U.S. Department of Justice
Office of Justice Programs
National Institute of Justice

National Institute of Justice

S o l i c i t a t i o n

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Solicitation for Forensic DNA Research & Development, FY2001

APPLICATION DEADLINE:
March 30, 2001

Solicitation for Forensic DNA Research & Development

I. Introduction

The intent of this solicitation is to stimulate all areas of research or development that can enhance or increase the capacity, capability, applicability, and/or reliability of DNA for forensic uses. Proposals that build or improve upon existing technologies, methods, or approaches as well as proposals based on new or novel technologies, methods, or approaches are encouraged to meet the goal of maximizing the value of DNA evidence to the criminal justice system.

II. Background

Forensic DNA analysis has played a crucial role in the investigation and resolution of thousands of violent crimes since the late 1980's. Heralded as the most powerful and discriminating method of identifying the source of biological evidence available to the criminal justice system, forensic DNA testing has evolved both in the technologies it uses and in its protocols to promote reliability and courtroom admissibility.

Originally, DNA evidence was analyzed by million-plus cell extracts using restriction fragment length polymorphism (RFLP) testing of variable number of tandem repeats (VNTRs). Southern blotted membranes were generally probed with four to six hypervariable minisatellite markers to establish a DNA profile that, statistically, could differentiate virtually all unrelated individuals. The process, which is both time consuming and technically demanding, is now limited to a few crime laboratories and has largely been replaced by less labor-intensive, more sensitive methods.

The advent of the polymerase chain reaction (PCR) and its subsequent incorporation into forensic DNA testing has substantially increased the successful analysis of degraded or small DNA samples. The first PCR-based forensic DNA tests used sequence specific oligonucleotide (SSO) probes in a “reverse dot blot” assay to detect single nucleotide polymorphisms (SNPs) in the HLA DQA1 locus and, later, in five additional loci. Although these SNPs lacked the discriminatory power of VNTRs, the results were robust and reliable. Additionally, the development of commercially available reverse dot blot kits permitted mass technology transfer of the PCR method to public crime labs, which in turn led to a broader use of forensic DNA testing.

Currently, STRs (short tandem repeats) are the most widely used markers for forensic DNA testing. Plentiful in the human genome, their high discriminatory power enhances forensic application beyond the reverse-dot-blot method while continuing to use the power of PCR amplification. Samples can be rapidly processed since numerous loci can be multiplexed in a single PCR reaction. Because of this high discriminatory power, good resolution of alleles, and the potential for additional STRs when even more unique profile identification is needed, 13 STRs have been chosen as the core loci upon which the FBI’s National DNA Index System (NDIS) of convicted offenders is being built.

In recent years, other genetic polymorphisms, such as those found in the mitochondrial DNA (mtDNA) hypervariable regions and the non-recombining portion of the Y chromosome, have been shown to provide effective alternatives to STRs. MtDNA analysis is especially useful for cases involving extremely degraded or limited biological residues, such as skeletal remains or shed hairs. Y chromosome markers can be beneficial in resolving sexual assault cases, particularly those with multiple male contributors. Other markers, such as Alu sequences, may become important tools for the forensic scientist in the future. An increased

understanding of the genetic properties of these systems, as well as the continued development of methods for detection, will increase their value as forensic tools.

Through appropriations to the National Institute of Justice, the Department of Justice has been a strong supporter of new technologies and tools for criminal justice applications, especially in the area of DNA testing. The Five-Year Forensic DNA Research and Development Program, now in its fourth year, was implemented to maximize the value of DNA evidence to the criminal justice system. Examples of projects funded under this program include: development of microchips, microdevices, and mass spectrometry assays for high throughput DNA analysis; improved methodologies for separating sperm and epithelial cell fractions in sexual assault cases; new analytical buffer systems for capillary electrophoresis; improved human DNA quantitation methods; and construction of databases of mtDNA and Y chromosome polymorphisms. Additional information about previously funded and ongoing projects can be reviewed on the NIJ Web page (www.ojp.usdoj.gov/nij).

Additional research and development agendas for appropriate criminal justice applications of DNA have been identified by the National Commission on the Future of DNA Evidence (www.ojp.usdoj.gov/nij/dna). The Commission—comprised of 22 nationally recognized experts in the areas of DNA testing, law enforcement, law, ethics and policy—was empaneled by the Attorney General in 1998. Its purpose was to submit recommendations that will enhance the power of DNA evidence to be used more rapidly, efficiently, and economically in the exoneration of those falsely accused and the prosecution of those implicated by the evidence. The information about the research and development agenda of the Commission is summarized in *The Future of Forensic DNA Testing: Predictions of the Research and Development Working Group* (available at www.ojp.usdoj.gov/nij/pubs-sum/183697.htm).

III. Relevant Areas of Research

The issues of high-throughput databasing and customized case work analysis continue to be of concern to the forensic DNA community. In order for DNA to reach its maximum value for the criminal justice system, the forensic DNA community, now comprised of more than 150 public and private crime laboratories, will need faster, less costly, and fundamentally reliable technical tools and innovations that can be appropriately validated, quality-controlled, and quality-assured for forensic use.

Emphasis is placed on developing methods or technologies that address the needs of databasing and/or methods that can be used for the analysis of crime scene samples that are often limited in quality and quantity. As the backlog of convicted offender samples awaiting testing and input into the National DNA Index System is reduced, the issue of the large number of no-suspect cases awaiting analysis will become paramount. High throughput analysis of bloodstains, swabs, and mixed stains from crime scenes is an issue that will continue to be faced by many laboratories.

Guidelines for forensic validation, quality control, and quality assurance, the cornerstones for courtroom admissibility, are detailed by the DNA Advisory Board (DAB) and need to be considered by applicants when developing their proposals. Applicants should also be familiar with other important forensic DNA recommendations such as those put forth by the Technical Working Group for DNA Analysis Methods (TWGDAM) (now SWGDAM), the National Commission on the Future of DNA Evidence, and the National Research Council.

Applicants should have an appreciation of, and general familiarity with, the current uses of forensic DNA testing, including mixed stain extraction and analysis, DNA database sample collection and through-put issues, off-ladder variants, population genetics issues, and other issues in order to design projects that will enhance analysis in one or more of these areas. However, applicants should consider not only existing technologies but are encouraged to develop new and innovative solutions to DNA profiling that may be beneficial in the future. **Please note that applications whose goal is to validate or implement an in-use system for their own laboratory's use will not be considered unless the model used to achieve the validation significantly improves current validation/implementation methods and can be readily transferred to other laboratories.**

In order to facilitate appreciation of forensic issues, NIJ encourages partnerships between developers and members of the forensic community. Such partnerships foster a greater understanding of the forensic needs and applications on the part of the applicant. Cooperative agreements between U.S.-based organizations and international organizations that result in advancing a technology in the U.S. that is currently employed elsewhere are also encouraged, however, NIJ is unable to fund foreign companies directly.

Applicants should further consider costs of the resulting technologies or tools. All areas of forensic science, including DNA testing, suffer from demand that is far greater than the available means. Cost factors can impede the timeliness in accepting new technologies.

This solicitation focuses on near-term innovations which can be completed in a one- to three-year framework. It is open to a wide variety of proposals in order to achieve a balanced portfolio of product development, implementation and assessment projects. However, applicants are encouraged to focus on projects that directly pertain to forensic DNA, as opposed to addressing broader basic research questions. By applying new tools to the analysis of DNA evidence, our ability to solve and prevent crimes and safeguard those falsely accused will become even greater than current abilities now afford.

The following questions can be used as guidelines to ensure that your proposal is framed appropriately to benefit forensic application. As guidelines, the questions do not need to be explicitly addressed, but can be used as implicit themes to be considered by the applicant.

- What areas of forensic DNA testing will the new technology/development you are proposing impact?
- How do you plan to market/make available your technology/development to the forensic community?
- How much will the technology/ development cost to purchase and maintain?
- How will your proposed technology/ development impact on the reliability, affordability, and/or speed of forensic DNA analysis?
- What kind and extent of training will be required for the forensic community to use your technology/development?
- How will your technology/development be validated for forensic use?
- What kinds of admissibility issues do you foresee for your technology/development in U.S. courts and how will those be addressed?

Applicants are encouraged to include preliminary data, if available, in addition to appropriate scientific and legal citations that will help demonstrate the potential contribution of the proposed research to the forensic DNA community.

IV. Selection Criteria

NIJ is firmly committed to the competitive process for awarding grants. All proposals are subjected to an independent, peer-review panel evaluation. The peer-review panel consists of members with academic, practitioner, technical, and operational expertise in the subject areas of the solicitation. Selection criteria used to evaluate proposals are as follows:

1. Quality and Technical Merit

- Soundness of methodology, analytic, or technical approach.
- Innovation and creativity.
- Feasibility of proposed project; awareness of pitfalls.
- Awareness of existing research and related applications.

2. Impact of the Project

- Understanding the importance of the problem.
- Potential for significant advance in crime prevention, law enforcement, forensic science, courts, corrections, or other practice or policy areas.
- Potential for advancement of scientific understanding of the problem area.
- Relevance to practice, including development and demonstration in application domains (if applicable).
- Affordable end products (if applicable).

3. Capabilities, Demonstrated Productivity, and Experience of Applicants

- Qualifications and experience of personnel as related to proposed project.
- Responsiveness to the goals of the solicitation.
- Demonstrated ability to manage proposed effort.
- Adequacy of proposed resources to perform effort.

4. Budget Considerations

- Total cost relative to perceived benefit.
- Appropriate budgets and level of effort.
- Use of existing resources to conserve costs.
- Cost-effectiveness of program or product for application in the criminal justice system (if applicable).

After peer-review panelists' consideration, Institute staff make recommendations to NIJ's Director based on the results of the independent reviews. Final decisions are made by the NIJ Director following consultation with Institute staff.

V. How to Apply

Those interested in submitting proposals in response to this solicitation must complete the required application forms and submit related required documents. (See below for how to obtain application forms and guides for completing proposals.) Applicants must include the following information/forms to quality for consideration:

- Standard Form (SF) 424—application for Federal assistance

- Geographic Areas Affected Worksheet
- Assurances
- Certifications Regarding Lobbying, Debarment, Suspension, and Other Responsibility Matters; and Drug-Free Workplace Requirements (one form)
- Disclosure of Lobbying Activities
- Budget Detail Worksheet
- Budget Narrative
- Negotiated indirect rate agreement (if appropriate)
- Names and affiliations of all key persons from applicant and subcontractor(s), advisors, consultants, and advisory board members. Include name of principal investigator, title, organizational affiliation (if any), department (if institution of higher education), address, phone, and fax
- Proposal abstract
- Table of contents
- Program narrative or technical proposal
- Privacy certificate
- Form 310 (Protection of Human Subjects Assurance Identification/ Certification/ Declaration)
- Environmental Assessment (if required)
- References
- Letters of cooperation from organizations collaborating in the research project
- Résumés
- Appendixes, if any (e.g., list of previous NIJ awards, their status, and products [in NIJ or other publications])

Confidentiality of information and human subjects protection. NIJ has adopted new policies and procedures regarding the confidentiality of information and human subjects protection. Please see the *Guidelines for Submitting Proposals for National Institute of Justice-Sponsored Research* (www.ojp.usdoj.gov/nij/funding_app.htm) for details on the new requirements.

Proposal abstract. The proposal abstract, when read separately from the rest of the application, is meant to serve as a succinct and accurate description of the proposed work. Applicants must concisely describe the research goals and objectives, research design, and methods for achieving the goals and objectives. Summaries of past accomplishments are to be avoided, and proprietary/confidential information is not to be included. Length is not to exceed 400 words. Use the following two headers:

Project Goals and Objectives:

Proposed Research Design and Methodology:

Page limit. The number of pages in the "Program Narrative" part of the proposal must not exceed 30 (double-spaced pages), no matter the amount of funding requested.

No other materials will be provided to the peer-review panels for consideration. Please do not send video or audio tapes, computer files or other, non-paper support materials. Photographs, diagrams or other paper figures are accepted as part of your application.

- Do not use 3-ring binders. Staples, rubber bands, binder-clips or paper-clips are acceptable.
- Facsimile transmissions will not be accepted.

Due date. Completed proposals **must be received** at the National Institute of Justice by the close of business on March 30, 2001. Extensions of this deadline will not be permitted.

Award period. In general, NIJ limits its grants and cooperative agreements to a maximum period of 12

or 24 months. However, longer budget periods may be considered.

Number of awards. NIJ anticipates supporting multiple cooperative agreements and grants under this solicitation, based upon available funding and peer-review recommendations.

Award amount. Awards totaling approximately $2 million will be made available for starting new programs under this phase of the Forensic DNA Research and Development solicitation.

Applying. Two packets need to be obtained: (1) application forms (including a sample budget worksheet) and (2) guidelines for submitting proposals (including requirements for proposal writers and requirements for grant recipients). To receive them, applicants can:

- Access the Justice Information Center on the Web: *http://www.ncjrs.org/fedgrant.htm#nij* or the NIJ Web site: *http://www.ojp.usdoj.gov/nij/funding.htm*

  These Web sites offer the NIJ application forms and guidelines as electronic files that may be downloaded to a personal computer.

- Request hard copies of the forms and guidelines by mail from the National Criminal Justice Reference Service at 800–851–3420 or from the Department of Justice Response Center at 800–421–6770 (in the Washington, D.C., area, at 202–307–1480).

- Request copies by fax. Call 800–851–3420 and select option 1, then option 1 again for NIJ. Code is 1023.

Guidance and information. Applicants who wish to receive additional guidance and information may contact the U.S. Department of Justice Response Center at 800–421–6770. Center staff can provide assistance or refer applicants to an appropriate NIJ professional. Applicants may, for example, wish to discuss their prospective research topics with the NIJ professional staff.

Send completed forms to:

Solicitation for Forensic DNA Research & Development
National Institute of Justice
810 Seventh Street N.W.
Washington, DC 20531
[overnight courier ZIP code 20001]

For more information on the National Institute of Justice, please contact:

National Criminal Justice Reference Service
Box 6000
Rockville, MD 20849–6000
800–851–3420
e-mail: askncjrs@ncjrs.org

You can view or obtain an electronic version of this document from the NCJRS Justice Information Center web site (http://www.ncjrs.org) or the NIJ web site (http://www.ojp.usdoj.gov/nij).

If you have any questions, call or e-mail NCJRS.

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