Course- M.Sc. Botany Part II Paper- XVI

Topic- DNA fingerprinting (BIOTECHNOLOGY & BIOINFORMATICS)

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DNA fingerprinting

In rhyme with the word 'fingerprint' of common use by the detectives and police investigators of crimes and crime scenes, the group of molecular techniques employed to ascertain a person's identity is called 'DNA fingerprinting'. It is a popular term. In scientific parlance, it is DNA profiling.

Each of us has a unique DNA profile in respect to different genes, DNA sequences and repeats of specific and ordered nucleotides present on our different chromosomes.

The laboratory protocol of DNA profiling has been used, since its discovery by Alec Jeffreys in 1984, to identify criminals on the basis of the tiny DNA containing remnants (like semen, hairs, skin fragments, blood spots, saliva, swab etc.) left by them on the crime scene.

DNA profiling is also used to identify biological father or mother of a child in disputed paternity or maternity cases.

How it is done?

Classically, DNA sample from the scene (or child) is subjected to a specific restriction enzyme. The DNA is thus cut at specific restriction sites to produce fragments of short lengths. Today, the specific DNA lengths are produced by employing PCR with the help of suitable known primers complimentary to a desirable Microsatellite or Short Tandem Repeat (STR) pieces of DNA of ours.

These pieces are then separated by Gel electrophoresis (Fig.2). Separated pieces are transferred from the Gel to a nylon membrane where they are made to melt into single strands.

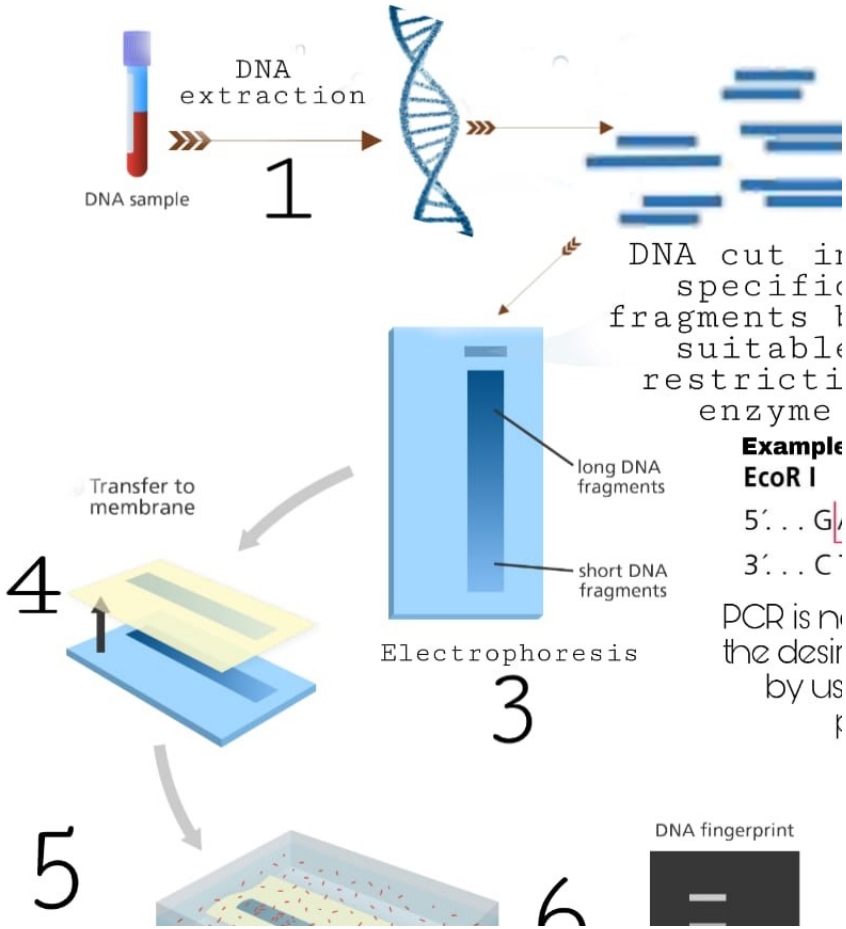
Then the nylon membrane is incubated with the known DNA probe created and tagged with radioactive phosphorus. 'Probe' is the sequence of the known minisatellite or DNA sequence from the person concerned or the suspect.

The probe attaches with the complimentary SS DNA pieces in the sample (if they are there). The final result can be seen by exposing the nylon membrane with DNA to an X-ray film.

Now, instead of one STR, two or several different STR sequences are used in the process to make sure that possibly most authenticated result is obtained as DNA fingerprinting would be a matter of life and death for the suspect.

Today X-ray filming is not used. Instead, DNA fragments are passed through a laser to cause the fragments tagged with fluorescent tags to glow.

Now go through the article https://www.yourgenome.org/facts/what-is-a-dna-fingerprint by the Wellcome Genome Campus, UK.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Electrophoresis
3
Transfer to membrane
4
5
6
DNA fingerprint

Fig. 2