	5	3

Table 5: Number of calls with firearms, with total prints, prints from cartridges and prints from casings.

143 cartridges were provided by the firearms units of Baltimore Police Crime Lab. 46 brass, 41 nickel-plated brasses, 35 aluminium, and 21 steel cartridges were obtained, with a variety of calibers including 0.22, AK 45 and 12G shotgun, and carefully sorted. Latent prints were deposited on the surface of the cartridges and processed for latent prints by dusting methods. The results were indicated in Table 6.

46 brass live cartridges were processed and only 8 visible prints were developed. All 0.45 auto brass cartridges produced visible prints and 3 of 5 AK45 brass cartridges also produced visible prints. 41 nickel plated brass cartridges were processed and only 4 (from 0.45 auto cartridges) visible prints were produced. 35 aluminium cartridges were processed and only 2 (from 40 S&W cartridges) visible prints were produced. 21 steel cartridges were processed and only 3 visible prints were produced (2 from 00.45 auto and 1 from AK45).

Caliber	Br		NBr		Al		St	
	T.P	V.P	T.P	V.P	T.P	V.P	T.P	V.P
0.22	5	0	5	0	0	0	5	0
380 auto	5	0	5	0	5	0	0	0
9 mm L	5	0	5	0	5	0	5	0
0.45 auto	5	5	5	4	5	0	5	2
0.40 S&W	5	0	5	0	5	2	0	0
0.38 Sp	5	0	5	0	5	0	0	0
10 mm	5	0	5	0	5	0	0	0
357 Mag	5	0	5	0	5	0	0	0
AK45	5	3	0	0	0	0	5	1
12G SG	1	0	1	0	0	0	1	0
Total	46	8	41	4	35	2	21	3

Table 6: numbers of undischarged cartridges processed for latent finger prints and number of latent prints developed by dusting method (Abbreviation: Br: Brass, NB: Nickel plated Brass, Al: Aluminium, St: Steel, T.P: Total Processed, V.P: Visible Prints).

Then, after the cartridges were cleaned with soap and water, wiped with paper towels and dried. Latent prints were deposited and discharged by the firearms unit. Out of 143 live cartridges submitted to the firearms unit, 141 discharged cartridge casings were collected back and processed for latent finger prints with the same procedure of the cartridges. 45 brass, 41 nickel plated brass, 35 aluminium, and 20 steel discharged cartridge casings were processed for latent finger prints and only 2 visible prints were developed from 10 mm brass cartridge casings.

19 visible print lift cards, 17 from cartridges and 2 from cartridge casings were developed and submitted to the latent print unit for checking of their suitability. According to the report from the latent prints unit, no suitable prints were found from cartridge casings.

Both lift cards were non-suitable. 6 suitable prints were found out of the 17 lift cards for cartridges. Theses 6 latent prints were from varying areas of the tip of the finger, above the pattern area of the same finger source. These latent finger prints were identified from 1 nickel plated brass 00.45 auto, 3 brass 00.45 auto and 2 brass AK45 (7.62*39 mm) cartridges. The sources of latent prints were volunteer donors.

Table 7 indicates the total number of cartridge casings processed and number of visible prints developed:

Caliber	Br		NBr		Al		St	
	T.P	V.P	T.P	V.P	T.P	V.P	T.P	V.P
0.22	5	0	5	0	0	0	5	0
380 auto	5	0	5	0	5	0	0	0
9 mm L	5	0	5	0	5	0	5	0
0.45 auto	5	0	5	0	5	0	5	0
0.40 S&W	5	0	5	0	5	0	0	0
0.38 Spe	4	0	5	0	5	0	0	0
10 mm	5	2	5	0	5	0	0	0
357 Mag	5	0	5	0	5	0	0	0
AK45	5	0	0	0	0	0	4	0
12G SG	1	0	1	0	0	0	1	0
Total	45	2	41	0	35	0	20	0

Table 7: Number of discharged cartridges casings processed for latent finger prints and number of latent prints developed by dusting method (Abbreviation: Br: Brass, NB: Nickel plated Brass, Al: Aluminium, St: Steel, T.P: Total Processed, V.P=Visible Prints).

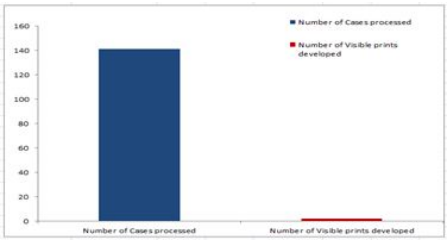

Figure 2: Number of discharged cartridge cases processed for latent finger prints and number of latent prints developed by dusting method.

There are a number of sister laboratories in the state of Maryland and the US who have similar duties as Baltimore Police Crime Laboratory. We have contacted some of the sister laboratories to share their practice and experiences of developing latent finger prints from cartridges and cartridge casings. For instance, District of Colombia crime laboratory at Washington did not apply the dusting method on cartridges and cartridge casings. According to Christopher Lojacono, the director of the laboratory, there was not data to share because they have been stopped this practice long time ago.

Figure 3: Some of the images of live cartridges or ammunition.

Figure 4: Some of the images of discharged cartridges casings.

According to Major Shull, Memphis crime laboratory in the state of Tennessee also did not have any records of dusting cartridges and cartridge casings. We have tried to contact Philadelphia crime laboratory in the state of Pennsylvania and we did not get any response.

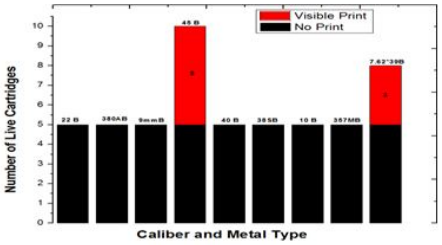

Figure 5: Brass live cartridges processed for latent prints with dusting methods.

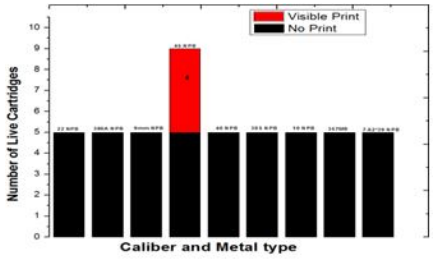

Figure 6: Nickel plated Brass live cartridges processed for latent prints with dusting methods.

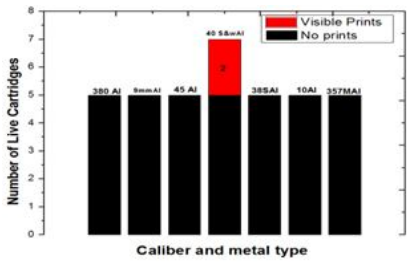

Figure 7: Aluminium live cartridges processed for latent prints with dusting methods.

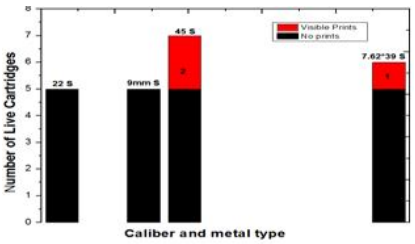

Figure 8: Steel live cartridges processed for latent prints with dusting methods.

Baltimore county and Prince George's county in the state of Maryland did not kept records of processing cartridges and cartridge casings with the dusting methods. They both addressed that chemical methods inside the laboratory have been used. The crime scene unit

transfers cartridges and cartridge casings, without processing, to latent prints units.

Scientific journals and articles focusing on latent prints from firearms evidence indicated that there are a number of shortcomings on the dusting methods used on cartridges and cartridge casings for developing latent prints. For example, research done in the state of California by California Criminalistics Institute in 2005 concluded that it is not likely of obtaining useable fingerprints on cartridge casings. No useable prints were obtained on the cartridge cases that had been fired.

Minneapolis Police Department compiled data over 12-month period from 2006-2007. The data indicated that 2727 cartridges were processed and no suitable latent prints were developed. 259 fired cartridge casings were processed and only 1 suitable print was developed. The fingerprint developed on this cartridge casing is believed to be touched by someone after being fired.

Denver Police Department also assessed the dusting method in 2010 on firearms evidence. 817 cartridges were processed and only 2 suitable prints were developed. 200 cartridge casings were processed and no identifications were found (Table 8).

	Cartridges		Cartridges casings		Identification
Institute	Processed	Prints	Processed	Prints	
California	24	4	24	1	0
Minneapolis	2727	0	259	1	1
Denver	817	2	200	0	2
Baltimore	143	17	141	2	6

Table 8: Number of cartridges and cartridge casings processed and number latent prints developed for identification in different cities crime laboratories.

Conclusion and Recommendation

Research indicated that it is possible to develop usable latent finger prints from cartridges and cartridge casings of different size even from 0.22 calibers. However, the dusting method is not the best method of retrieving prints from cartridges and cartridge casings. Most crime laboratories stopped using the dusting method. In this research, the survey study, live experiments, call history analysis, and information from sister laboratories experiences indicated that dusting using finger print powder and magnetic powder on cartridges and cartridge casings does not produce good quality and suitable latent finger prints. Literature reviews supported that dusting on cartridges and cartridge casings to develop suitable latent prints is not prudent. In developing of suitable and usable prints from cartridges and cartridge casings, chemical methods are more advisable than dusting methods.

The authors of this research strongly recommending Baltimore Police Crime Laboratory to continue processing cartridges and cartridge casings for latent prints. However, the dusting method is not effective and the best method. Instead, this method could destroy latent prints from cartridges and cartridge casings. Therefore, the Baltimore Police Crime Laboratory should look for some other methods of developing latent finger prints from undischarged and discharged ammunition.

Future Work

We have planned to test or develop suitable latent finger prints from cartridges and cartridges casings using:

- Cyanoacrylate or superglue techniques.
- Different colors: White powder, Silver/Gray Powder, Black Powder.
- Different types: Conventional Fingerprint Powder, Fluorescent Fingerprint Powder, Spray Fingerprint Powder.
- Metal deposition techniques and some new arrivals from research products in the field forensic science.

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