

BIOINFORMATICS: LECTURE 3: Molecular Techniques - DNA FINGERPRINTING

Course name: Bioinformatics and Computer Application

Course Code: MSCCONBC401



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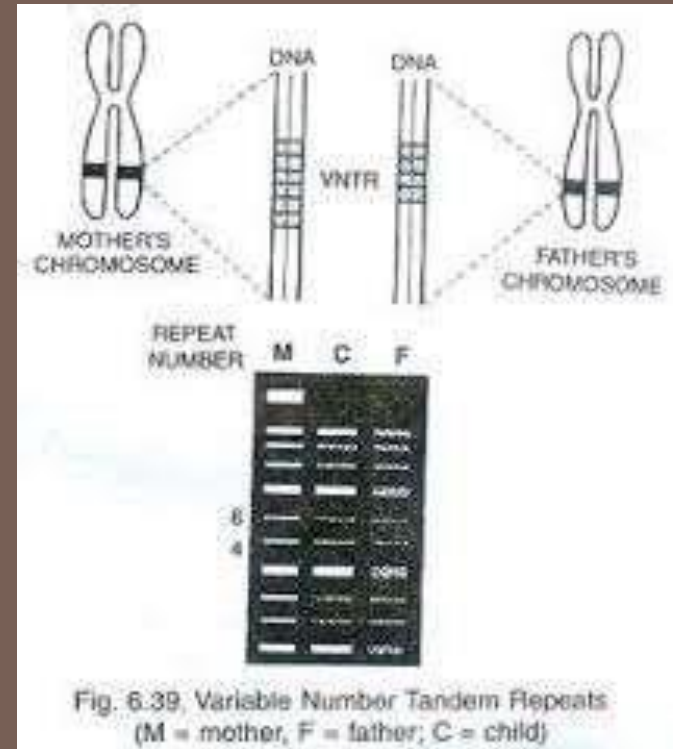
What is DNA Fingerprinting?

- ❖ DNA Fingerprinting is a forensic technique used to identify individuals by characteristics of their DNA.
- ❖ The process of DNA fingerprinting was invented by Alec Jeffrey at the University of Leicester in 1985.
- ❖ Also called DNA Profiling or Molecular Fingerprinting.

PRINCIPLE

❖ Variable Number of Tandem Repeats {VNTR} Small part of DNA vary from individual to individual

❖ Chances 30,000 million to 1 (except for identical twins).



METHODOLOGY

Steps involved :-

1. DNA Extraction
2. DNA Cutting
3. Gel Electrophoresis
4. Southern Hybridization
5. Autoradiography

1. DNA Extraction

- Cells are broken down to release DNA.

- Sample Collect from:-

- Blood
- Hair
- Saliva
- Semen
- Body tissue cells



2. DNA Cutting

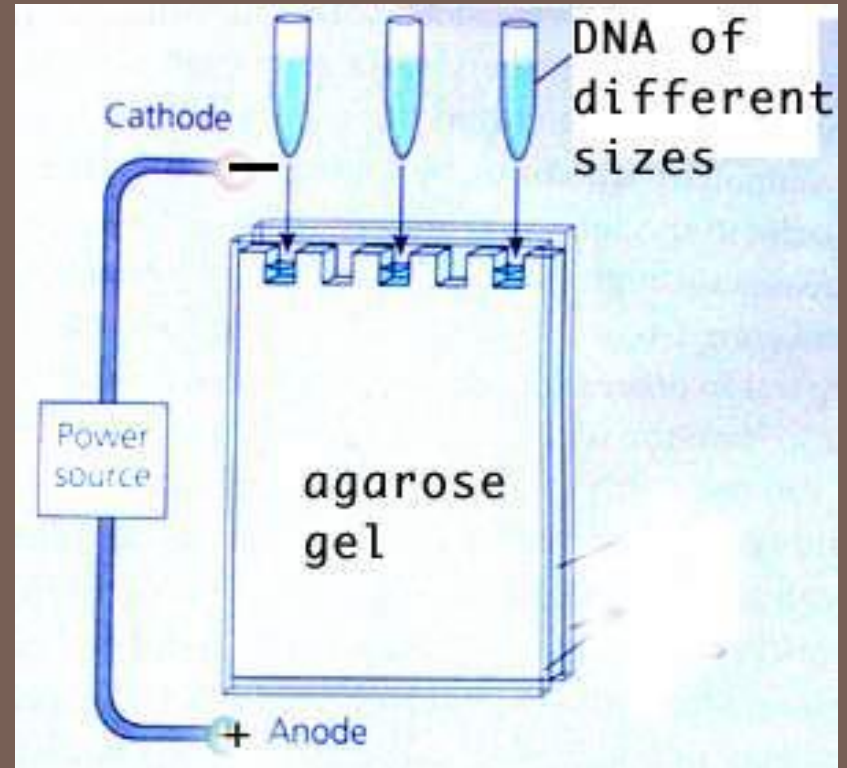
❖ The DNA is cut into fragments using **restriction enzymes**.

Each restriction enzyme cuts DNA at a specific base sequence.



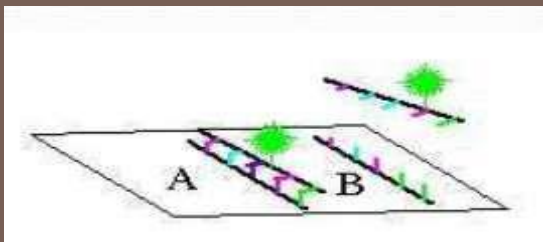
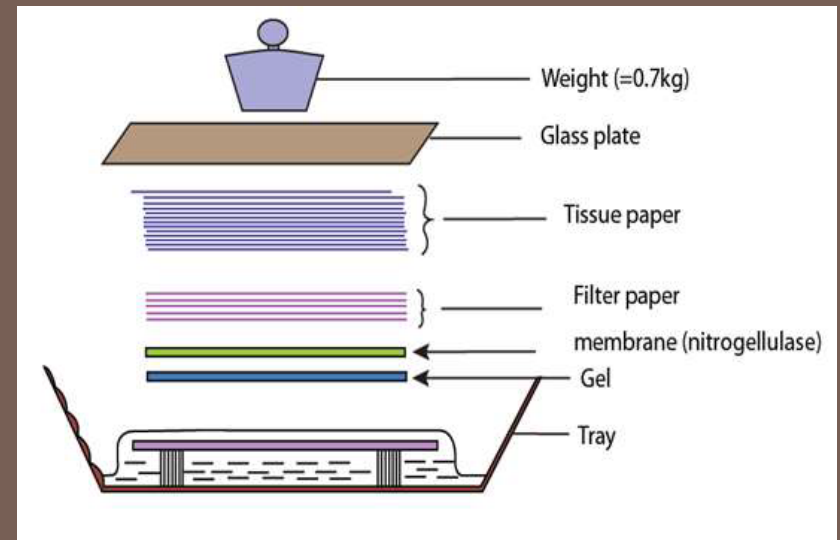
3. Gel Electrophoresis

- ❖ Fragments separated by length
- ❖ DNA (negatively charged)
- ❖ Moves towards +ve terminal
- ❖ Shorter fragments move faster



4. Southern Hybridization

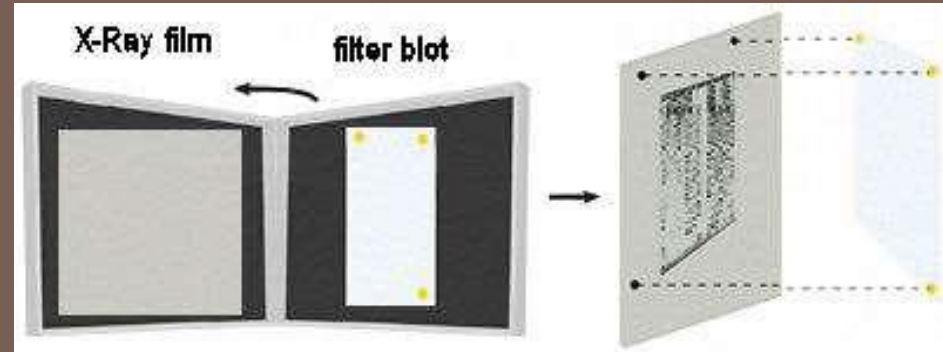
- ❖ DNA fragments transferred from gel to filter paper or nylon membrane
- ❖ DNA is split into single strands using an alkaline solution



- ❖ Radioactive probe in solution binds to DNA

5. Autoradiography

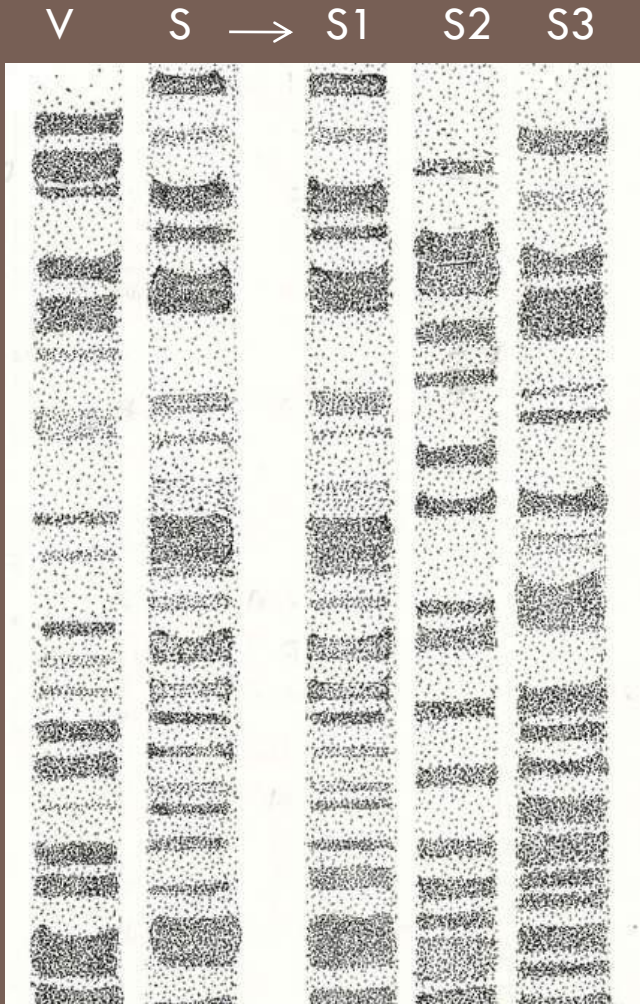
- ❖ X-ray film placed over filter paper.
- ❖ Radioactivity probes makes dark spots on film.
- ❖ DNA Fingerprinting patterns



EXAMPLE

- ❖ Violent murder case.
- ❖ The forensics team retrieved a blood sample from the crime scene.
- ❖ They prepared DNA profiles of the blood sample, the victim and a suspect as follows:

DNA Profile



V = victim

S = sample from crime scene

S1 = suspect 1

S2 = suspect 2

S3 = suspect 3

Paternity Test

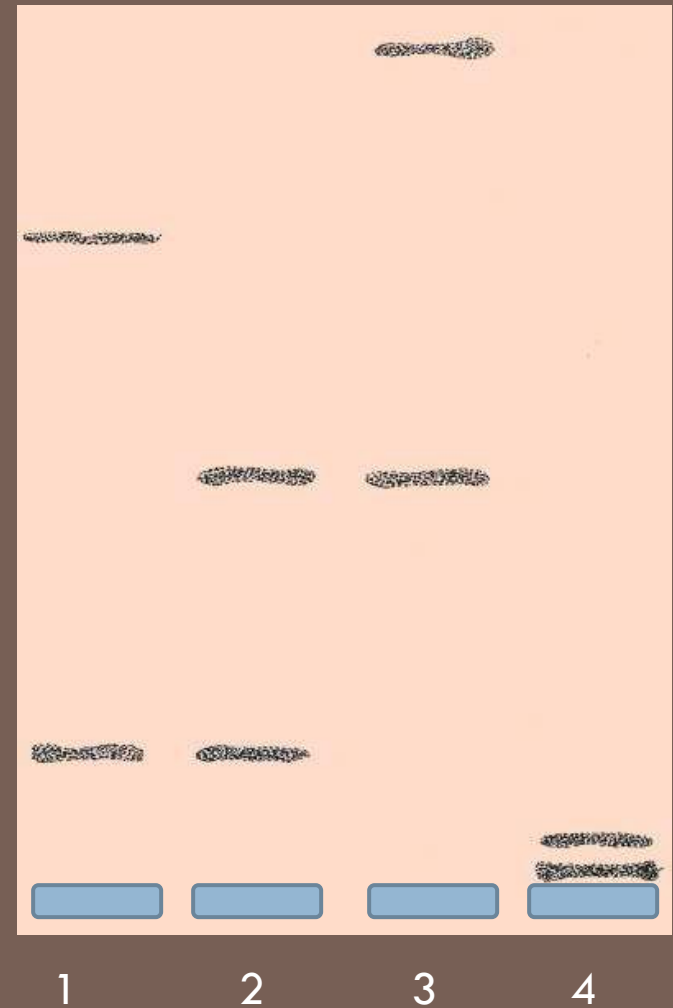
1 = mother

2 = son

3 = possible father A

4 = possible father B

There is a match between one of the child's restriction fragments and one of the mother's.



APPLICATIONS

- **Individuality**
- **Paternity/Maternity Disputes**
- **Hereditary Diseases**
- **Forensics**
- **Sociology**