



National Institute of Justice

Research Program and Budget, Future Needs and Priorities

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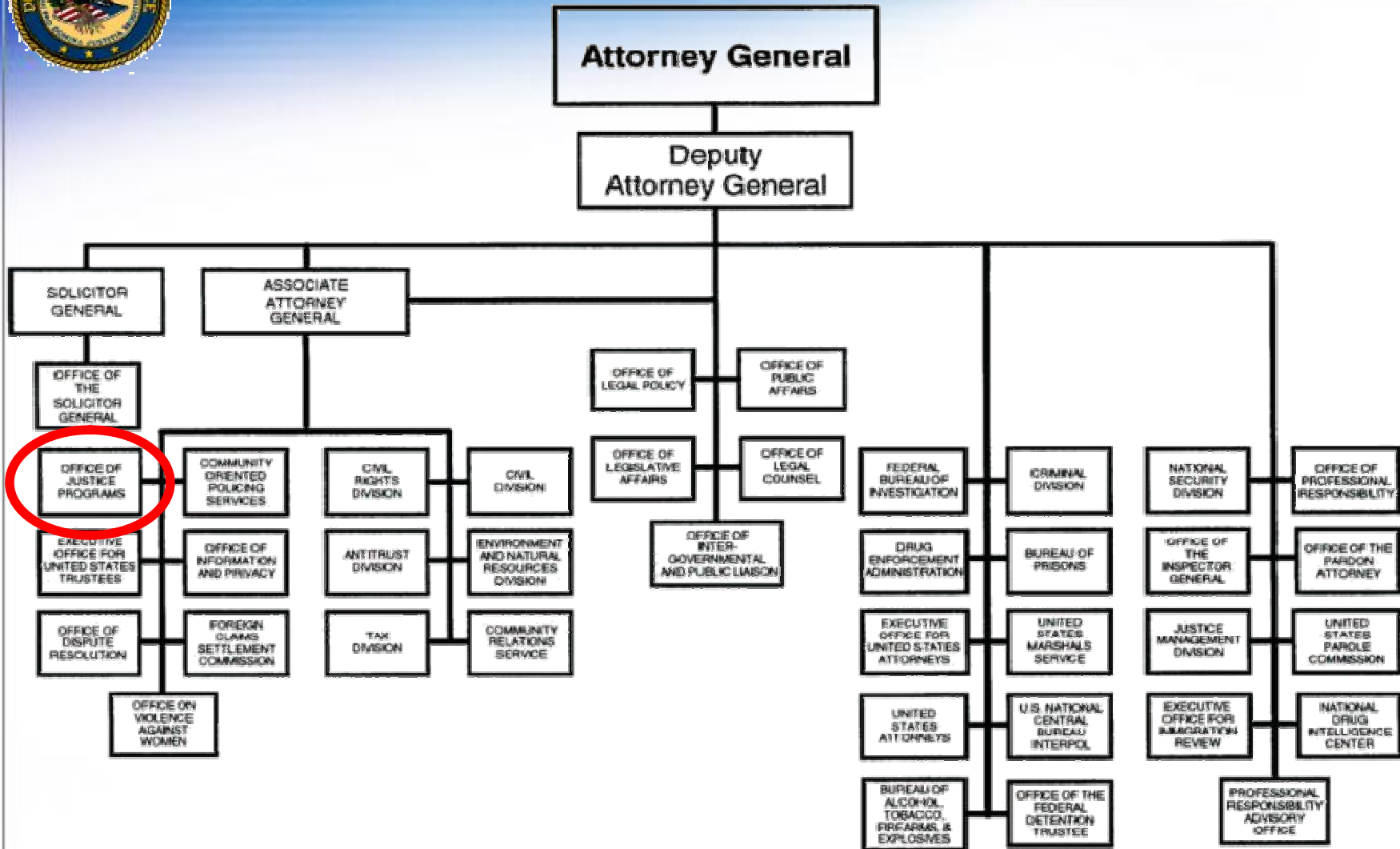
National Academy of Sciences
Committee on Identifying the Needs of the
Forensic Science Community
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National Institute of U.S. DEPARTMENT OF JUSTICE

Justice
NIJ

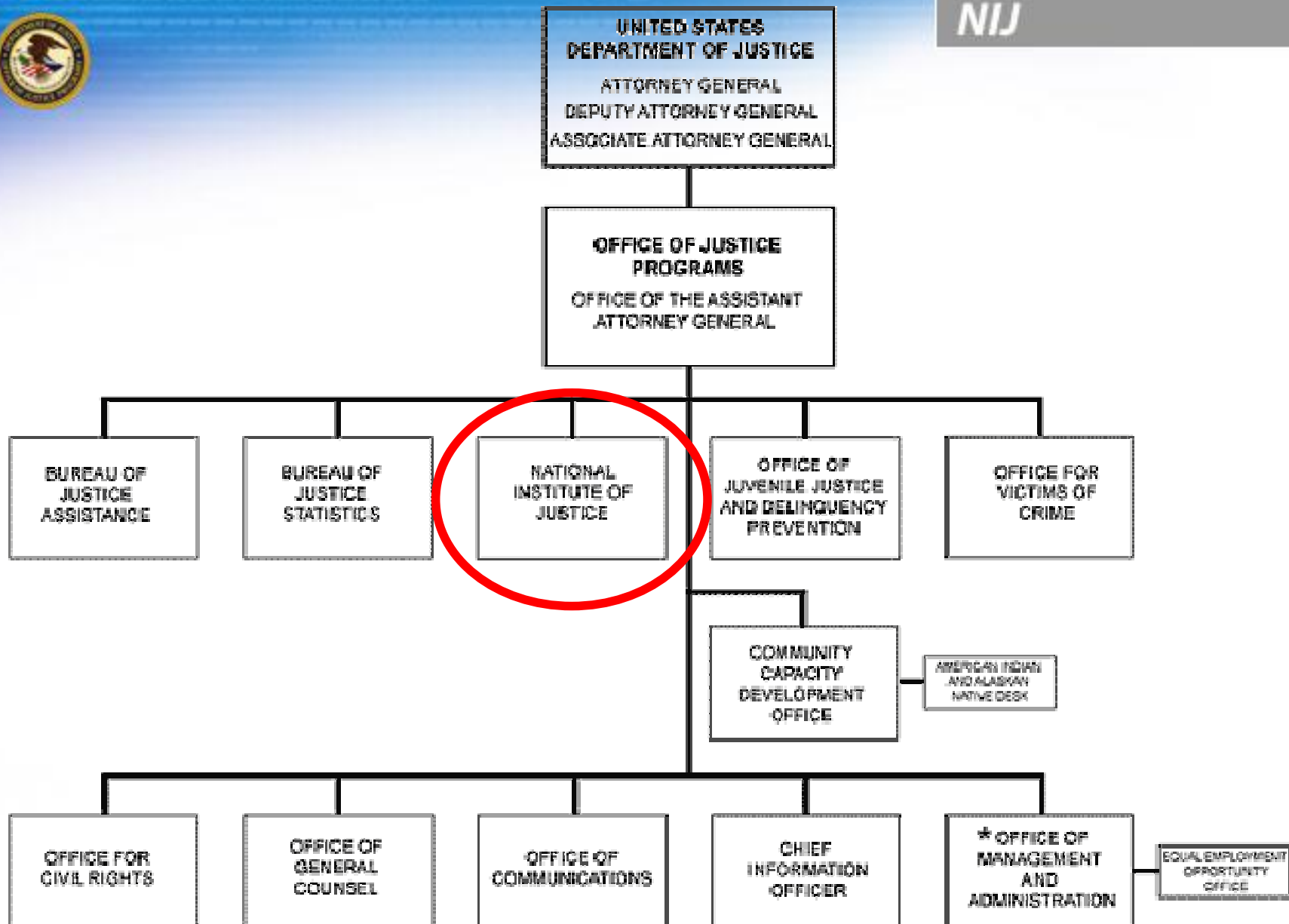


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National Institute of Justice

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NIJ Mission and Focus

- NIJ's mission is to advance **scientific research, development, and evaluation** to enhance the administration of justice and public safety.
- NIJ provides **objective, independent, evidence-based** knowledge and tools.
- NIJ's research agenda is guided by the needs of the field. NIJ actively solicits the views of criminal justice professionals, policymakers, and researchers to identify the highest-priority research needs.



NIJ has many customers

- Ø State & local justice system practitioners
- Ø Policymakers at all levels of government
- Ø Researchers
- Ø OJP program offices, DOJ Leadership
- Ø White House, other Federal agencies
- Ø American public



NIJ manages many functions

- Ø Social science research & evaluation
- Ø Technology research, development, testing and evaluation
- Ø Development of technology standards
- Ø Capacity building (in forensic laboratories)
- Ø Technology assistance to state/local law enforcement and corrections agencies
- Ø Dissemination of knowledge



NIJ's Forensic Science Programs

The President's DNA Initiative

General Forensics R&D

Paul Coverdell Forensic Science Improvement Act

Forensic Resource Network

Electronic Crime



The President's DNA Initiative: *Advancing Justice Through DNA Technology*

- Ø Announced by Attorney John Ashcroft in March 2003
- Ø A **5-year, \$1 billion** effort to increase the use of DNA analysis to solve crime, protect the innocent, and identify missing persons.
- Ø Six program goals:
 - Ø Eliminate all convicted offender sample backlogs and the casework backlogs in the most serious cases
 - Ø Build DNA analysis capacity in state and local laboratories
 - Ø Develop training for all those who work with this evidence
 - Ø Develop new DNA tools and techniques
 - Ø Ensure that DNA can be used to its full potential to solve missing persons cases and identify human remains
 - Ø Foster the use of DNA in post-conviction cases.
- Ø Congress has appropriated over \$300 million to date for the Initiative



The President's DNA Initiative: *Forensic Research & Development Program*

Since 2003, DOJ has made grants in excess of \$26 million for new research on forensics tools and techniques.

- Forensic DNA Research and Development
- General Forensics Research and Development



Coverdell National Forensic Science Improvement Program

- The **Paul Coverdell Forensic Science Improvement Program** is dedicated to enhancing the quality, timeliness, and credibility of forensic science services for criminal justice purposes.
- **Eligible to received funding:** State and Local Crime Labs
Medical Examiners / Coroners
- **Use of Funds:**
 - Laboratory Equipment and Supplies
 - Training and Education
 - Costs Associated with Accreditation and Certification
 - Personnel: Contracts / Consultants
 - Renovations and Construction
- **Base funding** – formula funding to States and Territories based on population.
- **Competitive funding** - funding provided directly to States and units of local governments on a competitive basis.



Coverdell National Forensic Science Improvement Program

Program Funding:

- FY 2004 - \$10,000,000
- FY 2005 - \$15,000,000
- FY 2006 - \$18,500,000*

*1,500,000 is set aside for the National Academy of Sciences to conduct a study on forensic science



How NIJ manages research

- NIJ awards grants, cooperative agreements and contracts based on national competition
 - Quality and technical merit
 - Impact of project on the field
 - Capabilities of research team
 - Budget, cost effectiveness
 - Dissemination strategy
- Independent peer reviews by researchers & practitioners
- Managed by NIJ staff -- experienced project managers, scientists, and researchers
- Final decisions by the NIJ Director



Forensic DNA Research & Development

GOAL

Develop tools and technologies that can enhance or increase the capacity, capability, applicability, and/ or reliability of analysis of crime scene evidence.



THINK “FASTER, BETTER CHEAPER” ¹⁴



The Goal of the Forensic DNA R&D Program...

...is to harness the tremendous growth in the broader scientific fields (such as molecular biology, genetics, and biotechnology) and direct it toward the development of highly discriminating, reliable, cost-effective, and rapid forensic DNA testing methods.



Where do we focus our DNA research?

- Development of tools and technologies to reduce the time, cost, and labor needed for DNA analysis (faster, better, cheaper).
- Improvement of the success rate of the analysis of DNA evidence that is old, scant, damaged, degraded, etc.
- Identification and characterization of genetic markers that will reveal additional information about the victim, perpetrator, or the circumstances surrounding a crime.
- Increasing the discriminatory power of DNA analysis.
- Improving the methods for separating mixtures of DNA (especially from sexual assault evidence).



Who are our grantees?

Population geneticists

Medical geneticists

Molecular biologists

Technology experts

Crime lab personnel with good ideas about how
to improve their lives



Forensic DNA R&D Program: Examples of Accomplishments

- § NIJ has developed an alternative approach for the **analysis of the 13 Short Tandem Repeat (STR) markers** currently used for analyzing biological evidence. This approach, known as “mini-STRs” allows STR testing to be performed on smaller fragments of DNA, and is especially applicable to degraded DNA evidence, such as that recovered following mass disasters or in missing persons investigations. This method was successfully used to assist the post-September 11th World Trade Center identification efforts.
- § NIJ has **improved the tools used for “human DNA quantitation” testing**. Human DNA quantitation testing must be performed on every piece of biological evidence to establish that the evidence left at the crime scene was from a human and that there was enough of it to get a reliable DNA profile. Through expansion of a technology called “real-time PCR”, NIJ-funded researchers have developed several human DNA quantitation assays, including assays that simultaneously quantitate nuclear, mitochondrial, and Y chromosome DNA, as well as an assay that combines DNA quantitation with an assessment of the level of DNA degradation. Crime laboratories have implemented these technologies.
- § A **field-portable DNA microdevice**, based on NIJ-funded research performed by MIT and NIST, has been commercialized.



Forensic DNA R&D Program: Examples of Accomplishments

- § NIJ has developed **novel tools which will expedite the detection and separation of sperm cells in sexual assault evidence**. These tools include “SpermPaints”, which use fluorescent tags to “light up” sperm on microscope slides, as well as laser microdissection (LMD), which is used to cut out and separate sperm cells.
- § NIJ has advanced the tools available for examining mitochondrial DNA. **Mitochondrial DNA** analysis is primarily used when the biological evidence is severely degraded or limited in quantity. A linear array assay developed by NIJ researchers was successfully used on skeletal remains recovered from mass graves in Croatia which could not be analyzed with traditional nuclear DNA markers. Other NIJ researchers performed population studies to identify single nucleotide polymorphisms (SNPs) that can increase the discriminatory power of mitochondrial DNA testing. This information has been used to assist in the identification of casualties from military conflicts.
- § NIJ has advanced the knowledge related to **male-specific markers on the Y chromosome**, as well as developed assays for use by crime laboratories for detection of these markers. This knowledge will assist in the examination of sexual assault evidence.



Mitochondrial DNA

- **Mitochondrial DNA analysis by dHPLC for the characterization and separation of mixtures in forensic samples** (University of Denver)
- **Development of multiplex PCR and linear array probe assay targeting informative polymorphisms within the entire mitochondrial genome** (Children's Hospital Oakland Research Institute)
- **Enhancing the size, sampling, and quality of forensic mtDNA databases** (Armed Forces Institute of Pathology)



Y Chromosome

- **Y-STR database compilation and management** (National Center for Forensic Science)
- **Validation of Y-chromosome STR multiplexes for operational use** (National Center for Forensic Science)



Compromised DNA

- **Development and evaluation of a whole genome amplification method for accurate multiplex STR genotyping of compromised forensic casework samples (Virginia Commonwealth University)**
- **The use of mini-STRs as tools for the investigation of DNA degradation and inhibition (Florida International University)**
- **An investigation of the effect of DNA degradation and inhibition on PCR amplification of single source and mixed forensic samples (Florida International University)**
- **Double strand break repair of highly degraded DNA (University of Central Florida)**
- **Repair of damaged DNA for forensic analysis (GE Global Research)**



Sperm Identification/ Separation

- **Sperm cell selection system for forensic DNA analysis of the male component (University of Virginia)**
- **Development of an automated system to detect spermatozoa on laboratory slides (Vermont Department of Public Safety)**
- **Laser microdissection separation of pure spermatozoa populations from mixed cell samples for forensic DNA analysis (Rosalind Franklin School of Medicine)**
- **Development of a procedure for dielectrophoretic separation of sperm and epithelial cells for application to sexual assault case evidence (CA Department of Justice)**
- **Separation of sperm and epithelial cells in a microfluidic device: An automated method for high efficiency, high purity separations (University of Virginia)**
- **Laser microdissection as a technique to isolate sperm cells and improve the analysis of touch Evidence (The Bode Technology Group, Inc.)**



Alternative Genetic Markers

- **Gene polymorphism and human pigmentation** (University of Arizona)
- **Population genetics of SNPs for forensic purposes** (Yale University)
- **Forensic stain identification by real-time PCR analysis** (Vermont Dept. of Public Safety)
- **The determination of the physical characteristics of an individual from biological stains** (University of Central Florida)
- **Isolation of highly-specific protein markers for the identification of biological stains: Adapting comparative proteomics to forensics** (University of Denver)



Automation/ Miniaturization

- **A hand-held DNA-based forensic tool (Cornell University)**
- **Microfabricated capillary electrophoresis genetic analyzers for forensic STR DNA profiling (University of CA)**
- **Microfluidic DNA analysis system for forensic applications (NIST)**
- **Nanotechnology DNA sequencing: Improving DNA processing technologies (Brown University)**
- **A SNP-based microarray technology for use in forensic applications (Affymetrix)**



Non-Human DNA

- **Generating more precise postmortem interval estimates with entomological evidence (Michigan State University)**
- **Mitochondrial DNA reference database for the domestic dog (George Washington University)**
- **The development and validation of a standardized canine STR panel for use in forensic casework (University of CA)**
- **DNA-based identification of forensically important Diptera (University of Cincinnati)**



Forensic DNA R&D: General Tools

- **Determination of the age (time since deposition) of a biological stain** (University of Central Florida)
- **Improving the efficiency of DNA casework analysis through simple, effective PCR-based screening methods** (Vermont Dept. of Public Safety)
- **DNA quantitation, STR microvariants, STRBase updates, SNP and STR Multiplexing** (National Institute of Standards and Technology)
- **Analysis of DNA forensic markers using high-throughput mass spectrometry** (Isis Pharmaceuticals, Inc.)



General Forensics R&D



General Forensic R&D: Portfolio

Discipline	Active Projects
Biology	-
Controlled Substances	5
Crime Scene	4
Firearms/ Toolmarks	4
Forensic Anthropology	4
Forensic Engineering	-
Forensic Entomology	1
Forensic Odontology	2
Forensic Pathology	1
Forensic Psychiatry and Psychology	-
Friction Ridge Identification	9
Impression Evidence	1
Questioned Documents	1
Toxicology	5
Trace Evidence	15
Other (Scientific Working Group, Forensic education, Elder Forensics)	2
TOTALS	53



The Goal of the General Forensic R&D Program...

...is to support projects that add to the scientific basis of forensic science through the research and development of techniques, tools, and technologies that can increase the capacity, capability, applicability, and/or reliability of analysis of forensic evidence.

The General Forensic Program consists of disciplines, including:

Controlled Substances | Crime Scene | Firearms/ Toolmarks

Forensic Anthropology | Forensic Entomology

Forensic Pathology | Forensic Odontology | Impression Evidence

Friction Ridge Identification | Questioned Documents

Toxicology | Trace Evidence



Where do we focus our General Forensic research?

- Development of tools and technologies that will allow faster, more reliable, more robust, less costly, or less labor-intensive identification, collection, preservation, and/or analysis of forensic evidence.
- Tools that provide a quantitative measure or statistical evaluation of forensic comparisons.
- Identification or characterization of new analytes of forensic importance.



Use of LC/MS/MS to Rapidly Perform First-pass Screening for Drugs and Poisons in Postmortem Toxicology Cases

Performer: Georgia Bureau of Investigation

Project Description:

- The purpose of this grant application is to investigate the feasibility of using electrospray ionization/liquid chromatography/tandem mass spectrometry (ESI/LC/MS/MS) as replacement methodology for enzyme immunoassay (EIA) in order to perform a comprehensive screen for drugs and poisons in postmortem samples.
- This grant developed a complete standardized operating procedure (SOP) as well as other procedures and policies for quantitating and reporting drugs on the **LC-MS-MS**.
- This represents a major advance in the capability of toxicology labs section to determine what types and concentrations of drugs the **LC-MS-MS** is able to analyze as well as the speed at which these analyses can be performed.
- Furthermore, this procedure provides a less expensive alternative for drug screening, since expensive EIA reagents will then be obviated. The further advantage of this procedure is that only a straightforward and rapid extraction will be required to test for >100 drugs using LC/MS/MS.



Capillary Electrophoretic Analysis of Clandestine Methamphetamine Laboratory Evidence

Performer: Washington State Patrol

Project Description:

- The clandestine manufacture of methamphetamine is a spreading epidemic. Manufacturing methods are constantly changing, necessitating the implementation of new analytical tools to identify materials from these labs.
- Three goals outlined for this project were to:
 1. Develop capillary electrophoresis (CE) methods that can be used to assist in the identification of inorganic chemical species from various methamphetamine manufacturing methods;
 2. Develop a better understanding of methamphetamine manufacturing methods and the chemistry of popular and emerging reactions;
 3. Provide training to forensic chemistry analysts, clandestine laboratory crime scene responders.
- This work resulted in the publication of six papers, production of eight training videos, and oral presentations of results at twenty meetings with forensic scientists, clandestine laboratory responders, law enforcement officials, community leaders, legislators and user agency personnel.
- Valuable tool for characterization of phosphate, phosphite, and hypophosphite in routine analysis of clandestine methamphetamine manufacturing evidence.



Tools that provide a quantitative measure or statistical evaluation of forensic comparisons.

State University of New York

Quantitative Assessment of the Discriminatory Power of Handwriting and Validating/Improving Handwriting Identification Procedures

Indiana University

Adding Human Expertise to the Quantitative Analysis of Fingerprints



Quantitative Assessment of the Discriminatory Power of Handwriting and Validating/Improving Handwriting Identification Procedures

Performer: State University of New York, Center of Excellence for Document Analysis and Recognition (CEDAR)

Project Description:

- The goal of this project is to develop algorithms for use in analyzing handwriting in questioned documents. In previous phases of this research the principal investigator, in collaboration with Forensic Document Examiners (FDEs), developed algorithms for a subset of the handwriting features used by FDEs in the examination of evidence.
- The software system (known as CEDAR-FOX) automatically extracts and analyzes handwriting features and can compare a handwriting sample to a database (writer identification) or compare two handwriting samples to each other (writer verification).
- This project, now in the end phase, now focuses on further optimization, refinement, and testing of eighteen algorithms for extracting handwriting features. Will collaborate with forensic science laboratories to evaluate, test, and refine the software to increase its forensic utility.



Adding Human Expertise to the Quantitative Analysis of Fingerprints

Performer: Indiana University

Project Description:

- Adding human expertise to the quantitative analysis of fingerprints Human expertise includes changes in both low-level perceptual and high-level cognitive processes.
- Many of these processes are difficult to verbalize, and thus we turn to empirical methods to infer the nature of these processes. We are using a combination of behavioral testing and eyetracking to measure the information that experts and novices acquire when they perform tasks that are similar to latent print examinations. We then use machine learning algorithms to identify the set of features that each group relies on.
- The larger goal of the project is to create mathematical descriptions of the processes that underlie performance in these tasks, which can then be used to improve machine-based algorithms that match fingerprints..



Identification or Characterization of New Analytes of Forensic Importance

Florida International University

Elemental Analysis of Glass and Paint Materials by Laser Ablation
Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS)
Forensic Application

University of Central Florida

Application of Fluorescence Line Narrowing Spectroscopy to
Forensic Fiber Examination



Elemental Analysis of Glass and Paint Materials by Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) Forensic Application

Performer: Florida International University

Project Description:

Small amounts of materials that transfer from a person to a crime scene, a scene to a person, or between two people or objects have been shown to provide for excellent “trace” evidence. Fiber, paint, and glass are commonly encountered as trace evidence.

This new While ICP-MS has been shown to be a highly discriminatory and powerful method, the complexity of the sample preparation step precluded its adoption into forensic laboratories. FIU incorporated a laser ablation solid sampling accessory as a replacement for solution analysis significantly reduces the complexity and time needed for the sample preparation step. A limited number of studies using laser ablation in conjunction with ICP-MS have been reported in the literature. A standard methodology prescribing the optimal parameters does not currently exist.

- **This project has resulted in the development and validation of a standard laser ablation ICP-MS method for the examination of glass and paint evidence.**



Application of Fluorescence Line Narrowing Spectroscopy to Forensic Fiber Examination

Performer: University of Central Florida

Project Description:

- This project will develop a nondestructive analytical methodology capable of providing highly discriminating identification of textile fibers encountered as physical evidence in criminal investigations.
- The applicant proposes to use fluorescence line narrowing spectroscopy, a high-resolution luminescence technique, to characterize textile dyestuffs for the purpose of establishing the possibility of a common source of a questioned and a known fiber. Because the same methodology can be used to track down previous fiber exposure to multiple washings, weathering and cigarette smoke, forensic scientists will have a nondestructive tool to obtain additional information on fiber history.



Forensic Anthropology

- Evaluation of Stature Estimates from the Database for Forensic Anthropology (University of Tennessee)
- Geometric Morphometric Tools For The Characterization Of Human Skulls (North Carolina State University)
- Knife and Saw Toolmark Analysis (Mercyhurst College)
- Measuring Atomic Bomb-Derived ^{14}C Levels In Human Remains To Determine Year Of Birth And/Or Year Of Death (Arizona Board of Regents, University of Arizona)



Controlled Substances

- **Capillary Electrophoretic Analysis of Clandestine Methamphetamine Laboratory Evidence** (Washington State Patrol)
- **The Development of Microfluidic Devices for the Rapid Isolation and Detection of Drugs of Abuse** (Florida International University)
- **Synthesis and Analytical Profiles for Regiosomeric and Isobaric Amines Related to MDMA, MDEA and MBDB: Differentiation of Drug and non-Drug Substances of Mass Spectral Equivalence** (Auburn University)
- **Enhanced Forensic Mass Spectrometry Methods** (West Virginia University Research Corporation)



Forensic Entomology

- **Development of Statistical Methods for Estimating a Minimum Postmortem Interval: an Evaluation Using Insect Growth Data** (West Virginia University Research Corporation)



Forensic Pathology

Erythema and Deep Tissue Injury Detector (elder forensics)

(National Institute of Biomedical Imaging and
Bioengineering [NIBIB])



Toxicology

- **Use of LC/MS/MS to Rapidly Perform First-pass Screening for Drugs and Poisons in Postmortem Toxicology Cases** (Georgia Bureau of Investigation)
- **Enhanced Studies of LC/MS/MS Capabilities to Analyze Toxicology Postmortem Samples** (Georgia Bureau of Investigation)
- **Evaluation of New and Nobel Direct Sample Introduction, Time of Flight Mass Spectrometry Instrument for Postmortem Toxicology Screening** (Research Triangle Institute)
- **Development and Production of Reference Materials for Control and Calibration of Hair Drug Testing** (Research Triangle Institute)
- **Analysis of Cocaine Analytes in Human Hair: Evaluation of Concentration Ratios in Different Hair Types, Cocaine Sources, Drug User Populations, and Surface-Contaminated Specimens** (Research Triangle Institute)



Crime Scene

- **Development of an Optical Hand-Held Biological Evidence Detection System** (MicroBioSystems of Utah, LLC)
- **Enhanced Visualization of Bloodstains** (John Jay College)
- **A New Forensics Tool: Development of an Advanced Sensor for Detecting Clandestine Graves** (Oak Ridge National Laboratory)
- **Field Detection of Drug and Explosive Odor Signatures Using SPME-IMS** (Florida International University)



Firearms/Toolmarks

- **Quantification of Tool Markings** (Ames Laboratory [DOE])
- **Standard Casing Reference Material** (National Institute of Standards and Technology [NIST])
- **A Statistical Validation on the Individuality of Tool Marks Due to the Effect of Wear, Environment Exposure and Partial Evidence** (Intelligent Automation, Inc.)
- **A Statistical Validation of the Individuality of Guns Using High Resolution Topographical Images of Bullets** (Intelligent Automation, Inc.)



Friction Ridge Identification

- **Adding human expertise to the quantitative analysis of fingerprints** (Indiana University)
- **Quantitative Assessment of the Individuality of Friction Ridge Patterns** (Research Foundation of SUNY)
- **Quantifying the Dermatoglyphic Growth Patterns in Children through Adolescence** (Ultra Scan Corporation)
- **Latent-Print Detection by Macro-Raman Imaging** (Oak Ridge National Laboratory)
- **Analysis of Level III Characteristics at High Resolutions** (International Biometric Group, LLC)
- **Improving Methods for Fingerprint Development on Hand-Guns** (Israeli National Police through TSWG)



Friction Ridge Identification

- **A Topological Model for the Evidential Value Assessment of Partial Fingerprints** (University of Lausanne through TSWG)
- **Cultivating Methods to Enhance the Quality of Aged Fingerprints Developed by Cyanoacrylate Fuming** (University of Tennessee)
- **Breakable cartridge Cyanoacrylate fingerprint development system/3 port sublimation chamber** (Mountain State University)



Impression Evidence

Application of Polynomial Texture Mapping (PTM) in the area of Shoe/Tire Impression Evidence (California Department of Justice)

Forensic Odontology

- **A Test of the Lamendin Age Estimation Method (SUNY College at Oswego)**
- **Probability of a Match in Bitemarks (Institute for Forensic Imaging)**



Trace Evidence

- **Forensic Glass Analysis by LA-ICP-MS: Assessing the Feasibility of Correlating Windshield Composition and Supplier** (Sacramento County)
- **Application of Laser-Induced Breakdown Spectroscopy to Forensic Science: Analysis of Paint and Glass Samples** (University of Central Florida)
- **Evaluation Of Ultraviolet Radiation Absorbing Compounds In Textile Fibers Utilizing High-Performance Liquid Chromatography And Atmospheric Pressure Ionization Mass Spectrometry (HPLC/MS)** (Sacramento County)
- **Instrumental Analysis Of Pigmented Inks** (Indiana University)



Trace Evidence (cont.)

- Density of the Refractive Index Glass Standard Reference Material (National Institute of Standards and Technology [NIST])
- The Development of a Method for Objective Physical Matching: Meeting Daubert (Israeli National Police through TSWG)
- Laser-Induced Breakdown Spectroscopy Workshop (Ames Laboratory [DOE])
- Elemental Analysis of Glass and Paint Materials by Laser Ablation Inductively Coupled Plasma Mass Spectrometry Forensic Application (Florida International University)
- Elemental Analysis of Glass by SEM-EDS, XRF, EPMA, LIBS and LAICPMS (Florida International University)



Trace Evidence (cont.)

- **Characterization of Triacetone Triperoxide (TATP) Synthetic By-Products for Source and Route Determination** (University of Central Florida)
- **Forensic Analysis of Inks Samples Using a Revolutionary Mass Spectrometry Method** (Iowa State University)
- **Application of Laser-Induced Breakdown Spectroscopy to Forensic Science: Analysis of Paint Samples** (University of Central Florida)
- **Development of Advanced Raman Spectroscopy Methods and Databases for the Evaluation of Trace Evidence and the Examination of Questioned Documents** (Research Foundation of CUNY)



Trace Evidence (cont.)

- **Application of Fluorescence Line Narrowing Spectroscopy to Forensic Fiber Examination** (University of Central Florida)
- **Fire Debris Research** (National Institute of Standards and Technology)



General Forensic R&D: FY 2007 Solicitations

- Research and Development on Crime Scene Tools, Techniques, and Technologies
- Research and Development on Impression Evidence
- Research and Development in the Forensic Analysis of Fire and Arson Evidence
- Forensic Toxicology Research and Development



Electronic Crime Portfolio

- **Goals**
 - Address the practical needs of the criminal justice community in its efforts to respond to electronic crime, aiding/assisting law enforcement in the discovery, analysis, presentation and preservation of digital evidence of probative value
- **Objectives**
 - Develop new tools that address specific needs in the field
 - Develop operational requirements for the field
 - Execute technology demonstrations/evaluations of emerging technologies
 - Support professional, laboratory and technology standards
 - Support coordination efforts among law enforcement, industry and academia



Responding to the Needs of Law Enforcement

- **Tools**
 - Develop new tools that address specific needs in the field
- **Requirements**
 - Develop operational requirements for the field
- **Technology**
 - Execute technology demonstrations/evaluations of emerging technologies
- **Standards**
 - Support professional, laboratory and technology standards
- **Coordination**
 - Support coordination efforts among law enforcement, industry and academia



Needs Assessment and Program Priorities

- Based on the needs identified by the ECPI Working Groups and NIJ's "Electronic Crime Needs Assessment," the following are the program priorities for the Electronic Crime portfolio:
 - All encompassing resource database for Electronic Crime & Digital Evidence
 - Identify and develop a method to record and quantify Electronic Crime and Digital Evidence incidents for accurate statistical information related to the ongoing State & Local Law Enforcement efforts and activities in these fields.
 - Develop a standard Macintosh Computer forensic examination curriculum to address the increasing use and seizure of Apple computers.
 - Thoroughly document the development of a mobile Digital Evidence Examination capacity that can be used as the guideline to build a resource that can be shared by multiple agencies.
 - Live Computer System Capture and Triage Tool



Addressing *specific*

TECHNOLOGY NEEDS identified by the field....

- **IP Tracing** - Tools and techniques to trace specific computers or their users based on the IP address the computer used when it accessed or used an Internet resource. Solutions in this category should not address infrastructure issues. Rather, they are tools used by law enforcement in ongoing investigations or post-seizure analysis of media
- **Data Hiding** - Technologies to identify and defeat Steganography, Data Encryption and Encrypted File Systems (EFS).
- **Macintosh Forensics** - Develop Macintosh Computer forensic examination solutions to address the increasing use and seizure of Apple computers.
- **Mobile Digital Evidence Examination** - development of mobile Digital Evidence Examination tools. NIJ also seeks development of guidelines that can be used to build a resource that can be shared by multiple agencies.
- **Live Computer System Capture and Triage Tool** – Development of tools that will allow examination on a live system, prior to seizure (determine the need to image live, as well as the capability for on-site system overview), and during permitted searches (knock & talk, probation searches, owner consent)



Current Projects

- Computer Forensic Tool Testing
- National Software Reference Library
- Standard Reference Test Data Set
- Electronic Crime Partnership Initiative
- National Panel on Electronic Crime
- Project WHO?
- Steganalysis/Stegextraction
- Predator and Prey Alert System
- UnMASK
- Authenticity Verification Algorithms for Digital Photographic Evidence
- Cell Phone Forensics
- Cyber Science Laboratory
- Steganography Analysis Center
- **File Hound**
- **File Marshall**
- **Automated Steganography Detection**
- **Forensic Rapid Evidence Extraction and Analysis Kit**
- **Automated Human Image Detection and Authentication**

RED – Not Yet Funded

BLUE – Funded



Forensic Resource Network

The Forensic Resource Network (FRN) is a system of four forensic centers whose mission is to assist state and local forensic service providers in achieving their service delivery goals through research and development, testing and evaluation, training, technology transfer, and technology assistance.



FRN Projects of Interest

FY2005 & FY 2006:

- West Virginia University
 - Free Continuing Education for Forensic Professionals Event
 - Free Crime Scene and Hair Analysis for DNA Examiners Training
- National Center for Forensic Science (NCFS)
 - National Y-STR Database – Consolidating and Managing
- Marshall University Forensic Science Center (MUFSC)
 - Free 1-week DNA Training Courses for new DNA Examiners
 - Free Expert System Demonstrations at Marshall University
 - Managing the NIJ Expert System Testbed Project
- National Forensic Science Technology Center (NFSTC)
 - Free Biological Screening and DNA Workshops
 - Free Fire Debris Analysis Validation/Verification Kits
 - Free Upcoming Cold Case Training Sessions



West Virginia University





FRN & Technology Transfer

- Mitochondrial DNA Workshop at NFSTC that included NIJ Funded Research Products
- qPCR Workshop at NFSTC that included NIJ Funded Research Products
- Expert System Demonstrations at Marshall University that included the 3 Commercially Available Single Source Expert Systems



Grants Progress Assessment Program

- In March, 2002 NFSTC began the DNA audit program offered to government crime labs in the US.
- In January 2005 at the request of NIJ, NFSTC started delivering Grant Progress Assessments (GPA) pertaining to DNA grants and awards.
- In September 2006, NIJ extended the GPA program to all its assistance programs, including Coverdell and cold case.
- All programs are made possible due to a cooperative agreement between NFSTC and NIJ and are provided at no expense to the laboratory.

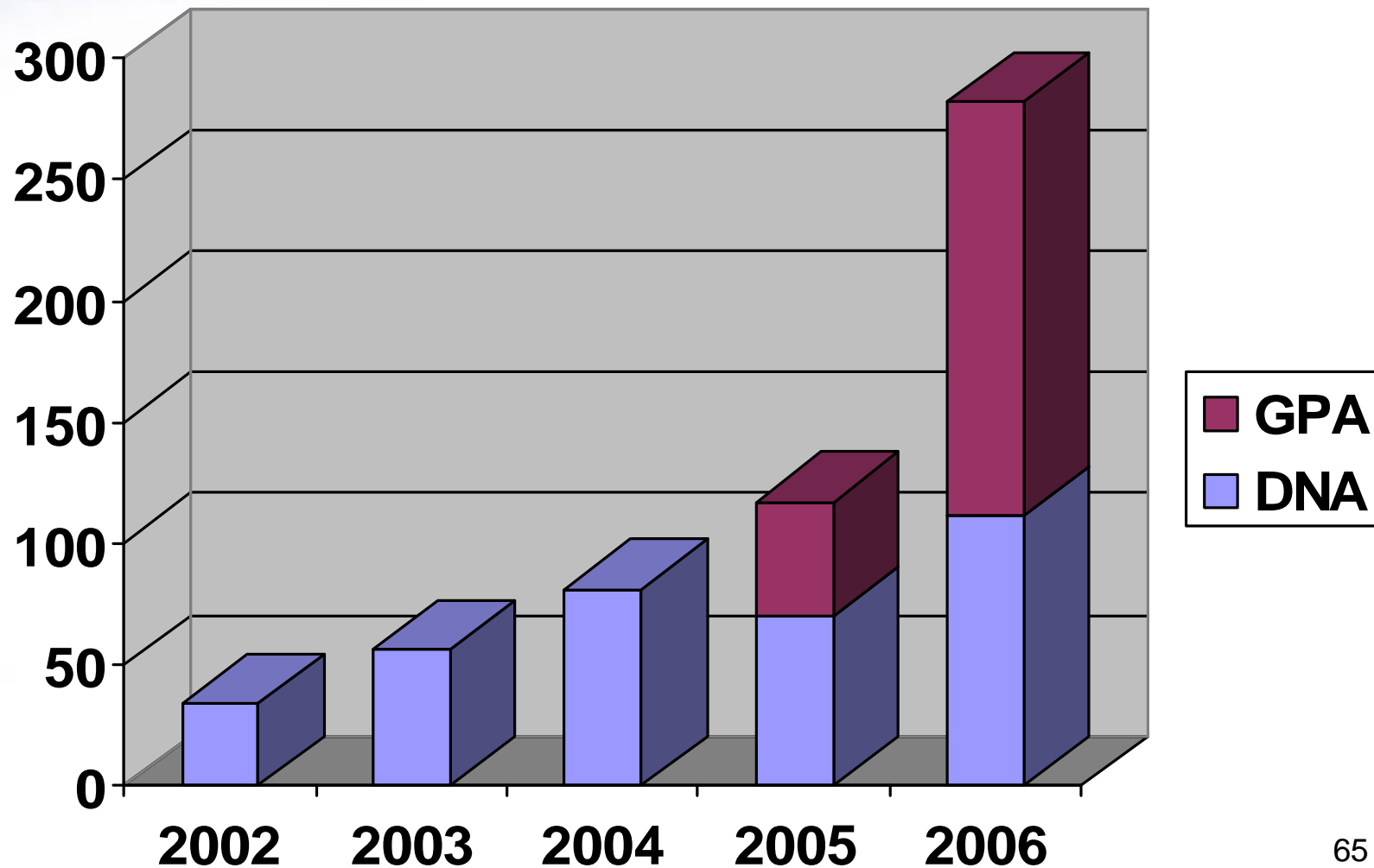


How Does the GPA Program Operate?

- All agencies within a state receiving DNA, Coverdell, & Cold Case grants are scheduled for a GPA assessment at the same time.
- The DNA audit is additionally offered as an optional service.
- Taking both assessments makes sense in that you only have 1 interruption of your staff every 2 years, and you can count on NFSTC being back in 2 years to conduct your next assessment.
- Upon completion of the assessment:
 - The lab receives the DNA Audit Report (usually within 2-3 weeks).
 - The GPA Reports go directly to NIJ.
 - The NIJ Program Manager will send the lab a copy of the final GPA Report.



Growth of the DNA/GPA Program





2005 GPA Year 1 Activity

Seven (7) GPA and DNA audits were delivered to the GSA Convicted Offender Vendor Labs in 2005.

Labs assessed include:

- The Bode Technology Group
- Orchid Cellmark of Nashville
- Myriad Genetics
- Orchid Cellmark of Dallas
- ReliaGene
- Identity Genetics
- Boston University



GPA Assessments on GSA Convicted Offender Vendor Labs

- Data quality checked for compliance with technical specifications.
- At least 100 samples from each state contract were reviewed.
- The assessment also covered compliance with NIJ requirements for documentation.
- Suggestions were made to NIJ to make next year's GSA contracts better.



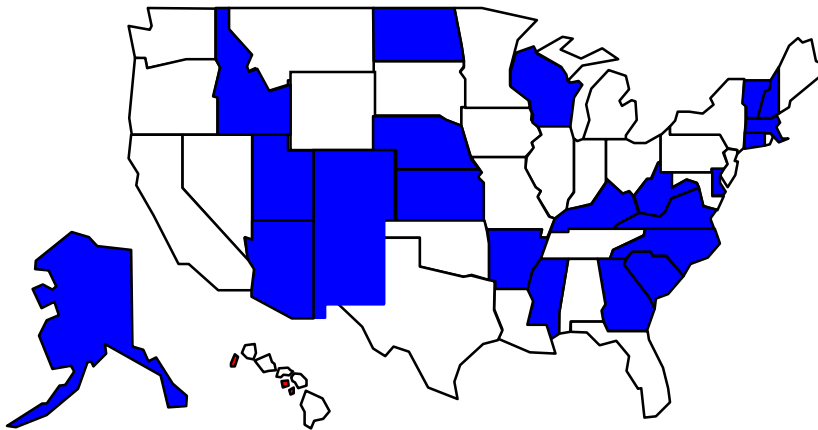
DNA Audits of the GSA Convicted Offender Vendor Labs

- DNA audits were commissioned on the GSA CO labs by NIJ so state labs wouldn't have this burden.
- State labs use their site visits to resolve any issues or challenges that arise with the data or data presentation.
- All DNA audit findings will/have been remediated.
- NIJ is assessing the GSA CO vendor labs yearly.



2005 GPA Year 1 Activity March 1, 2005- Dec. 31, 2005

47 GPA assessments were delivered in 2005.
States where assessments have been
completed are shown in blue.



Puerto Rico



Lessons Learned – GPA/DNA Assessments on GSA vendor Labs

- 7 GSA CO Vendor labs in 2005
- 5 GSA CO Vendor Labs in 2006 - two labs withdrew from the market
- Over the last year, vendor labs are making great strides in meeting technical specifications of contracts (PHR, min rfu's etc)
- The number of samples to be tested is greater than the vendor lab capacity to process the samples



Lessons Learned – DNA Assessments on GSA vendor Labs

- Between 2005 and 2006, the compliance of 4 of the 5 vendor labs with National DNA QA Standards has improved.
- The vendor labs are not regulated by NDIS. Since federal dollars are used for this testing, the vendor labs **MUST** be in compliance with DNA QA Standards. For this reason, NIJ has required the GSA Vendor labs to undergo a yearly assessment.



Lessons Learned – GPA Assessments on GSA vendor Labs

- State labs are slow to get samples to the vendors, and are having trouble keeping up with the NDIS mandated 100% technical reviews
- The overall quality of the profiles have been rated as very good to excellent by assessors



Lessons Learned – GPA Assessments on Crime Labs

- Trends noted included:
 - Casework grants that involved outsourcing were held up by:
 - the time to prepare contracts, bid them, and then get them approved.
 - People with DNA experience, but no contract experience were writing contracts....or vice versa
 - Contracts were being written where labs had no technical competency to review the data received
 - Solutions are to get good contract models and understand the NDIS rules before sending out contract specs. Also have these done prior to the award of the grant so you can move quickly when funds are available.



Lessons Learned – GPA Assessments on Crime Labs

- Trends noted included:
 - Labs that outsourced cases reported:
 - Difficulty with review of case files and errors in files or reports
 - Problems noted with screening tests being done at vendor labs. Potential training issue for PDI to address in the future



Lessons Learned – GPA Assessments on Crime Labs

- Trends noted included:
 - Labs that outsourced cases reported:
 - Great success with CODIS hits to cases they would never have been able to test any other way.
 - Some requested a program for casework reduction like the CO outsourcing program as a way to eliminate contract woes
 - Sadness to see the types of cases that can be tested being restricted by the 05 solicitations to violent crimes



Lessons Learned – GPA Assessments on Crime Labs

- Trends noted included:
 - Some labs that processed cases internally and used funds for supplies and personnel.
Assessors noted:
 - Labs made effective use of OT funds to work cases
 - Labs made effective use of grant personnel



Lessons Learned – GPA Assessments on Crime Labs

- Suggestion – use personnel funding available with grants to hire and train screeners.
 - 6 month training cycle is more than adequate
 - allow lab analysts to concentrate on DNA testing
 - If you outsource, this allows you to do a better preparation job before outsourcing and saves money by not sending out samples that won't yield a profile
 - No issues with NDIS rules on who can be a DNA analyst



Lessons Learned – GPA Assessments on Crime Labs

- Trends noted included:
 - Small labs with limited resources were having trouble spending all the funding available to them in the specified time
 - This was especially true for casework reduction grants and grants which included validation studies