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REVIEW ARTICLE

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A SHORT REVIEW ABOUT DNA FINGER PRINTING AND IT'S APPLICATIONS

INTRODUCTION

The chemical structure of everyone's DNA is the same. The only difference between human or animal is the order of the base pairs. There are so many millions of base pairs in each person's DNA that every person has a different sequence. DNADNA (Deoxyribonucleic acid), the chemical basis of life that complexes with proteins to form the chromosomes. Structurally, DNA is a double helix-two thread like long strands of genetic material spiraled around each other. DNA is a pol ymer of deoxyribonucleotides composed of Base [Adenine (A), Thymine (T), Guanine (G), Cytosine (C)], Sugar and a Phosphate. The sequential arrangement of the individual nucleotides is responsible for giving uniqueness to any individual living form be it humans, animals, plants, or microbes.

The procedure for creating a DNA fingerprint consists of first obtaining a sample of cells containing DNA (e.g., from skin, blood, or hair), extracting the DNA, and purifying it. The DNA is then cut at specific points along the strand with substances called restriction enzymes. This produces fragments of varying lengths that are sorted by placing them on a gel and then subjecting the gel to an electric current(electrophoresis): the shorter the fragment the more quickly it will move toward the positive pole (anode). The sorted, double-stranded DNA fragments are then subjected to a blotting technique in which they are split into single strands and transferred to a nylon sheet. The fragments undergo autoradiography in which they are exposed to DNA probes pieces of synthetic DNA that have been made radioactive and that bind to the minisatellites. A piece of X-ray film is then exposed to the fragments, and a dark mark is produced at any point where a radioactive probe has become attached. The resultant pattern of these marks can then be analyzed.

If only a small amount of DNA is available for fingerprinting, a polymerase chain reaction (PCR) may be used to create thousands of copies of a DNA segment. PCR is an automated procedure in which certain oligonucleotide primers are used to repeatedly duplicate specific segments of DNA. Once an adequate amount of DNA has been produced, the exact sequence of nucleotide pairs in a segment of DNA can be determined using one of several biomolecular sequencing methods. Automated equipment has greatly increased the speed of DNA sequencing and has made available many new practical applications, including pinpointing segments of genes that cause genetic diseases, mapping the human genome, engineering drought-resistant plants, and producing biological drugs from genetically altered bacteria.

Applications of DNA Finger Printing

1. Paternity and Maternity
Because a person inherits his or her VNTRs from his or her parents, VNTR patterns can be used to establish paternity and maternity. The patterns are so specific that a parental VNTR pattern can be reconstructed even if only the children's VNTR patterns are known (the more children produced, the more reliable the reconstruction). Parent-child VNTR pattern analysis has been used to solve standard father-identification cases as well as more complicated cases of confirming legal nationality and, in instances of adoption, biological parenthood.

2. Criminal Identification and Forensics
DNA isolated from blood, hair, skin cells, or other genetic evidence left at the scene of a crime can be compared, through VNTR patterns, with the DNA of a criminal suspect to determine guilt or innocence. VNTR

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patterns are also useful in establishing the identity of a homicide victim, either from DNA found as evidence or from the body itself.

3. The notion of using DNA fingerprints as a sort of genetic bar code to identify individuals has been discussed, but this is not likely to happen anytime in the foreseeable future. The technology required to isolate, keep on file, and then analyze millions of very specified VNTR patterns is both expensive and impractical. Social security numbers, picture ID, and other more mundane methods are much more likely to remain the prevalent ways to establish personal identification.

4. Determine who a person's parents or siblings are. This test also may be used to identify the parents of babies who were switched at birth.

5. Solve crimes (forensic science). Blood, semen, skin, or other tissue left at the scene of a crime can be analyzed to help prove whether the suspect was or was not present at the crime scene.

6. Identify a body. This is useful if the body is badly decomposed or if only body parts are available, such as following a natural disaster or battle.

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