

PERSPECTIVES IN FORENSIC MOLECULAR BIOLOGY

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The DNA identification of crime scene sample donors whose STR profile is already known to the authorities provides a highly successful tool in crime investigation and is receiving constant technical improvements such as increasing the sensitive of chemistry and machinery to allow STR profiling from less and less material. However, there additionally are recent advanced in human genetics, genomics and molecular biology that allow completely new types of forensically relevant information to become obtainable from crime scene samples potentially allowing crime investigation to get more effective in the near future. Progress in the genetic understanding of human externally visible characteristics and bio-geographic ancestry has already led to the development of DNA tools for eye and hair color prediction as well as for continental ancestry inference expected to provide investigative leads to better find perpetrators whose STR profile is not already known, and more such Forensic DNA Phenotyping markers and tools are expected to be available soon. Advances in human RNA biology have not only provided messenger RNA and micro RNA markers with strong expression differences between forensically relevant body fluids including skin traces, but moreover some RNA tools were already developed for molecular forensic tissue identification. Differences in the methylation status of the DNA of different body fluids have started to be explored for the same purpose. An improved understanding of Y-chromosomal STRs including their mutation rate has delivered new sets of Y-STRs providing interesting forensic application, such as rapidly-mutating (RM) Y-STRs for male relative differentiation and for improved male lineage identification (some of which are already used in the next generation commercial Y-STR kits) as well as slowly-mutating (SM) Y-STRs for improved paternal kinship testing. Other areas of recent attention in forensic molecular biology concern the exploration of differential degradation of biomarkers for sample age estimation and the use of circadian biomarkers for sample deposition timing. This presentation will provide a summary of some future perspectives in forensic molecular biology such as those mentioned here that are likely to improve individual identification and may also allow linking (DNA) identified crime scene sample donors with criminal acts in the future.