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DNA profiling in forensics

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DNA profiling is a technique used to determine the characteristics of an individual’s DNA. The basic requirement for DNA profiling is the availability of biological samples, such as bloodstains, a piece of hair with its root, a few drops of semen, skin cells, mouth swabs, cells from bone marrow, etc. In 1984, British genesis Alec Jeffreys developed the technique of DNA fingerprinting for the first time. Generally, DNA fingerprinting involves several steps, namely recovery of DNA, restriction digestion and electrophoresis (RELP), restriction fragment length polymorphism (RFLP), Southern blotting, autoradiography and analysis of banding pattern. The biological sample is isolated and the DNA is removed and dissolved in a suitable buffer for restriction digestion. The DNA sample is then cut into their respective fragments. Restriction of the fragments of source DNA ensures differences in the length of random repeats. The restriction enzyme is selected in such a way that it can cut on either side of the tandem repeats. Hind â… and Hae â…¢ are examples of restriction enzymes that are commonly used. After separation, the minisatellite DNA fragments are separated using agarose gel electrophoresis. This technique is called RFLP. The separated single-stranded DNA fragments are then transferred from gel to nylon membrane by Southern blotting. Single locus probes and multilocus probes are used in hybridisation, which is immediately performed after Southern blotting. Once hybridisation takes place between single-strand labelled probe DNA and complementary sequence of source DNA, it can be subjected to autoradiography. The X-ray film along with the probe records the pattern of radioactivity on the paper and the bands develop accordingly. By comparing the banding pattern with known resources, it can be detected whether the person’s DNA matches or if it does not match. Crime scene investigation, criminal verification, detection of genetic disorders and identification of blood relatives are some of the applications of DNA profiling. Therefore, DNA profiling is an essential forensic tool that can aid in various fields, from criminal investigation to medical research.

Keywords: Restriction enzyme, Restriction fragment length polymorphism, Gel electrophoresis, Southern blotting, Single locus probe, Autoradiography

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