



ADVANCING JUSTICE WITH DNA TECHNOLOGIES

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Patricia D. Powers

Patti Powers joined AEquitas after serving as a Senior Deputy Prosecuting Attorney in Washington State for 27 years, bringing extensive litigation expertise as a well respected trial attorney. She supervised the Sexual Assault—Domestic Violence Unit, and prosecuted and tried a high volume of violent crimes—specializing in adult sexual assault, child sexual assault and abuse, sexual exploitation of minors, domestic violence, and related homicides (including complex litigation of high-profile, as well as cold and current cases). Patti served on the domestic violence and child fatality review committees and was a member of the Washington State Technical Assistance Committee for Child Death Review Guidelines. For five years, she was appointed as a Highly Qualified Expert for the United States Army, Criminal Investigation Division; in this role, she provided training for army criminal investigation agents and prosecutors at Fort Leonard Wood, Missouri, and in Germany. Patti is the lead Attorney Advisor on the SAKI project.



Misty Marra

Misty Marra is a Forensic DNA Analyst and the DNA Laboratory Coordinator at the Marshall University Forensic Science Center (MUFSC) in Huntington, WV. She received a Bachelor of Arts degree in Biology from West Virginia University and a Master of Science degree in Forensic Science from Marshall University. Misty has performed analysis/review of over 3,500 forensic DNA cases, which have included sexual assaults, homicides and property crimes as well as analysis of over 10,000-convicted offender samples. She has been instrumental in coordinating the MUFSC's sexual assault kit testing projects and the contracted technical review of outsourced sexual assault kit projects with agencies and crime labs across the U.S.

Misty is also a member of the Sexual Assault Response Team (SART) Faculty for the SANE-SART Resource Service as well as a consultant for other organizations where she conducts online instructional webinars and on-site trainings regarding DNA and its use in sexual assault cases both nationally and internationally.



Objectives

Recognize the value of Y-STR DNA testing and significance of statistical findings

Consider the use of phenotyping for investigations

Identify the potential of familial DNA searches in jurisdictions that authorize its use

Determine the potential of forensic genetic genealogy testing as an investigatory lead

Employ advanced DNA technologies to identify single and serial suspects in cold and current violent crimes

Investigating and Prosecuting Current and Cold Violent Crimes

Recognize Dangerousness of Sexual Assault: Consider Linkage

Suspect known
to victim

Suspect
unknown to
victim

Serial offenders

Cross-over
offenders

Commission of
other violent
crimes

Linkage between
sexual assault
and homicide

Cuyahoga Study

In March 2016, researchers at Case Western Reserve University published an analysis of serial vs. one-time sexual offenders, based on a random sample of cases associated with previously backlogged kits from Cuyahoga County, Ohio. Their analysis found that **more than half of these sexual assaults were connected to serial offenders**, suggesting that serial offenders are more common than previously believed.

RACHEL LOVELL, ET. AL., CUYAHOGA COUNTY SEXUAL ASSAULT KIT PILOT PROJECT: REPORT ON SERIAL AND ONE-TIME SEXUAL OFFENDERS (Begun Center for Violence Prevention Research and Education, Case Western University, March 2016)

Other Crimes, Wrongs, or Acts

FRE 404(b)

(1) *Prohibited Uses.* Evidence of any other crime, wrong, or act is not admissible to prove a person's character in order to show that on a particular occasion the person acted in accordance with the character.

(2) *Permitted Uses.* This evidence may be admissible for another purpose, such as proving *motive, opportunity, intent, preparation, plan, knowledge, identity, absence of mistake, or lack of accident.*

Broadened Perspective for Serial Offending

- Consider that a rapist possibly has done this before, will continue to do this in the future, or both.
- Serial sex offenders frequently assault both victims known and unknown to them and often exhibit intraserial variations in victim relationship, age, and even gender.
- Offenders do not necessarily follow substantially similar patterns across offenses.

Rachel Lovell et al., *Identifying Serial Sexual Offenders Through Cold Cases*, LAW ENF'T BULLETIN, May 7, 2020

Strategies for Using “Other Acts” Evidence

- Identify and present evidence to demonstrate motive, opportunity, intent, preparation, plan, knowledge, identity, absence of mistake, or lack of accident.
- Recognize that the list is not exhaustive and that this is a rule of inclusion.
- Develop effective strategies for use of FRE 404(b) in case in chief, intelligence for cross-examination or rebuttal.
- *Recognize that patterns or signs may be physical, behavioral, or both*

Advancing Current and Cold Cases of Violent Crime

DNA Analysis of Evidence

Investigation: Sources of Evidence

Begin with reviewing police reports, statements, laboratory reports

Identify any items associated with and linking crime scene, victim, offender

Determine availability of all evidence: untested and unsubmitted

Recognize evidence that may corroborate aspects of the victim's disclosure, testimony of witnesses, presence of offender

Diving deeper—what details are significant: cold and new

Consider all aspects of evidence: physical, forensic, behavioral, testimonial

Collaboration with Laboratory Analyst

- Identify sources of DNA based upon investigation and in context of crime.
- Consult with laboratory analyst to determine potential of achieving results and testing that will be employed.
- Discuss any prior testing and testing limitations with laboratory analyst, *e.g.*, mixtures.

Then and Now

Identify any changes/ developments in related science or policy:

- Evidence may not have been previously submitted or tested based on earlier, more restricted time frames for medical collection of forensic evidence.
- Evidence may not have been previously submitted for testing based upon misapprehension that testing isn't needed in consent defense cases.
- Crime laboratories may not have had capacity for testing of mixtures.

Short Tandem Repeats (STRs)

- **Short** segments of DNA
- **Tandem** — located next to each other on the DNA strand
- **Repeated** over and over



Short Tandem Repeats (STRs)

ATAG ATAG ATAG ATAG ATAG ATAG ATAG ATAG ATAG ATAG

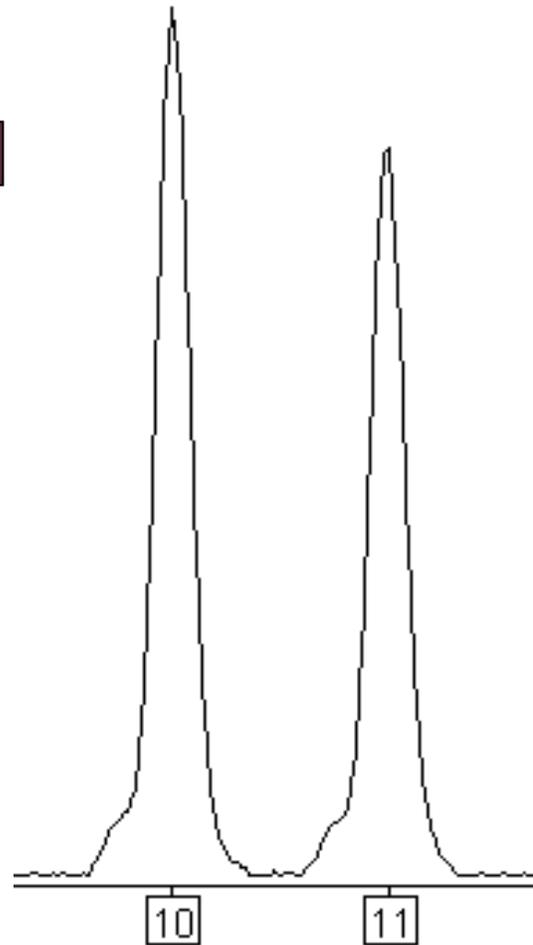
10 (STR) Repeats



11 (STR) Repeats



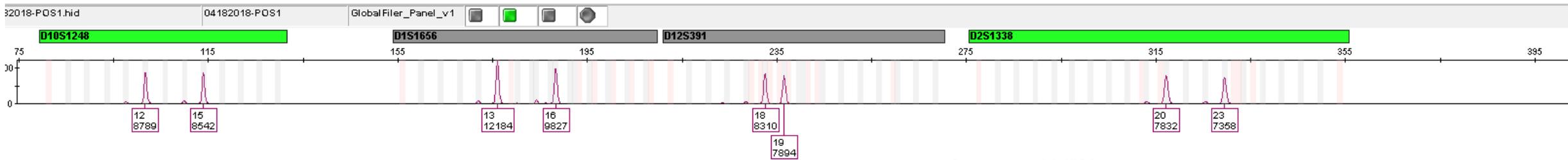
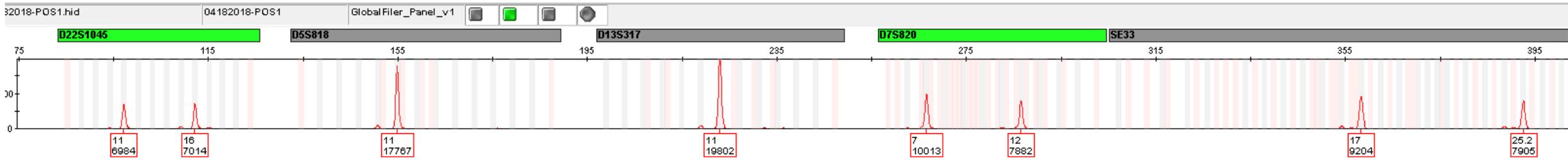
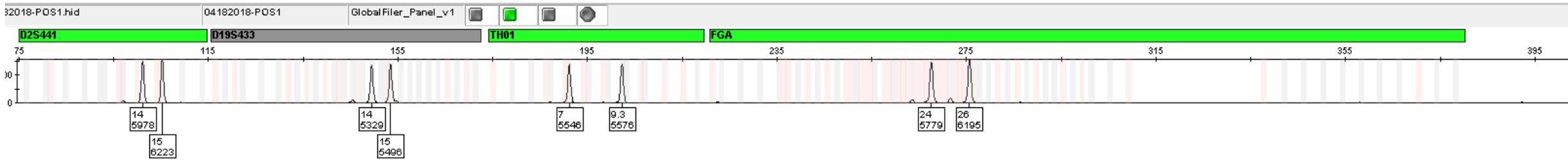
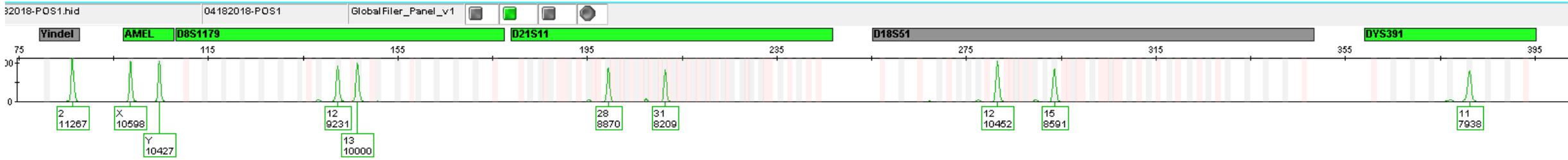
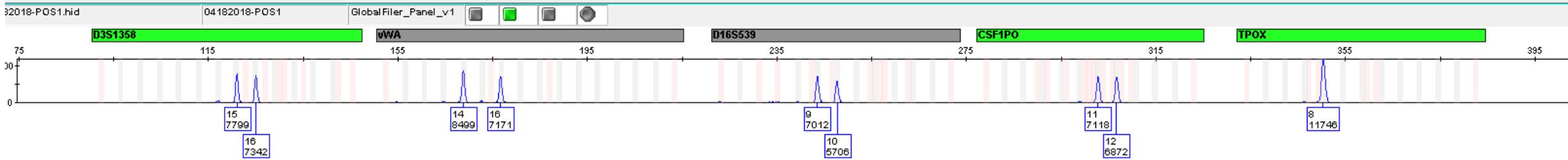
4 Building Blocks of DNA:
A, T, C, G



ATAG ATAG

STR Technology and STR DNA Profiles

- Standard crime laboratory DNA technology for forensics, human identification and paternity.
- Each STR area (locus) has several possible “types” (alleles).
- Highly variable among individuals.
- Multiple areas across the genome are typed simultaneously to develop a STR DNA profile that is unique to one individual (barring an identical twin).
- STR areas are independent from each other and can be multiplied together to yield a combined statistic when an evidence profile matches a known profile .
 - (Frequency Area 1) x (Frequency Area 2) x (Frequency Area 3) ...
 - Example wording – The probability of randomly selecting an unrelated individual with this DNA profile is at least 1 in 5.2 nonillion in the US population.



Courtesy of MUFSC

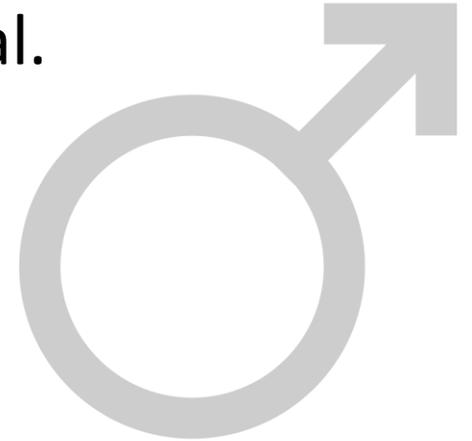
Statistics

Mixture:

- Resolvable = treat like single source stats.
- Irresolvable = Probability of Inclusion.
 - Probability of selecting randomly in a population of unrelated people an individual with a DNA profile that could be included in the evidence sample.
 - Stats drop considerably in comparison to single source because there are many more possibilities.

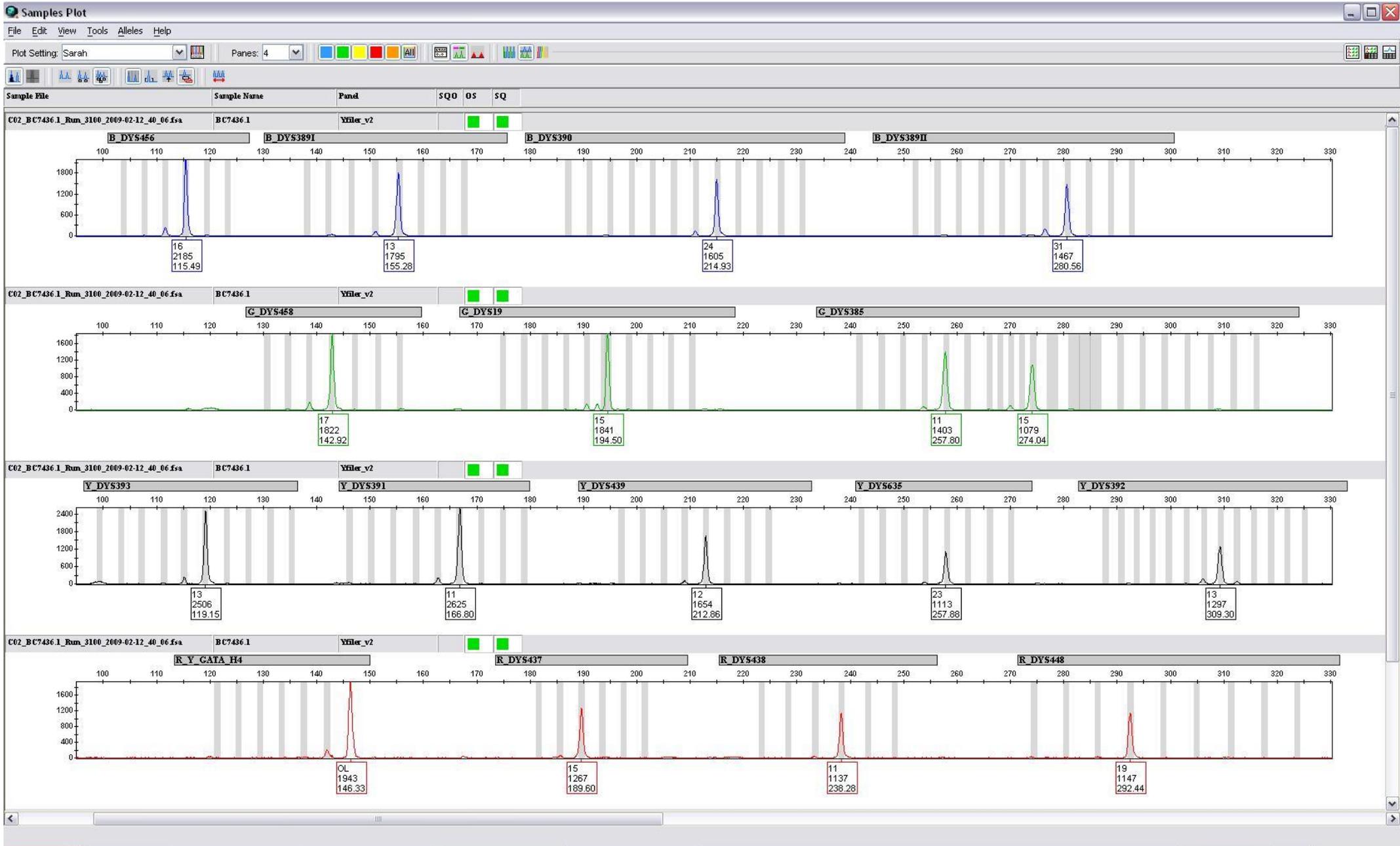
Y-STRs

- STRs on the Y-Chromosome – only in males.
- Inherited in full form from the father and will match relatives in the paternal line – Y-STR profile is **not unique** to one individual.
- Not as discriminating as STR technology.
- Y-STR testing performed by crime labs.
- Y-STRs can be searched in CODIS but currently only in the missing person-related index.



Y-STR DNA Profile

- Multiple areas across the Y-chromosome are typed simultaneously to develop a Y-STR DNA profile.
- Each Y-STR area has several possible “types” (alleles).
- Most Y-STR areas only yield one allele and a Y-STR profile is referred as a haplotype.



Ideal Scenarios for Y-STRs

- Y-STR technology does not react with female DNA.
- Failure to obtain a male DNA profile using traditional STR profile or the STR results are minimal or inconclusive, especially in the presence of high levels of female DNA.
 - Current DNA quantitation technology provides a ratio that estimates the amount of male DNA vs. total human DNA in a DNA sample.
- Extended time between the crime and evidence collection especially in sexual assaults.
- Trace amounts of male DNA in sexual assaults such as:
 - Digital penetration
 - Sterile or vasectomized male perpetrators or when there is no ejaculation
 - Fingernail scrapings from sexual assault victims
- Resolve male – male mixtures.

Y-STR TESTING: Working with Mixtures



Y-STR Statistics

- Y-STRs are all on the Y-Chromosome – not inherited independently.
 - Cannot calculate statistics like STRs.
- Treat the entire Y-STR haplotype as a single locus or area of DNA.
- Frequencies are estimated using the counting method when an evidence Y-STR profile matches a known Y-STR profile.
 - Search the haplotype against a Y-STR database (such as yhrd.org) to determine the number of times the haplotype was observed in the database .
 - Example wording – The Y-STR haplotype from the evidence item matches the Y-STR haplotype from the suspect and would be expected to match all other paternally related males. The Y-STR haplotype from the evidence item was searched against a known database and would be expected to be observed in 1 in 92,335 haplotypes.

On the Stand: Laboratory Analyst

STR and Y-STR

Testimony of Laboratory Analyst: STR and Y-STR

- Identify evidentiary source and present the exhibit.
- Establish chain of custody from submission through testing and return to evidence.
- Describe initial testing if tested previously.
- If previous witness unavailable, consider FRE 702 and *Williams v. Illinois*, 567 U.S. 50 (2012).

Testimony of Laboratory Analyst: STR and Y-STR

- Provide testimony about STR and Y-STR testing and methodology employed.
- Establish acceptance in the scientific community.
- Elicit description of results.
- Ensure that evidence is considered in the context of the crime: ***not everyone in a certain population was present at the scene!***

CODIS and Beyond

CODIS: Combined DNA Index System

- Searchable database of STR DNA profiles.
- As of April 2021
 - Over 14 million offender profiles
 - Over 4 million arrestee profiles
 - Over 1 million forensic profiles
- Even with advanced DNA technologies, uploading a CODIS eligible profile should still be the priority.
- Still the best tool in our toolbox for developing an investigative lead.

CODIS: Combined DNA Index System

- DNA data generated through PCR Short Tandem Repeat (STR) technology, Y chromosome STR (Y STR) technology, and Mitochondrial DNA (mtDNA) technology are accepted at NDIS.
- Y STR and mtDNA data are only searched with the missing person-related indexes.
- The National DNA Index no longer searches DNA data developed using restriction fragment length polymorphism (RFLP) technology.

Criminal Justice Information Services, FED. BUREAU OF INVESTIGATION,
<https://www.fbi.gov/services/cjis> (last visited July 13, 2021)

CODIS: Crime Scene

CRIME SCENE: DNA profiles obtained from crime scene evidence may also be partially degraded and/or contain DNA from more than one individual and as a result, may contain fewer than the required CODIS Core Loci.

FORENSIC PARTIAL AND FORENSIC MIXTURE INDICES: Partially degraded and/or mixtures. Forensic Partial and Forensic Mixture Indices are searched against the Offender Indices at moderate stringency—a search that requires all alleles to match, but the two DNA profiles can contain a different number of alleles.

These high and moderate stringency searches are designed to accommodate the fact that different typing kits may be used in generating the DNA profile, the DNA sample from the crime scene evidence may be degraded, or multiple individuals may be represented in the sample. They assist in facilitating the identification of high quality candidate matches between the crime scene and offender DNA profiles.

Criminal Justice Information Services, FED. BUREAU OF INVESTIGATION, <https://www.fbi.gov/services/cjis> (last visited July 13, 2021)

A Parallel Concern: Lawfully Owed DNA and CODIS

Not all offenders have provided requisite samples of DNA

- DNA is owed upon arrest and conviction or just upon conviction, depending on the state.
- In some jurisdictions, there are enumerated crimes or classification of offenses for which DNA is owed.
- There are timelines and/or procedures for obtaining samples.
- Inventories reflect absence of offender DNA required by type of offense or time of arrest/conviction.
- DNA profiles are constantly being uploaded.

Initial Steps: Investigating Violent and Serial Offenders

- Look for hits in the Combined DNA Index System (CODIS): crime scene or offender.
- Submit unresolved cases to the Violent Criminal Apprehension Program (ViCAP), whether there is DNA or not: identification, time-line, behavioral analysis.
- Employ familial search or forensic genetic genealogy searching (FGG) if authorized.

Caveat: Investigation Remains Crucial

“Not every kit will contain CODIS-eligible DNA, and not every CODIS-eligible DNA profile will identify a known offender or provide an investigative lead. While advanced methodologies, such as forensic genealogy, certainly can help identify numerous suspects, estimates suggest that DNA will not be the key to solving over 50 percent of cases.”

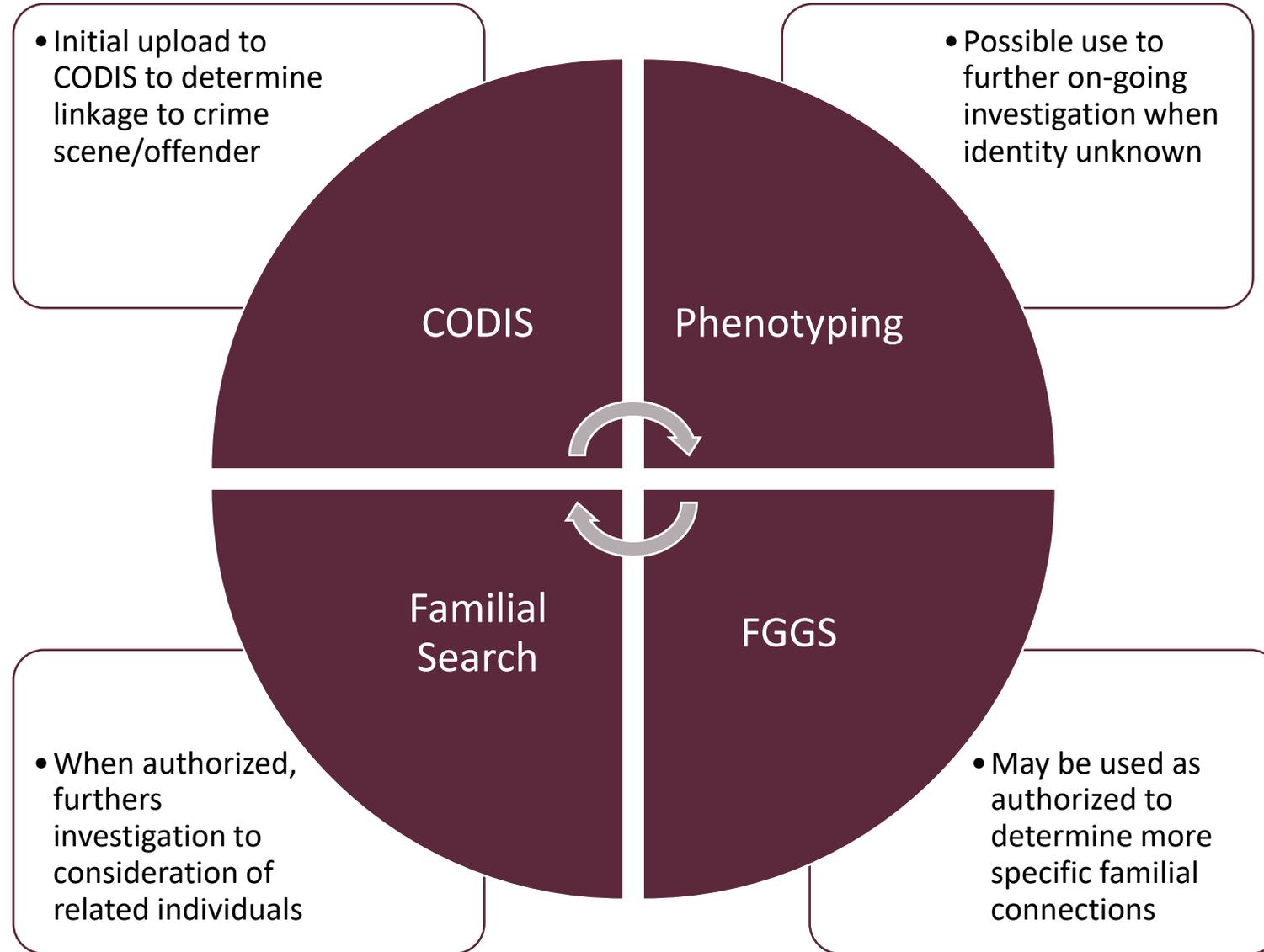
Rachel Lovell et al., *Identifying Serial Sexual Offenders Through Cold Cases*, LAW ENF'T BULLETIN,
May 7, 2020

What Are Your Options If You Don't Get a CODIS Hit?

Keys to Success

- Communication
 - Thorough case review and evaluation of evidence available.
 - Ensure right questions are being asked.
 - Joint decision on technology.
- CODIS Search
 - Should be first and last course of action in all scenarios.
 - Before pursuing advanced DNA technologies.
 - After investigative lead is produced to complete the confirmation of the match.
- Commitment
 - To the investigation even if an investigative lead is not produced.
 - Profiles are continually being entered into CODIS and genealogy databases.

DNA Technology



DNA Phenotyping

“Biologic Witness” and Science-Enhanced Investigation

- DNA Phenotyping is an investigative tool helping guide investigators when searching for suspects.
- Helpful in cold cases without a current lead.
- A step beyond eyewitness descriptions.
- Potential of age-progressed image based on DNA profile.
- Consider impact of environmental features.
- Consider geographical presence/activity.

Manfred Kayser, *Forensic DNA Phenotyping: Predicting human appearance from crime scene material for investigative purposes* 18 FORENSIC SCIENCE INTERNATIONAL: GENETICS 33-48 (2015).

DNA Phenotyping

Prediction of physical attributes and ancestry from DNA

- Requires a single source sample with high quality/quantity of DNA

Designed to help generate investigative leads

- No suspects, no database hits, narrow down suspect lists, help solve human remains cases

DNA Phenotyping

- Tens of thousands of genetic variations throughout a person's DNA are analyzed to predict physical appearance of an unknown person.
 - Similar to the same scientific methods being used for genetically-informed personalized medicine.
- This data is paired with forensic art and facial reconstruction techniques.
 - Genetic ancestry
 - Eye color
 - Hair color
 - Skin color
 - Freckling
 - Face shape

DNA Phenotyping – How It Works

- Assess quantity and quality of the DNA sample.
- Utilizes SNP Technology (yet another type of DNA).
 - Single Nucleotide Polymorphism – single base variation between individuals.
 - Most common type of genetic variation between people.
 - Genotyping laboratory will perform the SNP testing.
- Forensic Phenotyping Company utilizes bioinformatics.
 - Data mining of genotype and phenotype datasets using statistical analysis on hundreds of thousands of SNPs to identify markers associated with specific traits.
 - Data modeling to produce a prediction of traits with confidence intervals.
 - Forensic artist assists with facial composite if provided.

Snapshot Prediction Results

Composite Profile



#CPS-CAN-AB-CA17551669-Snapshot

PNL Document #20F15R51-PRDJD6S3



Actual Photo

Predicted (☐) & Excluded (☒) Phenotypes



Sex: Female ♀

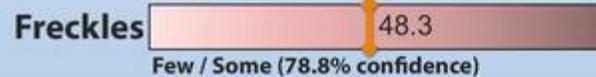
Age: Unknown
(Shown at age 25)



Body Mass: Unknown
(Shown at BMI 22, Normal)



Ancestry: N. European
and Native North
American Admixed



DNA Phenotyping – Crime Lab Involvement

Not routinely performed at crime lab

- Outsource to private companies

Crime lab will test confirmation samples

- Using traditional STR testing and comparison to evidence items

On the Stand: Investigator(s)

Investigator: Trial Testimony

Genetic phenotyping projection is an investigative lead

Investigator testifies how subject was identified, including phenotyping

Projected image is not evidence of identity, but an aid in identification

When there are few, if any, eye or secondary witnesses, phenotyping may refresh recollection

Establish other indicators of reliability, *e.g.*, time, circumstances, and corroboration

Familial DNA Searching

What is Familial DNA Searching?

- A deliberate search of a DNA Database for the purpose of identifying close biological relatives of the contributor of an evidentiary DNA profile.
 - Based on the tenet that close relatives share more genetic material (alleles) than unrelated individuals.
 - Can “match” to parents, siblings or children.
- Only performed when a routine search of CODIS does not yield any matches.
- Not currently performed at national level (NDIS) of CODIS and is not a partial match in CODIS.
 - FBI does not regulate these types of searches at the state level.
 - A state must use specialized software that was designed and validated for this type of search.

Familial DNA Searching: Consider State law

- Each state must determine whether or not to authorize familial DNA searching.
- Arkansas, California, Colorado, Florida, Michigan, Texas, Utah, Virginia, Wisconsin and Wyoming currently perform familial searching.
- Specially-designed software (not CODIS software) is used to perform familial searching of databases.
- Maryland and DC have passed laws prohibiting familial DNA searching.

Frequently asked questions on CODIS and NDIS, FED. BUREAU OF INVESTIGATION,
<https://www.fbi.gov/services/laboratory/biometric-analysis/codis/codis-and-ndis-fact-sheet> (last
visited July 7, 2021)

Familial DNA Searching

Database

- CODIS
- Local DNA Database

Technical Method

- Relies on previously obtained STR profile
- Extracts profiles from CODIS
- Uses 3rd party software to perform search

Possible Criteria for Familial DNA Searching

Exhausted all other investigative leads in an active serious violent crime

DNA profile must meet certain specification (minimum # of results)

Collaboration between law enforcement, prosecuting attorney, and crime laboratory

Law enforcement/prosecution commitment to follow leads and continue the investigation

Familial Search Process

Routine search of CODIS = no match

DNA profiles can be used to identify someone in database who may be close relative of suspect

Familial search can potentially provide investigatory lead as opposed to identification of suspect

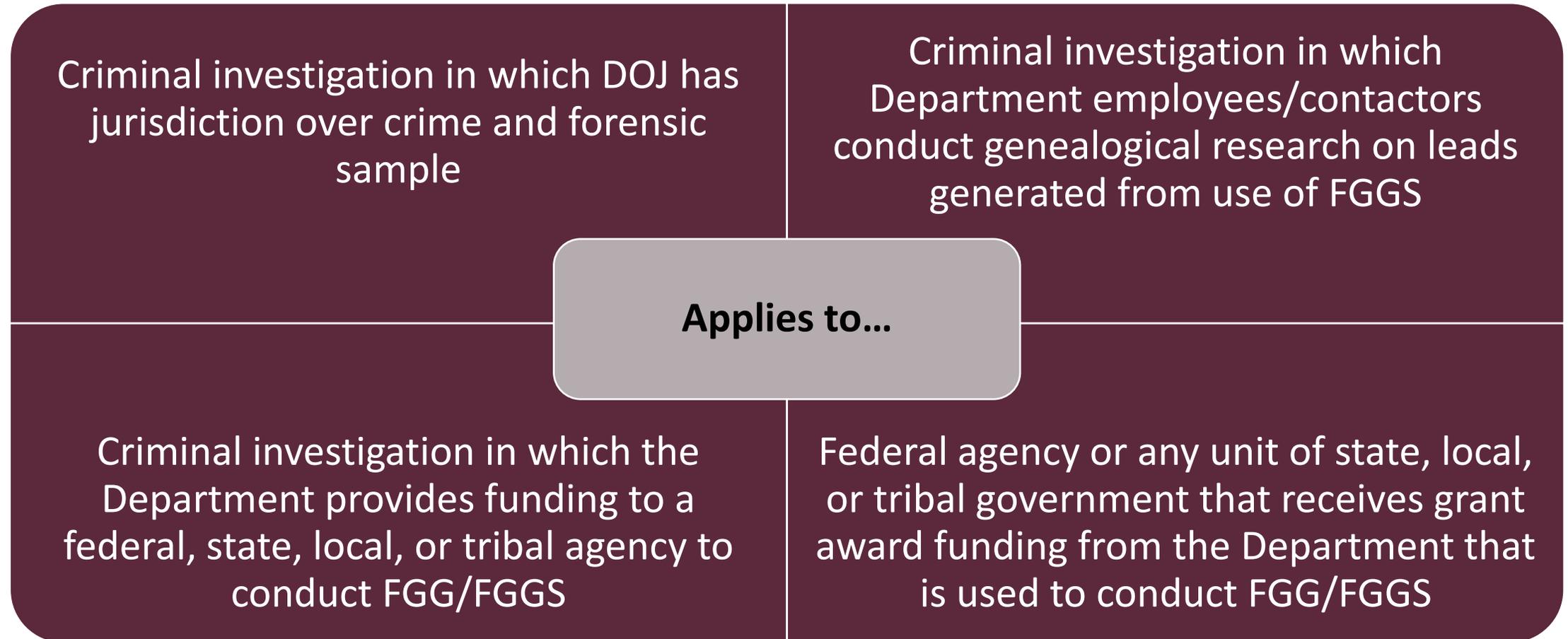
Law enforcement follows up with investigation narrowing individual based on time and other associations

Familial DNA Searching at the Crime Laboratory

- Search of the database is performed with a previously obtained STR profile using specialized software and validated search criteria.
- A list of candidates is generated from the search and may be ranked using statistical calculations to determine the likelihood of kinship.
- Additional testing will be performed to narrow down pool of candidates, exclude unrelated individuals and confirm the potential relative.
 - Lineage testing such as Y-STR or Mitochondrial DNA Testing.
- Investigative lead is reported to law enforcement for follow up.
 - Familial DNA Searching is only one piece of the puzzle – still lots of work to do.

Forensic Genetic Genealogy (FGG)

Application of Interim Policy



Criminal investigation in which DOJ has jurisdiction over crime and forensic sample

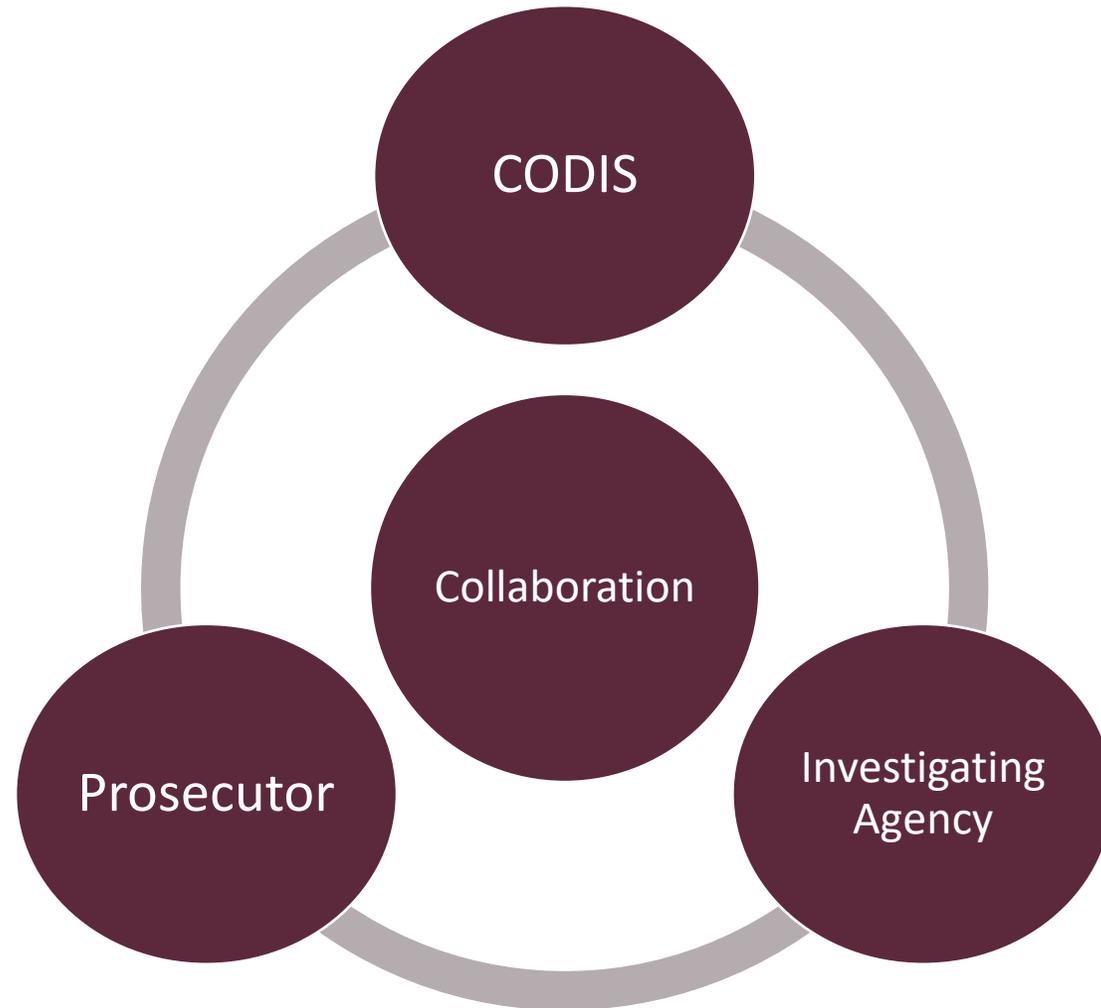
Criminal investigation in which Department employees/contactors conduct genealogical research on leads generated from use of FGGS

Applies to...

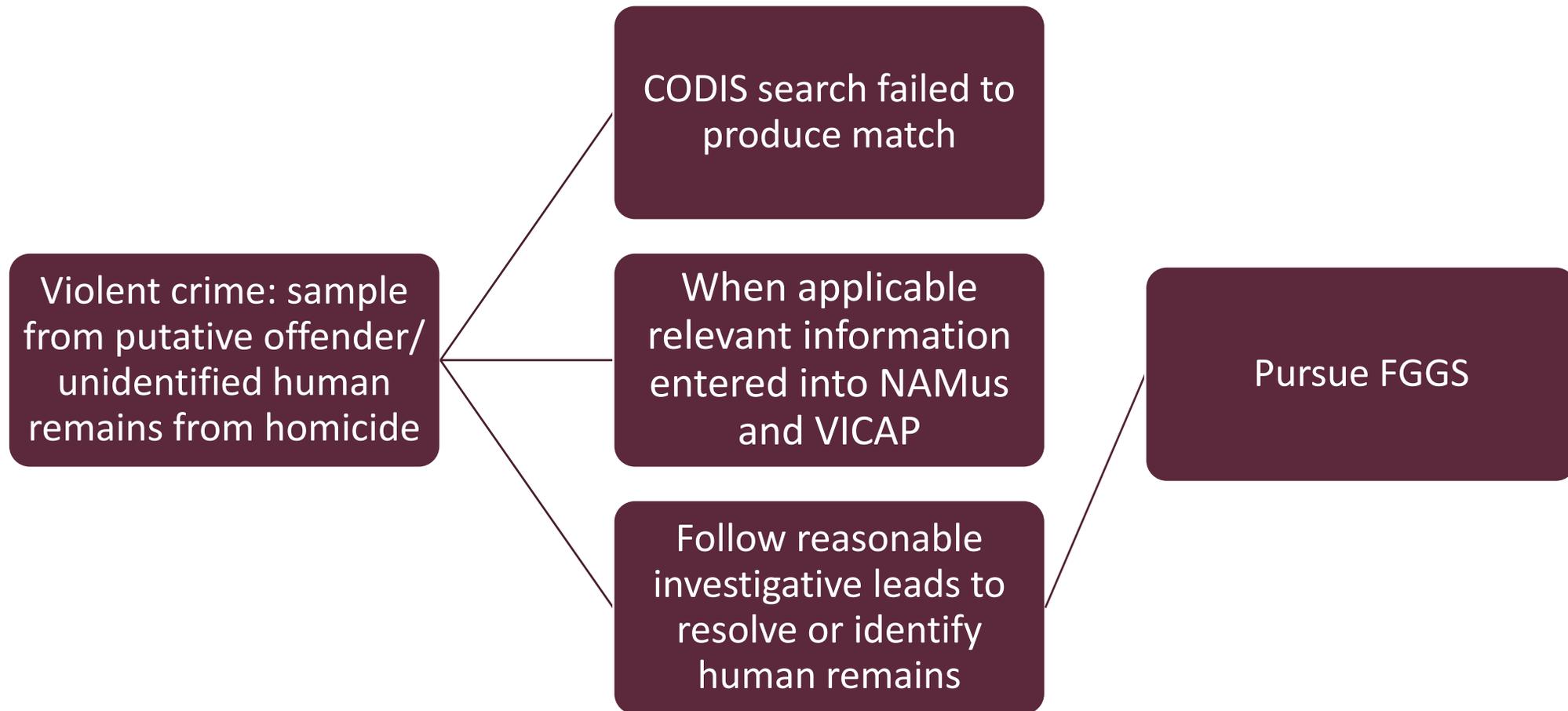
Criminal investigation in which the Department provides funding to a federal, state, local, or tribal agency to conduct FGG/FGGS

Federal agency or any unit of state, local, or tribal government that receives grant award funding from the Department that is used to conduct FGG/FGGS

Collaboration



FGGS Process



Forensic Genetic Genealogy

Combination of genetic analysis with traditional historical and genealogical research

- Also utilizes SNPs to determine how closely related two individuals are

Designed to help generate investigative leads

- No suspects, no database hits, narrow down suspect lists, help solve human remains/missing persons cases

Forensic Genetic Genealogy— How It Works

- Assess quantity and quality of the DNA sample.
- SNP analysis to determine if two people may have inherited their DNA from a common ancestor.
 - Analyze large segments of DNA measured in centimorgans (cM).
- Forensic Genetic Genealogy company uploads the SNP results to large public genetic genealogy databases.

Forensic Genetic Genealogy Database Search

- Genealogy databases are open-source public databases.
 - Voluntary samples from private citizens.
 - Limitations regarding law enforcement access.
 - GEDmatch and Family Tree DNA databases allow law enforcement upload.
- DNA from an unknown source is searched and compared to the samples in the database.
 - Total number of centimorgans shared across all chromosomes is used to make inferences regarding potential familial relationships.
- The genealogy database search can identify close and distant relatives with DNA in common with the unknown source.
 - Can even identify the individual themselves if they are in the database.

Forensic Genetic Genealogy – The Real Works Begins

Family trees are developed by genetic genealogists

- Employ public records search for historical information such as births, marriages, etc.
- Can be paired with forensic phenotyping

Communication with law enforcement is key!

Are Forensic Genetic Genealogy and Familial Searching The Same?

Forensic Genetic Genealogy

- SNP Technology
- 600,000+ SNPs
- Public databases
- Can generate leads from more distant relatives
- Available in all states if meet certain criteria

Familial Searching

- STR technology
- 20+ STRs
- Law enforcement databases
- Can generate leads from close relatives
- Only permitted in certain states
 - In those states, may have policy that familial search is performed before forensic genetic genealogy is pursued

Forensic Genetic Genealogy – Crime Lab Involvement

Not routinely performed at crime lab

- Outsource to private companies

Crime lab will test confirmation samples

- Using traditional STR testing and comparison to evidence items

Confirmatory Sample

- Lead establishes probable cause: sufficiency of genetic and non-genetic information linking suspect to crime.
- Collect reference sample from suspect: consent, search warrant, abandoned DNA.
- Testing of confirmatory sample with DNA from victim or crime scene is presented as evidence.

Collecting Discarded DNA



Discarded DNA: Foundation for Argument

California v. Greenwood 108 S.Ct. 1625 (1988)

- Fourth Amendment does not prohibit the warrantless search and seizure of garbage left for collection outside the curtilage of a home.
- Warrantless search and seizure of garbage bags left at curb outside Greenwood house would violate Fourth Amendment **only if** respondents manifested a **subjective expectation of privacy** in their garbage that society accepts as **objectively reasonable**.
- Individual states may construe their own constitutions as imposing more stringent constraints on police conduct than does the federal Constitution.

Legal Considerations: Doctrine of Abandonment

- The abandonment doctrine states that a person has no reasonable expectation of privacy in property that is abandoned in public, *California v Greenwood*, 486 U.S. 35 (1988).
- Warrantless examination or collection of such property does not constitute a search under the Fourth Amendment.
- Investigator should carefully document any associated surveillance, including offender conduct and context when DNA is discarded.

Discarded DNA Inquiries

Whether the abandonment was intentional: no intention to retain privacy

- *See Com. v. Perkins*, 883 N.E.2d 230, 239-40 (Mass. Sup. Jud. Ct. 2008); *see also State v. Williford*, 767 S.E.2d 139, 141 (N.C. Ct. App. 2015); *Com v. Cabral*, 866 N.E.2d 429, 434 (Mass. App. Ct. 2007)

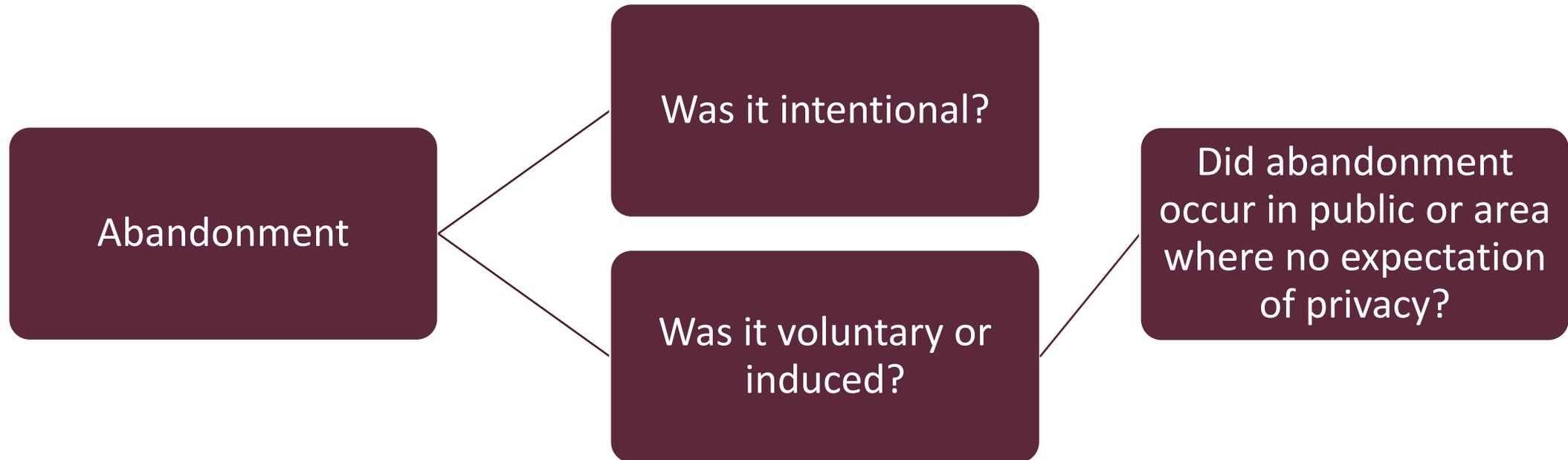
Whether abandonment was voluntary (or induced by police misconduct),

- *See Hudson v. State*, 205 S.W.3d 600, 604 (Tex. Ct. App. 2006)

Whether abandonment occurred in public,

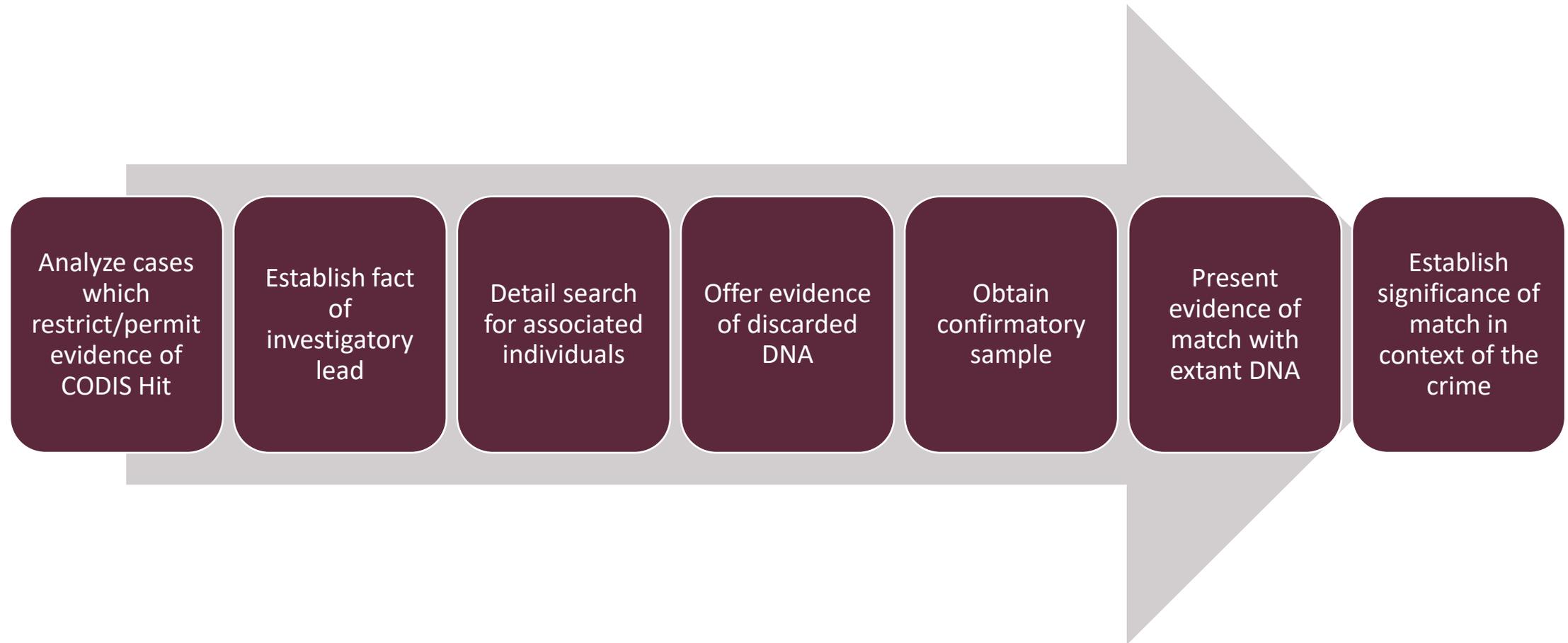
- *See State v. Reed*, 641 S.E.2d 320 (N.C. Ct. App. 2007)

Analyzing Abandonment



On the Stand: the Investigator(s)

Overview of Testimony: Preparation



Investigator Testimony

- Identify all investigation activities to identify suspect: review autopsy findings, witness interviews, vehicle license check, vehicle identification number search, DOL history, firearm tracing, timeline development.
- Include review of evidence and submission for DNA testing and any results yielded.
- Was CODIS hit upload pursued?
- Was VICAP or the National Missing and Unidentified Persons System (NamUs) utilized?
- Identify period of time when case was dormant and any identification efforts during that time.

Investigator Testimony

- Was familial search authorized and pursued or FGGS pursued?
- Describe investigatory work once familial association established: determination of family tree, research public records, census records, obituaries, and identify members of family by age reference and jurisdictions where they live.
- How did the defendant become a suspect?
- What surveillance was utilized? Call both primary and secondary witnesses.
- Was a sample of DNA obtained by search warrant?

Investigator Testimony

- Establish date and time of contact with suspect and identification of any other officers who were present.
- Establish fact of arrest and recitation of Miranda warnings.
- Determine if any statements were made by the suspect.
- Describe taking of DNA buccal swab and whether by consent or search warrant.
- Establish chain of custody of the swab, evidentiary packaging, date/time/initialing.
- Describe storage of evidence and submission to crime laboratory.

On the Stand: the Laboratory Analyst(s)

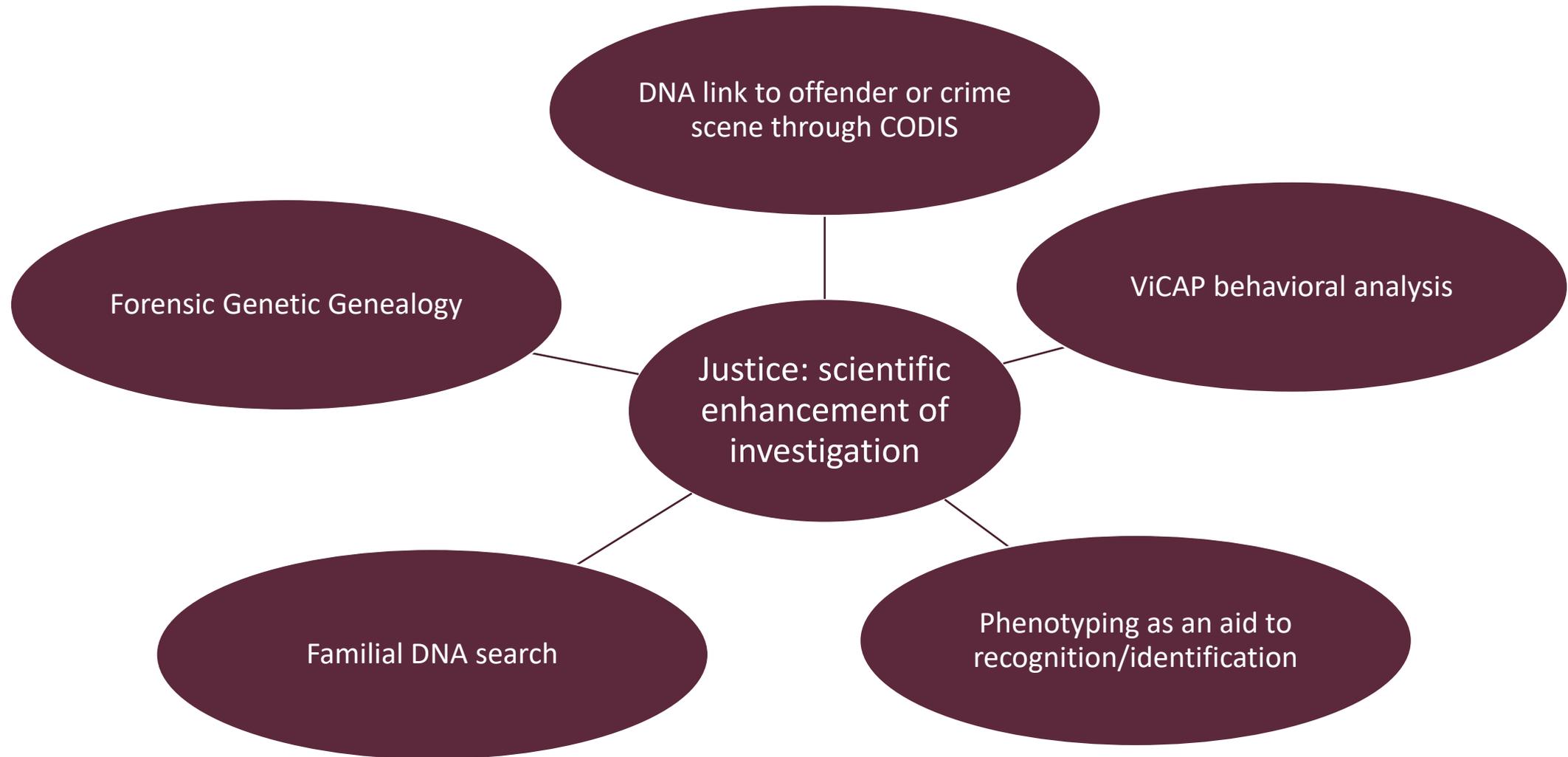
Direct Examination of Laboratory Analyst

- Present expert qualifications rather than agreeing to defense stipulation of qualifications.
- When referring to item of evidence, present the identification/exhibit to the expert.
- Establish the expert's role in the chain of custody of the evidence, referring to distinctive laboratory tape, signature, date.
- Refer to evidence along with assigned laboratory number.

Direct Examination of Laboratory Analyst

- Establish submission of items of evidence for testing and comparison.
- Discuss nature and purpose of testing given the item of evidence.
- Reference peer review.
- Findings and statistical representation of profile in given population.

Path to Justice



Going Forward

Recognize the value of Y-STR DNA testing and significance of statistical findings

Consider use of phenotyping for investigations

Identify potential of familial DNA search in jurisdictions which authorize

Determine the potential of forensic genetic genealogy testing as an investigatory lead

Employ advanced technologies to identify single and serial suspects in cold and current crimes

Contact Information



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