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QUESTION: EXPLAIN THE APPLICATIONS OF DNA FINGERPRINTING IN MEDICAL TECHNOLOGY

**DNA fingerprinting** is a laboratory technique used to establish a link between biological evidence and a suspect in a criminal investigation. It is also called DNA PROFILING. A DNA sample taken from a crime scene is compared with a DNA sample from a suspect. If the two DNA profiles are a match, then the evidence came from that suspect. Conversely, if the two DNA profiles do not match, then the evidence cannot have come from the suspect. DNA fingerprinting is also used to establish paternity. Dna fingerprinting is a technique that simultaneously detects lots of minisatellites in the genome to produce a pattern unique to an individual. DNA fingerprinting was invented in 1984 by Professor Sir Alec Jeffreys after he realised you could detect variations in human DNA, in the form of these minisatellites. DNA fingerprinting is a powerful tool for the pediatrician in cases of physical and sexual abuse and when issues arise regarding identification and familial relationships. If this technology is to be utilized effectively, the physician must know how to collect and document specimens. These sequences are unique to each individual, with the exception of identical twins. In DNA fingerprinting, scientists collect samples of DNA from different sources — for example, from a hair left behind at the crime scene and from the blood of victims and suspects. They then narrow in on the stretches of repetitive DNA scattered throughout these samples. The profile of repetitive regions in a particular sample represents its DNA fingerprint, which ends up looking a bit like a barcode. Each bar in the barcode represents one particular stretch of repetitive DNA.

Different methods used:

Different DNA fingerprinting methods exist, using either restriction fragment length polymorphism ([RFLP](https://www.thoughtco.com/rflp-definition-and-dna-analysis-applications-375574)), polymerase chain reaction (PCR), or both.

Each method targets different repeating polymorphic regions of DNA, including single nucleotide polymorphisms (SNPs) and short tandem repeats (STRs). The odds of identifying an individual correctly depends on the number of repeating sequences tested and their size.

**How DNA Fingerprinting Is Done**

For human testing, subjects typically are asked for a [DNA](https://www.thoughtco.com/dna-sequencing-methods-375671) sample, which can be supplied as a blood sample or as a swab of tissue from inside the mouth. Neither method is more or less accurate than the other, according to the [DNA Diagnostics Center](https://dnacenter.com/blog/swabs-vs-blood-samples-dna-testing/).

Patients often prefer mouth swabs because the method is less invasive, but it has a few drawbacks. If samples are not stored quickly and properly, bacteria can attack the cells containing DNA, reducing the accuracy of the results. Another issue is that cells are not visible, so there is no guarantee that DNA will be present after a swab.

Once collected, the samples are processed to extract the DNA, which is then augmented using one of the methods described previously (PCR, RFLP). The DNA is replicated, amplified, cut and separated through these (and other) processes to achieve a more thorough profile (fingerprint) to compare to the other samples.

DNA fingerprinting is generally regarded as a reliable forensic tool when properly done, but some scientists have called for wider sampling of human DNA to insure that the segments analyzed are indeed highly variable for all ethnic and racial groups. It is possible to create false genetic samples and use them to misdirect forensic investigators, but if those samples have been produced using gene amplification techniques they can be distinguished from normal DNA evidence. The technique is extensively used for forensic purposes. Deoxyribonucleic acid (DNA) is the vehicle of generational transference of heritable unit. While arching markers for genetic disease professor Alec Jeffreys discovered that certain regions of DNA showed variations in the number of tandem repeats known as variable number of tandem repeats (VNTRs). Thus DNA fingerprint was named by observing the number of repeated sequences which differ from individual to individual. The DNA fingerprinting in forensic science has generated considerable excitement in the criminal justice community. DNA fingerprinting can be applied to identify an individual in criminal and civil cases. Polymerase chain reaction has revolutionised molecular biology it has an ability to amplify (usually fewer than 3000 bp) a particular sequence of DNA into million of copies in a very short period. –

OTHER APPLICATIONS

**Plants and Animals**

DNA fingerprinting of plants and animals is performed for food security, food safety, identification and parentage. In food animals, DNA fingerprinting can be used to trace meat to the source animal. The technique can be used to identify endangered and non-endangered fish species, while the sources of plants can be verified to prevent counterfeiting of seeds and stock. Pathogenic food organisms can be quickly identified by their DNA fingerprints, allowing doctors to provide timely, targeted treatment.

**GENETIC FORENSIC**

A crime scene can contain biological samples, including blood, semen, saliva, skin, urine and hair, from perpetrators, victims and bystanders that can be processed to provide DNA fingerprints .The DNA fingerprints obtained are used to search existing databases for matches and to identify victims or suspects. The biological evidence and the DNA fingerprints can be used in trials to help prove guilt or innocence.

**Paternity Testing**

Testing paternity samples requires the collection of cells and comparison of DNA fingerprints from and between children and potential parents. Children will have a mix of DNA fingerprints inherited from each parent. When a child is conceived, each parent provides half of the genetic information. Most often the test is performed when the mother of the child is known but the father is in question. Since it is highly unlikely that any two people will have the same genetic fingerprint, paternity testing using DNA fingerprints is a reliable way to determine the parentage of a child. In Biological classification, it can help to show evolutionary change and relationships on the molecular level , it has the advantage of being able to be used even when only very small samples , such as tiny pieces of preserved tissue from extinct animals , are available .

**MOLECULAR ARCHEOLOGY**

This method of archeology DNA to determine a species of an archeological discovery or to trace blood lines of animal or human remains. DNA may be extracted from biological remains hair , teeth , body tissues, or even fossils. The best climates to preserve DNA are very cold temperatures and climates. Some examples of specimens from these types of climates are the ‘’Tyrolean Ice – MAN’’ who was found in the Alps and the mummies of Egypt found in the dry desert.

**DNA FINGERPRINTING IN MEDICAL DIAGNOSIS**

It is used to diagnose inherited disorders in both prenatal and newborn babies in hospitals around the world . These disorders may include cystic fibrosis , hemophilia , Huntingtons disease and many others . Each detection of such disorders enables the medical staff to prepare themselves and the parents for proper treatment of the child . In some programs genetic counselors use DNA fingerprint to help prospective parents understand the risk of having an affected child . In other programs prospective parents use DNA fingerprint information in their decisions concerning affected pregnancies