

DEVELOPMENT OF NEW TOOLS TO AID IN THE IDENTIFICATION OF MISSING PERSONS AND UNIDENTIFIED HUMAN REMAINS

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Each day in the United States there are nearly 100,000 active missing persons cases with many of them classified as long-term cases. It has been estimated that across the U.S. there are tens of thousands of skeletal remains yet to be identified. Virtually all of these remains are from victims who died under suspicious circumstances, with the vast majority being homicides. The identification of the skeletal remains can provide families with needed closure and law enforcement with the critical first step ultimately leading to the identification of the perpetrator of the violent crime.

For the past three years, the UNT System Center for Human Identification (UNTSCHI) has been receiving unidentified human remains from Medical Examiners/Coroners or Law Enforcement agencies for analysis and upload into CODIS. Many of these remains have been stored for 10 to 30 years prior to us receiving them. UNTSCHI is currently one of only three facilities in the entire nation that is capable of uploading both STR and mtDNA profiles into the FBI's CODIS+mito System. Although the success rate of obtaining mtDNA profiles is very high, in approximately 55% of the cases, DNA recovered from these skeletal remains yielded profiles from less than 10 of the Core STR Loci, with almost 30% of these DNA profiles with less than 6 loci. These remains are known to contain very limited amounts of DNA, which is often highly degraded and contain PCR inhibitors which co purify with the recovered DNA. In order to improve the sensitivity, robustness and quality of the profiles obtained from the DNA recovered from these skeletal remains, which in turn will increase the discriminating power of the profiles, the utilization of miniSTR multiplex systems has been evaluated. The miniSTR multiplex systems evaluated contain both non CODIS loci (NCO1 and NCO2) which have been developed at the National Institute of Standards and Technology, and a new 9-plex miniSTR system developed by Applied Biosystems containing 7 of the original "Core" CODIS loci. The miniSTR multiplex system from Applied Biosystems contains Amelogenin, D13S317, D7S820, D2S1338, D21S11, D16S539, D18S51, CSF1PO and FGA. The DNA obtained from skeletal remains when amplified with the Profiler Plus® *ID* and COfiler® systems often yielded incomplete limited profiles. However, in many cases this same DNA when amplified with the NCO1 and NCO2 miniSTR systems developed by NIST and the 9-plex miniSTR multiplex developed by Applied Biosystems, virtually all of the STR loci in these systems provided DNA profiles. In combination, these three new miniSTR systems have provided significantly greater discrimination power than the current commercially available products. In fact, these systems have provided valuable data which has been used to support several identifications made by the UNT System for Human Identification.

This work has been funded by grants (2004-DN-BX-K212 and 2004-DN-BX-K214) from the National Institute of Justice under the Presidents DNA Initiative.