DNA Analysis in China

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The Genetics Laboratory of the Institute of Forensic Sciences was the first DNA analysis unit established in China and is China's central and main DNA profiling laboratory. The laboratory, founded in 1987, began examining case evidence in 1989. One of its early cases was that of a serial rapist and murderer in Shijiazhuang, Hebei Province. This was similar to the celebrated DNA fingerprinting case of Colin Pitchfork, the first criminal ever to be convicted by DNA fingerprinting.* The early Chinese case provided an indication of the potential of DNA analysis:

1. It showed that four rape/murders were committed by the same man;
2. It demonstrated the effectiveness of DNA analysis as an investigative tool;
3. It saved the police enormous expense.

Evidence in this rape and murder case was examined with a multilocus probe (MLP). The probe detected the α-globin 3′ hypervariable region (HVR) and was kindly donated by Dr. Peter Gill of the Forensic Science Service in the United Kingdom. As new technologies developed, we moved from MLPs to the following methods successively.

After MLPs, we used single locus polymorphisms (SLP) to determine DNA profiles. After digesting the DNA with *Hae* III, three single locus probes were used to detect pMLJ14, a polymorphic DNA sequence on chromosome 14; pYNH24, a polymorphic DNA sequence on chromosome 2; and α-globin 3′ HVR.

Next, we employed the polymerase chain reaction (PCR) of variable number of tandem repeats (VNTR) alleles, or VNTR-PCR. PCR and silver staining were used to detect the following seven loci: D1S80, a VNTR DNA marker on chromosome 1; ApoB, a hypervariable locus 3′ to the apolipoprotein B gene; pYNZ22, a polymorphic DNA sequence on chromosome 17p; COL2A1, an AT-rich VNTR marker at the 3′-end of the collagen type IIα gene; IL6, an AT-rich VNTR marker at the 3′-end of the interleukin-6 (IL6) gene; p33.6 and p33.4. We also used minisatellite variant repeat (MVR) mapping to digitally code the MS32 minisatellite polymorphism, with detection of the region using an oligonucleotide probe labeled with horseradish peroxidase.

Currently, we employ short tandem repeat (STR) typing to evaluate our DNA samples. STR typing is more tolerant of degraded DNA templates than other previous methods of identification because the STR PCR products are less than 400bp long. Prior to 1993, we employed a multi-short tandem repeat (STR) system developed by our laboratory. This system included three loci: HUMTH01 (human tyrosine hydroxylase gene), HUMFABP (human fatty acid binding protein gene) and HUMARA (human androgen receptor gene). Currently, most DNA laboratories in China use one of Promega's *GenePrint*™ Systems, which provide a rapid method for accurate typing of very small amounts of DNA. STR typing is the main method used today in case examination.

We have found that PCR-based mitochondrial DNA (mtDNA) typing by direct automated sequencing is a reliable method of forensic identification. We have used amplification and sequencing of the polymorphic mitochondrial (mt) DNA region, 15997-16401, for identification of forensic DNA samples. Sequencing is performed with a Perkin-Elmer/Applied Biosystems Division automated DNA sequencer (model 377).

Over the past decade, China has set up over forty new DNA analysis laboratories, and additional laboratories are being founded in order to meet the demand for testing facilities for China's large population. The establishment of a national quality assurance system is extremely important for all of the laboratories in the Chinese system. Currently, a plan for construction of a national DNA database containing STR data is underway. Because there is a large, continuing demand for DNA profiling in China, the future development of our DNA analysis program is assured.

Figure 1. Attendees at a May 1998 STR training course at Beijing's Ministry of Public Security.

*Colin Pitchfork was convicted of the rape and murder of two English high school girls after the world's first DNA-based manhunt.