

IMPROVED Y-STR TYPING FOR DISASTER VICTIM IDENTIFICATION, MISSING PERSONS INVESTIGATIONS, AND HISTORICAL HUMAN REMAINS

Angie Ambers¹, Jitka Votrubova², Daniel Vanek^{2,3}, Antti Sajantila⁴, Bruce Budowle^{1,5}

¹ Center for Human Identification, University of North Texas Health Science Center

² Forensic DNA Service

³ Charles University in Prague, 2nd Faculty of Medicine

⁴ Department of Forensic Medicine, University of Helsinki

⁵ Center of Excellence in Genomic Medicine Research (CEGMR), King Abdulaziz University

Bones are a valuable source of DNA in forensic, anthropological, and archaeological investigations. There are a number of scenarios, such as bombings, terrorist attacks, natural disasters, homicide, mass graves, and exhumed historical remains, in which the only samples available for testing are highly degraded and/or skeletonized. Often it is necessary to perform more than one type of marker analysis on such samples in order to compile sufficient data for identification. Lineage markers, such as mitochondrial DNA (mtDNA) and Y-STRs, represent important systems to complement autosomal DNA markers and anthropological metadata in making associations between unidentified remains and living relatives or for characterization of the remains for evolutionary and/or historical studies. In this comparative study, Y-STR typing with both Yfiler™ and Yfiler™ Plus was performed on a variety of human skeletal remains, including samples from the American Civil War (1861-1865), World War II (1939-1945), Seven Years' War (1756-1763), and 19th century America. The Yfiler™ Plus kit includes the 17 Y-STR markers from the original Yfiler™ kit plus 10 additional highly polymorphic markers (DYS576, DYS627, DYS460, DYS518, DYS570, DYS449, DYS481, DYF387S1a/b and DYS533). The skeletal remains used for this study were recovered from a wide range of environmental conditions and were extracted using several common methods. Regardless of the DNA extraction method used and the age/condition of the bones, samples analyzed with the Yfiler™ Plus kit yielded a greater number of alleles compared with samples typed with the Yfiler™ kit, demonstrating the efficacy of the assay with degraded samples and increasing the discriminatory power over the previous generation multiplex due to the broader set of Y-STR markers analyzed and increased haplotype resolution.