

Statistics of DNA Profiling and Activities of Divisional Forensic DNA Screening Laboratory, Faridpur in Bangladesh

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Abstract

DNA is the basic building block for an individual's whole genetic makeup. DNA is a tiny thread like molecule which is existent in all forms of life, inception from humans to microscopic organism bacteria or virus. DNA fingerprinting which is currently most popularly known as DNA profiling, is a process of isolating and making images of DNA sequences. Forensic DNA test in Bangladesh launch from 2006 through National Forensic DNA Profiling Laboratory (NFDPL) under Ministry of Women & Children Affairs. It has seven branch which are known as Divisional DNA Screening Laboratory (DDSL). DDSL situated in every divisional medical college hospital (Rajshahi, Chittagong, Khulna, Rangpur, Shylhet, Barisal) and faridpur medical college hospital. Activities of faridpur divisional forensic DNA screening laboratory begin from 2012 to till now. Divisional DNA Screening Laboratory collect DNA sample from victim and accused or suspect criminal according to court order and preliminary screening then send to NFDPL for DNA profiling. From April, 2012 to November 2019 total DNA sample collection of 317 victim where rape 273, paternity 41 and murder 03. Most of the rape victim are child which age under 18. From this laboratory to send NFDPL total 76 case 215 evidence and result received total 55 cases 180 evidence. Most of the victim came in this laboratory from Faridpur, Rajbari, Madaripur, Shariotpur, Gopalgonj, Magura district region people.

Keywords: DNA Test; DDSL; NFDPL; Screening Laboratory; Victim; Evidence

Introduction

DNA is existent in all human cells and is the same in every cell. It is made of sugar, phosphate and nitrogen bases namely Adenine (A), Guanine (G), Cytosine (C) and Thymine (T). The series of the nitrogen bases appoint the so-called 'DNA sequence'. Various DNA molecules make up a gene. Humans have 22 pairs of body chromosomes (autosomes) and 1 pair of sex chromosomes per body cell. The genetic make-up of every individual is unique (except for identical twins) and may be used to identify a person. DNA is also very static and can be isolated from both living and dead persons as long as biological samples are not exposed to escape environmental conditions and/or microbial contaminants that can demote them [1].

DNA profiling is also entitled DNA test, DNA typing or DNA fingerprinting. Forensic DNA typing generally consists of comparing DNA evidence (i.e. DNA banished from a biological sample left a crime scene, e.g. blood stain, weapon, cans, bottles, glasses, cigarette butt, personal items etc) with suspect DNA (i.e. DNA expelled from blood of a suspect or accused). In case of sexual assault, the DNA extracted from the semen sample recovered from the victim is compared with the DNA sample caught from

the suspect. Each human cell (except reproductive cells) comprise approximately 3 billion base pair of DNA. Among these about 10% of the DNA encodes above 40,000 genes. In humans about 99.9% of all 3 billion nucleotides we inherit from our parents are identical among all individuals and difference remain in only 0.1% DNA [2]. Surprisingly, the first widespread use of commercial DNA testing, other than for research, was in forensics, not clinical medicine.

Most commentators credit Sir Alec Jeffreys of the University of Leicester with the first published description of a forensically useful DNA test. In his 1985 Nature article, Jeffreys coined the term "DNA fingerprint" for restriction fragment length polymorphism (RFLP) analysis of hypervariable "minisatellite" regions of DNA [3]. The genetic make-up of each individual is unique (except for identical twins) and may be used to identify a person. DNA is also very stable and can be DNA (DNA fingerprinting) was invented by Alec Jeffreys in 1984 at the University of Leicester while studying the human myoglobin gene [4]. The benefit of DNA testing in human DNA identification was pioneered by Alec Jeffreys and was first used in the inquiry of the rape/murder of two British schoolgirls in November 1986. In the primary investigations, semen samples isolated from the victims' bodies did not match the suspect's DNA.

To find individuals with the same DNA specimen as that of the semen sample, police investigators requested 17–34 year old males alive in the area to voluntarily submit blood samples. Above 4000 reference samples were processed and compared with the DNA pattern of the semen specimen. Eventually, the DNA profile from the semen specimen matched the DNA profile of a man named Collin Pitchfork. Pitchfork last confessed to the crime and was subsequently convicted for the rape and killing of the two schoolgirls [5]. In 1997, DNA testing was performed in approximately 17,000 criminal cases in the United States. Most cases involved sexual assaults, although a significant number involved homicides and other categories of offenses. Despite many earlier challenges, DNA test results now are admitted routinely into court evidence. No other forensic evidence, except fingerprints (themselves a biologic correlate), is so personal to the perpetrator as biologic evidence.

Most forensic evidence links scenes or objects together, rather than to the individual that the police are trying to catch. Other than fingerprints and DNA, few other types of evidence have the potential to identify an individual [6]. Forensic DNA analysis has played a conclusive role in the investigation and resolution of thousands of violent offense since the late 1980. Recently, short tandem repeats (STR) are the most extensively used markers for forensic DNA testing. Because of their high discriminatory strength, good resolution of alleles, and the capability to rapidly process samples using multiplexed polymerase chain reaction (PCR), 15 STR have been selected as the core loci upon which the FBI's national Combined DNA index system (CODIS) has been formed.

The National Forensic DNA Profiling Laboratory (NFDPL) is the premier DNA laboratory of its kind in Bangladesh. It has been founded at Dhaka Medical College through the Ministry of Women and Children Affairs Government of the People's Republic of Bangladesh under the auspices of Multi-Sectoral Programme on Violence Against Women (MSPVAW). Danish International Development Assistance (DANIDA) has provided the necessary financial and technical support to established the laboratory [7]. The laboratory will provide service to different investigating agencies to solve violent crimes like killing or rape, disputes arising over issue like paternity, maternity or inheritance and determining the identity of missing children, mass disaster hunting or unrecognizable dead bodies.

The laboratory is good equipped to provide all kinds of DNA testing service related to criminal inquiry. However, on principle cases involving violence versus women will be given preference. Gel electrophoresis and SDS PAGE are use for DNA and Protein purification respectively [8]. Surprisingly, the first widespread use of commercial DNA testing, other than for research, was in forensics, not clinical medicine. Most commentators credit Sir Alec Jeffreys of the University of Leicester with the first published description of a forensically useful DNA test. In his 1985 Nature article, Jeffreys coined the term "DNA fingerprint" for restriction fragment length polymorphism (RFLP) analysis of hypervariable "minisatellite" regions of DNA. In that same year, he solved an immigration case and began to apply his technique to a double rape/homicide criminal case. In 1986, commercial laboratories in the United States began forensic DNA testing. The first criminal conviction related to DNA testing was that of Tommy Lee Andrews in Florida in 1987 for serial rape and homicide [9].

Material and Methods

This retrospective study was carried out in Divisional DNA Screening Laboratory (DDSL) department of Faridpur Medical College Hospital, Faridpur, Bangladesh. During the period from 2012 to 2019, DNA sample collected alleged paternity, rape victim and murder' report forms of five district (faridpur, rajbari, madaripur, shariatpur, gopalganj) were enrolled. Relevant documents were collected from the preserved copies of the reports in the department with the verbal consent of the reporting coordinator and scientific officer.

Activities of Divisional Forensic DNA Screening Laboratory

Sample Collection from Victim or Accused Person: Each person tested (or their legal guardian) completes and signs an identification-consent form. Police/investigating officer must bring a valid photo and any relevant legal documents (court order, custody documents etc.) Tested parties are photographed and fingerprinted, and specimens (blood, vaginal swab, tissue sample, hair, bone, teeth or buccal swabs) are collected. Specimen containers are labeled in the presence of each person and signed by the police officer, forensic doctors & scientific officer.

Preservation of DNA evidence in Divisional DNA Screening Laboratory (DDSL) Faridpur: Most biological evidence is preserved best when stored dry and cold. Dry sample can be kept at room temperature (out of direct sunlight) or be refrigerated at 4 °C or frozen at -20 °C. Undried sample (e.g. tissue, bones) should be kept frozen at -20 °C. Liquid blood was kept refrigerated. Garments with blood stain or semen stain was air dried, can be stored at room temperature or refrigerated.

Transportation of DNA sample to National Forensic DNA Profiling Laboratory (NFDPL), Dhaka: DNA samples was properly labeled and sealed (preferably using a security seal). All samples accompany proper documentation (use form 1-4 wherever appropriate) and containing biological material placed in a secondary package for transportation. DNA evidence was sent through chain of custody in order to prevent sample tampering or manipulation. Basically evidence shipped on a business day. Never be shipped over weekends or holidays.

Received DNA Profiling result from National forensic DNA Profiling Laboratory: National Forensic DNA Profiling Laboratory basically every test result send to the direct Honorable Judge or Justices in every district and Divisional DNA Screening Laboratory.

Results

From April, 2012 to November 2019 total DNA sample collection of 317 victim as case number where rape 273, paternity 41 and murder 03. Total 76 case 215 evidence send to NFDPL and result received total 55 cases 180 evidence from NFDPL of DNA screening laboratory, faridpur. Now 21 case and 35 evidence of DNA test sample result are pending till November, 2019. This laboratory thus contribute and service in this region people through DNA test to prevent against women and child violence such as rape, murder and paternity.

Faridpur Divisional DNA Screening Laboratory (DDSL) collect DNA sample and evidence from victim or accused person from 2012 to till now. Then it send to National Forensic DNA Profiling Laboratory (NFDPL) for DNA test and received the result. Statistics of disposed cases and evidence from 2012-2019, DDSL, Faridpur are given in (Tables 1 and 2).

Duration/ Year	DNA sample store in DDSL as case number	From DDSL to Send NFDPL		DNA test result received DDSL from NFDPL	
		Case	Evidence	Case	Evidence
2012	20	14	51	05	15
2013	34	12	41	10	37
2014	40	13	24	12	32
2015	31	08	24	06	18
2016	29	03	07	06	13
2017	49	07	18	00	00
2018	50	08	20	05	27
2019	64	11	30	11	38
Total	317	76	215	55	180

Table 1: Statistics of disposed cases and evidence from 2012-2019, DDSL, Faridpur

Month	Year															
	2012		2013		2014		2015		2016		2017		2018		2019	
January	00	R-0	00	R-1	01	R-1	01	R-1	00	R-0	05	R-5	02	R-2	04	R-4
		P-0		P-1		P-0		P-0		P-0		P-0		P-0		
		M-0		M-1		M-0		M-0		M-0		M-0		M-0		
February	00	R-0	04	R-3	04	R-3	01	R-1	05	R-5	01	R-1	01	R-1	01	R-1
		P-0		P-1		P-0		P-0		P-0		P-0		P-0		
		M-0		M-0		M-0		M-0		M-0		M-0		M-0		
March	00	R-0	01	R-1	03	R-3	04	R-2	04	R-4	01	R-0	00	R-0	03	R-2
		P-0		P-0		P-0		P-2		P-0		P-1		P-0		
		M-0		M-0		M-0		M-0		M-0		M-0		M-0		
April	01	R-1	02	R-1	05	R-3	03	R-3	04	R-4	04	R-4	04	R-4	05	R-5
		P-0		P-1		P-2		P-0		P-0		P-0		P-0		
		M-0		M-0		M-0		M-0		M-0		M-0		M-0		
May	02	R-1	07	R-5	03	R-3	02	R-2	01	R-1	08	R-7	05	R-5	09	R-9
		P-1		P-2		P-0		P-0		P-0		P-1		P-0		
		M-0		M-0		M-0		M-0		M-0		M-0		M-0		
June	00	R-0	04	R-2	06	R-6	02	R-1	03	R-3	04	R-4	10	R-10	07	R-7
		P-0		P-2		P-0		P-1		P-0		P-0		P-0		
		M-0		M-0		M-0		M-0		M-0		M-0		M-0		

Month	Year	2012		2013		2014		2015		2016		2017		2018		2019	
July	03	R-2	02	R-1	01	R-1	01	R-1	02	R-1	05	R-5	12	R-12	06	R-6	
		P-1		P-1		P-0		P-0		P-0		P-0					
		M-0		M-0		M-0		M-0		M-0		M-0					
August	03	R-1	01	R-1	03	R-2	03	R-2	04	R-4	06	R-6	04	R-4	05	R-4	
		P-2		P-0		P-1		P-1		P-0		P-0					
		M-0		M-0		M-0		M-0		M-0		M-0					
September	01	R-1	03	R-2	07	R-6	04	R-3	01	R-1	05	R-5	04	R-4	10	R-8	
		P-0		P-0		P-1		P-1		P-0		P-0					
		M-0		M-1		M-0		M-0		M-0		M-0					
October	04	R-1	03	R-2	02	R-1	04	R-3	03	R-3	03	R-3	02	R-2	08	R-8	
		P-3		P-1		P-1		P-1		P-0		P-0					
		M-0		M-0		M-0		M-0		M-0		M-0					
November	03	R-1	04	R-4	04	R-3	00	R-0	01	R-1	02	R-2	02	R-2	06	R-5	
		P-1		P-0		P-1		P-0		P-0		P-0					
		M-1		M-0		M-0		M-0		M-0		M-0					
December	03	R-3	00	R-0	01	R-1	06	R-6	01	R-1	05	R-5	04	R-3			
		P-0		P-0		P-0		P-0		P-0		P-1					
		M-0		M-0		M-0		M-0		M-0		M-0					
Total	20	R-11	34	R-23	40	R-32	31	R-25	29	R-28	49	R-47	50	R-49	64	R-59	
		P-08		P-09		P-08		P-06		P-01		P-02		P-01			
		M-01		M-02		M-00		M-00		M-00		M-00		M-00			
Total received DNA sample as case number = 317 Rape = 59, Paternity = 40, Murder = 03									Note: R=Rape, P= Paternity, M= Murder								

Table 2: Monthly statistics of DNA sample collection as case number in DDSL, faridpur from 2012 to November 2019

Statistics of total DNA sample, send to NFDPL and received DNA test result in Divisional DNA Screening Laboratory, Faridpur Medical College Hospital from 2012 to November, 2019 are given below (Figure 1).

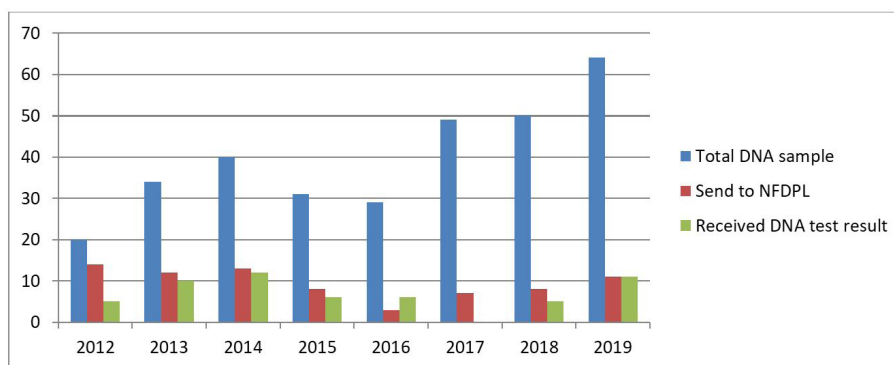


Figure 1: Statistics of total DNA sample, send to NFDPL and received DNA test result in Divisional DNA Screening Laboratory, Faridpur Medical College Hospital from 2012 to November, 2019

Discussion

DNA analysis is a most powerful tool for human identification and has clear forensic applications in identity testing (crime scene and mass disaster investigations) and parentage determination. The development of forensic DNA technology in other countries and its potential to improve the Bangladesh criminal justice system. The strength of DNA evidence to resolve crimes is well established in the US, Germany, Australia, New Zealand, Japan, the UK and other countries. However, the routine use of DNA evidence in criminal cases has yet to be adopted in the Bangladesh. The development of DNA testing and forensic science overseas has provided us a remarkable opportunity to improve our criminal justice system. Divisional forensic DNA screening laboratory and National forensic DNA profiling laboratory collaborately enhance and solve various case in criminal justice. The utility of forensic DNA testing in criminal investigations was highlighted using an actual criminal case wherein DNA evidence played a clear role in the resolution of the case [10].

DNA is considered as an ultimate unique identifier of any biological entity. Forensic DNA technology takes into account this uniqueness to accurately identify and distinguish individuals, establish heredity, separate human and nonhuman samples- which are of vital importance when investigating rape, murder, resolve paternity issues, identifying an unknown dead body and so forth. In this region basically southern part of Bangladesh are increasing rape victim, paternity case consecutively every year except 2015 & 2016 year. This screening laboratory service to the root level people through free of cost DNA test. By utilizing DNA test result Honorable Judge establishing faithfully criminal justice system and prevent violence against women & child. Overall all of sector officer basically who are related to the justice system, police section, laboratory section are accomplished to prevent violent against women free Bangladesh. Thus DNA profiling or DNA test gain most popularity in our country and contribution criminal justice system.

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Conflict of Interest

The author (s) declared no potential conflicts of the interest with respect to the present research work.

References

1. de Ungria MCA (2003) Forensic DNA Analysis in Criminal Investigations. Philippine J Sci 132: 13-4.
2. MSPVAW (2007) Introduction to Forensic DNA Profiling, Multiectoral Programme on Violence Against Women (MSPVAW), Ministry of Women & Children Affairs, Government of the People's Republic of Bangladesh, Bangladesh.
3. Jeffreys AJ, Wilson V, Thein SL (1985) Hypervariable minisatellite regions in human DNA. Nature 314: 67-72.
4. de Ungria MCA, Frani AM, Magno MMF, Tabbada KA, Calacal GC, et al. (2002) Evaluating DNA tests of motherless cases using a Philippine genetic database. Transfusion 42: 954-7.
5. de Ungria MCA (2003) Forensic DNA Analysis in Criminal Investigations, Philippine J Sci 132: 15-6.
6. Parker B, Peterson J (1970) Physical evidence utilization in the administration of criminal justice. In: Cohn SI, McMahon WB, eds. Law Enforcement, Science and Technology III. Chicago, Illinois Institute of Technology Research Institute, USA.
7. MSPVAW (2007) Introduction to Forensic DNA Profiling, Multiectoral Programme on Violence Against Women (MSPVAW), Ministry of Women & Children Affairs, Government of the People's Republic of Bangladesh, Bangladesh.
8. Islam R, Hossain MdN, Alam MdK, Uddin MdE, Rony MH, et al. (2020) Antibacterial Activity of Lactic Acid Bacteria and Extraction of Bacteriocin Protein. Adv Biosci Biotechnol 11: 49-59.
9. Weedn VW, Rogers GS, Henry BE (2016) DNA Testing in the Forensic Laboratory. Lab Medicine 29: 485-6.
10. de Ungria MCA (2003) Forensic DNA Analysis in Criminal Investigations. Philippine J Sci 132: 13-9.

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