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DNA IDENTIFICATION OF BURNT SKELETAL REMAINS OF 15 YEARS OLD MISSING GIRL: A CASE STUDY

Forensic Science

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ABSTRACT

In Forensic DNA casework, we frequently encounter cases in which burnt bones are submitted for identification and subsequently help solve the crime. The modus operendi of criminals is often to destruct the evidence by burning the corpse, in murder cases. The authors present a case report of results obtained from DNA STR analysis of burnt skeletal remains of a 15 year old murder victim. The burnt bones were collected from a well after approximately 9 months of the date of incidence. DNA was successfully extracted and amplified from the bunt bones.
Complete DNA profiles were obtained from burnt vertebra, rib and humerus head. The identity of deceased was proved by comparing DNA profiles of parents.

KEYWORDS

Forensic identification Burnt bone STR Cremation Nuclear DNA

1. INTRODUCTION:

Both physical and chemical properties of bone change significantly when burned and these changes cause difficulties in both anthropological testing and DNA profiling [4]. When applying DNA tests to burnt bones, early decrease of the organic matrix should be considered, since DNA is an organic component of the bone. The decrease in organic matrix makes DNA analysis of severely burnt bones quite a difficult task. Studies involving isolation and amplification of human DNA from old teeth, bone and burnt skeletal remains have been reported [1-3]. Kazuhiko Imaizumi reviewed the challenging alterations to bunt bones that make DNA analysis difficult [4].

We describe here, the identification of a female murder victim, whose remains were burnt and thrown in a well, with the intent of destruction of the evidence. After almost nine months from the date of incidence, the burnt remains were seized and autosomal STR profiles were obtained, which helped to identify the victim in a highly sensitive case.

2. Case History

A missing person case, of 15 year old girl was filed in the month of January 2020 by her paternal uncle. The investigation leads disclosed that, victim/deceased's paternal Aunt and her husband had executed a well planned murder, due to some personal disputes between the accused and deceased's father. The accused kidnapped the girl using their own car by giving her sleeping pills. When the girl became unconscious, both of them killed her by chocking her neck with a scarf. The body was then burnt and the burnt bones were dumped in a well. After nine months of the incident, the team of police investigators followed a lead, visited the crime scene and collected various burnt bones from the well. The car used during the execution of this crime was examined and hair samples were collected from three locations in the car. Burnt bones and hair samples were then submitted to Regional Forensic Science Laboratory, Amravati for DNA analysis, along with reference blood samples of parents of the deceased.

The various burnt bones, submitted to the laboratory included pieces of vertebra, partial scalp bone, mandible, part of jaw, partial Humerus, partially fractured Scapula, and broken ribs. (Fig. 1, 2 and 3)

3. MATERIAL AND METHODS

3.1 Sample preparation and DNA extraction:

Bone samples seized from the well, were cleaned to remove soil matter and subsequently air dried. Decalcification of burnt humerus head, rib and other bones were conducted using EDTA method. Powdered bone sample from each burnt bone were subjected to DNA extraction using PrepFiler Express BTA™ Forensic DNA Extraction Kit (Applied Biosystems). The hair samples collected from the car and reference blood samples were subjected for DNA extraction using PrepFiler Express™ Forensic DNA Extraction Kit (Applied Biosystems).

Fig. 1 Burnt Bones

Fig. 2 Burnt Humerus bone

Fig. 3 Burnt Vertebra

3.2 Quantification, PCR amplification and DNA typing:

DNA was quantified with 7500 Real-Time PCR system and HID Real-Time PCR analysis software using Quantifiler® Human DNA Quantification Kit (Applied Biosystems). The PCR amplifications were performed on Veriti 96 well thermal cycler (Applied Biosystems) using AmpF/STR® Identifiler® PCR Amplification Kit (Applied Biosystems)and AmpFℓSTR™ MiniFiler ™ PCR Amplification Kit (Applied Biosystems), following the manufacturers protocols, standardized in the laboratory. Amplified PCR products were then subjected to Capillary electrophoresis on Genetic Analyzer 3500 (Applied Biosystems).

4. RESULTS:

Extracted DNA from three burnt bone samples were successfully amplified using AmpF/STR® Identifiler Kit (Table 1). The DNA profiles obtained from Humerus head, Rib and Vertebra were analysed and found to be identical and also from same source of female origin. Due to extensive exposure to high temperature and being submerged under water for approximately nine months, less quantity of DNA was extracted in corresponding samples (ranging from 0.0012 to 0.45 ng/µl). The deceased was identified by comparing Autosomal DNA profiles obtained from reference blood samples of parents. No amplifiable DNA was obtained from Scalp bone, Mandible and Metatarsals or Metacarpels.

The DNA profiles obtained from hair collected from the car, were of female origin but failed to match with DNA profile obtained from burnt

bones of deceased.

Table 1:Nuclear DNA quantity and the efficiency of STR typing of the bone samples:

Burned bone samples	Quantity (ng/µl)	Efficiency of STR typing AmpF/STR® Identifiler Kit
Vertebra	0.45	16/16
Humerus	0.21	16/16
Metatarsal and metacarpals	0.0012	0/16
Ribs	0.02	16/16
Scalp bone	0.04	13/16
Other Burnt Bones	0.006	1/16

5. DISCUSSION

As mentioned earlier, the organic matrix disappears at a comparatively early phase in the burning process, and its effect on the quantity of DNA cannot be ignored. Burnt remains are typically challenging for DNA typing, however in the present study, successful DNA profiles were obtained from three burnt bone remains (Vertebrae, Ribs and Humerus). Crime scene evidential samples were collected after nine months of the murder; during this period more than two seasons passed over it. The burnt bones were collected from a well containing water and mud after a long period. The successful DNA analysis proved the identity of the deceased.

6. CONCLUSION

The important step in DNA analysis is extraction of DNA and is quite difficult from the challenging samples like brittle burnt, skeletal remains and degraded samples. The authors were able to successfully extract and amplify DNA, after almost nine months of the incident. Careful sampling, thoroughly performed extraction process and proper DNA analysis lead to obtain a complete DNA profile of the deceased; which helped to prove identity of 15 year old missing girl.

Although burnt bones pose many difficulties for forensic identification, DNA analysis has the potential to provide conviction in the court of law with the help of higher scientific methods for the results of identification attempts.

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8. Conflict of interest

Authors declare no conflict of interest.

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