

NO-SUSPECT FORENSIC CASEWORK: A ONE IN FIVE HIT RATE!

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Abstract

The Indiana State Police Crime Laboratory and Genelex Corporation have formed a partnership to build a database of convicted felon DNA profiles and to analyze forensic casework evidence samples recovered from old and new crime scenes in which there is no suspect (1,2). DNA analysis was performed on samples using the core CODIS (Combined DNA Index System) STR (short tandem repeat) loci analyzed by Promega PowerPlex® technology in combination with the Hitachi FMBIO® II Fluorescent Scanner (Figure 1,2)(3,4). CODIS, the FBI-developed software system used for analyzing and tracking DNA profiles, has been successfully used across the United States to generate matches between database samples and crime scene evidence. These “blind” or “cold” hits have typically led to the resolution of serious, difficult cases.

The Indiana State Police Laboratory, in conjunction with the Indianapolis Marion County Forensic Science Agency, have screened evidence from unsolved sexual assault, sexual assault /homicide and burglary cases. Evidence samples were examined using body fluid identification testing methods and then profiled by STR DNA analysis. STR profiles were developed in 117 cases. As of September 2000, twenty blind hits had been made between DNA profiles derived from evidence samples from unsolved cases and convicted offender database profiles. The offender database contained DNA profiles from more than 22,000 previously convicted offenders. This represented a 17% hit rate from less than 120 unsolved forensic cases.

This data justifies the collection of samples from persons convicted not only of sexual assaults, but also of non-sexual violent crime and of lesser crimes such as burglary. Furthermore, the data supports the theory that some violent criminals start out performing lesser crimes, such as burglary, and then progress to more serious offenses, such as rape and homicide.

Six of the sexual assault cases were linked to persons previously convicted of non-sexual violent crimes. In this case, the category non-sexual violent crime included homicide, assault and battery, kidnapping, confinement, and robbery. Significantly, three of the sexual assault cases were tied to one offender, originally convicted of a non-sexual violent crime. Two of the three homicides also involved sexual assault. The DNA profile obtained from the semen in these cases was used to link the suspect with the homicide. Several of the hits from burglary cases were linked to offenders previously convicted of burglary. However, one sexual assault case and one sexual assault /homicide case were also linked to persons previously convicted of burglary.

The extremely high rate of matches between CODIS database samples and no-suspect crime scene evidence samples validates the importance of both of these projects. Due to the potential of identifying suspects from older unsolved cases, the Indiana State Police is supporting legislation to extend or negate the statute of limitations for sexual assaults. The data justifies the collection

of samples from persons convicted not only of sexual assaults, but also of violent crime and of lesser crimes such as burglary.

Impact of DNA analysis on offender database collection and legislation

The number of offender database samples requiring DNA profiling in the US has exploded (Figure 3). As of January 2000, approximately 750,000 felon samples had been collected. Virginia, California, Alabama, Florida, Washington, Ohio and Indiana are some of the states that have been the most aggressive in building DNA databases.

As of 1998, all 50 states had laws authorizing them to collect DNA from offenders and match the DNA profile via the CODIS database to evidence from unsolved crimes. Currently all states have laws passed to collect DNA from sex offenders, and about 40% of states collect samples from those convicted of offenses against children and homicides (Table 1). Approximately one third of states collect DNA from a variety of lesser felons, including those convicted of felony attempts, robbery, burglary and juveniles. Seven states currently collect samples from all felonies. The Indiana DNA database law was passed in 1996, and Indiana currently collects all categories except felony attempts and juveniles. In 1999, a bill was proposed that would have included persons arrested for all felonies. The bill was defeated in committee.

The state legislatures have been very active. This year, legislative bills to expand DNA testing have passed in six states including Arizona, Colorado, West Virginia, South Carolina, Georgia and Florida. In contrast, eleven legislatures rejected or declined to act on bills designed to expand the number of offenders from whom DNA is drawn. Laws establishing databases have withstood challenges in sixteen state and federal courts. Among other issues in some legislature's recent debates has been whether police should be able to use DNA samples to reopen old criminal cases. Proposals to allow that have passed in five out of ten states.

Critics of expanded testing say DNA evidence is rarely useful in solving non-violent felonies. The data presented in this paper indicates that it is extremely beneficial to collect DNA from lesser crimes, including non-sexual violent crimes and burglaries. Furthermore, the data supports the theory that violent criminals start out committing lesser crimes and progress to more violent crime.

No-suspect casework hit summary

STR analysis has been performed using the PowerPlex®1.1 and 2.1 fluorescent STR systems from Promega Corporation, and the Hitachi FMBIO® II fluorescent scanner (Figure 1,2). Each system allows the simultaneous amplification and single lane detection of the eight or nine core CODIS loci. The fluorescent scanner performs automated three-color detection of the STR loci and the internal lane marker.

The Indiana State Police have processed 144 unsolved forensic cases, screening evidence for body fluids. Some of these cases were very old and some were cases in which the original suspect had been excluded. Casework has primarily fallen into two major categories: rape (70%) and burglary (20%). The Indiana State Police have found that about half of the cases were

negative for body fluids and not suitable for DNA analysis. Typical rape case samples include a vaginal swab and a victim's reference standard. Typical burglary samples are crime scene bloodstains.

As of September 2000, 117 no-suspect cases have been searched in CODIS. Twenty of those have been linked to offenders in the database, representing a 17% hit rate. One case linked four unsolved rape cases but did not identify an offender and another case linked two unsolved burglary cases. There were two case-to-case hits. This technology is very powerful in solving difficult crimes and identifying serial perpetrators.

Conviction offense comparison

Many offenders repeat crimes, progressing from crimes that are less serious in nature to more violent crimes. This can be seen when analyzing this small set of "cold hits" by comparing the type of forensic case, now "solved", with the previous conviction offense of the felon (Table 2). Of the twenty hits obtained, ten were from rape cases, three from homicides and seven from burglaries. Three rape cases were linked to persons previously convicted of sexual assault. Significantly, six of the rape cases were linked to persons previously convicted of non-sexual violent crimes. Three of the sexual assault cases were tied to one offender, previously convicted of a non-sexual violent crime. One of the rape cases was linked to an offender previously convicted of burglary.

All three homicides were linked to persons previously convicted of non-sexual violent crimes or burglary. Two of the homicides involved sexual assault. The DNA profile obtained from the semen in these cases was used to link the suspect with the homicide. One of the sexual assault cases and one homicide case were linked to persons previously convicted of burglary. Seven case hits were burglary cases with three cases matching one offender. In approximately half of the cases, the data indicate a clear progression from a less serious offense (non-sexual violent crime and burglary) to a more serious offense (rape and homicide).

If we look at the breakdown of the Indiana offender database by conviction offense (Table 3), 21% of offenders are priority one (convicted of sex crimes). Approximately 50% are priority two (convicted of non-sexual violent crimes) and 28% are priority three (convicted burglary). In Indiana, non-sexual violent crimes include homicide, assault and battery, kidnapping and confinement, and robbery. By inference, 15% of the hits match priority one offenders, 40% match priority two offenders and 45% match priority three offenders. The data certainly justifies the collection of samples from persons convicted not only of sexual assaults, but also of non-sexual violent crime and of lesser crimes such as burglary.

Case outcome

In January 2000, the first matches were made in Indiana between no-suspect casework evidence and the CODIS database. Several hits have led to charges though no case has been closed by trial or plea. One trial was set for October 2000. No charges will be filed in at least two rape cases. In one, the victim is no longer living; in the other, the victim is not cooperating.

One hit was from a rape/homicide that had been unsolved since it occurred in 1987. Previous analysis by Polymarker, DQA1 and D1S80 had eliminated a previous suspect as the semen donor. Recent reanalysis by STR typing and a CODIS search yielded a hit. The offender, Jeffrey Whipps, has been charged with the 1987 homicide and rape of Lisa McCracken. Whipps was already serving an 89-year sentence for a later 1995 homicide and sexual assault of a fifteen-year-old family friend, Jill Slater. In both cases, the women had been raped, stabbed and left in a burning home. In both cases, the DNA profile from the sperm-cell-fraction of the vaginal swab matched Whipps's DNA profile. This case would probably not have been solved without the combined DNA database and no-suspect program. Furthermore, if the McCracken murder had been solved in 1987 by use of the database program, the later homicide could have been prevented.

Legislative changes under consideration

Several legislative changes are under consideration in Indiana. Current legislation is being drafted that will change the statute of limitation for sexual crimes and possibly some other crimes. A bill, requiring sample collection at the county level as a sentencing requirement for convicted offenders not entering the Department of Corrections, is also being considered. In Indiana, there has been a concerted effort to reduce the number of incarcerated offenders, especially non-violent offenders. This has increased county-based probation, home detention and work release. A recent survey indicated that two-to-three times more offenders enter these programs than the Department of Corrections system.

The no-suspect forensic casework program in conjunction with the offender database program provides reliable and timely information to the justice system. The high rate of "cold hits" obtained supports the importance of working unsolved cases from old and new crime scenes. These programs clearly have the ability to solve difficult and serial crimes. The data supports the assertion that many criminals repeat crimes and some progress from crimes that are less serious in nature, such as burglary, to those that are more violent crimes, such as rape and homicide. The data justifies the extended collection of samples from all felons.

References

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Figures and Tables

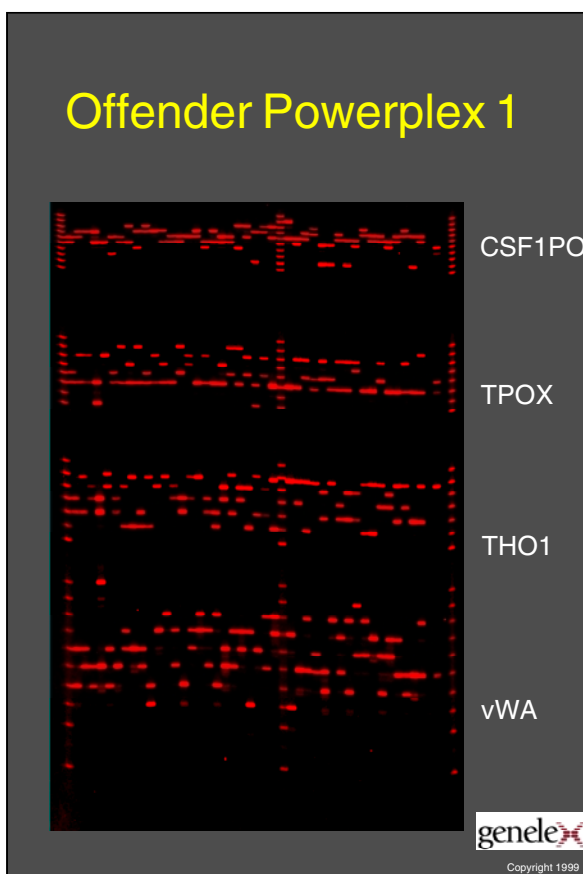


Fig 1 a. Database samples: PowerPlex®1.1. Blood samples were collected from convicted offenders. DNA was extracted from bloodstains, made on 903 or FTA® paper (FTA® protocol, Life Technologies). Amplification using the PowerPlex®1.1 kit (Promega Corporation) was as recommended by the manufacturer's protocol for the Perkin Elmer 9600 thermal cycler (5). Amplified samples were separated by PAGE on 43 cm gels (SA-32, Life Technologies Inc.) using 4.5% acrylamide:bisacrylamide (19:1), 1xTBE, 7M urea. Electrophoresis was at 65 W for 1.5 hr (pre-run ~0.3 hr at 65W). Bands were detected by scanning with an FMBIO® II (Hitachi) and were analyzed with Hitachi Analysis 6.0 and STARcall software. Depicted above is the red channel, showing the separation of four of the eight STR loci.

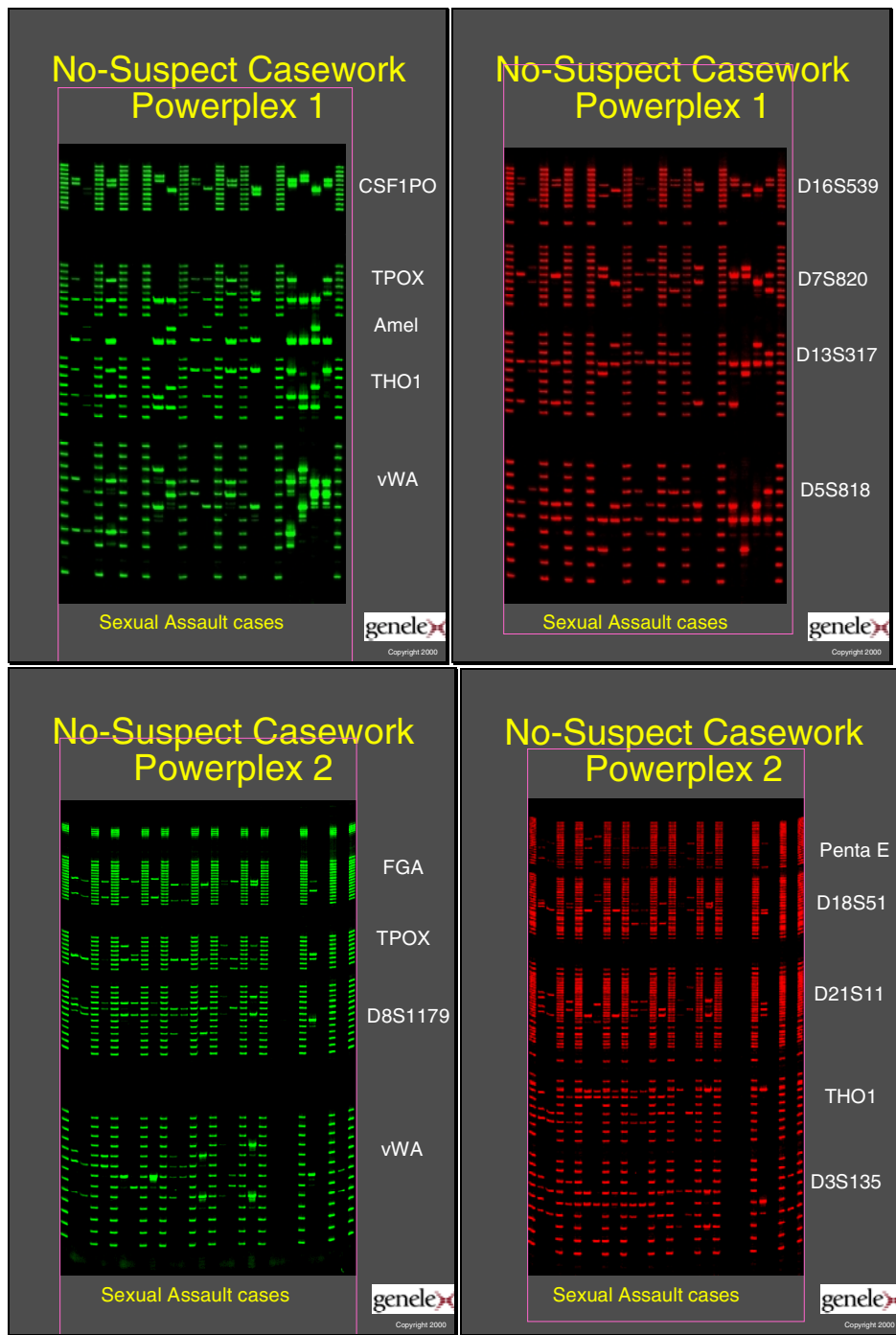


Figure 2. Non-suspect casework analyzed by PowerPlex®1.1 and Powerplex®2.1. Purified human DNA was obtained from questioned evidence by organic extraction (phenol-chloroform) and from known reference samples on FTA paper (FTA® protocol, Life Technologies). Quantitation of human DNA was by slot blot using radiolabeled probe to the locus D17Z1. Amplification, electrophoresis and analysis are as described in Figure 1 and as recommended by the manufacturer's protocol for the Perkin Elmer 9600 thermal cycler (5).

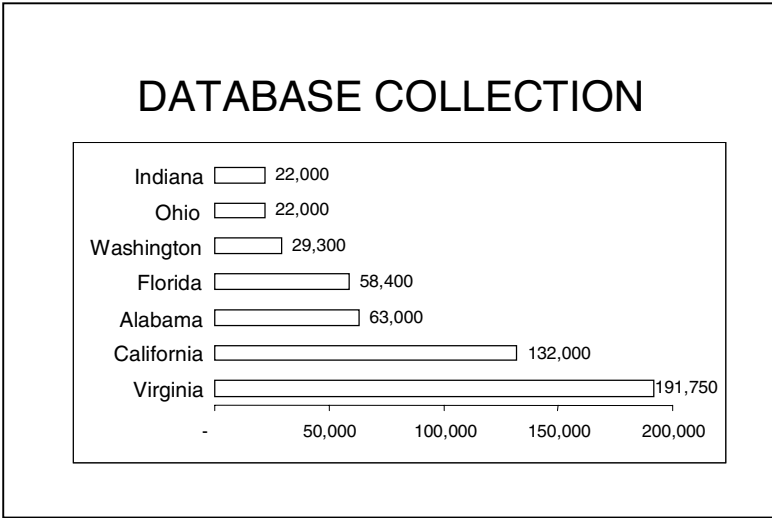


Figure 3. Database Collection. Over 750,000 samples have been collected from offenders as of January 2000. Data from USA Today, June 2000.

QUALIFYING OFFENSES

Type of offense	# States
Sex Offenses	50
Offenses against children	40
Homicide	37
Assault / Battery	28
Felony attempts	25
Juvenile	24
Robbery	19
Burglary	18
All felonies	7

Table 1. Status of state legislation regarding the collection of samples from offenders. Data from USA Today, June 2000.

OFFENDER HIT SUMMARY

Hit #	Type of Case	Conviction Offense
3	Rape	Sex crime
6	Rape	Nonsexual violent crime
1	Rape	Burglary
2	Homicide	Nonsexual violent crime
1	Homicide	Burglary
7	Burglary	Burglary

Table 2. No-suspect forensic hit summary. Twenty hits were made between DNA profiles from 117 no-suspect cases and convicted offender database samples. The hit rate was compared with the type of forensic case examined and the previous conviction offense of the felon.

STATISTICS BY CONVICTION OFFENSE

Conviction Offense	Priority Class	% Offenders	% Hits
Sex crime	1	21	15
Nonsexual violent crime	2*	51	40
Burglary	3	28	45

* homicide, assault / battery, kidnapping / confinement, robbery

Table 3. Forensic statistics by conviction offense. The percentage of offenders in the database and the number of hits were tabulated by conviction offense and priority class.