DNA ANALYSIS TECHNIQUES

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Introduction

The DNA analysis techniques that make it possible to identify a suspect using a person's unique genetic blue print have only been around since 1985. That's when Alec Jeffreys and his colleagues in England first demonstrated the use of DNA in a criminal investigation. Since then, DNA evidence has played a bigger and bigger role in many nations' criminal justice systems. It has been used to prove that suspects were involved in crimes and to free people who were wrongly convicted.

Polymerase Chain Reaction (PCR) Analysis

PCR analysis is a technique that allows technicians to create millions of precise DNA replications from a single sample of DNA. DNA amplification alongside PCR can let forensic scientists perform DNA analysis on samples that are as tiny as only a couple of skin cells. In contrast to some other DNA analysis techniques, PCR analysis has the advantage of analyzing minuscule sample sizes, even if they are degraded although they must not be contaminated with DNA from other sources during the collection, storage, and transport of the sample.

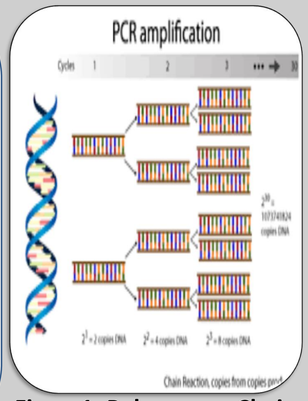

Figure1: Polymerase Chain Reaction (PCR) Analysis

Mitochondrial DNA (mtDNA) Analysis

MtDNA analysis works well on samples that are unable to be analyzed through STR analysis. There are two kinds of DNA in the cell: mitochondrial DNA and nuclear DNA. With other types of analysis, nuclear DNA is removed from the sample but with mitochondrial DNA analysis, DNA is removed from the cell's mitochondria. Sometimes, a sample can be old and will no longer have nuclear material in the cell; however, mitochondrial DNA can be removed, thus having important ramifications for cases that were not solved over many years. Mitochondrial DNA will be the same from a woman to her daughter because it is passed on from the egg cell.

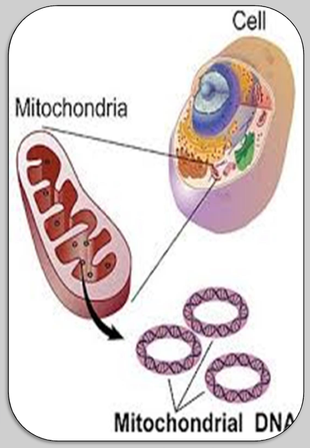

Figure2: Mitochondrial DNA Analysis

Short Tandem Repeat (STR) Analysis

STR analysis works to examine individual areas in DNA. The differences from the collective areas of one person to another can allow for distinguishing between individuals. In criminal investigations, there are 13 regions that are analyzed and compared to establish profiles. In fact, DNA databases used at the government level involve the sequence of these thirteen regions. The chances of two people having the exact same thirteen regions is virtually impossible - likely one in a billion.

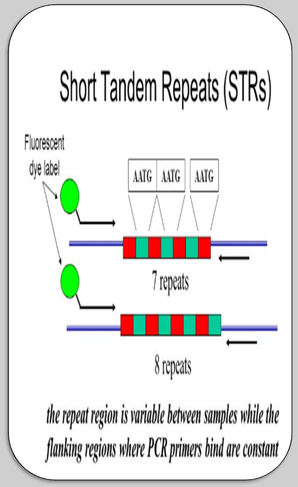

Figure3: Short Tandem Repeat (STR) Analysis

Y-Chromosome Analysis

Since the Y chromosome passes from a male to his son, analyzing genetic markers on a Y chromosome can be of aid in identifying familial ties in males. Another benefit of Y-chromosome analysis is to establish a family line over many generations.

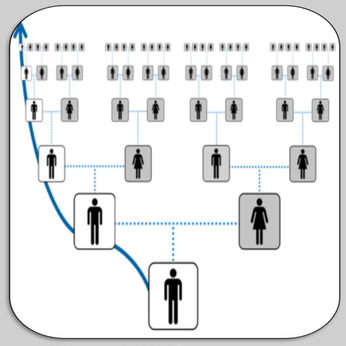

Figure4: Y-Chromosome analysis

Summary

There are techniques used in DNA analysis. However, most commonly used techniques are Polymerase Chain Reaction (PCR) analysis, Mitochondrial DNA analysis, Short Tandem Repeat (STR) analysis, and Y-Chromosome analysis. These techniques are mainly used in forensics science.

References

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