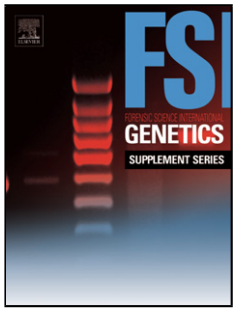

Title: The power of forensic DNA data bases in solving crime cases

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THE POWER OF FORENSIC DNA DATA BASES IN SOLVING CRIME CASES

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Abstract:

Forensic DNA databases constitute an important investigative resource in contemporary criminal justice systems. The centralized and computerized storage of DNA profiles in a database enables the systematic comparison and automated matching of crime scene samples and individual profiles. Many countries operate forensic DNA-databases to identify owners of crime related stains. Using DNA to trace people who are suspected of committing a crime has been a major advance in policing. When DNA profiling is used wisely it can help to convict people who have committed serious crimes or exonerate people who are innocent. DNA database is a computer database containing records of DNA profiles. Usually there are two different sources of these DNA profiles: crime scene DNA samples and individuals' DNA samples. The use of DNA databases in criminal investigations requires an individual's identity to be revealed only if there is a match between their DNA profile and a crime scene DNA profile.

We present two homicide cases where killers where identified by comparing the unknown STR's profile found on ropes, which were used to tie the victims, and exhibit from the crime scene with the Macedonian forensic DNA database stored in Forensic department of MIA. Statistical analyses were performed using DNA View software.

Introduction:

Forensic DNA databases constitute an important investigative resource in contemporary criminal justice systems. The centralized and computerized storage of DNA profiles in a database enables the systematic comparison and automated matching of crime scene samples and individual profiles.[1] Many countries operate forensic DNA-databases to identify owners of crime related stains.[2] Using DNA to trace people who are suspected of committing a crime has been a major advance in policing. When DNA profiling is used wisely it can help to convict people who have committed serious crimes or exonerate people who are innocent.[3] DNA database is a computer database containing records of DNA profiles. Usually there are two different sources of these DNA profiles: crime scene DNA samples and individuals' DNA samples. The use of DNA databases in criminal investigations requires an individual's identity to be revealed only if there is a match between their DNA profile and a crime scene DNA profile.

Case report 1

In a village near by the city of Kicevo a married couple was found killed and bodies were corded. During the autopsy blood from the two victims, nail debris and pieces from the ropes were sent for DNA analysis. Extraction of DNA was made with Qiagen mini kit. PCR reaction was performed with Identifier Amp Kit, and capillary electrophoresis was done on 310 Genetic analyzer. DNA profile from the rope which was used to tie the male's victim legs show autosomal STR profile from unknown male. The presumed unknown DNA profile was sent to the Macedonian forensic DNA database stored in the Forensic department of MIA. The result was negative.

After five years in one church a burglary happened. During the crime scene investigation blood was found on the broken window. The suspected person was arrested and buccal swab was taken for DNA analysis which was compared with the blood found on the broken window of the church and was a positive match. His profile was also run in the Macedonian National DNA data base and there was a positive match with the DNA profile extracted of the exhibit of the double murder of the married couple, so this case was solved.

Case report 2

In village Rankovce, an old woman was found killed in her barn and her body was corded on the mouth, hands and legs. During the crime scene investigation cigarette butt and other exhibit material were found in the house of the victim, which were taken for DNA analysis. During the autopsy blood from the victim, nail debris and pieces from the ropes were sent for DNA analysis. Extraction of DNA was made with Qiagen mini kit. PCR reaction was performed with Identifier Amp Kit, and capillary electrophoresis was done on 310 Genetic analyzer. DNA profile from the cigarette butts and from the bottle of coke showed unknown male DNA profile. The presumed unknown male DNA profile was sent to the Macedonian National DNA data basis, and there was a positive match with the prisoner convicted for drug trafficking, who was in that period released for the weekend.

Discussion and conclusion

The forensic DNA database may help criminal investigators to establish links between a particular suspect of a specific crime and other unsolved crimes, or can provide support to identify potential suspects while clearing other suspects in the early stages of an investigation.[1]
The political and financial investments in the implementation of forensic DNA databases and the ethical issues related to their use and expansion justify inquiries into their performance and general utility. The main function of the forensic DNA database is to produce matches between individuals and crime scene stains, which requires a constant input of individual profiles and crime scene stains.[1]
Our experience through those two cases shows that forensic DNA data base was crucial to identify the killers. There is an ongoing need for greater public and policy debate as DNA databases expand around the world. Some safeguards are implemented at the national or regional level, but there is a lack of global standards and a need for more societal engagement and debate.[4]
Extensive database and DNA profiling of criminals and indexing them will help to speed up crime detection.[5,6,7]
Larger DNA databases reduce crime rates, especially in categories where forensic evidence is likely to be collected at the scene—e.g., murder, rape, assault, and vehicle theft. The probability of arresting a suspect in new crimes falls as databases grow, likely due to selection effects. Back-of-the-envelope estimates of the marginal cost of preventing each crime suggest that DNA databases are much more cost-effective than other common law enforcement tools.[8]
Forensic DNA databases have the potential to prevent and detect crime.[1]

Role of founding

Financial support was provided by self founds from the Institute of forensic medicine, criminology and medical deontology, Faculty of medicine, Ss. Cyril and Methodius University, Skopje, Macedonia

Conflict of interest

None

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Table 1 Profile analysis results for autosomal STR's from the married couple victim, suspected and exhibit material

	Lokus	Victim1	Victime 2	Rope	Gloves	Suspected
1	D8S1179	11, 15	14, 16	9, 14	9, 14	9, 14
2	D21S11	28, 30	28, 30	28, 29	28, 29	28, 29
3	D7S820	10, 12	10, 12	8, 9	8, 9	8, 9
4	CSF1PO	11, 12	12, 12	10, 12	10, 12	10, 12
5	D3S1358	15, 16	14, 17	15, 18	15, 18	15, 18
6	TH01	6 , 9.3	8, 9.3	6,8	6,8	6,8
7	D13S317	11, 11	11, 13	10, 12	10, 12	10, 12
8	D16S539	11, 11	11, 12	12, 12	12, 12	12, 12
9	D2S1338	17, 17	17, 25	17, 23	17, 23	17, 23
10	D19S433	13, 14	12, 13	14, 14	14, 14	14, 14
11	vWA	17, 18	14, 16	17, 18	17, 18	17, 18
12	TPOX	8, 9	11, 11	11, 11	11, 11	11, 11
13	D18S51	13, 15	15, 17	15, 16	15, 16	15, 16
14	D5S818	11, 12	12, 12	12, 13	12, 13	12, 13
15	FGA	21 26	21, 23	23, 24	23, 24	23, 24
21	Amelogenin	XY	XX	XY	XY	XY

Table 2. Profile analysis results for autosomal STR's from the victim, suspected and exhibit material

	Lokus	Victim	Bottle of coke	Gigarette butt	Suspected
1	D8S1179	14, 14	12, 14	12, 14	12, 14
2	D21S11	28, 29	28, 29	28, 29	28, 29
3	D7S820	9, 11	8, 8	8, 8	8, 8
4	CSF1PO	11, 12	11, 11	11, 11	11, 11
5	D3S1358	15, 19	15, 18	15, 18	15, 18
6	TH01	8, 8	9, 9.3	9, 9.3	9, 9.3
7	D13S317	12, 14	11, 14	11, 14	11, 14
8	D16S539	11, 11	10, 11	10, 11	10, 11
9	D2S1338	23, 24	18, 24	18, 24	18, 24
10	D19S433	13, 15	14, 15	14, 15	14, 15
11	vWA	17, 17	16, 18	16, 18	16, 18
12	TPOX	9, 11	8, 11	8, 11	8, 11
13	D18S51	13, 16	14, 16	14, 16	14, 16
14	D5S818	11, 11	12, 12	12, 12	12, 12
15	FGA	21, 22	21, 24	21, 24	21, 24
21	Amelogenin	XX	XY	XY	XY