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Extraction and analysis of ancient DNA from human skeletal remains from Sri Lanka

Analysis of ancient DNA (aDNA) gives archaeologists and anthropologists alternative and innovative ways to interpret and understand the past. The postmortem instability of nucleic acids, presence of inhibitory factors for analysis and the contamination with modern DNA prevent authentic and high recovery of undamaged DNA from archeological specimens. Ancient DNA is heavily modified over time, mainly due to spontaneous hydrolysis and oxidation and consequently, most such specimens do not contain any Polymerase Chain Reaction (PCR) amplifiable endogenous DNA while those that do amplify, generate only fragments in 100 – 500 base pairs in size. Nonetheless, the preservation rate of DNA in human remains is very low under tropical conditions in Sri Lanka due to environmental conditions of high temperature and high humidity.

The present study attempts to optimize a method of extracting and PCR amplification of DNA from older human skeletal remains. Samples were obtained under strict measures to prevent contamination with modern DNA. A 15year old (15YH) human humerus excavated from a burial site at Kuliyapitiya and a 40year old (40YT) human tibia from the bone collection of Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenapura, were analyzed. DNA was extracted by a modified Phenol / chloroform method from each specimen and was subjected to PCR using nested reactions in generating 4 overlapping fragments between the nucleotide positions 15978 and 16417 of the human mitochondrial genome. The success of PCR amplifications were verified upon agarose gel electrophoresis. At all the four reactions per each bone generated DNA fragments of desired length (378bp, 247bp, 233bp and 233bp). The products were purified and are being sequenced. The present study established methodologies for extracting and analyzing of aDNA which has been exposed to climatic and environment conditions that favor rapid DNA degradation. This optimized methodology is being applied for mtDNA analysis of prehistoric human skeletal remains from Bellan bandi palassa, Fahien lena, Sigiriya Pothana, Miniethiliya etc.

Keywords: Ancient mitochondrial DNA, Modern human bones, Sri Lanka