The National Institute of Justice’s Expert Systems Testbed Project

The Evaluation of Expert Systems for Single Source Samples

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NIJ's Expert Systems Testbed (NEST) Project

• Goal
  – Reduce backlog in data review of convicted offender samples.
  – Ensure timely submission into NDIS.

• Objective
  – Communicate results of evaluation.
Definition and Scope of Expert Systems


• Added Scope
An Expert System...

- A software program or set of software programs
- Performs all of these functions without human intervention
  - Identifies peaks/bands
  - Assigns alleles
  - Ensures data meet laboratory-defined criteria
  - Describes rationale behind decisions
  - No incorrect calls
Scope for NEST Project Evaluation...

- Publicly available for purchase
- Configurable off-the-shelf software
- Completely housed in laboratory facilities
- No programming knowledge is needed to use the software package(s)
Expert Systems Evaluated
First Phase
Single Source Samples

• GeneMapper™ ID Software v. 3.2
  – Applied Biosystems

• FSS-i³
  – Promega Corporation/FSS

• TrueAllele® System 2
  – Cybergenetics
Survey Conducted of Samples to be Processed and/or Analyzed in 2005

- 3100 Identifiler
- 3100 Profiler Plus/COfiler
- 377 Profiler Plus/COfiler
- 3100 PowerPlex 16

Top 81% Responses
Datasets for Phase I of the NEST Project

• 3100 Identifiler
• 3100 Profiler Plus/COfiler
• 377 Profiler Plus/COfiler
• 3100 PowerPlex 16
Evaluation of Applications

- Screen Displays
- Flags and Rules
- Ability to Edit, Reject, and Record Human Intervention Actions
- Concordance and Accuracy
- Import of Source Data Files and Data File Structure/Management
- Generation and Import of CMF Files
- Reports
- Security Features
Evaluation of Applications

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- Security Features
Raw Data View in GMID
‘Capillary View’ in TA
View of Size Standard in GMID
View of Size Standards in TA
View of Size Standards in TA
View of Allelic Ladder in GMID
View of TH01 Allelic Ladder in FSS-i³
View of TH01 Allelic Ladder Information in FSS-i³
Ladder Check (Overlay) in TrueAllele
Sample View in GMID
Sample View in FSS-i³
Sample View in TrueAllele
### View of Peak-Height Ratio Flag in GMID

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<th>Sample Name</th>
<th>Panel</th>
<th>Match</th>
<th>OS</th>
<th>HPX</th>
<th>LPH</th>
<th>SPU</th>
<th>AN</th>
<th>BD</th>
<th>CC</th>
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*There are no controls in this section.*

**153/337 = 45%**

![Graph showing peak analysis with highlighted flag area]

- Peak at 157.24
- Peak at 158.10
- Peak at 582.81
- Peak at 597.91

*Graph with highlighted peak area and flag.*
View of Preferential Amplification A:B Flag in FSS-i³
View of Relative Height in TA
View of Low Peak Height Flag in GMID
Low Heterozygote Flag in FSS-i^3
Low Signal Flag in TA
Sample Evaluated in GMID...
...and in FSS-i³...
...and in TrueAllele
Required Information in Choice of Software/System

- Throughput Needs
- Management/Structure of Agency
- Budget
- Human Resources
- IT Support
- QA/QC Program
NEST Project Introduction:

NIJ
National Institute of Justice's Expert Systems Testbed (NEST) Project

Marshall University Forensic Science Center (MUSFC) is the host site of the National Institute of Justice Expert Systems Testbed (NEST) Project to evaluate commercially available expert systems for the national forensic DNA community. The NEST Project Implementation Team is on the cutting edge of supplying the latest information on expert systems through presentations, demonstrations and references.

Three expert systems are being evaluated by the NEST Project Implementation Team, comprised of NIJ and MUFSC personnel and under the guidance of the NEST Project Advisory Committee. Current NEST Project evaluations are...
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Training/Demonstration Sessions at Marshall University

- Training/Demonstrations of all systems
  - Marshall University has travel funds available
  - Please see me and/or Dr. Terry Fenger after the presentation if you are interested
Conclusion

• The Expert Systems produce concordant results based on our analysis at this time
• Each ES has its own features, benefits, and limitations
• It is imperative that you evaluate your individual laboratory’s needs prior to purchase
• Expert Systems can assist in assurance of quality data entered into NDIS
Please send an email to Rhonda Roby at:

RhonDNA@earthlink.net

• Interested in visiting Marshall University for demonstrations of the software systems
Team of Advisors

- Cecelia Crouse, PhD; PBSO/SWGDAM Subcommittee
- Richard Guerrieri, MS; FBI
- John Butler, PhD; NIST
  David Deuwer, PhD
- Barry Duceman, PhD; NYSP
- Ken Konzak, MS; CalDOJ
- Tracey Johnson, MSFS; AFDIL
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