



DNA Analysis Report

St. Louis County Police Department
ASCLD/LAB Accredited since 2005

COPY

DNA Case # 14-D450

Complaint # 99-14-43984

Investigating Officer:

Offense: Assault on LEO

Department Name: Saint Louis County P. D.

VICTIM: P.O. Wilson

SUSPECT: Michael Brown

Evidence submitted for DNA analysis (Note: RBS indicates reddish-brown stain):

- Q1-1 Swabs from Michael Brown's t-shirt (shirt, item #3)
- Q2-1 Swabs from Michael Brown's shorts (shorts, item #2)
- Q5 Swabs from the palm of Michael Brown's left hand (RBS) (item #7)
- Q6 Swabs from the back of Michael Brown's left hand (RBS) (item #8)
- Q7 Swabs from the palm of Michael Brown's right hand (RBS) (item #9)
- Q8 Swabs from the back of Michael Brown's right hand (RBS) (item #10)
- Q9-1 Swab from the fingernail scrapings/clippings of Michael Brown's left hand (scrapings/clippings, item #11)
- Q10-1 Swab from the fingernail scrapings/clippings of Michael Brown's right hand (RBS) (scrapings/clippings, item #12)
- Q11 Piece of apparent tissue or hardened nasal mucus from the driver front exterior door of Ferguson P.D. vehicle 108 (RBS) (item #8)
- Q12 Swab from the driver rear passenger exterior door of Ferguson P.D. vehicle 108 (RBS) (item #9)
- Q13 Swab from roadway in front of 2943 Canfield (RBS) (item #19)
- Q14 Swab from roadway in front of 2943 Canfield (RBS) (item #20)
- Q15 Swabs from RBS on the upper left thigh of P.O. Wilson's uniform pants (item #2B-1)
- Q16 Swabs from top exterior left front door of Ferguson P.D. vehicle 108 (item #4)
- Q17 Swabs from exterior left front door mirror of Ferguson P.D. vehicle 108 (item #5)
- Q18 Swabs from interior left front door handle of Ferguson P.D. vehicle 108 (RBS) (item #6)
- Q19 Swabs from P.O. Wilson's "SIG P229" (RBS) (item #1B)
- Q20-1 Swabs from P.O. Wilson's uniform shirt – left side and collar (shirt, item #2A)
- Q21-1 Swabs from P.O. Wilson's uniform pants – left side (pants, item #2B)
- K1 Buccal swab reference sample from P.O. Wilson
- K2 Bloodstain card reference sample from Michael Brown

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August 14, 2014

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DNA EXAMINATION

Amplification of extracted DNA from the above evidence was performed using the Polymerase Chain Reaction (PCR) and profiled at the following STR loci (locus abbreviations used in this report are noted in parenthesis): D3S1358 (D3), vWA, D16S539 (D16), CSF1PO (CSF), TPOX, D8S1179 (D8), D21S11 (D21), D18S51 (D18), D2S441, D19S433 (D19), TH01, FGA, D22S1045(D22), D5S818 (D5), D13S317 (D13), D7S820 (D7), SE33, D10S1248 (D10), D1S1656 (D1), D12S391 (D12), D2S1338, DYS391 (STR locus on the Y male chromosome), Y indel (a Y insertion/deletion locus), and the sex-determining marker, Amelogenin.

RESULTS OF ANALYSIS AND CONCLUSION

The DNA typing results obtained from **Q1-1** (Michael Brown's t-shirt) are consistent with being a mixture of two or more individuals. This profile can be separated into a major component profile consistent with Michael Brown and one or more trace contributors. Due to the limited genetic information available from the trace component of the mixture, no inclusionary statements will be made regarding the trace component. P.O. Wilson is excluded as a contributor to this mixture profile.

The DNA typing results obtained from **Q2-1** (Michael Brown's shorts) are consistent with being a mixture of three or more individuals. This profile can be separated into a major component profile consistent with Michael Brown and two or more trace contributors. Due to the limited genetic information available from the trace component of the mixture, no inclusionary statements will be made regarding the trace component. P.O. Wilson is excluded as a contributor to this mixture profile.

The DNA typing results obtained from **Q5** (palm of Michael Brown's left hand, RBS) are consistent with being a mixture of two or more individuals. This profile can be separated into a major component profile consistent with Michael Brown and a minor contributor. One additional allele indicates a possible trace contributor. Due to the limited genetic information available from the possible trace contributor, no conclusions regarding the possible trace contributor can be made. P.O. Wilson is included as a possible source of the minor contributor profile. The observed mixture profile is 98 times more likely if it originated from Michael Brown and P.O. Wilson than if it originated from Michael Brown and an unknown individual in the in the general unrelated population.

The male DNA profile obtained from **Q6** (back of Michael Brown's left hand, RBS), **Q7** (palm of Michael Brown's right hand, RBS), and **Q8** (back of Michael Brown's right hand, RBS) is consistent with the DNA profile of Michael Brown.

The DNA typing results obtained from **Q9-1** (Michael Brown's left hand fingernail scrapings/clippings) are consistent with being a mixture of three or more individuals. This profile can be separated into a major component profile consistent with Michael Brown and two or more trace contributors. Due to the limited genetic information available from the trace component of the mixture, no inclusionary statements will be made regarding the trace component. P.O. Wilson is excluded as a contributor to this mixture profile.

The male DNA profile obtained from **Q10-1** (Michael Brown's right hand fingernail scrapings/clippings, RBS) is consistent with the DNA profile of Michael Brown.

Michael Brown is the source* of the DNA profile obtained from **Q11** (apparent tissue or hardened nasal mucus from vehicle 108), the **Q12** (driver rear passenger exterior door of Ferguson P.D. vehicle 108, RBS), **Q13** (RBS from roadway in front of 2943 Canfield), and **Q14** (RBS from roadway in front of 2943 Canfield).

The DNA typing results obtained from **Q15** (RBS on the upper left thigh of P.O. Wilson's uniform pants) are consistent with being a mixture of two or more individuals. This profile can be separated into a major male component profile and a minor contributor consistent with P.O. Wilson. One additional allele indicates a possible trace contributor. Due to the limited genetic information available from the possible trace contributor, no conclusions regarding the possible trace contributor can be made. Michael Brown is the source* of the major male component profile detected from Q15.

The DNA typing results obtained from **Q16** (top exterior left front door of vehicle 108) are consistent with being a mixture of three or more individuals. This profile can be separated into a major mixture of two individuals with a trace contributor. Due to the limited genetic information available from the trace contributor, no conclusions regarding the

possible trace contributor can be made. Michael Brown and P.O. Wilson are included as contributors to this major mixture profile. The observed major mixture profile is 6.9 million times more likely if it originated from Michael Brown and P.O. Wilson than if it originated from P.O. Wilson and an unknown individual in the in the general unrelated population.

The partial DNA profile obtained from **Q17** (exterior left front door mirror of vehicle 108) is consistent with being a mixture of two or more individuals. Due to the limited genetic information available the presence or absence of P.O. Wilson and Michael Brown cannot be determined.

The DNA typing results obtained from **Q18** (interior left front door handle of vehicle 108) are consistent with being a mixture of two or more individuals. This profile can be separated into a major male contributor profile and one or more minor contributors. Michael Brown is the source* of the major male contributor profile. Due to the limited genetic information available from the minor component the presence or absence of P.O. Wilson cannot be determined.

The DNA typing results obtained from **Q19** (P.O. Wilson's "SIG P229", RBS) are consistent with being a mixture of three or more individuals. This profile can be separated into a major mixture of two individuals with a trace contributor. Due to the limited genetic information available from the trace contributor, no conclusions regarding the possible trace contributor can be made. Michael Brown and P.O. Wilson are included as contributors to this major mixture profile. The observed major mixture profile is 2.1 octillion times more likely if it originated from Michael Brown and P.O. Wilson than if it originated from P.O. Wilson and an unknown individual in the in the general unrelated population.

The DNA typing results obtained from **Q20-1** (P.O. Wilson's uniform shirt – left side and collar) are consistent with being a mixture of three or more individuals. This profile can be separated into a major mixture of two individuals with a trace component. Due to the limited genetic information available from the trace component, no conclusions regarding the possible trace contributor can be made. Michael Brown and P.O. Wilson are included as contributors to this major mixture profile. The observed major mixture profile is 2.1 trillion times more likely if it originated from Michael Brown and P.O. Wilson than if it originated from P.O. Wilson and an unknown individual in the in the general unrelated population.

The DNA typing results obtained from **Q21-1** (P.O. Wilson's uniform pants – left side) are consistent with being a mixture of three or more individuals. This profile can be separated into a major mixture of two individuals with a trace component. Due to the limited genetic information available from the trace component, no conclusions regarding the possible trace contributor can be made. Michael Brown and P.O. Wilson are included as contributors to this major mixture profile. The observed major mixture profile is 34 sextillion times more likely if it originated from Michael Brown and P.O. Wilson than if it originated from P.O. Wilson and an unknown individual in the in the general unrelated population.

*Conclusion based on the calculated frequency of the DNA profile being rarer than approximately 1 in 310 billion unrelated individuals (Caucasian, African American, Hispanic, and Asian population groups) which is approximately one thousand times the population of the United States. Identical siblings will share the same DNA profile.

The DNA typing results obtained from K2 and Q12 will be transferred to CODIS (Combined DNA Index System) and searched against other DNA profiles on a regular basis. Should a match be generated, a notification will be sent.

PRESERVATION OF SAMPLES

The remaining portion(s) of the above evidence and a portion of any remaining extracted DNA that may still exist are being preserved in the St. Louis County Police Crime Laboratory for any additional tests that may be requested in the future.

DNA Technical Leader

Technical Reviewer, DSN, Date

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August 14, 2014

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DNA Analysis Report

St. Louis County Police Department
ASCLD/LAB Accredited since 2005

DNA Case # 14-D450-2

Complaint # 99-14-43984

Investigating Officer:

Offense: Assault on LEO

Department Name: Saint Louis County P. D.

VICTIM: P.O. Wilson

SUSPECT: Michael Brown

This report is a supplement to the original report 14-D450 dated August 14, 2014.

Evidence submitted for DNA analysis (Note: RBS indicates reddish-brown stain):

- Q22-1 Swabs from red "Cardinals" baseball cap (item #2)
- Q23-1 Swab from RBS on Left "Nike" sandal (item #6)
- Q23-2 Swabs from Left "Nike" sandal (item #6)
- Q24-1 Swab from RBS on Right "Nike" sandal (item #7)
- Q24-2 Swabs from Right "Nike" sandal (item #7)
- Q25-1 Swabs from black, yellow, and white rubber bracelet (item #1)
- Q26-1 Swabs from dark brown beaded bracelet (item #5)

Evidence previously submitted (refer to original report 14-D450):

- K1 Buccal swab reference sample from P.O. Wilson
- K2 Bloodstain card reference sample from Michael Brown

DNA EXAMINATION

Amplification of extracted DNA from the above evidence was performed using the Polymerase Chain Reaction (PCR) and profiled at the following STR loci (locus abbreviations used in this report are noted in parenthesis): D3S1358 (D3), vWA, D16S539 (D16), CSF1PO (CSF), TPOX, D8S1179 (D8), D21S11 (D21), D18S51 (D18), D2S441, D19S433 (D19), TH01, FGA, D22S1045 (D22), D5S818 (D5), D13S317 (D13), D7S820 (D7), SE33, D10S1248 (D10), D1S1656 (D1), D12S391 (D12), D2S1338, DYS391 (STR locus on the Y male chromosome), Y indel (a Y insertion/deletion locus), and the sex-determining marker, Amelogenin.

RESULTS OF ANALYSIS AND CONCLUSION

The DNA typing results obtained from **Q22-1** ("Cardinals" baseball cap) are consistent with being a mixture of two or more individuals. This profile can be separated into a major component profile and one or more trace contributors. Due to the limited genetic information available from the trace component of the mixture, no inclusionary statements will be made regarding the trace component. The presence or absence of P.O. Wilson as a possible trace contributor cannot be determined. Michael Brown is the source* of the major male component profile detected from Q22-1.

Michael Brown is the source* of the DNA profile obtained from **Q23-1** (RBS on Left "Nike" sandal) and **Q24-1** (RBS on Right "Nike" sandal).

No definitive DNA typing results were obtained from **Q23-2** (Left "Nike" sandal) and **Q24-2** (Right "Nike" sandal). Due to the limited genetic information obtained, no conclusions regarding these samples will be made.

The DNA typing results obtained from **Q25-1** (black, yellow, and white rubber bracelet) are consistent with being a mixture of two or more individuals. This profile can be separated into a major male component profile and one or more minor contributors. Due to the limited genetic information available from the minor component of the mixture, no inclusionary statements will be made regarding the minor component. Michael Brown and P.O. Wilson are excluded as contributors of the major male component profile, however, the presence or absence of Michael Brown and P.O. Wilson as possible minor contributors cannot be determined.

The DNA typing results obtained from **Q26-1** (dark brown beaded bracelet) are consistent with being a mixture of three or more individuals. This profile can be separated into a major male component profile and two or more minor contributors. Due to the limited genetic information available from the minor component of the mixture, no inclusionary statements will be made regarding the minor component. Michael Brown and P.O. Wilson are excluded as contributors of the major male component profile, however, the presence or absence of Michael Brown and P.O. Wilson as possible minor contributors cannot be determined.

*Conclusion based on the calculated frequency of the DNA profile being rarer than approximately 1 in 310 billion unrelated individuals (Caucasian, African American, Hispanic, and Asian population groups) which is approximately one thousand times the population of the United States. Identical siblings will share the same DNA profile.

No DNA profile will be transferred to CODIS (Combined DNA Index System).

PRESERVATION OF SAMPLES

The remaining portion(s) of the above evidence and a portion of any remaining extracted DNA that may still exist are being preserved in the St. Louis County Police Crime Laboratory for any additional tests that may be requested in the future.

DNA Technical Leader

Technical Reviewer, DSN, Date

7900 Forsyth Blvd.
Saint Louis, MO 63105

Email:

Education

- 05/09 **Master of Arts - Biology**
Washington University in St. Louis
- 05/04 **Bachelor of Science – Biology**, minor in Chemistry
Bachelor of Arts – Anthropology
Departmental Honors (Biology)
University of Missouri-Columbia

Experience

- 2/11-present **Forensic DNA Technical Leader, St. Louis County Police Department
Crime Laboratory**
- Manage the technical operations of the Laboratory
 - Ensure compliance with all FBI and ASCLD accreditation standards for forensic DNA analysis
 - Perform and approve validation studies to benefit the Laboratory
 - Coordinate and oversee technical problem solving of analytical methods, oversee training, quality assurance, and proficiency testing as it pertains to the DNA Unit and review all above documents on an annual basis
 - Perform DNA casework and casework review; prepare reports and testify to results in court
- 12/05-2/11 **Criminalist - DNA Analyst and back-up CODIS Administrator (6/10
to 2/11), St. Louis Metropolitan Police Department Crime Laboratory**
- Assist the CODIS Administrator with CODIS hit dispositions, notifications, and record keeping
 - Purify, quantitate and amplify forensic samples using EZ1 robots, ABI 7500 (Quantifiler and Quantifiler Duo kits) and Identifiler
 - Perform STR DNA typing on forensic samples using 310/3130 Genetic Analyzers and GeneMapper ID software
 - Prepare reports and testify to results in court
 - Train new analysts in forensic biology and DNA analysis
 - Perform validation studies to benefit the Laboratory
- 1/05-12/05 **Contract Forensic Biologist, St. Louis Metropolitan Police
Department Crime Laboratory**
- Screen evidence for biological fluids using an alternate light source, STMP, phenolphthalein, and other presumptive tests
 - Take cuttings or swabs of biological materials and retain for DNA

analysis

- Examine slides using oil immersion microscopy
 - Prepare reports based on laboratory results using JusticeTrax-LIMS software
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- 6/04-8/04 **Intern at St. Charles County Crime Laboratory, St. Charles Missouri**
- Participated in validations of ABACard, HemaTrace and Phadebas
 - Observed working of rape, homicide, and drug cases including use of GC/MS, FTIR, and presumptive color tests
- 1/01-6/04 **Student Assistant at Research Reactor, University of Missouri (UMC)**
- Trained employees in laboratory procedures and safety policies
 - Revised safety procedures and protocol for laboratory equipment
 - Prepared standards and archaeological samples for Neutron Activation Analysis (NAA)
 - Utilized ICP-Mass Spectrometry, Scanning Electron Microscope, analytical balances, fume hoods, ovens and gas torches
 - Worked with hazardous materials including radioactive material, Nitric, Hydrochloric and Hydrofluoric acids weekly
- 6/02-8/02 **Undergraduate Researcher at Research Reactor, UMC**
Funded by Life Sciences Undergraduate Research Opportunity Program
- Investigated Barium/Strontium ratios in prehistoric human bones using Laser Ablation ICP-MS to determine dietary patterns

Association Memberships

- 02/10 **American Academy of Forensic Sciences** – Member in Criminalistics, 2014
10/07 **Midwestern Association of Forensic Scientists** – Regular Member, 9/2012

Additional Training/Meetings

- 09/14 **ASCLD/LAB International Internal Auditor Training Course**
Sponsored by the St. Louis County Police Academy
Instructor: Emma Dutton
- 08/14 **Association of Forensic DNA Analysts and Administrators Summer 2014**
Sponsored by AFDAA – Houston Texas
Instructors: various speakers
- 07/14 **Future Trends in Forensic DNA Technology Seminar – San Francisco**
Sponsored by Life Technologies/Thermo Scientific
Instructors: various speakers
- 04/14 **Mid-America 2014 Forensic DNA Conference**
Sponsored by Paternity Testing Corporation

Workshop: ISO 17025 Top Ten Non-Conformances
Workshop: ISO 17025 Root Cause Analysis
Instructor for workshops: Anna Yoder

- 08/13 **Grant Writing USA Workshop**
Sponsored by the St. Louis County Police Academy
Instructor: Jennene Colky
- 05/13 **ASCLD/LAB 40th Annual Symposia**
Workshops:
Improving the Effectiveness of Forensic Services: Using the FORESIGHT Project
Instructors: Paul J. Speaker and Richard Riley
Laboratory Lean Six Sigma: A Recipe for Dramatic Efficiency and Quality
Instructors: Tim Kupferschmid, Adam Becnel, and Cami Green
Using FORESIGHT Output to Improve Employee Retention, Satisfaction, and Leverage
More Resources
Instructors: David Dawley, Richard Riley and Paul Speaker
- 04/13 **DNA Analyst Training on Mixture Interpretation**
Sponsored by NIST (web delivered)
Instructors: John Butler, Bruce Heidebrecht, Mike Coble, Robin Cotton, and
Charlotte Word
- 04/13 **Mid-America 2013 Forensic DNA Conference**
Sponsored by Paternity Testing Corporation
Instructors: various speakers
- 03/13 **GeneMapper ID-X Training**
Sponsored by St. Louis County Police Crime Laboratory
Instructor: April Orbison
- 01/13 **3500 Genetic Analyzer Install Training**
Sponsored by St. Louis County Police Crime Laboratory
Instructor: April Orbison
- 04/12 **Mid-America 2012 Forensic DNA Conference**
Sponsored by Paternity Testing Corporation
Instructors: various speakers
Workshops:
Introduction to CODIS 7.0, Instructor: Melody Josserand
Paternity Testing for Crime Laboratories, Instructor: Michelle Beckwith
- 02/12 **DNA Mixture Interpretation Workshop**
Sponsored by St. Louis County Police Crime Laboratory
Instructor: Bruce Heidebrecht
- 02/12 **64th Annual Scientific Meeting of the American Association of Forensic**

Sciences (AAFS)
Sponsored by AAFS
Instructor: various speakers

- 08/11 **ASCLD/LAB-*International* Preparation Course**
Sponsored by ASCLD/LAB
Instructor: Anja Einseln
- 06/11 **2011 NIJ Conference**
Sponsored by the National Institute of Justice
Instructors: various speakers
- 11/10 **16th Annual National CODIS Conference**
Sponsored by the Federal Bureau of Investigation
Instructors: various speakers
- 09/10 **Forensic Y-STR Training**
Sponsored by Marshall University
Instructor: Sarah Bowen
- 07/10 **Introduction to SQL**
Intermediate Applications of SQL
Introduction to Crystal Reports
Sponsored by the University of Missouri-St. Louis, Computer Education and Training Center
Instructor: Sandy Lux
- 07/10 **Quality Assurance Standards/Auditor Training**
Sponsored by the U.S. Department of Justice, Federal Bureau of Investigation Laboratory Division
Instructor: Online self-paced training
- 06/10 **2010 NIJ Conference**
Sponsored by the National Institute of Justice
Instructors: various speakers
- 04/10 **Mid-America 2010 Forensic DNA Conference**
Sponsored by Paternity Testing Corporation
Instructors: various speakers
- 10/09 **2009 NIJ Grant Management Summit**
Sponsored by the Investigative and Forensic Sciences Division, the Office of Science and Technology, the National Institute of Justice and the U.S. Department of Justice
Instructors: various speakers

- 06/09 **Advanced DNA Training**
Sponsored by NIJ President's DNA Initiative and Marshall University
Instructor: Justin Godby
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- 04/09 **To Hell and Back: The Ethics of Stewardship and the Stewardship of Ethics**
Sponsored by the National Institute of Justice
Instructor: Paul J. Voss, Ph.D.
- 03/09 **Bloodstain Pattern Analysis for DNA Scientists**
Sponsored by the St. Louis Metropolitan Police Department Crime Laboratory
Instructors: Kevin R. Winter and Michael J. Van Stratton
- 04/08 **Mid-America 2008 Forensic DNA Conference**
Sponsored by Paternity Testing Corporation
Instructors: various speakers
- 03/08 **Screening Hair for DNA**
Sponsored by St. Louis County Police Department
Instructor: William Randle
- 10/07 **18th International Symposium on Human Identification**
Sponsored by Promega
Instructors : various speakers
Validation workshop – John Butler, PhD
Expert Witness Testimony workshop – Charlotte Word and George Clarke
- 06/07 **Hair Identification for DNA Analysts**
Sponsored by West Virginia University and Midwest Forensics Resource Center
Instructor: Dick Bisbing
- 03/07 **Mid-America 2007 Forensic DNA Conference**
Sponsored by Paternity Testing Corporation
Instructors: various speakers
- 03/07 **Continuing Education for Forensic Professionals**
Sponsored by National Institute of Justice and West Virginia University Forensic Science Initiative
Instructors: various speakers
Expert Testimony Workshop
Ethics in Forensic Science
Scientific and Technical Writing
- 01/07 **FBI CODIS version 5.7.3 Software Training**
Sponsored by Federal Bureau of Investigation
Instructors: Meghan Carlin and Inez Kendall

11/06 **Forensic Statistics: The Calculations Behind PopStats and Beyond**
Sponsored by Missouri Association of Crime Laboratory Directors
Instructor: John Planz, Ph.D.

10/06 **Courtroom Testimony Techniques: Success Instead of Survival**
Sponsored by Midwest Forensics Resource Center
Instructor: Dwane Hilderbrand

04/06 **Mid-America 2006 Forensic DNA Conference**
Sponsored by Paternity Testing Corporation
Instructors: various speakers

Paternity Statistics Workshop

Instructor: David W. Gjertson

Forensic DNA Statistics Workshop

Instructor: George Carmody

10/05 **Midwestern Association of Forensic Scientists Annual Meeting**
Sponsored by: Midwestern Association of Forensic Scientists
Instructors: various speakers

Genemapper ID Software Workshop

Instructor: Erica Currie-Fraser

Real-Time PCR Workshop

Instructor: Catherine Caballero

03/05 **Mid-America 2005 Forensic DNA Conference**
Sponsored by: Paternity Testing Corporation
Instructor: various speakers

Forensic Statistics Workshop

Sponsored by: Paternity Testing Corporation

Instructor: Charles Brenner

02/05 **Forensic Statistics Workshop**
Sponsored by: St. Louis Metropolitan Police Department—Crime Laboratory
Instructor: Donna Becherer

Papers Presented

- 2014 Globalfiler Casework and Express Kits Validation. Presented at the Summer 2014 Association of Forensic DNA Analysts and Administrators Meeting in
- 2014 Globalfiler Casework and Express Kits Validation. Presented at the 2014 (July) Future Trends in Forensic DNA Technology Seminar in
- 2014 Globalfiler Casework and Express Kits Validation. Presented at the 2014 (April) Mid-America Forensic DNA Conference in
- 2013 Casework Experience with Erase-Update. Presented at the 2013 Mid-America Forensic DNA Conference in

- 2012 Casework Experience with Erase. Presented at the 2012 Mid-America Forensic DNA Conference in
- 2008 Minifiler: Designer Primers for the Degradation Blues. Presented at the 2008 Mid-America Forensic DNA Conference in
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- 2003 Reconstruction of Prehistoric Human Dietary Patterns by Laser Ablation ICP-MS. Presented at the annual Society for American Archaeologists meeting in Milwaukee, WI.
- 2002 Laser Ablation ICP-MS of Missouri Chert. Presented at the MURR Nuclear Sciences Research Symposium in Columbia, MO.

References upon request