

DNA Fingerprinting



DNA Fingerprinting , Principle , Steps and Applications

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).

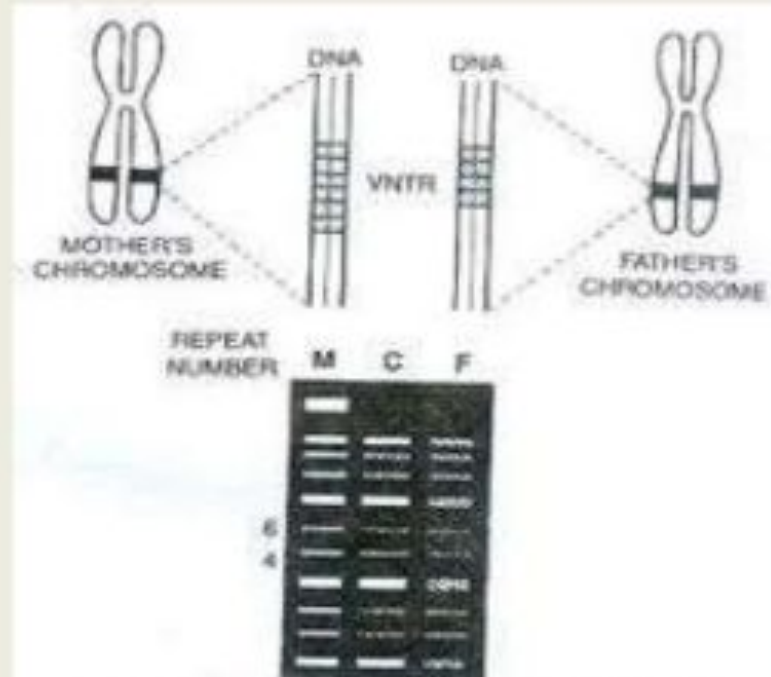


Fig. 6.39. Variable Number Tandem Repeats (M = mother, F = father; C = child)

Methodology

Steps involved :-

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

Steps involved in DNA fingerprinting technique.

1. DNA EXTRACTION



- Cells are broken down to release DNA.
- Sample Collect from:-
 - ✓ Blood
 - ✓ Hair
 - ✓ Saliva
 - ✓ Semen
 - ✓ Body tissue cell

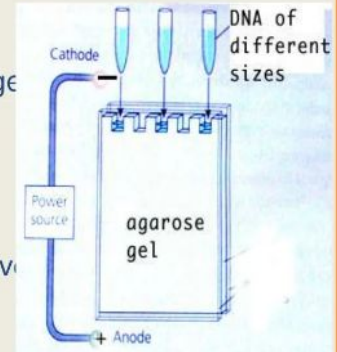
2. DNA CUTTING

- The DNA is cut into fragments using **restriction enzymes**.
- Each restriction enzyme cuts DNA at a specific base sequence.

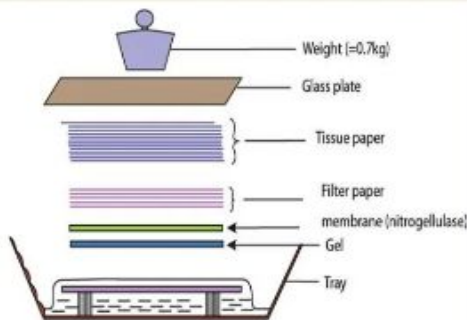


3. Gel Electrophoresis

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

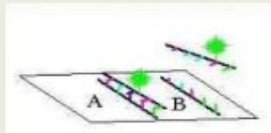


4. Southern Hybridization

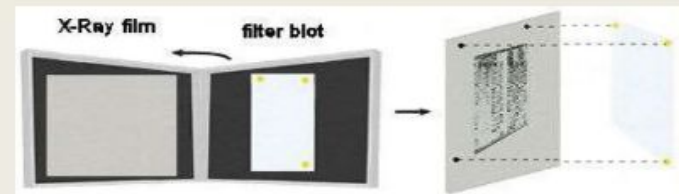


- DNA fragments transferred from gel to filter paper or nylon membrane
- DNA is split into single strands using an alkaline solution

- Radioactive probe in solution binds to DNA

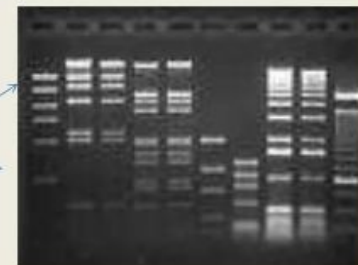


5. Autoradiography

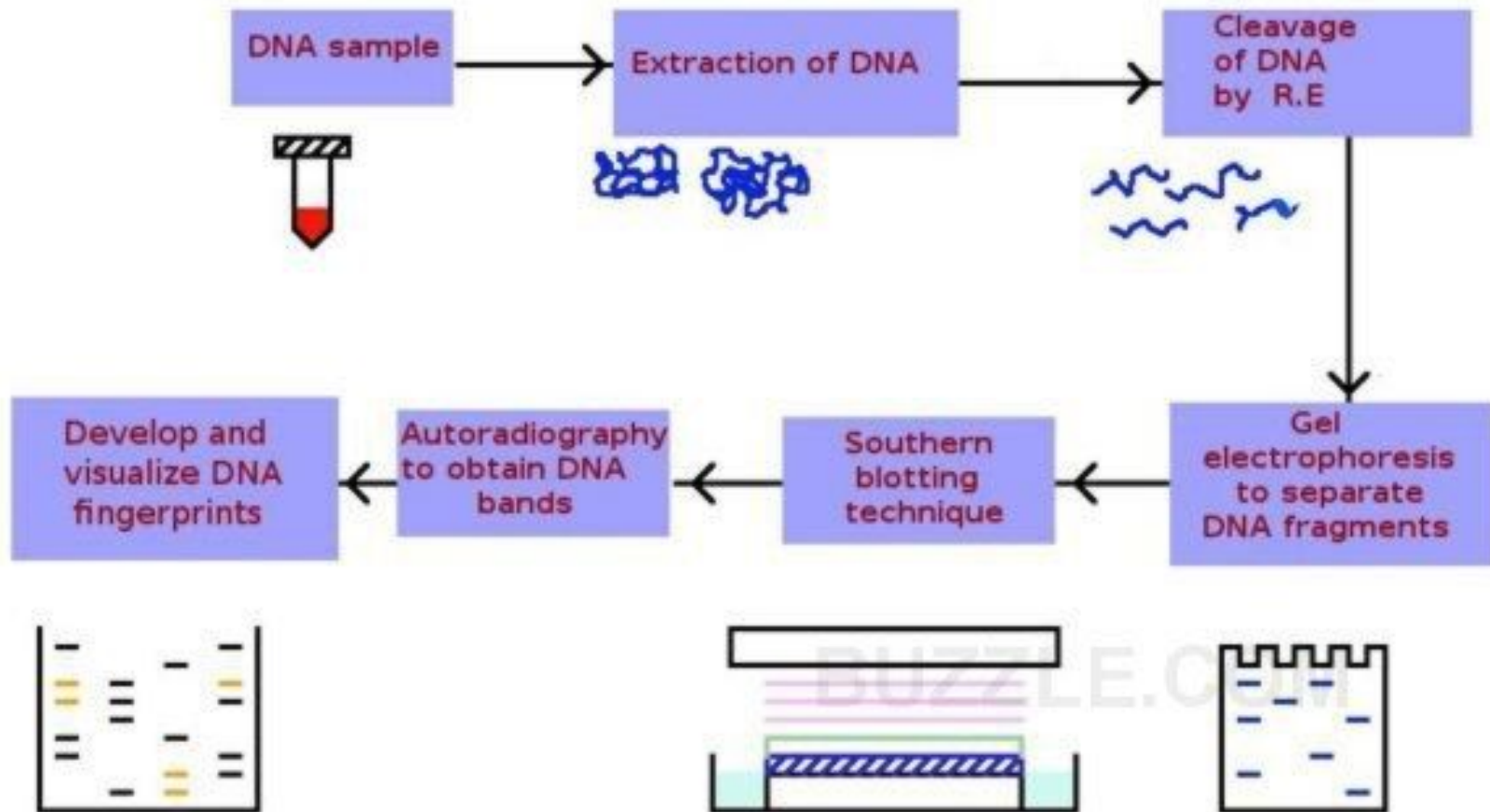


- X-ray film placed over filter paper.
- Radioactivity probes makes dark spots on film.

DNA Fingerprinting patterns



Steps involved in DNA fingerprinting technique.



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**

Applications

- Forensic cases -- **matching suspect with evidence**
- Paternity testing -- **identifying father**
- Historical investigations
- Missing persons investigations
- Mass disasters – **matching tissue to known DNA to identify victims**
- Military DNA “dog tag”