Fingerprints & DNA on Cartridges & Cartridge Cases: How Likely?

Terry Spear, Jeanne Clark, Mike Giusto, Neda Khoshkebari, Michael Murphy and John Rush

Bureau of Forensic Services Latent Print Unit

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California Criminalistics Institute

Purpose

To evaluate the likelihood of obtaining fingerprints & DNA profiles on cartridges that were handled before being fired

Methodology

- Cartridges used in the study:
  - 22LR
    - Brass
    - Nickel
  - 9mmP
    - Brass
    - Nickel
    - Aluminum

Methodology

- Cartridges used in the study:
  - 45ACP
    - Brass
    - Nickel
    - Aluminum

Methodology

- Three types of fingerprints were placed on separate cartridges by three different people:
  - Bloody
  - Eccrine/sweat
  - Oily
- Duplicate fingerprints were made so that similar fired and unfired cartridges could be examined.
- The latent print-bearing samples consisted of 48 cartridges divided into two groups: 24 unfired cartridges & 24 fired cartridge cases.

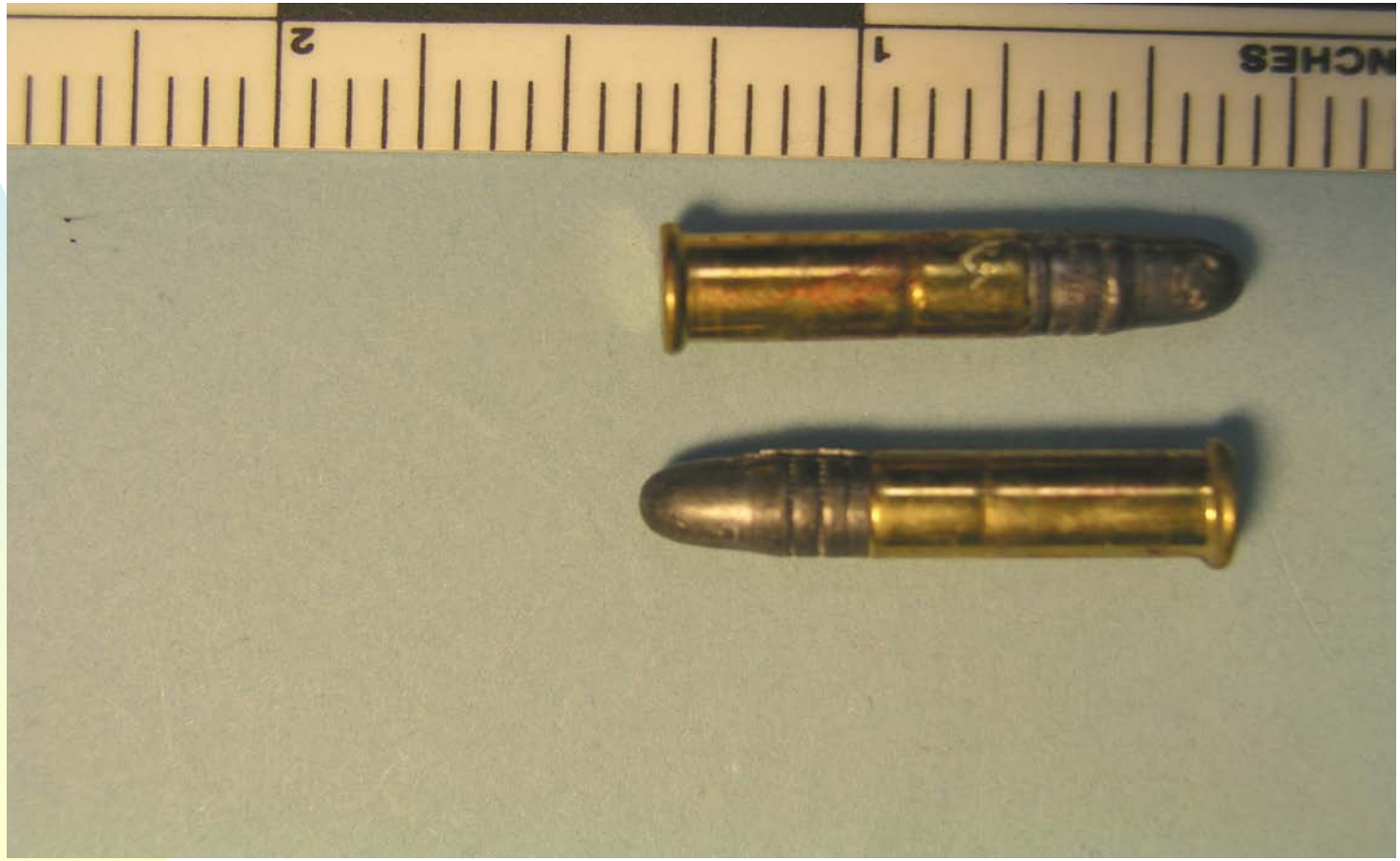
Methodology

- Sequence:
  - Scribe reference line along cartridges side.
  - Place print on cartridges on either side of reference line
    - Not likely to reflect conditions at crime scenes
  - Fire one set of cartridges (N=24) through weapon.
  - Process fired and unfired (N=48) cartridges/cases for fingerprints.
  - Swab fired and unfired cartridges/cases for DNA (N=48)

Methodology: Fingerprint Processing

- Bloody prints were evaluated and then processed with amido black.
- Sweaty prints **and** oily prints were evaluated and then processed with CAE fuming/Rhodamine 6G dye staining and visualized with laser.
- Prints were ‘aged’ before processing for an extended period of time.

22LR cartridges w/bloody prints



45ACP nickel cartridges w/bloody prints

Fingerprint Results: *Bloody* Prints Unfired Cartridges

Cartridge	Metal	Print Visible Before?	Print Quality After	
22LR	Brass	Yes	No Value	
22LR	Nickel	Yes	No Value	
45ACP	Alum.	Yes	Identifiable	
45ACP	Brass	Yes	No Value	
45ACP	Nickel	Yes	No Value	
9mmP	Alum.	Yes	Useable	
9mmP	Brass	Yes	No Value	
9mmP	Nickel	Yes	No Value	

Fingerprint Results: *Sweat* Prints Unfired Cartridges

Cartridge	Metal	Print Visible Before?	Print Quality After	
22LR	Brass	No	No Print	
22LR	Nickel	No	No Print	
45ACP	Alum.	No	No Print	
45ACP	Brass	No	Print but No Value	
45ACP	Nickel	No	No Print	
9mmP	Alum.	No	Print but No Value	
9mmP	Brass	No	No Print	
9mmP	Nickel	No	No Print	

Fingerprint Results: *Oily* Prints Unfired Cartridges

Cartridge	Metal	Print Visible Before?	Print Quality After	
22LR	Brass	No	No Value	
22LR	Nickel	Yes	No Value	
45ACP	Alum.	No	No Value	
45ACP	Brass	Yes	**Identifiable**	
45ACP	Nickel	Yes	**Useable**	
9mmP	Alum.	No	No Value	
9mmP	Brass	Yes	No Value	
9mmP	Nickel	Yes	**Identifiable**	

Summary: Useable Fingerprints on *Unfired* Cartridges

- Bloody Prints: 2/8 or 25%
  - This type of print is not frequently encountered on cartridges.
- Sweat Prints: 0/8
  - Delay between time print placed on cartridge and processed for prints
- Oily Prints: 2/8 or 25%

Fingerprint Results: *Bloody* Prints Fired Cartridges

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22LR	Brass	No	No Print	
22LR	Nickel	No	No Print	
45ACP	Alum.	Yes	No Value	
45ACP	Brass	Yes	Useable	
45ACP	Nickel	No	No Print	
9mmP	Alum.	No	No Value	
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45ACP	Brass	No	No Print	
45ACP	Nickel	No	No Print	
9mmP	Alum.	No	No Print	
9mmP	Brass	No	No Print	
9mmP	Nickel	No	No Print	

Summary: Useable Fingerprints on *Fired* Cartridges

- Bloody Prints: 1/8 or 12.5%
  - This type of print is not frequently encountered on cartridges.
- Sweat Prints: 0/8
  - Delay between time print placed on cartridge and processed for prints
- Oily Prints: 0/8

Conclusions: Likelihood of obtaining useable fingerprints on c. cases

- Not likely
  - If you eliminate bloody prints from consideration, then only 3/32 [9%] cartridge cases displayed useable prints.
    - *No* useable prints were obtained on the cartridge cases that had been fired.

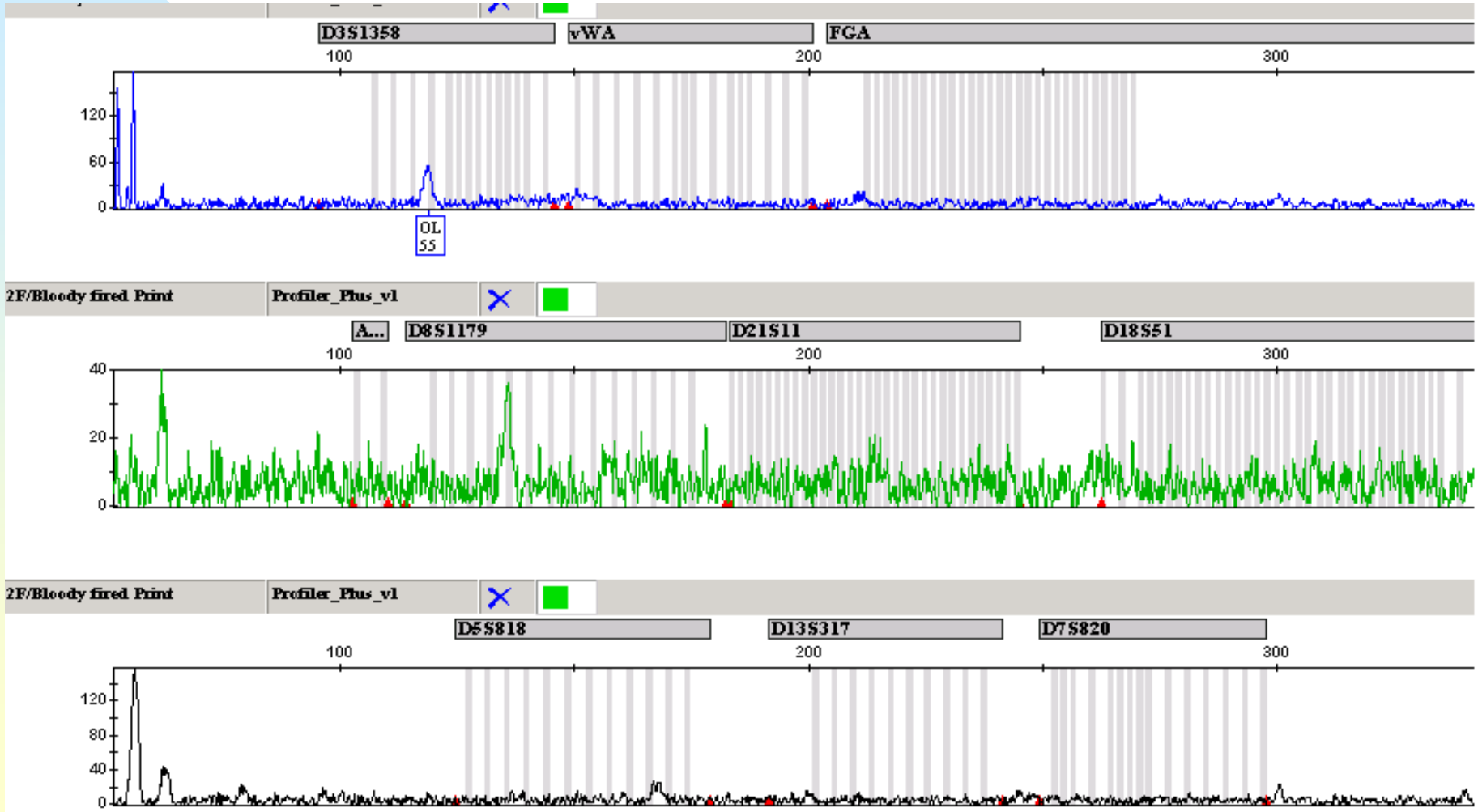
Methodology: DNA analysis

- After cartridges processed for prints, the fingerprints were swabbed with a swab dampened with deionized water.
- Swabs were organically extracted for DNA with phenol-chloroform.
- Only DNA from bloody prints were quantitated with QuantiBlot: No DNA detected
- All samples amplified with Applied Biosystem's Profiler Plus reagent kit.

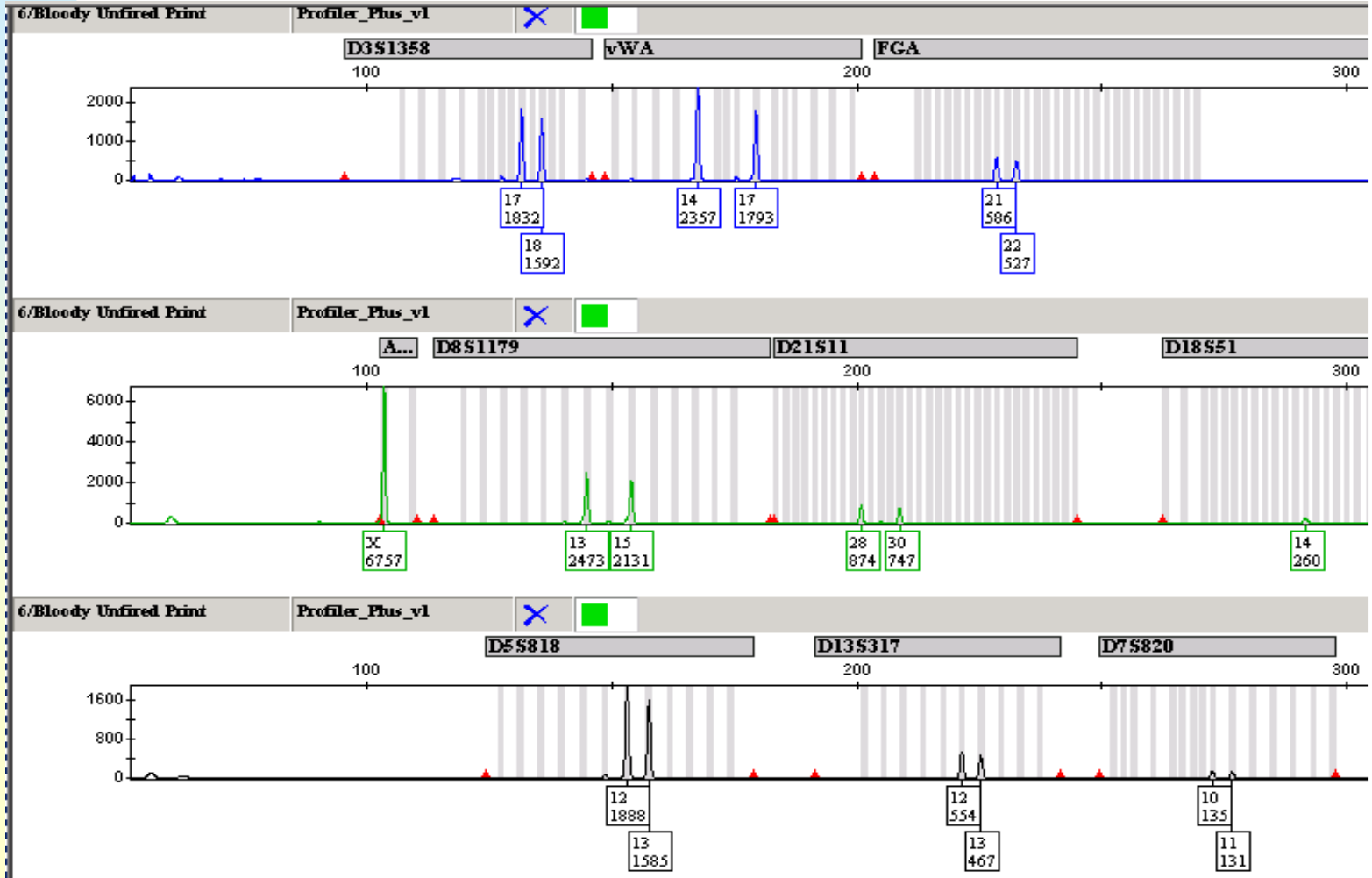
DNA Results

- A total of 3 DNA profiles were obtained from the 48 cartridges/cases [6%] that were processed.
  - All profiles were from bloody prints
- Only one full DNA profile was obtained from the cartridges/cases during this experiment:
  - The bloody print off the 9mmP aluminum cartridge
    - Cartridge had not been fired

Typical DNA profile on these cartridges/cases: No info.



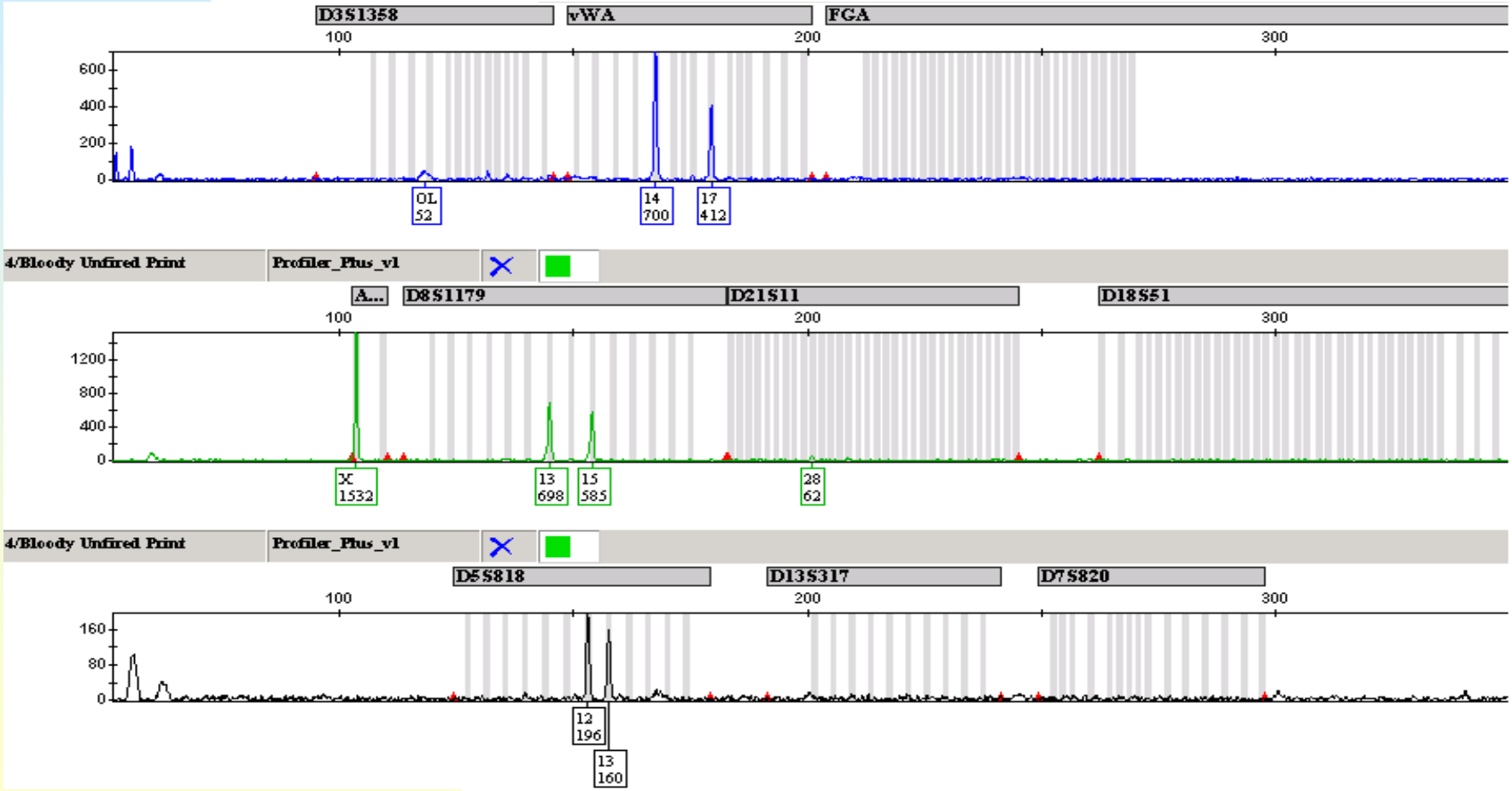
Full DNA profile from bloody print on unfired cartridge



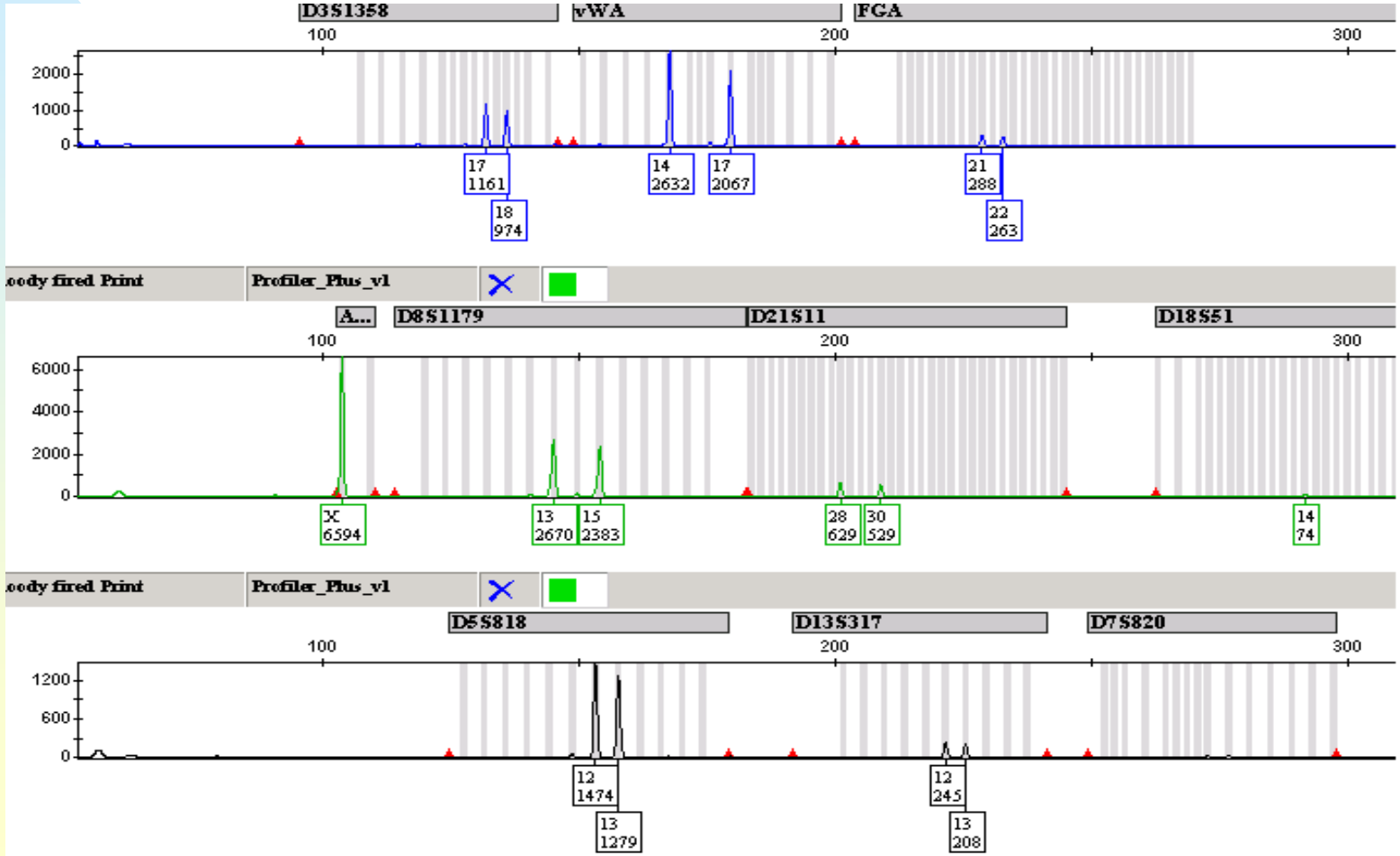
DNA Results

- Two partial DNA profiles were obtained:
  - The bloody print from the 45ACP aluminum cartridge case
    - Cartridge had not been fired
  - The bloody print from the 45ACP aluminum cartridge case
    - Cartridge HAD been fired

Partial DNA profile from bloody print on *unfired* cartridge



Partial DNA profile from bloody print on *fired* cartridge



Conclusions

- The **only** DNA that survived on cartridges/cases processed for fingerprints was DNA from bloody prints.
  - No DNA profiles were obtained from any of the sweat or oily prints.
- 3/16 cartridges/cases with bloody prints gave a full or partial DNA profile.
  - One of these cartridges had been fired through .45 pistol.

Conclusions: likelihood of obtaining DNA profiles on cartridges/cases

- Not likely
  - If you eliminate bloody prints from consideration, then *no* DNA profiles were obtained.