



### E7 Mitochondrial DNA Forensics for the Legal Practitioner: Critical Knowledge From Crime Scene to Courtroom

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After attending this presentation, attendees will: (1) understand the basic biological features of forensic mitochondrial (mtDNA) analysis; (2) understand the progression of a case from crime scene to courtroom; and, (3) and learn of interesting cases that capture the relevant issues that arise in courtroom presentation.

This presentation will impact the forensic science community by increasing the number of legal practitioners knowledgeable of forensic mtDNA analysis. The overall experience of the legal community with forensic mitochondrial DNA cases is limited due to the relatively small number of cases nationally. Through exposure to a distillation of the basics including critical facts and issues the legal practitioner will become conversant in this useful forensic method.

Recent high profile cases using forensic mitochondrial DNA (mtDNA) analysis include the murders of Laci Peterson, Samantha Runnion, and Danielle Van Damm, as well as the prosecutions of Michael Skakel, Jason Williams, and Gary Ridgeway, the Green River Killer. Although this form of testing is routinely accepted in the courtroom at state and federal levels, most defense and prosecuting attorneys have had limited exposure to it due to the relatively small number of cases annually. For current prosecutions and cold cases as well as post-conviction explorations of guilt or innocence; however, mtDNA can be a critical and highly useful piece of the crime scene puzzle. Naturally shed hairs, especially those found in highly probative locations at the crime scene or on the homicide victim's body, are frequent case samples for mtDNA analysis. Skeletal remains subjected to extreme environmental challenges are also frequently submitted for identity confirmation using this type of testing when nuclear DNA testing is unsuccessful. Laboratory analyses have been routinely carried out since the early 1990s and are typically straightforward. Major areas of utility have been forensic, military, and historical; however, criminal justice attorneys should have a "mtDNA toolkit" ready and waiting for the potential case. In addition, a basic awareness of the pitfalls and best practices is required of the attorney with a "mito" case.

Relatively simple biological basics underlie the principles of mtDNA analysis. Legal practitioners need to understand these at a foundational level, as well as how to explain and use this non-unique marker in a courtroom setting once the forensic laboratory has developed a failure to exclude with crime scene evidence such as a shed hair or skeletal remains. Relevant topics to become comfortable with include basic lab techniques, statistical context, mixtures, databases, contamination, and other challenges to the evidence. For example, contamination is more prevalent and likely when testing this naturally abundant DNA molecule, yet mitochondrial DNA analysis results can be reliably obtained when a contamination is present when the laboratory has comprehensively validated its protocols to include interpretation in situations when contamination is minimal. The FBI's on-line

mitochondrial DNA forensic database will be described in depth as a resource for understanding frequency estimates of individual mtDNA types. The difference between this "non-unique" form of DNA analysis that links maternal relatives and the "source attribution" form of nuclear DNA analysis, STR typing, will also be covered.

Using interesting litigated prosecution and defense cases to illustrate the courtroom basics of forensic mtDNA analysis, the above topics will be discussed. Cases that examine post-conviction testing and exoneration, successful trial outcomes for the state, small and old hairs, and skeletal remains will be highlighted. The attendee will also gain an understanding of why mtDNA analysis is not used in certain types of cases such as cuttings, stains, and paternity testing. In addition, the presentation will provide the legal practitioner with some simple resources for gathering further information that are readily available on-line.

This presentation will provide the legal practitioner with brief and basic "need to know" information that can be augmented at any later date. **Forensic Mitochondrial DNA, Legal Education, Courtroom Issues**