

Mitochondrial DNA: New Methods, Automation and Sequence Analysis Software

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The use of mitochondrial DNA (mtDNA) sequence analysis to identify biological evidence has been well documented. More than 50 laboratories worldwide are now applying mtDNA analysis in forensic casework; e.g., to help identify human remains from previous military conflicts or to help identify the source of a shed hair. In addition, the number of mtDNA sequences added to population databases has grown rapidly. Estimates find that there are greater than 5000 sequences which have been generated in forensic laboratories, and that an equal number will be generated in the next year or two. As a result, more is known about the genetics of mtDNA, as well as the power of the system as a forensic marker. Consequently, mtDNA analysis is in a strong position as we approach the next millennium.

Given the hardy state of mtDNA analysis, the goal now of the Armed Forces DNA Identification Laboratory (AFDIL), as well as other forensic laboratories, is to expand on and further improve the current systems. Developing a more sensitive method for detection mtDNA heteroplasmy; sequencing variable and/or coding regions of mtDNA to further increase the discrimination power of the system; development of primer sets for amplification of smaller regions of mtDNA; development of laboratory automation for DNA extraction, amplification and sequencing processes; and development of automated mtDNA sequence analysis software, are all topics that have been recently addressed, and will be discussed. In addition, some prospective on the future of mtDNA analysis will be provided.