Advanced Topics in Forensic DNA Analysis

Introductions

New Jersey State Police **Training Workshop**

> Hamilton, NJ December 5-6, 2006



Dr. John M. Butler National Institute of Standards and Technology

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Dr. John M. Butler

http://www.cstl.nist.gov/biotech/strbase/butler.htm

Experience

- University of Virginia/FBI Laboratory (1992-1995) Work performed in Bruce McCord's lab
- NIST NRC Postdoc (1995-1997)
- GeneTrace Systems Inc (1997-1999)
- NIST Human Identity Project Leader (1999-present)
- Ph.D. dissertation (Aug 1995): "Sizing and quantitation of polymerase chain reaction products by capillary electrophoresis for use in DNA typing"
- Forensic DNA Typing textbook (now in its 2nd Edition)
- STRBase website: http://www.cstl.nist.gov/biotech/strbase/
- Family: wife Terilynne and 6 children
- Hobbies: reading, writing, and making PowerPoint slides





NIST History and Mission

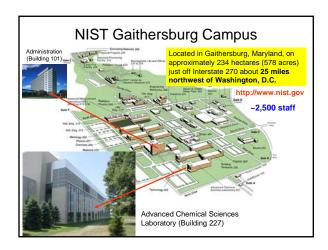
- National Institute of Standards and Technology (NIST) was created in 1901 as the National Bureau of Standards (NBS). The name was changed to NIST in 1988.
- NIST is part of the U.S. Department of Commerce with a mission to develop and promote measurement, standards, and technology to enhance productivity, facilitate trade, and improve the quality of life.
- NIST supplies over 1,300 Standard Reference Materials (SRMs) for industry, academia, and government use in calibration of measurements.
- . NIST defines time for the U.S.

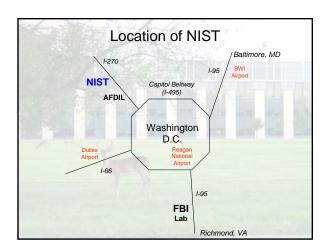


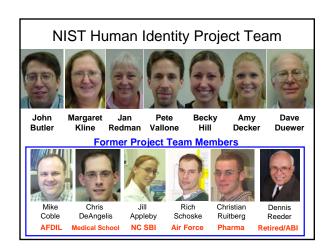
\$532 for 3 jars



DNA typing standard









Current Areas of NIST Effort with Forensic DNA

Standards

- Standard Reference Materials
- Standard Information Resources (STRBase website)
- Interlaboratory Studies

Technology

- Research programs in SNPs, miniSTRs, Y-STRs, mtDNA, qPCR
 Assay and software development

Training Materials

- Review articles and workshops on STRs, CE, validation
- PowerPoint and pdf files available for download



- 27 publications (published or submitted) since Jan 2006
- 45 presentations and 10 workshops to the community since Jan 2006
- Training workshops: AAFS, MAAFS, MAFS, NEAFS, OCME, MASP, NYSP, MN BCA (slides available on STRBase)
- PDI Workshops: Validation, mtDNA, qPCR

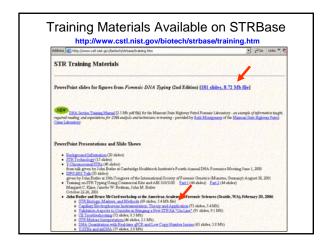
All NIST publications and presentations available on STRBase: http://www.cstl.nist.gov/biotech/strbase/NISTpub.htm

AAFS Workshop #6 (Feb 2006, Seattle) **Advanced Topics in STR DNA Analysis** Instructors: John Butler and Bruce McCord

For DNA analysts using the ABI 310 or ABI 3100 who would like to better understand the underlying issues and science involved with STR DNA typing

- · STR Biology, Markers, and Methods
- Capillary Electrophoresis Instrumentation: Theory and Application
- Validation Aspects to Consider in Bringing a New STR Kit "On-line"
- **CE Troubleshooting**
- **STR Mixture Interpretation**
- DNA Quantitation with Real-Time qPCR
- **Low-copy Number Issues**
- Y-STRs and mtDNA

Available at http://www.cstl.nist.gov/biotech/strbase/training.htm







Review Article on STRs and CE pdf available from http://www.cstl.nist.gov/biotech/strbase/NISTpub.htm Contents General aspects..... 1397 Forensic DN 1.2 John M. Butler¹ Eric Buel² Federica Crivellente³⁺ Bruce R. McCord² Early work with CE. Sample preparation and injection. Sample separation. The polymer separation matrix. Early work with CE... 1400 using the AB 2 for STR analy National institute of Standards and Technology, Biotechnology Division, Gaithersburg, MD, USA Nermont Forensic Laboratory, Waterbury, YT, USA "Onio University, Department of Chemistry, Athens, OH, USA The buffer . . 1403 DNA typing with sho 3.3 The capillary. 1404 DNA typing with shor 3,3 applications including suphia the ABI Print 5 for many laboratories ing sample preparat 5,2 results using CE syst 6 ered in the context throughput and ease 6,2 Sample detection. Sample interpretation Software used Assessing resolution of DNA separations. 1405 1406 1406 1406 Applications of forensic DNA testing 1407 1407 1408 1408 1408 1409 Forensic casework..... DNA databasing ... Increasing sample throughput ... Capillary array electrophoresis systems ... Microchip CE systems ... Future methods for DNA typing with STR 1410

Analytical Chemistry Application Review June 15, 2005 issue of Analytical Chemistry Forensic Science T. A. Brettell* Office of Forensic Sciences, New Jersey State Police, New Jersey Forensic Science and Technology Complex, 1200 Negron Road, Horizon Certier, Hamilton, New Jersey 08691 J. M. Butter National Institute of Standards and Technology, Gaithersburg, Maryland 20898-8311 R. Saferstein Box 1334, Mount Laurel, New Jersey 08054 250 articles referenced covering forensic DNA analysis during 2003-2004 Review Customs. Characterization, Preservation, Microbial England Control Medicalism, and Quantification, and Microbial Forensic DNA Targing Systems and Microbial Forensic DNA Typing Systems and Microbial DNA Typing Systems and Microbial Forensic DNA Typing Systems and Microbial DNA Typing Systems and Microb

Primary Sources for Material Covered in this Workshop

- Butler, J.M., Buel, E., Crivellente, F., and McCord, B.R. (2004) Forensic DNA typing by capillary electrophoresis using the ABI Prism 310 and 3100 genetic analyzers for STR analysis. *Electrophoresis* 25: 1397-1412
- Butler, J.M. (2006) Genetics and genomics of core STR loci used in human identity testing. J. Forensic Sci. 51(2): 253-265
- McCord, B. (2003) Troubleshooting capillary electrophoresis systems. *Profiles in DNA* 6(2): 10-12 (Promega Corporation); available at http://www.promega.com/profiles/602/ProfilesInDNA_602_10.pdf
- Butler, J.M. (2005) Forensic DNA Typing, 2nd Edition: Biology, Technology, and Genetics of STR Markers. Elsevier Science/Academic Press
- NIST STRBase website: http://www.cstl.nist.gov/biotech/strbase/

These workshop materials will be made available at http://www.cstl.nist.gov/biotech/strbase/training.htm

Outline for Workshop

Day 1

Day 2

- Introductions
- CE Fundamentals
- CE Troubleshooting
- miniSTRs
- · Validation Essentials
- · Statistics & Pop Gen

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- · Mixture Interpretation
- qPCR and LCN
- mtDNA
- Y-Chromosome

My Goal is to Answer YOUR Questions - So Please Ask Them...

Background of Participants...

Name

Experience (years) with DNA typing Something memorable about yourself What you hope to learn from this workshop



NIST and NIJ Disclaimer

<u>Funding</u>: Interagency Agreement 2003-IJ-R-029 between the <u>National Institute of Justice</u> and NIST Office of Law Enforcement Standards

Points of view are mine and do not necessarily represent the official position or policies of the US Department of Justice or the National Institute of Standards and Technology.

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Our publications and presentations are made available at: http://www.cstl.nist.gov/biotech/strbase/NISTpub.htm