

DNA or Latent Prints? Or Both?

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LAKE COUNTY CRIME LABORATORY

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Fingerprint History

- **1000-2000** B.C. Fingerprints were used on clay tablets for business transactions in ancient Babylon.
- **3rd Century B.C.** Thumbprints begin to be used on clay seals in China to "sign" documents.
- **610-907 A.D.** During the T'ang Dynasty, fingerprints are reportedly used on official documents.
- 1st Century A.D. A petroglyph located on a cliff face in Nova Scotia depicts a hand with exaggerated ridges and finger whorls
- 14th Century A.D. Many official government documents in Persia have fingerprint impressions. One government physician makes the observation that no two fingerprints were an exact match.

- **1870's** Dr. Henry Faulds had begun his study of what he called "skinfurrows" during the 1870's after looking at fingerprints on pieces of old clay pottery. He is also credited with the first fingerprint identification: a greasy print left by a laboratory worker on a bottle of alcohol.
- 1880 Faulds published an article in the Scientific Journal, "Nautre" (nature). He discussed fingerprints as a means of personal identification, and the use of printers ink as a method for obtaining such fingerprints.

1880's - Sir Francis Galton began his study of fingerprints. Galton became the first to provide scientific evidence that no two fingerprints are exactly the same, and that prints remain constant throughout a person's lifetime. He calculated that the odds of finding two identical fingerprints were 1 in 64 billion. (population of the world approx. 1.5B)

• **1892** - Galton's book "Fingerprints" is published. Galton detailed the first classification system for fingerprints; he identified three pattern types (loop, whorl, and arch) and individual characteristics also known as minutia and/or Galton points.

- 1905 The U.S. Army gets on the fingerprinting bandwagon, and within three years was joined by the U.S. Navy and Marine Corps.
- Law enforcement agencies began using fingerprints as personal identification methods
- Fingerprint cards were sent to the recently established National Bureau of Criminal Investigation.
- 1970's Development of AFIS

History of DNA

- 1869 DNA–short for deoxyribonucleic acid–was discovered
- **1943** Role in determining genetic inheritance established
- **1950's** Physicists James Watson and Francis Crick determined the structure of DNA.
- **1986** DNA was first used to aid a criminal investigation by Dr. Alec Jeffreys. This investigation used DNA fingerprinting techniques to link semen stain samples, collected from two rapes/murders that had occurred three years apart in 1983 and 1986, in a small village in Leicestershire, UK.

- **1987** First time DNA evidence lead to a criminal conviction in the UK Robert Melias : UK : convicted of rape
- **1988** First time on American soil DNA evidence lead to a criminal conviction : Tommie Lee Andrews : FL : convicted of rape
- Combined DNA Index System (CODIS)
 - Pilot software project **1990**
 - Establishment of National DNA Index System FBI 1994

Sources of Biological Evidence

Semen

Blood

Saliva







Hair



Skin Cells



Touch DNA

"Touch DNA" refers to the DNA that is recovered from skin cells transferred to an object that has been touched or casually handled.

Potential Sources of Touch DNA/Latent Prints











Latent Prints



Rocks / Bricks



Firearms



Be cognizant of need for Elimination Standards for both DNA and Latent Prints at Public Locations as well as commonly handled items



Residential





Counterfeit Currency



Genuine Currency

Unpredictability of DNA

- Shedder vs non-shedder
- •Oily skin vs dry skin
- Duration of touch
- Texture of item being handled
- •Number of people handling item

FACTS

Average human skin is composed of about 10 trillion cells
Every minute, your skin sheds over 30,000 dead cells! (shed only about 20 to 100 hairs a day)

Approximately 50% of dust in homes is dead skin

Latent Development Tools Pre-DNA Collection

Sterile Single Use Brush



Sterile Single Use Powder





Re-sealable Powder packs / Coffee Filter/ disposable weighing boat

DNA Collection Tools

DE/Sterile Water





Swab





Burglary Scene



What to Process – What to Collect



Where to Collect



One swab of one location



One swab several Locations





- Wear protective Gloves
- Change gloves often
- Do not store clean gloves in pockets
- Keep gloved hands off phones, face, and hair
- Avoid Contamination

Pre-Latent Print Processing DNA collection

- Surfaces deemed not suitable for Latent Processing
 - Finely Textured surfaces
 - Rough Surfaces
 - Knurled surfaces of Firearms
 - Grips
 - Exposed Hammers
 - Triggers
 - Magazine Lips/Bases



Post Latent Print DNA Collection

Must use single use sterile powder and brush

Caution must be used to avoid cross contamination

Post Super-Glue (cyanoacrylate) Swab Using:

- Acetone must be careful of substrate
- Methanol

Most Common Latent Print Processing Techniques will not harm DNA

Powders including magnetic

- Chemical techniques
 - Cyanoacrylate
 - Ninhydrin
 - Dye Stains

Techniques That Can Damage or Hinder DNA

- Lasers
- Short Wave UV light
- Vacuum Metal Deposition (VMD)
- Silver Nitrate
- Un-Du and Sticky Side Powders

Poor Candidates for DNA and Latent Print Processing

- Spent Cartridge Cases
- Real Leather Items due to chemical processing of leather

Worth Trying for Touch DNA

- Latent lifts of no value for Identification
- Carefully separate lift tape from backer
- Use Methanol or Ethanol to cut through adhesive

Burglary



Wet window screen recovered from yard



Cody Simpson

Homicide



John Funari





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Marvin Lambert

This is a robbery I have a gun and theres a bamb on the side of the building Put 20,000 dollars in the bug no die Packs If i leave and a die pack explodets or the police follows me I will blen this place up you have 30 seconds mare ast but dont Make it Notice able Now give me buck my note NowII

Bank Robbery



17 yr. old Darriyan Sharp Sentenced to 4 years

Bank Robbery



11/22/2014 11:28:24.90 TELLER 2 Surveillance LAKENATIONALBANKMIDLAND



Tania Harper



Home Invasion



- Latent print of no value lifted from window (entry point)
- Sterile swab and ethanol used to remove any potential skin cells on latent lift
- Single source DNA profile developed resulting in a CODIS hit

LCCL Statistics

- Approximately 60% of all DNA **Cases** submitted to the laboratory have had a profile uploaded into CODIS
 - Includes Post Latent processing Touch DNA
- Approximately 25% of all CODIS hits have been from Touch
 DNA Evidence post latent print processing
- Over 200 CODIS entries in 2017 resulting in 63 CODIS hits which assisted in investigations.



Internal Study using three different brushes

New Unopened Single Use Brush

No DNA



New Single Use Brush

Used one Time on Test object

No DNA Detected



Old Brush

Brush in use for several years

Negligible amount of DNA detected: a grossly insufficient amount for a profile

* Is it a Real Concern?

- * Is it something we have to worry about?
- * Defense Questions in Trial?
- Develop Policies and Strategies to Avoid

LCCL Cost Analysis

DNA	Fingerprinting
Approximately \$500 per sample	Approximately \$10 per sample
Multi-day process	Less than a day
Highly discriminating with statistics	Highly discriminating without statistics
DNA <u>and</u> Latent print processing can be done on same item	

It's Always worth a try!

Questions?

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