

THE ROLE OF DNA ANALYSIS ON CRIME INVESTIGATION

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Since Jeffreys, an English geneticist created the DNA fingerprint technique in the mid 1980's, DNA analysis methods have developed very quickly. It has become a very important tool in the examination of Bio-samples in forensic science. In our laboratory, DNA technique is progressively replacing the routine test of the Bio-sample. Up to now, we have been able to use this technique to identify many kinds of bio-samples, for example: blood (blood stain), semen stain, saliva (saliva stain), muscle, bone, tooth and hair-even when the amount is very small. DNA analysis technique has been a tool of great value in more than 2000 cases in our laboratory consisting of murder, rape, theft, dismembered bodies, pregnancy by rape and serial crime.

In this paper we will introduce some typical cases in which DNA analysis is used successfully.

Case 1:

Before dawn of May 30, 1999, a murder case took place at Shijingshan district of Beijing. In this case eight young women were killed. We collected nearly 80 bloodstains at the scene. These bloodstains were compared with the blood of the eight women in several STR loci, and the following conclusion was obtained:

1. Through comparison, we can draw a picture of the blood distribution at the scene and explicit the activity of each victim when the murder was occurring. It provided scientific clues for the investigator to recreate the scene of this case.
2. We collected two footprints with blood. One left a bloody sock; the other was left by a slipper that belonged to a dead woman outside the room. At the same time, the forensic pathologist confirmed that the eight women were stabbed to death by two single-edge knives. How many murderers were there in this case? This was a key to investigate and solve this case. Through examining footprints with blood and the slipper left at the scene, we found that the genotype of the bloodstain inside the slipper was a mixture of four victims, which was different from the bloodstain on the surface of the slipper but was identical with the footprint of the sock. From this, we deduced that the bloodstain inside the slipper was left by the same murderer who wore socks when committing the crime, and after that wore the slippers. So the same suspect left the footprints of the socks and the slippers.
3. The 9th genotype was detected from several bloodstains that were different from the eight victims. Through this, we concluded that the suspect had bled when the murder was occurring, and the genotype of the suspect was obtained. It provided the only evidence to identify the suspect.

After this case was solved, it was confirmed that there was one murderer indeed in this case, and the 9th genotype in the scene was the same as the suspect.

Case 2:

From Dec 10 to 13, 1998, several sacks that were filled with dismembered body parts were found in different area of Beijing. Its head and some guts were not found among these parts. In order to identify the source of the dismembered body parts, we used DNA methods. By using several STR loci, we found the genotype of all parts were identical, the Pm value is 3.3×10^{-12} . From this, we concluded that all these dismembered body parts were from one person.

Not so long after that, somebody reported that a man named Shiwei Gu was missing. In order to know whether the dismembered body was Shiwei Gu, we collected the blood of Shiwei Gu's sister, wife and daughter. By using several STR loci and mtDNA sequence analysis, we concluded that the dismembered body was Shiwei Gu daughter's biological father, and the possibility is 0.99995. MtDNA follows maternal heredity. By comparing the dismembered body's sequence with Shiwei Gu' sister, we

found that the bases and the positions of variation were the same. It confirmed that the dismembered body and the missing man was indeed the same person. The identification of the parts provided the right direction to the case detection.

Four months later, the suspect was found after the investigation. We found a bloodstain under the drawer of the writing desk at the suspect's home. STR and DNA sequencing results suggested that the genotype of the bloodstain was different from all members of this family and it was identical with Shiwei Gu's. The Pm value was 2.28×10^{-14} . Thus we concluded that this place was the first scene of the case.

Case 3:

September 22, 1998, a woman about 20 years old was killed at Yanqing county of Beijing. Six cigarette butts were found at the scene. The investigation department sent us more than 20 suspect's cigarette butts, they required our lab to analyze all these samples using DNA methods and compare the results of the suspects with the six cigarette butts left at the scene. At last we confirmed that the genotype of the six cigarette butts was identical with a suspect, the Pm value is 3.58×10^{-13} . So we concluded that this suspect left the cigarette butts at the scene. It proved that DNA analysis is very important in case detection.

The above three cases are only a representative of the large number of cases we have undertaken. It indicates that DNA analysis can point out the direction for detection. It is an important tool, which can provide important evidence to detect and solve cases rapidly and accurately.