COMPARISON BETWEEN DIFFERENT TISSUES USING INNOVATED METHODS IN EXTRACTION OF DNA FOR IDENTIFICATION OF CORPSE IN CASE OF ENVIRONMENTAL DISASTERS EXPLOSIONS AND FIRES

Submitted By

Jihan Ahmed Abd Elwahab El Sayed Naser

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Master in Clinical Pathology, Faculty of Medicine (Girls), Al-Azhar University, 2008

A Thesis Submitted in Partial Fulfillment
Of
The Requirement for the Doctor of Philosophy Degree
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Environmental Sciences

Department of Environmental Medical Sciences
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APPROVAL SHEET

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*I am extremely sincere to **my mother** who stood beside me throughout this work giving me her support.*

*Words fail to express my love, respect and appreciation to **my husband** for his unlimited help and support.*

Jihan Ahmed Abd Elwahab

Abstract

INTRODUCTION: Every disaster is unique and involves interplay of different factors and circumstances such as nature of disaster, number of victims and extent of body fragmentation that ultimately challenges the disaster response planning. With some planning, and proper sample selection we can reduce stress for those involved in the identification process thus increasing the probability that all recovered samples are identified.

AIM OF THE WORK: To recognize and decide which human tissue is preferred over the other for DNA tests for human identification for available samples saved from different disasters. Thus we can obtain the best results and avoid failure of victim identification.

MATERIALS AND METHODS: This cross sectional laboratory based study was conducted at the Egyptian Forensic Medicine Authority (EFMA) at Sayda Zaynab. From May 2016 to April 2017 and tested using Prep Filer, manual Qiagen extraction kit or Qiagen automated kit using EZ1. Extracted DNA was then quantified using Quatifiler® Human DNA Quantification kit by Step one Real Time PCR. Samples were amplified using AmpFlSTR ® Identifier ® Plus PCR and AmpFlSTR ® Y filer Amplification Kits. Amplified PCR products were run electrophorethically on a 3130xl or 3500 Genetic Analyzer and finally analyzed.

RESULTS: Comparison between various tissues recovered from the site of different disasters showed that dry blood stain have better DNA yield and STR results followed by fresh tissue then hair samples containing roots. Moreover cartilage samples were preferred to bone samples

concerning DNA yield and STR results. Finally skin tissue then teeth samples had the least DNA yield and STR results.

CONCLUSION: During sample selection of collected tissue remains and fragments, it is preferable to get a dry blood sample if available, if not try to select fresh muscle tissue if not available search for hair with roots then selection of cartilage gave better results than bone concerning DNA yield and STR results leaving skin then teeth as the last choice.

KEYWORDS: Disasters, human remains, human identification, DNA yield, STR, tissues.

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List of Abbreviations

ADD : Accumulated Degree Days.
AFIS : Automated fingerprint identification system.
AISNPs : Ancestry informative SNPs.
AM : Ante-mortem.
ATP : Adenosine tri-phosphate.
BGA : Biogeographical ancestry.
Bp : Base pairs.
Ca : Calcium
CE : Capillary electrophoresis.
CODIS : Combined DNA Index System.
CT : Computed tomography.
CT : Cycle threshold.
°C : Degree Celsius.
DDC : Digital Dental Chart.
DNA : Deoxyribonucleic acid.
DNTPs : Deoxynucleotide triphosphates.
DVI : Disaster Victim Identification.
EVCs : Externally visible characteristics.
FDP : Forensic DNA phenotyping.
FISH : Fluorescence in situ hybridization.
FSS : The Forensic Science Service.
H : Hour.
IAFIS : Integrated Automated Fingerprint Identification System.
IISNPs : Identity-informative SNPs.
InDels : Insertion-deletion length polymorphisms.
INNULs : Inherent size differences associated with insertion and null alleles.
INTERPOL : International Criminal Police Organization.
IPC : Internal positive control.
IT : Information technology
LINEs : Long interspersed nuclear elements.

List of Abbreviations (Cont.)

LISNPs	**:** lineage informative SNPs.
MSC	**:** mesenchymal stromal cells.
MHL	**:** The minimal haplotype loci.
Min	: Minute
MP	**:** Missing person.
MRI	**:** Magnetic Resonance Imaging.
MtDNA	**:** Mitochondrial DNA.
NDIS	**:** DNA Index System.
NGS	**:** Next-generation sequencing.
OCME	**:** Office of Chief Medical Examiner.
PBS	**:** phosphate buffered saline.
PCR	**:** Polymerase Chain Reaction.
PH	**:** Power of hydrogen
PISNPs	**:** Phenotype informative SNPs.
PM	**:** Post-mortem.
PMCT	**:** Post-mortem computed tomography.
PMI	**:** Post Mortem Interval.
R-DNA	**:** Rapid DNA.
REs	**:** Retrotransposable elements.
RFLP	**:** Restriction fragment length polymorphism.
Rpm	**:** Revolution per minute.
Sec	**:** Second.
SGM	**:** Second-generation multiplex.
SINEs	**:** Short interspersed nuclear elements.
SNP	**:** Single nucleotide polymorphisms.
SOP	**:** Standard Operating Procedures.
STRs	**:** Short tandem repeats.
SWGDAM	**:** Scientific Working Group on DNA Analysis Methods.
TBS	**:** Total Body Score
UK	**:** United Kingdom.
VNTRs	**:** Variable number tandem repeats.
WHO	**:** World Health Organization.
WTC	**:** World Trade Center.