

POINTING TO AN OPTIMAL POST MORTEM SAMPLE TYPE – DISTAL PHALANGES AND NAILS FOR DNA-BASED IDENTIFICATION IN COMPROMISED HUMAN REMAINS CASES

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DNA can be recovered from a range of biological sources, with some samples more ideal for DNA-based identification when remains are of a compromised nature. Factors such as resistance to degradation, or damage due to its natural structure, can also affect DNA recovery. Current recommendations suggest certain skeletal samples are most appropriate for compromised remains due to a higher success rate of DNA recovery from femur shafts and teeth as compared to blood, buccal and tissue samples. However, recovering DNA from femur and teeth requires: surgical removal from the deceased, an extensive sample preparation, and a time consuming and labour-intensive DNA extraction protocol. Recently the successful recovery of DNA from toenails and phalanges from decomposed remains has been demonstrated. Both of these sources are associated with a simple collection method yet still offer the protection afforded to hard tissues offering particular value to disaster victim identification (DVI) efforts.

At the Australian Facility for Taphonomic Experimental Research (AFTER), we collected distal phalanges (allowing recovery of nail, tissue and bone) from human donors exposed to surface and burial decomposition. Samples from a surface human donor were collected over 14 days at which point the human donor had mummified and reached partial skeletonization. Additional samples were collected from other human donors that had been at AFTER for two weeks to over three years. Samples were also collected after a year from humans donors buried in shallow graves. DNA was extracted from nail, tissue and phalange samples, then quantified. An evaluation of DNA yield between hand and foot phalanges as well as intra and inter-individual differences, DNA yield of nail clippings versus the nail bed, DNA yield over a two-week period mimicking DVI efforts as well as a longer time period applicable to unidentified remains cases, and the impact of rapid sample preparation approaches on DNA yield will be presented.

Where previous recommendations and international guidelines suggest femur and teeth should be collected as optimal samples in compromised cases, this research highlights the value of distal phalanges and nails in human identification when available. Furthermore, this approach is associated with a simpler collection method, sample preparation and DNA extraction protocol. This approach could save resources whilst expediting the identification process; providing answers to the family sooner and directing investigators in a criminal investigation.