

**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

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M.B.B.Ch., Faculty of Medicine, Cairo University, 1995

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
In
Environmental Sciences

Department of Environmental Medical Sciences
Institute of Environmental Studies and Research
Ain Shams University

2019

APPROVAL SHEET
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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 Quatifier® Human DNA Quantification kit by Step one Real Time PCR. Samples were amplified using AmpFISTR® Identifier® Plus PCR and AmpFISTR® Yfiler Amplification Kits. Amplified PCR products were run electrophoretically 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.

List of Contents

Title	Page
List of Tables	VII
List of Figures	VIII
List of Abbreviations	XIII
Introduction	1-4
Aim of the work	5
Review of literature	6
Chapter 1: Disasters & environmental Mass Fatality Incidents	6
Chapter 2: Identification of victims in disasters	12
Chapter 3: DNA role in victim identification	30
Chapter 4: Effect of degradation, decomposition and fire on DNA	42
Chapter 5: Innovative methods in DNA victim identification ...	52
Chapter 6: Examples of tissues used in DNA identification	70
Chapter 7: Reference samples	80
Materials and Methods	84
Results and Statistics	112
Discussion	134
Summary and Conclusion	144
Recommendations	148
References	150
Arabic summary	

List of Tables

Table	Subject	Page
(1)	Thermal cycling of AmpF ℓ STR Identifiler PCR.	104
(2)	Thermal cycling of AmpF ℓ STR Yfiler.	106
(3)	Type of tissue examined in aircraft crash disaster.	113
(4)	DNA yield from various types of tissues examined in aircraft crash disaster.	114
(5)	Profile identification in aircraft crash disaster (STR success rate).	115
(6)	Comparison of DNA yield (ng/100 mg/ μ l) from various types of tissue examined in aircraft crash disaster to their count.	116
(7)	Comparison of profile identification from various types of tissues examined in aircraft crash disaster (STR success rate).	117
(8)	Type of tissue examined in factory fire disaster.	119
(9)	DNA yield (ng/100 mg/ μ l) from various types of tissues examined in factory fire disaster.	120
(10)	Profile identification in factory fire disaster (STR success rate).	121
(11)	Comparison of DNA yield per (ng/100 mg/ μ l) from various types of tissue examined in factory fire disaster to their count.	122
(12)	Comparison of profile identification from various types of tissues examined in factory fire disaster (STR success rate).	123

Table	Subject	Page
(13)	Type of tissue examined in terroristic bomb explosion disaster.	125
(14)	DNA yield from various types of tissues examined in terroristic bomb explosion.	126
(15)	Profile identification in terroristic bomb explosion (STR success rate).	127
(16)	Comparison of DNA yield (ng/100 mg/ μ l) from various types of tissue examined in terroristic bomb explosion to their count.	128
(17)	Comparison of profile identification from various types of tissues examined in terroristic bomb explosion (success STR rate).	129
(18)	Comparison of DNA yield and profile identification in an aircraft crash, a factory fire or a terroristic bomb explosion.	131

List of Figures

Fig.	Subject	Page
(1)	Members of the DVI team searching for victim remains.	2
(2)	Boeing aircraft crash.	7
(3)	Nuclear explosion.	8
(4)	Dental X ray imaging.	24
(5)	X-ray image in a DVI dead with an orthopedic plate.	28
(6)	Nuclear DNA structure.	31
(7)	Shape and composition of DNA.	32
(8)	Pattern of inheritance of nDNA and mtDNA.	36
(9)	Structure of DNA in a Mitochondrion.	37
(10)	The steps of PCR.	39
(11)	Effect of degradation as shown on electrophoresis.	47
(12)	QIAcube (QIAGEN).	54
(13)	The Genetic analyzer 3500 and genetic analyzer 3130.	56
(14)	GlobalFiler™ kit.	60
(15)	The Applied Biosystems™ RapidHIT™ ID System.	67
(16)	Microscopic picture of hair and hair shaft.	70
(17)	Structure of human skin showing the skin layers.	71
(18)	Layout of the articular cartilage and its various layers.	73
(19)	Compact bone tissue, consisting of spongy bone tissue and living osteocytes.	74

Fig.	Subject	Page
(20)	Histology of muscle tissue: (a) skeletal muscle, (b) smooth muscle, and (c) cardiac muscle.	75
(21)	Structure of tendons connected to muscles and bones.	77
(22)	Histological view of the pulp dentine border of human molar displaying odontoblasts.	78
(23)	Structure of a tooth of a human mandibular molar sectioned buccolingually.	79
(24)	Examination tables in a disaster site.	87
(25)	Biosafety cabinet.	88
(26)	Bone sample preparation.	89
(27)	Recovered bone remains.	90
(28)	Tissue lyser.	91
(29)	EZ1 for automated extraction.	94
(30)	Manual Silica Membrane Extraction.	97
(31)	Matching STR profiles (focusing on 3 markers).	109
(32)	An inclusion STR profile child sample share one allele at every locus (focusing on 5 markers).	110
(33)	Full STR profile for Hair sample giving quantitation of 17.3ng.	110
(34)	Failed STR profile for skin sample	111
(35)	Pie chart illustrating frequency distribution of the type of tissue examined in aircraft crash disaster.	113
(36)	Distributions of the density of DNA yield from various types of tissues examined in aircraft crash disaster. Fitted curve represents the mean value for each type.	114

Fig.	Subject	Page
(37)	Pie chart illustrating profile identification in aircraft crash disaster (STR success rate).	115
(38)	Box plot illustrating DNA yield from various types of tissue examined in aircraft crash disaster. Box represents the interquartile range. Line inside the box represents the median. Whiskers represent minimum and maximum values excluding outliers (dots).	117
(39)	Profile identification from various types of tissues examined in aircraft crash disaster (STR success rate).	118
(40)	Pie chart illustrating frequency distribution of type of tissue examined in factory fire disaster.	119
(41)	Spectrum of the density of DNA yield from various types of tissues examined in factory fire disaster. Fitted curve represents the mean value for each type.	120
(42)	Pie chart illustrating profile identification in factory fire disaster (STR success rate).	121
(43)	Box plot illustrating DNA yield from various types of tissue examined in factory fire disaster. Box represents the interquartile range. Line inside the box represents the median. Whiskers represent minimum and maximum values excluding outliers (dots).	123
(44)	Profile identification from various types of tissues examined in factory fire disaster (STR success rate).	124
(45)	Pie chart illustrating frequency distribution of type of tissue examined in terroristic bomb explosion.	125

Fig.	Subject	Page
(46)	Distributions of the density of DNA yield from various types of tissues examined in terroristic bomb explosion. Fitted curve represents the mean value for each type.	126
(47)	Pie chart illustrating profile identification in terroristic bomb explosion (STR success rate).	127
(48)	Box plot illustrating DNA yield from various types of tissue examined in terroristic bomb explosion. Box represents the interquartile range. Line inside the box represents the median. Whiskers represent minimum and maximum values excluding outliers (dots).	129
(49)	Profile identification from various types of tissues examined in terroristic bomb explosion and STR results (STR success rate).	130
(50)	Box plot illustrating DNA yield in an aircraft crash, a factory fire or a terroristic bomb explosion. Box represents the interquartile range. Line inside box represents the median. Whiskers represent minimum and maximum values excluding outliers (dots).	132
(51)	Profile identification in an aircraft crash, a factory fire or a terroristic bomb explosion.	133

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.
SWGDM	: 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.