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Using forensic DNA analysis as an investigative tool to answer questions about the past

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Bloodstain pattern analysis has been an integral part of criminal investigations for over a century. The use of chemiluminescent reagents such as luminol or Bluestar® to visualize presumed bloodstains in criminal investigations has provided useful investigative information. Newer technologies and recent advances in forensic DNA analysis have gained much notoriety over the past two decades as a tool in human identification and parentage verification. More recently, bloodstain analysis, coupled with methods to generate DNA profiles, have been applied to investigate samples of historical significance. This study investigated samples collected from America's past conflicts to determine the biological origin and nature of the samples/stains using classic and various state-of-the-art approaches as well as isolate the genetic material for forensic DNA analysis. Specifically, samples were collected from the Hillsman House in Rice, VA that served as a Union field hospital during the last battle of the Civil War. Approximately 358 Union and 161 Confederate soldiers were treated over a twenty-four-hour period during the battle at Sailor's Creek. The prominent bloodstains on the floorboards under the single surgical table and two post-surgical beds provide evidence of the vast number of soldiers treated. These presumed bloodstains also found their way through the cracks in the wood floors onto the supporting floor joists. The presumed bloodstains were subjected to various presumptive blood tests (e.g., luminol and Bluestar®, leucomalachite green, phenolphthalein, and RSID™ Blood Competitive Analysis Kit), the DNA isolated, quantitated, and subjected to genetic analysis using capillary electrophoresis. The generation of partial or complete DNA profiles will confirm the presence of human DNA, as well as demonstrate the ability of DNA profiling to reveal a part of history from a battle fought over 150 years ago. Other presumed bloodstain samples from the Korean War era and tissue and hair samples collected from burial sites from a civilization long extinct have been analyzed to generate DNA profiles and to corroborate historical documentations of accounts that occurred many decades ago.

Biography

J Thomas McClintock is a Professor and Director of Forensic Sciences in the Department of Biology and Chemistry at Liberty University in Lynchburg, VA where he teaches Under-graduate and Graduate courses in Forensic Sciences (forensic DNA analysis, trace evidence) and Microbiology. The forensic DNA course focuses on current laboratory methods and applications in forensic DNA profiling and effective presentation of DNA evidence at trial. His latest book, entitled *Forensic Analysis of Biological Evidence: A Laboratory Guide for Serological and DNA Typing* focuses on the newest techniques available for the analysis of biological material. He is also the Founder of DNA Diagnostics, Inc., a forensic service company that provides DNA testing and the scientific review and analysis of DNA test results performed in forensic casework. In 2013, he was named among the top 15 DNA analysts in the country by ForensicsColleges.com, a leading website on forensics programs across the nation.

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